The Journal of

Economic Perspectives

A journal of the
American Economic Association

Summer 2024

The Journal of
Economic Perspectives

Contents   *Volume 38 • Number 3 • Summer 2024*

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Sweeping Changes and an Uncertain Legacy: The Tax Cuts and Jobs Act of 2017

William G. Gale, Jeffrey L. Hoopes, and Kyle Pomerleau

After the 2016 election, when Donald Trump won the presidency and Republicans held both chambers of Congress, lawmakers made tax reform a priority. The official process was quick. The Tax Cuts and Jobs Act was introduced on November 2, 2017, and signed into law on December 22, 2017. Although the bill was arguably the most sweeping realignment of the US tax code since the Tax Reform Act of 1986, there were no hearings. Stakeholders had little time to comment on the bill. That said, the provisions enacted in the law had strong antecedents in ideas that had been expressed in previous years by lawmakers in both chambers of Congress, by President Barack Obama, and by presidential candidates from both parties.

The 2017 law combined a substantial tax cut for individuals and businesses with significant broadening of the tax base. But in 2017, Senate Republicans only had a slim majority and did not have the 60 votes needed to overcome a filibuster. A budget procedure called "reconciliation" allows lawmakers to make certain budgetary changes with only a simple majority. However, a Senate procedural rule known as the "Byrd rule"—named after Senator Robert Byrd (D-West Virginia) and dating

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back to 1985—requires that reconciliation bills cannot increase the federal budget deficit outside of the ten-year budget window. Thus, Republicans needed either to offset any tax cut after the tenth year or make some of the tax cuts temporary. They opted to make almost all the individual income tax provisions expire at the end of 2025, hoping to extend them when the time came. Having met the requirements to pass the bill through the reconciliation process, Republicans passed what was technically known as "The Act to provide for reconciliation pursuant to titles II and V of the concurrent resolution on the budget for fiscal year 2018" along strictly party lines in both the House (224–201) and Senate (51–48).

In this paper, we begin by describing the major goals and provisions of the Tax Cuts and Jobs Act, and the build-up of tax reform ideas in advance of 2017. We then review the evidence of its impact on tax simplification, marginal tax rates, the government budget, several measures of aggregate economic activity, including business investment, and the distribution of resources.

The Tax Cuts and Jobs Act offers a fresh opportunity to examine the effects of taxes on economic behavior.[1] Indeed, as Slemrod (2018) wryly remarked in this journal: "[W]hether or not the Tax Cut and Jobs Act is good for the US economy and its population, it is clearly good for those of us who study taxation." Estimating the impact of the Tax Cuts and Jobs Act and its individual provisions can be difficult, both because so many provisions changed at the same time and because contemporaneous economy-wide events may have blurred the tax effects. However, we will also present some survey evidence that the economics profession understood the likely consequences of the law when it was passed, as shown by the evidence that has accumulated since then.

Other papers in this symposium then delve more deeply into particular aspects of the law, with discussions of changes to the individual income tax, the taxation of domestic business income, provisions concerning international business taxation, and the attempt to encourage place-based economic development through "opportunity zones."

Goals and Major Provisions

Prior to 2017, the last major tax overhaul occurred in 1986. There was a bipartisan understanding that the tax system needed reform, and even some general agreement on the direction of needed reforms. However, the bill was ultimately put together by the slim Republican majority in Congress, which approached tax reform with several major goals.

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[1]Auerbach (2018), Barro and Furman (2018), Gale et al. (2019), and Slemrod (2018) provide early analyses of the Tax Cuts and Jobs Act. The TCJA Tracker, https://tax.kenaninstitute.unc.edu/what-do-we-know-about-the-effects-of-the-tax-cuts-and-jobs-act/, provides a repository of papers addressing effects of the Act.

The first was business "competitiveness," which in this context refers to the belief that lower corporate taxes would help US firms gain market share when competing against foreign rivals. Prior to the Tax Cut and Jobs Act, US corporations faced the highest statutory tax rate among any advanced economy—about 39 percent when considering federal and state levies (Pomerleau 2023). In addition, most other countries had "territorial" systems, in which their firms paid tax domestically only on their domestic profits. In contrast, US-based multinational corporations paid US tax on their worldwide profits, but could defer tax on actively-earned foreign profits until they were repatriated to the US parent company, at which time they also received a credit for having paid foreign taxes (Pomerleau 2021). This situation generated twin concerns that it discouraged US firms from repatriating foreign profits to the US parent and disadvantaged US companies when competing overseas. Republican lawmakers also wanted to reduce taxes for pass-through businesses. Income from pass-through businesses does not face the corporate tax; instead, it is passed on to the owners and falls under the individual income tax. Over 60 percent of net business income reported to the IRS comes from pass-through firms (Pomerleau 2022).

The second goal was economic growth and a more efficient economy (Gaertner, Hoopes, and Williams 2019). Supporters believed that reducing marginal tax rates would raise the size of the economy by reducing penalties on saving and investment and that reducing the dispersion of the tax rates across alternative uses would reduce distortions in the allocation of economic resources. These distortions ranged from addressing "special interest subsidies" like credits and deductions for specific economic activities to international profit shifting and corporate base erosions and "tax subsidies for debt-financed investment" (House GOP 2016).[2]

Simplifying individual income tax compliance costs was a third goal. Rep. Dave Camp (R-Michigan) stated in 2011 that "the tax code is onerous and burdensome because it is too complex, too costly and requires too much time to be spent on compliance" (House Ways and Means Committee 2011). Speaking about the 2017 Act, then-President Trump commented, "We're going to simplify very greatly the tax code. H&R Block probably won't be too happy. That's one business that might not be happy with what we're doing" (Isidore 2017).

In keeping with these goals, the Tax Cuts and Jobs Act made dozens of changes to the individual income tax, the corporate income tax, and estate and gift taxes. Table 1 shows the major features of the law and their ten-year revenue costs as scored by the Joint Committee on Taxation at the time the law was passed.

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[2]By convention, the Joint Committee on Taxation estimates the revenue change of a tax plan while assuming that behavioral changes cannot increase the total amount of income. Republican lawmakers were generally in favor of using "dynamic scoring," which would relax the fixed national income assumption, so that policies which changed total output would have a direct effect on tax revenue (Paletta 2014). Proponents of dynamic scoring argued that this would make tax reform easier by allowing economic growth to pay for part of the "static" revenue loss (Hodge 2015).

Table 1
Revenue Effects of Key Provisions of the Tax Cuts and Jobs Act

Provision	Revenue Effect 2018–2027 ($ Billions)
Individual changes, total:	***−1,127***
New tax rate and bracket structure	−1,214
Expand the standard deduction and repeal personal exemptions	491
Index tax provisions to chained CPI	134
New pass-through business deduction	−415
Pass-through business loss limits	150
Expand Child Tax Credit (CTC) and new non-child dependent credit	−573
Repeal and modifications to itemized deductions	668
Increase Alternative Minimum Tax (AMT) exemption phaseout threshold	−637
Reforms to certain deductions and credits	25
Reforms to certain individual tax expenditures, including the ACA individual mandate	328
Double Estate Tax Exemption	−83
Corporate changes, total:	***−654***
Reduce corporate tax rate to 21 percent, repeal corporate AMT	−1,389
Net interest deduction capped at 30 percent of income	253
Changes to the treatment of investment	−86
Modification to net operating loss deductions	201
Amortize research & experimentation costs	120
Repeal of Domestic Production Deduction	98
Reforms to certain business tax expenditures	149
International changes, total	***324***
Territorial System	−224
Special one-time repatriation rate	339
Other international reforms	210
TOTAL	***−1,456***

Source: This table reports Joint Committee on Taxation (2017) estimates of the revenue effects of major TCJA provisions, in broad categories reported by PWBM (2017).
Note: All estimates assume provisions of the Tax Cuts and Jobs Act will sunset as planned under current law.

The first twelve rows of Table 1 show changes to individual taxes. The largest revenue consequences stem from the reduction in marginal tax rates. In simplifying taxes, the Tax Cuts and Jobs Act consolidated several family benefits by eliminating personal and dependent exemptions, expanding the child tax credit, enacting a non–child dependent exemption, and roughly doubling the standard deduction. In combination with new limits on the state and local tax deduction and the home mortgage interest deduction, the increase in the standard deduction was meant to reduce the number of itemizers. At the same time, the income level at which the alternative minimum income tax might apply was greatly increased and the overall

limitation to itemized deductions was eliminated. The TCJA also introduced a new 20 percent deduction for certain forms of pass-through business income.

The tax on individuals who did not have health insurance coverage, enacted in the Patient Protection and Affordable Care Act of 2010, was set to zero. The measure used to index income tax parameters for inflation was changed from the standard Consumer Price Index for All Urban Consumers (CPI-U) to a "chained" version of the index that allows for greater substitution away from those goods and services where price changes have been relatively higher—and thus generally leads to a lower inflation adjustment for tax parameters. The estate tax exemption was increased substantially, so that fewer taxpayers would be affected by the estate tax. All of these provisions are set to expire at the end of 2025, except for indexing and the elimination of the health insurance penalty.

The next eight rows show some historic changes in corporate taxation. Prior to 2017, the corporate tax had a graduated rate structure, though the largest firms faced, and most revenue derived from, the top rate of 35 percent. The act converted the corporate tax to a flat rate at 21 percent and repealed the corporate alternative minimum tax. The law enacted, temporarily, 100 percent "bonus depreciation," which allowed firms to count the entire cost of certain investments as a current expense, rather than depreciating them over time, reducing the after-tax cost of investment. Several other changes were designed, at least in part, to reduce the net cost of the bill: a tighter limit on net interest expense deductions as a proportion of income; a requirement that businesses amortize research and development expenses over time as opposed to immediately deducting them (starting in 2022); a tighter limit on the use of net operating losses to reduce taxable income; and the elimination of the Domestic Production Activities Deduction that had been available to firms with most of their production or work in the United States.

The final few rows of Table 1 show the main alterations in tax treatment of multinational corporations, which moved US corporate taxation toward a territorial system. The primary reform was to enact a "participation exemption," which eliminated the tax on profits paid from controlled foreign corporations to US parent firms. One challenge of pure territorial systems is that firms have larger incentives to shift profits outside the United States to reduce their tax burden than under residence-based systems. To reduce such activity, the law included a variety of so-called "guardrails:" global intangible low-taxed income (GILTI), foreign-derived intangible income (FDII), and the base erosion and anti-abuse tax (BEAT). In addition, the Tax Cuts and Jobs Act enacted a one-time tax on previously accumulated but unrepatriated, and therefore untaxed, foreign profits.

A wide variety of other changes in the Tax Cuts ad Jobs Act created or altered tax provisions ranging from "opportunity zones," excise taxes on alcohol, limits on executive compensation, and tax breaks that benefited private jet companies and the owners of dead citrus trees. The 2017 law also included provisions beyond taxation, including a mandate to open the Arctic National Wildlife Refuge to oil and gas drilling.

The Road to 2017

Although the Tax Cuts and Jobs Act of 2017 was passed into law quickly after being introduced, there had been an active discussion about many of its provisions for several years. Many of the roots of TCJA were present in a 2014 bill introduced by Representative Dave Camp (R-Michigan), Chairman of the House Ways and Means Committee. That bill would have increased the standard deduction and the Child Tax Credit, while eliminating the personal exemption and state and local tax deduction. It would have reduced top statutory rates to 35 percent for individuals and 25 percent for corporations, and taxed pass-through business income generated from manufacturing activity at 25 percent. Camp's bill would also have shifted US multinationals to a quasi-territorial system. Corporations could repatriate earnings back to the United States, tax-free, but would face a minimum tax on foreign profits above a deemed return (Joint Committee on Taxation 2014).

A year later, the US Senate Committee on Finance (2015) launched five bipartisan working groups, covering individual income taxation, business income taxation, savings and investment, international taxation, and community development and infrastructure. The working groups did not produce any specific tax plan, but discussed several tax proposals that made their way into the Tax Cuts and Jobs Act, including limiting business deductions for interest payments and taxing all currently deferred foreign profits at a discounted rate over several years.

In 2016, the Obama administration released a business-only tax reform plan. Like the Camp bill, it was revenue-neutral and proposed a territorial tax system with a minimum tax on foreign profits, an allowance for corporate equity (similar to an exemption for a deemed return), and limits on the foreign tax credit. It proposed reducing the top corporate tax rate to 28 percent, eliminating the corporate alternative minimum tax, curtailing interest deductions, and eliminating many corporate tax expenditures, most notably for the oil and gas industries. It also argued for including a one-time levy on currently deferred profits in the transition to a new system for treating foreign income of multinationals. These ideas elaborated on a 2012 proposal from the Obama administration (White House and US Department of the Treasury 2012, 2016).

Also in 2016, House Republican leadership—Speaker of the House Paul Ryan (R-Wisconsin) and Chairman of the Ways and Means Committee Kevin Brady (R-Texas)—released what they called the "Blueprint" (House GOP 2016). Like the Camp bill, for the individual income tax, the plan would cut tax rates, reform family benefits, limit itemized deductions, and eliminate the individual alternative minimum tax. For corporations and other businesses, the Blueprint introduced the so-called "destination-based cash flow tax," which would have adjusted the corporate tax in three fundamental ways: it would allow expensing (full, immediate write-offs) of investment; it would eliminate interest deductions; and rather than using either a worldwide or territorial system to tax multinationals, it would "border adjust" taxes—that is, it would tax imports and exempt exports (Auerbach 2010; Gaertner, Hoopes, and Maydew 2019). Border adjustment generated widespread opposition

and was eventually dropped. But the Tax Cut and Job Act moved towards a cash flow tax by including bonus depreciation and partially limiting interest deductions.

From a broader perspective, the Tax Cuts and Jobs Act reflected two different approaches to tax reform. One approach focuses on "broaden the tax base and reduce marginal tax rates." In this spirit, the earlier Tax Reform Act of 1986 reduced statutory tax rates for both businesses and individuals and contained numerous base-broadening provisions.[3] Indeed, by limiting the deduction for state and local taxes (which barely survived the 1986 act) and in modernizing the taxation of foreign profits of multinational corporations, the TCJA in some ways went farther than the 1986 law. However, whereas the 1986 law sought to tax more forms of income at the same rate, the 2017 law introduced new distortions, such as subsidies for business income relative to wage income.

The second approach focuses on reducing taxes in the hope of stimulating economic growth or reducing other distortions (Romer and Romer 2010). In this spirit, major tax cuts occurred in 1981, 2001, 2003, 2010, and 2012, with relatively minor increases in 1990 and 1993. In particular, the Tax Cuts and Jobs Act has much in common with 1981 tax cuts under President Reagan and the 2001 and 2003 tax cuts under President Bush, which were extended under President Obama for all taxpayers in 2010 and most taxpayers in 2012 (Hanlon and Hoopes 2014). Those reforms were focused on reducing marginal tax rates as a way to stimulate growth, but they also cut revenues substantially and were regressive.

Another way that tax reforms differ is in their ability to survive. For example, the "broaden the tax base, cut the rates" bipartisan deal in the 1986 Tax Reform Act began to unravel just a few years after it was enacted. In contrast, although the TCJA was approved by strict party line votes, when the Democrats had control of both Houses of Congress and the White House starting in 2021, they did not make any significant changes to TCJA, even when they passed a major tax reform of their own, also by strictly party line votes. But many provisions of the TCJA seem likely to be relegislated in 2025, when significant portions are scheduled to expire.

Simplification

In many ways, the Tax Cut and Jobs Act succeeded in its goal of simplifying the individual income tax. Measuring simplification is not simple. But as one measure, in 2017, about 31 percent of tax filers itemized their deductions rather than taking the standard deduction (IRS 2017a). Itemizing deductions required tracking expenses such as mortgage interest, charitable contributions, healthcare, and state and local taxes. In 2018, this figure fell to 11 percent of taxpayers (IRS 2018a). Further, before the 2017 tax act, 55 percent of households earning more than

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[3] The Tax Reform Act of 1986 was subject of a symposium in the first issue of the Journal of Economic Perspectives. In particular, see Auerbach (1987), Hausman and Poterba (1987), McLure and Zodrow (1987), Musgrave (1987), and Pechman (1987).

$200,000 a year were subject to the Alternative Minimum Tax—a parallel income tax with its own independent tax calculation that increased the cost of complying with the tax code (IRS 2017b). In 2018, this figure fell to 2.3 percent (IRS 2018b).

The biggest potential setbacks on the simplification front relate to business taxation. The deduction for pass-through business is complex. It allows for new ways to shelter income and creates new distinctions in the tax law (Kamin et al. 2018). Also, some of the international provisions, such as the global intangible low-taxed income tax and the base erosion and anti-abuse tax, are difficult to comply with and to audit, and may have spurred entirely new forms of tax planning (Kelley et al. 2023).

Marginal Tax Rates: Levels and Dispersion

The Tax Cut and Jobs Act clearly succeeded in reducing the level of marginal tax rates on labor and capital income and the dispersion of such rates across types of firms and financing options. The Congressional Budget Office (2018b) estimated that the marginal tax rate on labor would be persistently lower from 2018 until 2025 (when the individual tax cuts are scheduled to expire, absent Congressional action), primarily due to lower statutory income tax rates.

The Congressional Budget Office (2018b) also projected that the effective marginal tax rate on capital would fall early in the budget window then rise slowly through the decade as certain provisions expired. The effective marginal rate is a theoretical measure of the burden on a "marginal" investment, or an investment that just breaks even in present value terms. The CBO measure captures both the taxes on the returns and the value of any deductions and credits business receive for new investment projects. The primary mechanisms by which capital tax rates fell were the cut in the corporate rate, the pass-through deduction, and the expansion of expensing. Partially offsetting these provisions were the limitation on interest payments and the amortization of research and development expenses (which went into force in 2022), among other provisions discussed above.

Besides reducing marginal tax rates on labor and capital, the Tax Cuts and Jobs Act also reduced the *dispersion* of marginal effective tax rates across asset types, financing methods, and organizational forms. The act reduced the difference between the marginal effective tax rate on corporate and noncorporate investments by 3.5 percentage points (from 3.3 percent to -0.2) and reduced the difference in the marginal effective tax rate on equity- versus debt-financed corporate investments by 44.4 percentage points (from 57.8 percent to 13.4 percent) (CBO 2018b). These smaller tax differentials lowered incentives to engage in tax planning involving entity selection choices and reduced the benefit to debt financing over equity financing, lowering incentives for firms to be overlevered in ways that contribute to financial crises (De Mooij, Keen, and Orihara 2014).

The Tax Cuts and Jobs Act also affected the *average* effective tax rate on corporate investment. In a global economy, corporations locate profitable assets where

they can maximize the total return on new investment. Thus, the average tax rate, not the marginal rate, matters for the location of mobile assets. In 2017, the average effective US tax rate on corporate investment was 37.1 percent, 11 percentage points higher than the non-US OECD average. After the tax act, it fell to 26.3 percent, just above the non-US OECD average of 25.5 percent (US Department of the Treasury 2018, 2022).[4]

Finally, even as average tax rates fell for large and multinational firms, tax rates rose, on average, for privately-held domestic firms, some of whom had faced 15 percent corporate tax rates before the Tax Cut and Jobs Act on a significant share of their profits and some of whom were caught up in the tighter "net operating loss" rules imposed in 2017.

Revenue and Budget Effects

A few political figures who supported the Tax Cut and Jobs Act argued that it would spur enough economic growth to be self-financing; for example, former US Treasury secretary Steven Mnuchin claimed the law would "not only pay for itself but in fact create additional revenue for the government" (as reported in Bryan 2018), while former Senate majority leader Mitch McConnell (R-Kentucky) said he was "totally convinced [it was] a revenue neutral bill" (as reported in Tankersley and Phillips 2018).

However, a consensus of economic forecasters predicted that the Tax Cuts and Jobs Act would reduce revenue substantially (Barro and Furman 2018; International Monetary Fund 2018; Mertens 2018; Page et al. 2017; Penn Wharton Budget Model 2017; Tax Foundation 2017; Zandi 2017). Nonpartisan estimates from within the government agreed. The Joint Committee on Taxation (2017) projected a reduction in revenues totaling $1,456 billion through 2027. In April 2018, Congressional Budget Office (2018a) concluded that decline in revenue would be more than originally estimated due to more baseline economic output than initially expected before passage of the TCJA. Counting the additional net interest payments due on the resulting higher levels of debt, the total budgetary cost came to $2,291 billion within the budget window, raising the ratio of debt-to-GDP by 8 percentage points by 2028.

These estimates account for many behavioral responses, but hold macroeconomic aggregates fixed. However, the increases in GDP associated with the Tax Cuts and Jobs Act (discussed in the next section) can offset some of the revenue losses obtained under conventional scoring. Various estimates projected that dynamic responses would reduce the revenue loss by between 7 percent and 31 percent

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[4]These estimates exclude the impact of the FDII ("foreign-derived intangible income") and GILTI ("global intangible low-taxed income") provisions. FDII would reduce, but GILTI could raise or reduce, the average tax rate.

Figure 1
Tax Revenues Before and After the Tax Cuts and Jobs Act

Panel A. Actual and projected tax revenues

Panel B. Actual corporate tax revenues
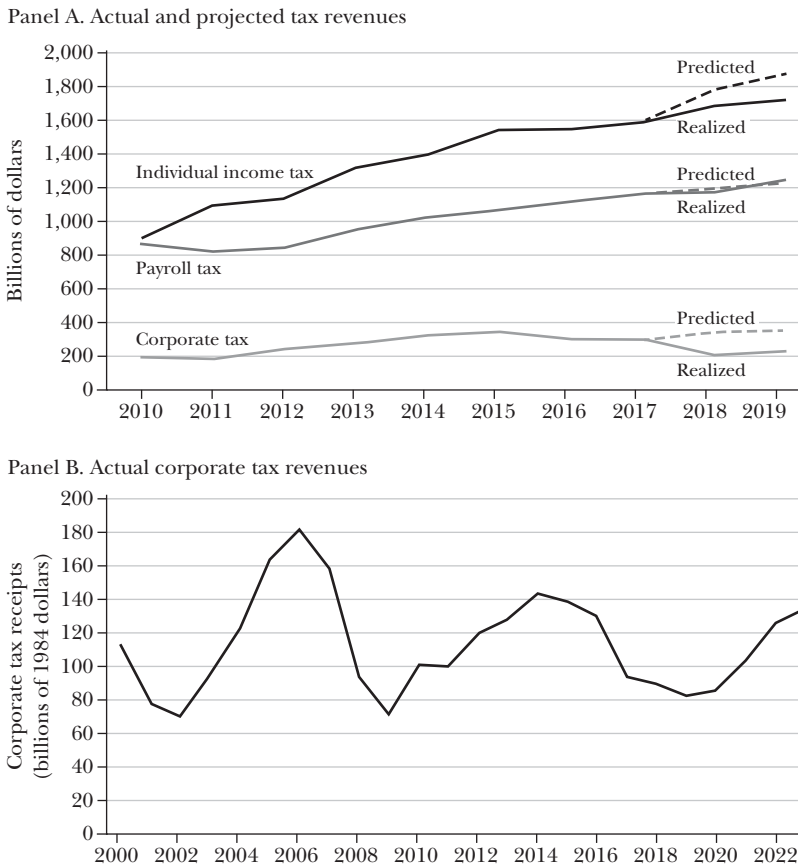
Source: Panel A: CBO (2017a); CBO (2020). Panel B: FRED (https://fred.stlouisfed.org/series/FCTAX), inflation adjusted in constant 1984 dollars.
Note: Panel A shows actual revenues from individual income, payroll, and corporate taxes between 2010 and 2019 (solid lines; CBO 2020), along with CBO revenue projections from before the TCJA was passed (dotted lines; CBO 2017a). Panel B shows real corporate tax revenues (from the BEA series "Federal Government: Tax Receipts on Corporate Income," inflation-adjusted in constant 1984 dollars.

(CBO 2018a; Joint Committee on Taxation 2017; Page et al. 2017; Penn Wharton Budget Model 2017).

Short-term estimates of the budget effects are derived from comparing projected federal tax revenues immediately after the passage of the Tax Cuts and Jobs Act to realized revenue from 2018 and 2019 (Gale and Haldeman 2021). As shown in Figure 1, panel A, total federal revenue in 2018 and 2019 was 7.4 percent ($545 billion) lower than projected before the TCJA (CBO 2020). The decline is 6.9 percent below projections in the individual income tax and 37 percent for corporate tax revenue. In contrast, payroll tax revenues, which were not affected

by the TCJA, tracked projections very closely, which suggests that the declines in revenue from the other taxes were not the product of overly optimistic prior projections.

Medium-term revenue effects are more difficult to examine for two reasons. First, although firms clearly reacted in 2018 and 2019 (Chodorow-Reich et al. 2024; Kennedy et al. 2024), long-term responses along various dimensions could be larger or smaller than short-term responses.[5] Second, the disruption created by COVID and subsequent fiscal and monetary actions, as well as the large corporate tax cut passed by Democrats in 2022 by way of the Inflation Reduction Act, blur the impact of the Tax Cut and Jobs Act.

One difficulty in assessing medium-term revenue effects involves corporate income tax revenue. Figure 1, panel B, shows real corporate tax revenue collected from 2000 through 2023. While the same initial drop in 2017 is evident as in panel A, so too is an increase in revenues starting in 2020. It is difficult to know how much of this increase to attribute to firms' responses to the Tax Cut and Jobs Act, however, given the COVID pandemic, the fiscal and monetary responses, and other factors, (Gale, Pomerleau, and Rosenthal 2022; Hoopes 2022). Despite the economic gyrations since 2020, real corporate revenues in 2023 were almost exactly what the Congressional Budget Office predicted post-TCJA (Goldwein 2024).

Over the long term, the Tax Cuts and Jobs Act is projected to reduce federal revenue. Federal tax revenues averaged 17.4 percent of GDP from 1962 to 2016 and equaled 18.1 percent of GDP in 2016 (CBO 2024a). In the wake of the Tax Cuts and Jobs Act, federal revenues fell to 16.3 percent of GDP in 2018, the lowest share since before 1962 except for 2003–2004 and 2009–2012. In those periods, the economy experienced significant slack. In contrast, TCJA was enacted during a long economic expansion (CBO 2024a). Revenues are now slated to rise to 17.9 percent of GDP by 2033 under current law (CBO 2024b). If instead, the individual tax provisions in TCJA that expire after 2025 are extended, along with the expensing rules for equipment investment, CBO (2023) projects receipts will be 1.1 percent of GDP lower—16.8 percent of GDP in 2033. The ten-year costs of extension would exceed $4.5 trillion (CBO 2024c). Over the 30-year window that CBO and other groups typically use for long-term projections, extending the individual income tax provisions would raise the debt by more than 30 percent of GDP by 2053 (Auerbach and Gale 2024).

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[5] In order to see a tax-cut-induced expansion of the tax base, firms would need some time to respond to the changed tax incentives in the bill by, for example, repatriating cash that had been trapped abroad due to the change to a territorial system (Hanlon, Lester, and Verdi 2015), increasing investment during to bonus depreciation and lower tax rates (Ohrn 2019), repatriating intellectual property from abroad due to changing foreign-derived intangible income (FDII) provisions (Fung et al. 2020), changing income shifting patterns from tax haven nations (Clausing 2020), and so on. With time, those actions may expand the tax base and generate taxable income, which in turn could decrease the amount of revenue loss due to the tax cut. The Congressional Budget Office's revenue estimates account for such factors.

Growth and Economic Activity

Tax cuts can affect both aggregate demand and aggregate supply. They can boost aggregate demand by raising households' after-tax income. As this additional after-tax income is spent, it can result in additional temporary hiring, investment, and economic output. The effect on output will depend on the state of the economy. In a slump, additional spending could bring unemployed workers into the labor force and encourage new investment. In a boom, additional spending would mainly bid up prices without changing real output much. The impact will also depend on the extent to which the monetary authority accommodates or offsets the tax policy. Further, it will depend on who receives the tax cut, as low-income households tend to have a higher propensity to consume out of income than high-income households, although their consumption may derive more from foreign-produced goods. While demand effects can temporarily boost national income, they are unlikely to boost the economy's capacity permanently.

Tax cuts can also boost an economy's aggregate supply—and hence its capacity to produce goods and services—by increasing incentives to work, save, and invest and by reducing distortions across similar activities. The effect of the Tax Cuts and Jobs Act on marginal and average tax rates was discussed earlier. These supply-side effects could lead to more supply of labor and capital and more efficient allocation of resources, and thus to faster economic growth in the short and medium term and a permanently higher level of output in the long run.

Another effect of tax cuts, though, is to increase the federal budget deficit. Additional federal borrowing reduces national saving and reduces future national income. In simple closed-economy models, all investment is financed by domestic saving, and so higher government deficits (that are used to finance consumption) typically raise interest rates, crowd out private investment, and reduce future output and income. In more realistic open economy models, government borrowing from abroad would not necessarily increase interest rates, depress domestic investment, or reduce future output. But it would lead to an increase in the share of US assets held by foreign investors; that is, it would worsen the US "net international investment position," which is claims on foreign assets by US residents minus claims on US assets by foreign residents. As a result, even if foreign borrowing does not reduce future output, it still reduces future income for people in the domestic economy because it raises the share of output that has to be paid to foreign investors.

Since its passage, researchers have employed three approaches to examine the effects of the Tax Cuts and Jobs Act: macroeconomic simulations; comparisons of economic aggregates, from before the 2017 tax law to 2018 and 2019, before the pandemic hit; and micro-econometric studies of particular sectors. Longer-term effects that allow for further supply-side responses are made difficult because of complicating factors after 2019.

Macroeconomic Simulations

Simulation modeling has certain advantages. It can provide estimates of a policy while holding constant other factors that could impact the economy, and the estimates are not constrained by having to wait for data on policy outcomes to emerge. The downside is that many parameter assumptions are required, and in many cases, the relevant empirical literature has not consolidated around a precise estimate of these parameters.

Typically, simulation models project that the Tax Cut and Jobs Act would boost output of the United States, at least temporarily. For example, the Congressional Budget Office (2018a, Figures 1–3) estimated that output would rise by 0.3 percent in the first year and would be almost 1 percent larger than it otherwise would have been by 2022, due to both increased aggregate demand and greater supply of labor and capital. After 2022, output growth would slowly fall and GDP would only be higher by 0.5 percent in 2028—the final year of the budget window—than it would have been under preexisting law, both because many of the temporary features of the law would expire and because the additional borrowing would raise interest rates and start crowding out private sector investment. Several other studies generate similar—but not always identical—levels and time patterns of estimates.[6]

These estimates examine the tax cut as it was legislated. If the temporary provisions in the Tax Cuts and Jobs Act (and the rest of the tax system) are extended, and the scheduled increases in some corporate provisions are not allowed to take effect, Barro and Furman (2018) estimate that GDP would be 1.0 percent larger in 2027 than it would have been relative to a baseline that assumes pre-TCJA law holds (including crowd-out effects of government debt).[7]

Aggregate Trends

Several efforts have been made to assess the impacts of the Tax Cuts and Jobs Act using aggregate data from 2018 and 2019—before the COVID pandemic

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[6] For example, the Tax Policy Center estimated that the Tax Cuts and Jobs Act would have "little effect on GDP in 2027 (Page et al. 2017)." The Tax Foundation (2017) estimated "a 1.7 percent increase in GDP over the long term. EY estimated "1.2 percent higher over the first five years (2018–22) and 0.8 percent higher over the second five years (2023–27)" (Pizzola, Carroll, and Mackie 2017). Penn Wharton Budget Model (2017) finds: "By 2040, we project that GDP is between 0.7 percent and 1.6 percent larger under our baseline assumptions."

[7] The studies above focus on GDP, which measures what is produced within a country. Given that the US economy is open to world capital markets, a better measure of resources available to Americans is GNP, which starts with GDP, but then adds the foreign income of residents and subtracts the domestic income earned by foreigners. By increasing the after-tax return to domestic investment and increasing government borrowing, the Tax Cuts and Jobs Act raises capital inflows and thus increases future payments to foreign investors. As a result, while the Congressional Budget Office predicted that the 2017 law would raise the level of GDP by 0.5 percent in 2028, it also predicted that GNP would rise by only 0.1 percent. The Congressional Budget Office also estimates that the rise in depreciation is about 0.1 percent of output in 2028—enough to erase the already meager boost to GNP. Thus, long-run incomes for Americans as measured by net national product (GNP minus depreciation) will be more or less unchanged by the TCJA under CBO's projections (Gale and Page 2018).

disrupted the economy (Gravelle and Marples 2019; Furman 2020a; Gale and Haldeman 2021; Sullivan 2024). The advantage of these studies over simulations is that they use relevant macroeconomic data. However, these studies may not be compelling for at least two reasons. First, by considering results only through 2019, the studies focus on short-term effects. Short-term growth dynamics are typically dominated by changes in aggregate demand, whereas long-term growth stems from changes in aggregate supply. Although the micro-investment studies noted below suggest that firms did respond actively in 2018 and 2019, supply-side process may take a significant amount of time to take full effect, as Mathur (2019), Viard (2019), and others emphasize. Ultimately, the long-term supply-side effect could be larger or smaller than the short-term effect.

Second, aggregate comparisons are not dispositive, because many things could and did change in the macro-economy at the same time, but they can still help frame the discussion. Because it is difficult to tease out effects from aggregate data under the best of circumstances, we confine our attention to the effects in 2018 and 2019, the period before the COVID pandemic disrupted the economy.

With those caveats, we note that the aggregate studies generally do not find a significant short-term impact of the Tax Cuts and Jobs Act on macro variables such as GDP, investment, employment, and labor compensation. Real GDP growth averaged 2.65 percent in 2018–2019, compared to 3.05 percent in 2017 and 2.52 percent in 2013–2017 (Sullivan 2024). GDP grew at the same rate in the eight quarters preceding enactment of TCJA as in the eight quarters after enactment (Furman 2020a).

Just after the passage of the Tax Cuts and Jobs act in 2018 and 2019, several other major factors impacted the economy. On one side, rising trade tensions and tariffs slowed growth—estimates suggest that tariffs reduced GDP by roughly 0.3 percentage points relative to baseline in the short run, falling to around 0.1 percentage points by 2029 (CBO 2019; Fried 2019). Conversely, fiscal policy was expansionary: Furman (2020a) and Campbell et al. (2019) estimate that the Bipartisan Spending Acts of 2018 and 2019 boosted GDP growth by between 0.75 and 1.75 percentage points. In addition, monetary policy was more accommo-dating in 2018 and 2019 than had been predicted pre-TCJA. When the TCJA was enacted, Federal Reserve Officials projected a federal funds rate of 2.7 percent at the end of 2019, but it ended up being substantially lower at 1.625 percent (Furman 2020a).

Perhaps surprisingly, several comparisons suggest that trends in aggregate investment were not markedly influenced by the Tax Cuts and Jobs Act.

First, the Tax Cuts and Jobs Act substantially reduced the user cost of capital for equipment and structures (Barro and Furman 2018, Chodorow-Reich et al. 2024, Congressional Budget Office 2018, Kennedy et al. 2024). But Figure 2 and Table 2 show that real equipment investment rose only slightly as a share of real GDP, from 5.9 percent in 2015–2016 to just over 6.0 percent in 2018–3019, and that invest-ment in structures was the same share of GDP (3.1 percent) in those two periods. In addition, an IMF study found that investment growth after TCJA was smaller than

Figure 2
Nonresidential Fixed Investment by Major Category, Share of GDP
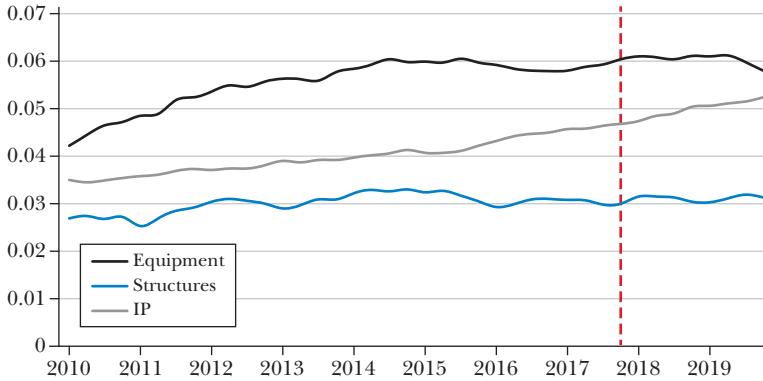
Source: BEA (2024) Table 5.3.6, and authors' calculations. Annual data on real investment as a share of real GDP are available in Table 2.
Note: This figure shows real nonresidential fixed investment in three major categories—equipment, structures, and intellectual property—as a share of real GDP on a quarterly basis from Q1 2010 to Q4 2019. The dotted line at Q4 2017 indicates the quarter when the first TCJA provisions began to take effect. 100 percent expensing was backdated to September 27, 2017, and most other provisions of the law took effect on January 1, 2018. Annual data on real investment as a share of real GDP are available in Table 2.

Table 2
Nonresidential Fixed Investment by Major Category, Percent of GDP

Year	Equipment	Structures	Equipment + structures	Intellectual property	All
2010	4.51	2.71	7.22	3.49	10.71
2011	5.04	2.75	7.79	3.65	11.44
2012	5.47	3.05	8.52	3.75	12.26
2013	5.65	3.02	8.67	3.90	12.57
2014	5.95	3.27	9.22	4.05	13.26
2015	6.00	3.18	9.18	4.12	13.30
2016	5.84	3.03	8.87	4.43	13.29
2017	5.91	3.03	8.95	4.62	13.57
2018	6.08	3.12	9.20	4.88	14.08
2019	6.00	3.12	9.12	5.14	14.26

Source: BEA (2024) Table 5.3.6, and authors' calculations.
Note: This table reports annual figures for real nonresidential fixed investment as a share of real GDP in three major categories—equipment, structures, and intellectual property. It also reports composite figures for investment in equipment and structures, the categories thar received the largest change in their tax treatment under the TCJA, and the total across all categories. Figure 2 shows trends in the same measure of investment on a quarterly basis.

would have been expected based on previous corporate tax cuts and was explained by increases in aggregate demand (Kopp et al. 2019).

Second, relative changes in marginal effective tax rates (or the user cost of capital) across different asset types do not correlate well with relative changes in investment. The studies noted above show that the Tax Cuts and Jobs Act reduced the tax burden for investments in equipment and structures by more than it did for intellectual property, but investment in intellectual property grew faster than in equipment and structures. Unlike equipment and structures, investment in intellectual property had risen steadily in the years before the TCJA and essentially just continued that trend after the TCJA.

Third, comparisons of CBO investment projections with actual investment data show similar patterns. In early 2017, after President Trump took office and before the Tax Cuts and Jobs Act was introduced, CBO projected that real nonresidential investment would rise by 8.6 percent from the first quarter of 2017 to the final quarter of 2019 (CBO 2017b). It actually rose by significantly more—13.8 percent (BEA 2024). However, mirroring the results above, virtually all the difference between projected and actual figures was due to intellectual property investment. Equipment and structures investment, which received the largest tax cuts, was projected to rise by 8.3 percent and only did slightly better in actual terms—8.6 percent.

Finally, comparisons of investment across countries similarly do not show significant impact of the Tax Cuts and Jobs Act. Figure 3 shows that, after 2017, the change in investment as a share of GDP in the United States was not exceptional compared to other G-7 countries (that is, Canada, France, Germany, Italy, Japan, and the United Kingdom). Although the US economy had the second-highest growth rate in investment/GDP from 2013 to 2016, investment growth was not exceptional from 2016 to 2019. Indeed, the US economy had only the fourth-highest growth rate (essentially tied with Japan) in investment/GDP from 2016 to 2019, incorporating the period after the TCJA. Other than Japan, none of the other G-7 countries had major business tax reforms during this period.[8]

Investment in owner-occupied housing declined after 2017, in line with the estimated increase in the cost of capital for housing and the limits on the deductibility of property taxes in the Tax Cuts and Jobs Act (Pomerleau 2019). As with GDP, however, factors other than the TCJA affected investment over this period. For example, delayed deliveries of Boeing's 737 MAX plane reduced investment growth by an estimated 0.5 percentage points in 2019 (CBO 2020).

Wage and employment data align with the notions that the Tax Cuts and Jobs Act had little aggregate effect in 2018–2019 and predominantly benefited high-income earners, without substantially enhancing wages for other workers or overall employment rates. Following the enactment of the TCJA, the growth in

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[8]Likewise, growth in US investment in real terms (rather than as a share of GDP) from 2015–2016 to 2018–2019 was also unexceptional relative to other G-7 economies. Real investment in the US economy grew about the same rate as in the United Kingdom, faster than Japan and Canada but slower than Italy, Germany, and France.

Figure 3
Investment as a Share of GDP, Indexed (2016 = 100)
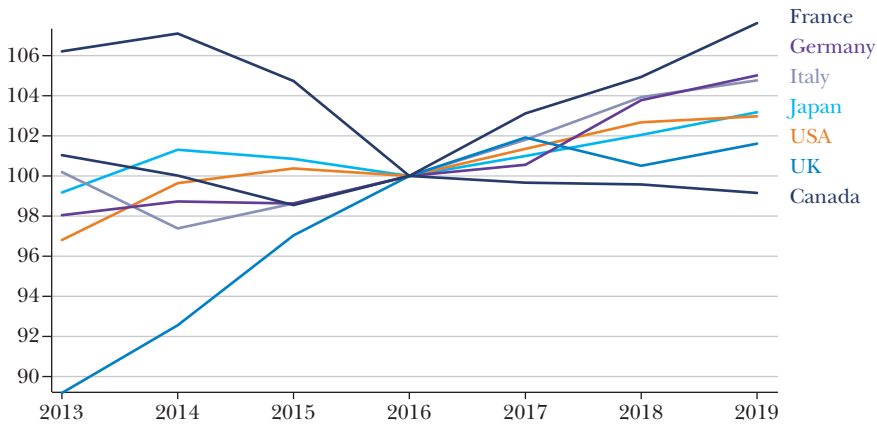
Source: OECD (2024a, b) and authors' calculations.
Note: This figure shows the level of investment as a fraction of GDP in each of the G7 countries: the United States, the United Kingdom, France, Germany, Japan, Italy, and Canada. The ratio of investment/GDP is indexed to 100 for each country in 2016 to compare changes in the ratio over time.

total nonfarm employment witnessed a decrease of 0.44 percentage points during 2018–2019 compared to 2016–2017, as shown in Figure 4. Moreover, the growth in employment-to-population ratio among prime-age individuals (25–54) declined by 0.16 percentage points. It is worth noting that employment levels were already nearing historic highs at the time of the Tax Cuts and Jobs Act passing, potentially making further employment growth harder to achieve as the economy neared full employment. It might seem that tightening labor markets should have led to an increase in wage growth. But growth in real median earnings for all wage and salary employees rose by only 0.09 percentage points after the enactment of the TCJA. However, one alternative gauge of wages did exhibit a faster rise following the 2017 law—the portion of the Employer Cost Index that measures average wages and salaries rose by 0.57 percentage points. The accelerated growth in mean wages alongside the much growth in median wages raises an intriguing possibility: the shift in employer costs primarily favored high-income earners, with low- and middle-income workers not experiencing commensurate wage growth. Supporting this idea, Kennedy et al. (2024) indicate that the corporate tax cuts in the TCJA resulted in wage hikes for owners, executives, and the top 10 percent of workers in small firms, while leaving the wages of workers in the bottom 90 percent unaffected. Similar incidence results for other corporate tax cuts have been shown by Ohrn (2023) and Dobridge et al. (2023).

These wage patterns may seem inconsistent with some well-publicized corporate announcements of pay raises and bonuses for employees after the Tax Cuts and Jobs Act was enacted. For example, Walmart (2018), the nation's largest private

Figure 4
Growth in Labor Market Indicators, 2015–2016 compared to 2018–2019
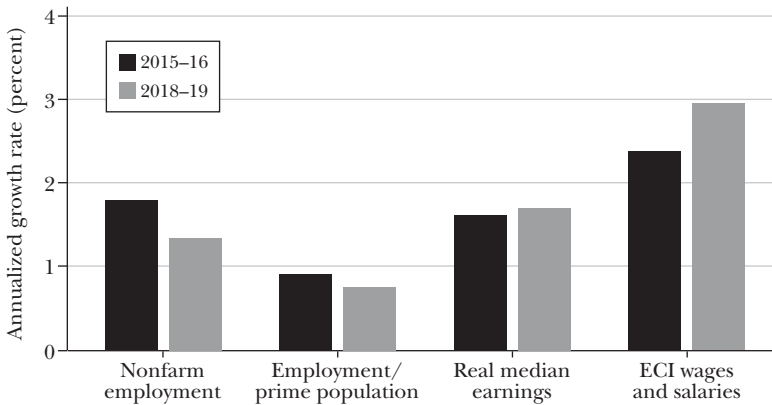
Source: BLS (2024) and BEA (2024a, b, c, d).
Note: This figure shows annualized growth rates for four economic indicators: total nonfarm employment, the employment/prime population ratio, real median earnings, and Employer Cost Index (ECI) wages and salaries. Growth rates in 2015–2016, before the TCJA was developed, are shown in black; growth rates in 2018–2019, after the law was implemented, are in gray.

employer, announced an increase in its minimum wage up to $11 an hour starting February 17, 2018, and attributed the increase to the 2017 tax law. Moreover, companies that gave bonuses at this time were more likely to have received larger tax cuts under the TCJA (Hanlon, Hoopes, and Slemrod 2019) and sometimes announced these bonuses as "sharing the gains" with workers. But more broadly, these bonuses look like political advertising. The wage bonuses were generally small (Gale and Haldeman 2021), and companies that gave bonuses were also more likely to have contributed to Republican political action committees than Democratic ones (Hanlon, Hoopes, and Slemrod 2019; Rosenthal 2019).

The Tax Cuts and Jobs Act may also have encouraged firms to move their foreign-held intellectual property assets back to the US economy. For example, payments from Ireland to the United States for the use of intellectual property products rose sharply from roughly €2 billion per quarter in the early-to-mid 2010s to nearly €4 billion in the last quarter of 2019 and to €28.7 billion in 2023Q3. These changes are consistent with incentives embedded in the TCJA but also correspond to the timing of the OECD's work on harmonizing a minimum global corporate tax (as discussed in the paper by Clausing in this symposium) and changes to Irish corporate tax law (Cole 2024).

Comparisons and Causality

Other papers have sought to measure the impact of the Tax Cuts and Jobs Act using methods that emphasize using micro data and drawing comparisons that are more likely to allow causal inferences (as reviewed in more detail in the paper

by Chodorow-Reich, Zidar, and Zwick in this symposium). Here, we mention an illustrative selection of methods that have been used and discuss the results. These studies generally find corporate behavior, such as investment, more in line with the incentives created by the law, but these methods have weaknesses of their own.

One approach is to look across the range of C corporations, calculate how the Tax Cuts and Jobs Act affected the cost of capital for different firms, and then see if changes in cost of capital are reflected in investment decisions. Chodorow-Reich et al. (2024) take this approach, using a sample of about 12,000 tax returns from mid- and large-size corporations. Their regressions show that firms with larger tax cuts increased their investment from 2015–2016 to 2018–2019 by more than firms with smaller or no tax cuts. They construct a long-term, general equilibrium simulation model, calibrated with the tax parameter estimates and find that the domestic and foreign capital stock held by domestic corporations will rise about 7 percent and 13 percent, respectively. They also find that moving to expensing has a bigger "bang for the buck" than cuts in corporate tax rates, that domestic and foreign capital appear to be complements at the firm level, and that "dynamic" revenue estimates of the revenue loss from the corporate cuts are very close to the "static" estimates.

Another type of analysis involves comparing S corporations, which pass through their income to the owners each year, and C corporations, whose income is taxed at the firm level and again at the individual level, as either dividends or capital gains (when realized). Kennedy et al. (2024) show the Tax Cuts and Jobs Act reduced taxes for C corporations by more than for S corporations. They use matched employer-employee tax data to examine the effects of the TCJA on otherwise similar (same industry and size category) C and S corporations. Their regression evidence suggests that the larger reductions in marginal tax rates caused C corporations to increase their sales, profits, investment, and employment relative to S corporations, with responses driven by capital-intensive industries. Their simulation estimates suggest that a $1 reduction in corporate tax revenue generates an additional $0.44 in output on average and that the corporate tax cuts generated a net output increase of $38 billion, or 0.18 percent of 2016 GDP.

However, S and C corporations differ in several ways, some of which may have varied with time before and after the Tax Cuts and Jobs Act, and many of which are unobservable in tax data (Hoopes et al. 2024). Further, comparing similar S corporations and C corporations precludes a comprehensive study of some of the largest C corporations—like Apple or Walmart—for which there are no comparable S corporations. However, those largest C corporations are plausibly the firms that the TCJA affected most.

A third approach focuses on "synthetic controls." This approach attempts to create a sample of firms in other countries that are similar to US firms and compares investment of the two groups over time. Markarian and Crawford (2022) show that that relative to a control group of Canadian firms, US firms increased investments after the Tax Cuts and Jobs Act by 0.4 percent of total assets and that the increases were concentrated in the firms the TCJA was likely to affect—large multinationals with cash trapped abroad. In their study, Chodorow-Reich et al. (2024) find that the

US C corporations in their sample increased their investment by 17 percent more than a synthetic control group that they created.

Synthetic controls of different groups of corporations, however, have two potential shortfalls. First, unlike cross-country studies, synthetic controls analysis requires (or allows) analysts to make choices about which firms to include and exclude in the analysis, and such decisions are often based on data availability rather than firm characteristics. For example, in their synthetic control analysis, Chodorow-Reich et al. (2024) end up excluding 83 percent of corporations (accounting for 41 percent of investment) in their potential synthetic group. Second, synthetic control analyses of corporations omit consideration of how noncorporate investment changed. A tax cut that resulted in reallocation of investment from pass-through businesses to C corporations in the United States would misleadingly appear as a positive effect on overall US investment.

A final approach is to examine changes in economic activity by pass-through organizations whose owners had different exposure to the pass-through deduction enacted in 2017. Goodman et al. (2024) use this approach to demonstrate that, in 2018 and 2019, variations in exposure to the deduction had little effect on firms' reported business income eligible for the deduction, physical investment, wages paid to nonowners, or employment by the affected firms.

Distributional Effects

Determining who bears the burden of taxes is one of the oldest and most controversial issues in economics. For income taxes, it is reasonable to claim that those who pay the tax bear the burden. For payroll taxes, the common belief is that workers end up bearing the burden both for what they pay directly, and also—in the form of wages lower than they would otherwise be—for the share nominally paid by employers.

Although the corporate tax is remitted by companies to the government, the tax is ultimately borne by individuals. Traditionally, the "corporate tax burden" refers to the extent that the tax affects different sources of income. Individuals can be made worse off by the tax in various ways: reduced wages (workers), reduced dividends or capital gains (shareholders), or reduced rate of return on capital (all capital owners). The Urban-Brookings Tax Policy Center Simulation Model, used for the estimates below, assumes that 20 percent of the corporate burden is borne by workers, 20 percent by all capital owners, and 60 percent by shareholders. Models used by the Treasury Department provide similar assumptions (Cronin 2022). CBO (2018c) and Joint Committee on Taxation (2013) assume that 75 percent is allocated to capital owners and 25 percent to labor, which, in practice, does not generate dissimilar results.[9]

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[9] Gale and Thorpe (forthcoming) provide a review of recent literature. It is also possible to distribute the tax according to uses of income. For example, Baker, Sun, and Yannelis (2023) find that consumers bear a significant portion of the corporate tax. See Viard (2014) for further discussion.

Distributional analysis distributes the cash value of tax burdens: it essentially examines income effects, but typically falls short of a full welfare analysis that would include substitution effects. It omits the short-run and dynamic impacts of taxes and focuses instead on the long-run comparative static impacts (Auerbach 1993, 2018). Nevertheless, it can be valuable, especially for taxes like the corporate income tax, where the payer is by definition not the entity that bears the burden of the tax.

Many distributional analyses follow a convention that changes to taxes are distributed to households while assuming no changes in government spending, other taxes, or national income. However, these conventional analyses do typically assume that individuals can change their behavior to reduce their tax liability, given changes in tax law.

Based on standard assumptions, the Tax Cuts and Jobs Act reduced tax liability of most households, with a larger effect on after-tax income for high-income households. According to estimates from the Tax Policy Center in the first column of Table 3, 80 percent of tax filing units received a tax cut; the average tax cut over all tax units was $1,610 in 2018. After-tax income rose by 2.2 percent on average, but by only 0.4 percent for households in the lowest quintile, compared with 1.6 percent and 2.9 percent for those in the middle and top quintile respectively, more than 4 percent for those in the ninety-fifth–ninety-ninth percentiles, and 3.4 percent for taxpayers in the top 1 percent. The differences in dollars are more extreme: $60 for those in the bottom quintile, $930 for the middle quintile, and $51,140 for the top 1 percent. While the specific numerical estimates vary in different studies, the general thrust of the results above are matched in other studies (CBO 2017c; Tax Foundation 2017; Penn Wharton Budget Model 2017).[10]

Taxes fell for high-income households for three main reasons: rate reductions (high-income households benefit from all the rate cuts, not just the reduction in the top rate); the deduction for pass-through firms (section 199A), where between one-third and one-half of the benefits went to taxpayers with adjusted gross income above $1 million (Joint Committee on Taxation 2018; Goodman et al. 2024); and the corporate tax cuts, because shareholding is concentrated among affluent households.

At the same time, however, the highest income households also had the highest probability of having their taxes rise. As shown in column 2 of Table 3, the Tax Cuts and Jobs Act raised taxes on about 4.8 percent of all households, with the likelihood

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[10] While the results above are based on annual income measures, Auerbach, Kotlikoff, and Koehler (2023) develop distributional measures of "lifetime spending power" as equal to the present value of a household's expected future lifetime expenditures, including imputed rent and expected future bequests. In general, this measure suggests a dramatically more equal distribution of resources than income or wealth measured during a single year. In one part of the paper, the authors use their approach to estimate effects of the Tax Cuts and Jobs Act, assuming that all its provisions become permanent. The distributional effect of the TCJA using lifetime spending is slightly more progressive compared to annual income measures, but the overall general pattern that the TCJA provides great benefits to those with higher incomes, lifetime or annual, remains.

Table 3
Distributional Effects of the Tax Cuts and Jobs Act

ECI percentile	Percent of tax units with cut >$10	Percent of tax units with increase >$10	Change in after-tax income, percent	Change in after-tax income, dollars
Lowest quintile	53.9	1.2	0.4	60
Second quintile	86.8	4.6	1.2	380
Middle quintile	91.3	7.3	1.6	930
Fourth quintile	92.5	7.3	1.9	1,810
Top quintile	93.7	6.2	2.9	7,640
All	80.4	4.8	2.2	1,610
Addendum				
80–90th	92.3	7.6	2.0	2,970
90–95th	94.4	5.5	2.2	4,550
95–99th	97.3	2.7	4.1	13,480
Top 1 percent	90.7	9.3	3.4	51,140
Top 0.1 percent	83.7	16.2	2.7	193,380

Source: Gale et al. (2019).
Note: The data include both filing and nonfiling tax units but not those who are dependents of other tax units. Tax units with negative adjusted gross income are excluded from their respective income class but included in the totals. The income measure used is Expanded Cash Income (ECI), a measure developed by the Tax Policy Center and explained in detail in Rosenberg (2013). Each income percentile contains an equal number of people. The dollar breaks (in 2022 dollars) are 20 percent $25,000; 40 percent $48,600; 60 percent $86,100; 80 percent $149,400; 90 percent $216,800; 95 percent $307,900; 99 percent $732,800; 99.9 percent $3,439,900. Tax units with an increase includes all units with a change in federal tax burden of $10 or more in absolute value.

highest for those at the top of the income distribution—including 9.3 percent of households in the top 1 percent. The main reason some high-income taxpayers faced higher rates was the capping of the deduction for state and local taxes.

These effects were not geographically neutral. Altig et al. (2020) compare Republican- and Democratic-leaning states, and find that taxpayers in Republican-leaning states benefitted more from the Tax Cuts and Jobs Act—with a 1.6 percent increase in potential lifetime spending, compared to 1.3 percent for those in Democratic-leaning states. The differential is explained largely by limits on the deduction for state and local taxes, which most affected the very highest income earners, in states with the highest taxes, and with the highest property values (all three of which are more common in Democratic-leaning states). In the absence of that change, households in Democratic-leaning states would have benefited more (2.1 percent) than in Republican-leaning states (1.9 percent). This outcome of the TCJA was likely seen as a feature, not a bug, by the Republican legislature that passed it.

If the individual income tax cuts are allowed to expire as scheduled at the end of 2025, the distributional effects in Table 3 would change. On average, taxes in 2027 would be little changed compared to before the 2017 law for taxpayers in the bottom 95 percent of the income distribution, but the top 1 percent would

continue to receive a significant tax cut—0.9 percent of after-tax income or $20,660 (Tax Policy Center 2017). That is, the tax cuts the Republicans made permanent in 2017 vastly disproportionately benefited the highest-income households relative to others.

Conventional distributional analyses do not consider the fact that tax cuts eventually have to be financed with higher taxes or lower spending (or perhaps higher inflation to reduce the real value of government debt). Gale et al. (2019) show that if the tax cuts are financed by cuts in entitlement spending, the net effect of the tax cut and the financing will be hugely regressive. Overall, 74 percent of households would experience a tax increase with this assumption about financing—including 100 percent of households in the bottom quintile. Alternatively, if the Tax Cuts and Jobs Act were financed proportionally to each household's pre-credit income tax liability, replicating the distributional properties of the existing current income tax system, the results would be more progressive.[11] Accounting for modest amounts of economic growth does not materially change these outcomes.

Expert Opinion

The Tax Cuts and Jobs Act is difficult to assess. It was a complex piece of legislation, combining both the base-broadening and tax-cut features of previous reforms, with major changes to both corporate and individual taxes. Further, it was followed up by the COVID pandemic, a once-in-a-lifetime shock to the economic system. As a result, simply asking economists, who could look at the evidence comprehensively and mentally adjust for these factors, seems useful.

The Kent A. Clark Center for Global Markets at the University of Chicago regularly polls a panel of leading academic economic experts on different issues. In November 2017, as Congress was considering the legislation that would eventually become Tax Cuts and Jobs Act, the Clark Center asked the group to respond to two statements:[12]

- If the United States enacts a tax bill similar to those currently moving through the House and Senate—and assuming no other changes in tax or spending policy—US GDP will be substantially higher a decade from now than under the status quo.

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[11] Accounting for these credits in financing the legislation would make the resulting law even more progressive, but seems unrealistic because many taxpayers have negative tax liabilities post credits, so financing the Tax Cuts and Jobs Act would mean giving them bigger credits while raising taxes on everyone else.

[12] For details of the survey, see https://www.kentclarkcenter.org/surveys/tax-reform-2/. The survey reports the raw responses as well as confidence-weighted responses. We report the confidence-weighted responses in the text and note that switching to raw responses did not substantially change the results for any of the questions.

- If the United States enacts a tax bill similar to those currently moving through the House and Senate—and assuming no other changes in tax or spending policy—the US debt-to-GDP ratio will be substantially higher a decade from now than under the status quo.

Only 2 percent of respondents, weighted by their confidence, agreed that GDP would be substantially higher in the future (with the rest approximately equally divided between disagreeing, strongly disagreeing, and being uncertain). In contrast, 100 percent of experts (88 percent in the raw data, with the other 12 percent either uncertain or not answering and, in either of those cases, receiving zero weight in the confidence-weighted calculations) thought that the debt-to-GDP ratio would be substantially higher if the Tax Cuts and Jobs Act were enacted.

In late 2023, in response to our request, the Center posed several more statements, asking respondents to compare the outcome "now, as a result of the passage of the TCJA, [relative to what it] would have been had the TCJA not been passed, and all else was equal."[13] We focus on responses to four outcomes: (1) US GDP is substantially higher; (2) federal tax revenues are substantially lower; (3) corporate capital stock is substantially higher; and (4) real median wages are substantially higher.

Figure 5 shows that the responses for GDP and fiscal effects in 2017 remain consistent in the more recent survey. Relative to a no–Tax Cuts and Jobs Act world, only 8 percent of respondents agreed that GDP was substantially higher in 2023 than it would have been otherwise (and 51 percent disagreed or strongly disagreed); in contrast, 87 percent agreed or strongly agreed that revenues are substantially lower due to the TCJA (and only 3 percent disagreed). Respondents showed significant uncertainty about GDP but not revenue. Only 1 percent agreed that real median wages were substantially higher in 2023 than they would have been without the TCJA, in contrast to an overwhelming majority (73 percent) that disagreed or strongly disagreed. Results for the corporate capital stock were more mixed. About 27 percent agreed that it was substantially higher than it would have been without the TCJA, 36 percent disagreed, and 38 percent were uncertain.[14] Overall, the story that emerges from the experts is that the capital stock may have increased, but real median wages and GDP changes seem very modest and revenues fell relative to a world without the TCJA. These judgments seem in accord with the evidence that has emerged.

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[13] For details, see https://www.kentclarkcenter.org/surveys/the-tax-cuts-and-jobs-act-tcja-of-2017/. Notice that the 2017 questions ask about a decade later—2027—while the 2023 question asks about the status in 2023. In 2023, the survey also asked about charitable contributions. Almost two-thirds of respondents were uncertain whether contributions were higher than they otherwise would have been, one-quarter thought they were, and one-eighth thought they were not.

[14] Questions about the Tax Cuts and Jobs Act did elicit more nonresponse and more uncertainty that other Clark Center polls. We downloaded the 36,890 answers to the 842 questions on the 432 issues about which the Clark Center has asked its experts over time. For questions about the TCJA, about 29 percent of TCJA questions were unanswered, and another 45 percent of the answers were "uncertain," compared to a 14 percent rate of unanswered questions and a 20 percent rate of "uncertain" answers for questions on other subjects.

Figure 5
US Economic Experts Panel on the Effects of the Tax Cuts and Jobs Act in 2023
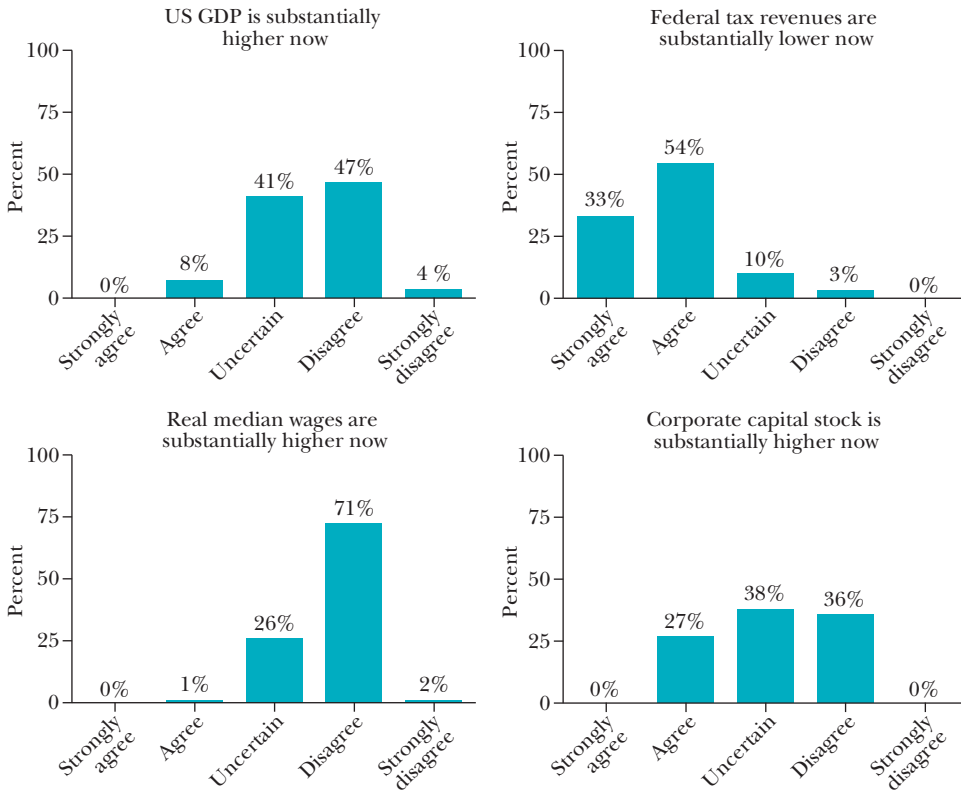
Source: Figures are from https://www.kentclarkcenter.org/surveys/the-tax-cuts-and-jobs-act-tcja-of-2017/.
Note: This figure shows the results of a survey of economic experts conducted by the Kent Clark Center at the University of Chicago. Experts were asked to respond with their opinions on the following two statements: (1) if the United States enacts a tax bill similar to those currently moving through the House and Senate—and assuming no other changes in tax or spending policy—US GDP will be substantially higher a decade from now than under the status quo; and (2) if the United States enacts a tax bill similar to those currently moving through the House and Senate—and assuming no other changes in tax or spending policy—the US debt-to-GDP ratio will be substantially higher a decade from now than under the status quo. Results are weighted by the experts' confidence in their answers.

Conclusion

Controversy over tax policy never really stops. In looking at the effects of tax policy on outcomes such as GDP and wages, causal identification is difficult, both by virtue of the nature of the law, which simultaneously legislated several counter-vailing forces, as well as the COVID pandemic, which makes long-term analysis, necessary for a full understanding of the potential dynamic effects, difficult. In 2025, the immediate short-run decision that policymakers face involves whether or how to extend the temporary provisions of the Tax Cuts and Jobs Act, which revolve

around the individual income tax. But the broader issues remain regarding how the United States generates sufficient revenue to cover its expenses, and the budgetary challenges will only become more salient in light of slowly growing revenues and looming shortfalls in the Social Security and Medicare trust funds.

References

Al-Muslim, Aisha. 2018. "H&R Block to Close 400 Locations." *Wall Street Journal,* June 13. https://www.wsj.com/articles/h-r-block-to-close-400-locations-1528918588.

Altig, David, Alan Auerbach, Patrick Higgins, Darryl Koehler, Laurence Kotlikoff, Ellyn Terry, and Victor Ye. 2020. "Did the 2017 Tax Reform Discriminate against Blue-State Voters?" *National Tax Journal* 73 (4): 1087–1108.

Arnon, Alexander. 2019. "The Price of Oil is Now a Key Driver of Business Investment." Penn Wharton Budget Model, January 17. https://budgetmodel.wharton.upenn.edu/issues/2018/12/14/the-price-of-oil-is-now-a-key-driver-of-business-investment.

Auerbach, Alan J. 1987. 1987."The Tax Reform Act of 1986 and the Cost of Capital." *Journal of Economic Perspectives* 1 (1): 73–86.

Auerbach, Alan J. 1993. "Public Finance in Theory and Practice." *National Tax Journal* 6 (4): 519–26.

Auerbach, Alan J. 2010. "A Modern Corporate Tax." Washington, DC: Center for American Progress and The Hamilton Project. December.

Auerbach, Alan J. 2018. "Measuring the Effects of Corporate Tax Cuts." *Journal of Economic Perspectives* 32 (4): 97–120.

Auerbach, Alan J. and William G. Gale. 2024. "The Federal Budget Outlook: Update for 2024." *Brookings*, March 7. https://www.brookings.edu/articles/the-federal-budget-outlook-update-for-2024.

Auerbach, Alan J., Laurence J. Kotlikoff, and Darryl Koehler. 2023. "US Inequality and Fiscal Progressivity: An Intragenerational Accounting." *Journal of Political Economy* 131 (5): 1249–93.

Baker, Scott R., Stephen Teng Sun, and Constantine Yannelis. 2023. "Corporate Taxes and Retail Prices." NBER Working Paper 27058.

Barro, Robert J., and Jason Furman. 2018. "The Macroeconomic Effects of the 2017 Tax Reform." *Brookings Papers on Economic Activity* 49 (1): 257–345.

Bryan, Bob. 2018. "Treasury Secretary Steve Mnuchin Doubled Down on a Claim about the Tax Bill that Almost Every Independent Group Says is Wrong." *Business Insider*, August 28. https://www.businessinsider.com/mnuchin-gop-trump-tax-law-pay-for-itself-deficit-rising-debt-2018-8.

Bureau of Economic Analysis (BEA). 2024. "Table 5.3.6. Real Private Fixed Investment by Type, Chained Dollars." National Income and Product Accounts. US Department of Commerce, Washington, DC. https://apps.bea.gov/iTable/?reqid=19&step=2&isuri=1&categories=survey (accessed on May 14, 2024).

Bureau of Labor Statistics (BLS). 2024a. "All Employees, Total Nonfarm." US Department of Labor, Washington, DC. https://fred.stlouisfed.org/series/PAYEMS (accessed on May 16, 2024).

Bureau of Labor Statistics. 2024b. "Employed Full Time: Median Usual Weekly Real Earnings: Wage and Salary Workers: 16 Years and Over." US Department of Labor, Washington, DC. https://fred.stlouisfed.org/series/LES1252881600Q (accessed on May 16, 2024).

Bureau of Labor Statistics. 2024c. "Employment Cost Index: Wages and Salaries: Private Industry Workers." US Department of Labor, Washington, DC. https://fred.stlouisfed.org/series/ECIWAG (accessed on May 16, 2024).

Bureau of Labor Statistics. 2024d. "Employment-Population Ratio—25–54 Yrs." US Department of Labor, Washington, DC. https://fred.stlouisfed.org/series/LNS12300060 (accessed on May 16, 2024).

Campbell, Jeffrey R., Filippo Ferroni, Jonas D. M. Fisher, and Leonardo Melosi, 2019. "The Macroeconomic Effects of the 2018 Bipartisan Budget Act." *Economic Perspectives* 43 (2).

Chodorow-Reich, Gabriel, Matthew Smith, Owen M. Zidar, and Eric Zwick. 2024. "Tax Policy and Investment in a Global Economy." NBER Working Paper 32180.

Clausing, Kimberly A. 2020. "Profit Shifting Before and After the Tax Cuts and Jobs Act." National Tax Journal 73 (4): 1233–66.

Cole, Alan. 2024. "The Impact of GILTI, FDII, and BEAT." *Tax Foundation*, January 31. https://taxfoundation.org/research/all/federal/impact-gilti-fdii-beat.

Congressional Budget Office (CBO). 2017a. "The Budget and Economic Outlook: 2017 to 2027." Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2017b. *An Update to the Budget and Economic Outlook: 2017 to 2027. Data and Supplemental Information.* Washington, DC: Congressional Budget Office. https://www.cbo.gov/system/files/115th-congress-2017-2018/reports/2017-06dataunderlyingfiguresandsupplemental-material.xlsx (accessed on June 24, 2024).

Congressional Budget Office (CBO). 2017c. "Cost Estimate for H.R.1, the Tax Cuts and Jobs Act." Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2018a. *The Budget and Economic Outlook: 2018 to 2028.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2018b. *Tax Parameters and Effective Marginal Tax Rates. Supplement to the Budget and Economic Outlook: 2018 to 2028.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2018c. "An Overview of CBO's Microsimulation Tax Model." June 22. https://www.cbo.gov/publication/54096.

Congressional Budget Office. 2019. *The Budget and Economic Outlook: 2019 to 2029.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2020. *The Budget and Economic Outlook: 2020 to 2030.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2023. *Budgetary Outcomes under Alternative Assumptions About Spending and Revenues.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2024a. *Historical and Economic Data. Supplement to the Budget and Economic Outlook: 2024 to 2034.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2024b. *The Budget and Economic Outlook: 2024 to 2034.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2024c. *Budgetary Outcomes under Alternative Assumptions about Spending and Revenues.* Washington, DC: Congressional Budget Office.

Cronin, Julie-Anne. 2022. "US Treasury Distributional Analysis Methodology." Office of Tax Analysis Technical Paper 8.

De Mooij, Ruud A. and Michael Keen. 2016. "Debt, Taxes, and Banks." *Journal of Money, Credit and Banking* 48: 5–33. https://doi.org/10.1111/jmcb.12289.

Dobridge, Christine, Patrick Kennedy, Paul Landefeld, and Jacob Mortenson. 2023. "The TCJA and Domestic Corporate Tax Rates." FEDS Working Paper 2023-078.

Dobridge, Christine, Paul Landefeld, and Jacob Mortenson. 2021. "Corporate Taxes and the Earnings Distribution: Effects of the Domestic Production Activities Deduction." FEDS Working Paper 2021-81.

Fried, Daniel. 2019. "The Effects of Tariffs and Trade Barriers in CBO's Projections." Congressional Budget Office, August 22. https://www.cbo.gov/publication/55576.

Fung, Katie, Stewart Lipeles, Joshua Odintz, and Julia Skubis Weber. 2020. "Homeward Bound: Repatriating Assets and Activities." *Taxes; The Tax Magazine* 98 (7): 5–10.

Furman, Jason. 2020a. "The Disappearing Corporate Income Tax." Testimony, US House of Representatives Committee on Ways and Means, Washington, DC, February 11. https://www.congress.gov/116/meeting/house/110494/witnesses/HHRG-116-WM00-Wstate-FurmanJ-20200211.pdf.

Furman, Jason. 2020b. "How to Increase Growth While Raising Revenue: Reforming the Corporate Tax Code." In *Tackling the Tax Code: Efficient and Equitable Ways to Raise Revenue*, edited by Ryan Nunn and Jay Shambaugh, 285–315. Washington, DC: Brookings Institution.

Gaertner, Fabio B., Jeffrey L. Hoopes, and Edward L. Maydew. 2019. "Shareholder Wealth Effects of Border Adjustment Taxation." *Journal of Law and Economics* 62 (2): Article 1. https://chicagounbound.uchicago.edu/jle/vol62/iss2/1.

Gaertner, Fabio B., Jeffrey L. Hoopes, and Braden M. Williams. 2019. "Making *Only* America Great? Non-U.S. Market Reactions to U.S. Tax Reform." *Management Science* 66 (2): 687–97.

Gale, William G., Hilary Gelfond, Aaron Krupkin, Mark J. Mazur, and Eric Toder. 2019. "Effects of the Tax Cuts and Jobs Act: A Preliminary Analysis." *National Tax Journal* 71 (4): 589–612.

Gale, William G., and Claire Haldeman, 2021. "The Tax Cuts and Jobs Act: Searching for Supply-Side Effects." *National Tax Journal* 74 (4): 895–914.

Gale, William G., and Benjamin R. Page. 2018. "CBO Estimates Imply That TCJA Will Boost Incomes for Foreign Investors but Not for Americans." *Brookings*, May 10. https://www.brookings.edu/articles/cbo-estimates-imply-that-tcja-will-boost-incomes-for-foreign-investors-but-not-for-americans.

Gale, William G., Kyle Pomerleau, and Steven M. Rosenthal. 2022. *The Booming Economy, Not the 2017 Tax Act, Is Fueling Corporate Tax Receipts*. Washington, DC: Brookings Institution.

Gale, William G., and Samuel I. Thorpe. Forthcoming. "The Incidence and Distributional Effects of the Corporate Income Tax: The Role of Rent Sharing." *National Tax Journal*.

Gale, William G., and Samuel I. Thorpe. 2024. "A Reconsideration of the Investment Effects of the Tax Cuts and Jobs Act." Brookings Institution and Urban–Brookings Tax Policy Center.

Goldwein, Marc. 2024. "2017 Tax Cuts Continue to Lose Revenue." Committee for a Responsible Federal Budget, April 15. https://www.crfb.org/blogs/2017-tax-cuts-continue-lose-revenue.

Goodman, Lucas, Katherine Lim, Bruce Sacerdote, and Andrew Whitten. 2024. "How Do Business Owners Respond to a Tax Cut? Examining the 199A Deduction for Pass-Through Firms." NBER Working Paper 28680.

Gravelle, Jane G., and Donald J. Marples. 2019. "The Economic Effects of the 2017 Tax Revision: Preliminary Observations." Congressional Research Service Report 45736.

Hanlon, Michelle, and Jeffrey L. Hoopes. 2014. "What Do Firms Do When Dividend Tax Rates Change? An Examination of Alternative Payout Responses." *Journal of Financial Economics* 114 (1): 105–24.

Hanlon, Michelle, Jeffrey L. Hoopes, and Joel Slemrod. 2019. "Tax Reform Made Me Do It!" Tax Policy and the Economy 33: 33–80.

Hanlon, Michelle, Rebecca Lester, and Rodrigo Verdi. 2015. "The effect of repatriation tax costs on U.S. multinational investment." *Journal of Financial Economics* 116 (1): 179–196.

Hausman, Jerry A., and James M. Poterba. 1987. "Household Behavior and the Tax Reform Act of 1986." *Journal of Economic Perspectives* 1 (1): 101–19.

Hodge, Scott. 2015. "Dynamic Scoring Made Simple." Tax Foundation Paper 451.

Hoopes, Jeffrey L. 2022. "What Did the 2017 Tax Cuts Achieve?" *Wall Street Journal,* May 15. https://www.wsj.com/articles/trump-tax-cuts-reform-2017-economics-hayek-11652458728.

Hoopes, Jeffrey L., Patrick T. Langetieg, Edward L. Maydew, and Michele S. Mullaney. 2024. "Are Private Firms More Aggressive Tax Planners?" *Accounting Review.* https://doi.org/10.2308/TAR-2020-0499.

House GOP. 2016. "A Better Way: Our Vision for a Confident America." https://www.novoco.com/public-media/documents/ryan_a_better_way_policy_paper_062416.pdf.

House Ways and Means Committee. 2011. "Camp: Broad-Based Tax Reform Should Help All Job Creators and Families." Press Release, January 20. https://waysandmeans.house.gov/2011/01/20/camp-broad-based-tax-reform-should-help-all-job-creators-and-families.

Internal Revenue Service (IRS). 2017a. "All Returns: Adjusted Gross Income, Exemptions, Deductions, and Tax Items, by Size of Adjusted Gross Income and by Marital Status." Statistics of Income, Table 1.2. https://www.irs.gov/pub/irs-soi/17in12ms.xls (accessed May 6, 2024).

Internal Revenue Service. 2017b. "All Returns: Sources of Income, Adjustments, and Tax Items by Size of Adjusted Gross Income." Statistics of Income, Table 1.4. https://www.irs.gov/pub/irs-soi/17in14ar.xls (accessed May 6, 2024).

Internal Revenue Service. 2018a. "All Returns: Adjusted Gross Income, Exemptions, Deductions, and Tax Items, by Size of Adjusted Gross Income and by Marital Status." Statistics of Income, Table 1.2. https://www.irs.gov/pub/irs-soi/18in12ms.xls (accessed May 6, 2024).

Internal Revenue Service. 2018b. "All Returns: Sources of Income, Adjustments, and Tax Items by Size of Adjusted Gross Income." Statistics of Income, Table 1.4. https://www.irs.gov/pub/irs-soi/18in14ar.xls (accessed May 6, 2024).

International Monetary Fund. 2018. "Brighter Prospects, Optimistic Markets, Challenges Ahead." World Economic Outlook Update. International Monetary Fund: Washington, DC. https://www.imf.org/en/Publications/WEO/Issues/2018/01/11/world-economic-outlook-update-january-2018.

Isidore, Chris. 2017. "Trump Says H&R Block Will Be Unhappy with His Tax Plan." *CNN*, February 15. https://money.cnn.com/2017/02/15/pf/taxes/donald-trump-hr-block/index.html.

Joint Committee on Taxation. 2013. "Modelling the Distribution of Taxes on Business Income." JCX-14-13. Washington, DC: US Congress.

Joint Committee on Taxation. 2014. "Technical Explanation, Estimated Revenue Effects, Distributional Analysis, and Macroeconomic Analysis of the Tax Reform Act of 2014, a Discussion Draft of the Chairman of the House Committee on Ways and Means to Reform the Internal Revenue Code." JCS-1-14. Washington, DC; US Congress.

Joint Committee on Taxation. 2017. "Estimated Budget Effects of the Conference Agreement for H.R. 1, the 'Tax Cuts and Jobs Act.'" JCX-67-17. Washington, DC: US Congress.

Joint Committee on Taxation. 2018. "Tables Related to the Federal Tax System as in Effect 2017 through 2026." JCX-32R-18. Washington, DC: US Congress.

Kamin, David, David Gamage, Ari Glogower, Rebecca Kysar, Darien Shanske, Reuven Avi-Yonah, Lily Batchelder et al. 2018. "The Games They Will Play: Tax Games, Roadblocks, and Glitches under the 2017 Tax Legislation." *Minnesota Law Review* 103: 1439–1521.

Kelley, Stacie O., Christina M. Lewellen, Daniel P. Lynch, and David M. P. Samuel. 2023. "'Just BEAT It' Do Firms Reclassify Costs to Avoid the Base Erosion and Anti-abuse Tax (BEAT) of the TCJA?" *Journal of Accounting and Economics* 77 (2–3): 101648.

Kennedy, Patrick J., Christine Dobridge, Paul Landefeld, and Jacob Mortenson. 2024. "The Efficiency-Equity Tradeoff of the Corporate Income Tax: Evidence from the Tax Cuts and Jobs Act." Unpublished.

Kopp, Emanuel, Daniel Leigh, Susanna Mursula, and Suchanan Tambunlertchai. 2019. "U.S. Investment Since the Tax Cuts and Jobs Act of 2017." IMF Working Paper 19/120.

Markarian, Garen, and Steve Crawford. 2022. "The Effect of the Tax Cuts and Jobs Act of 2017 on Corporate Investment." Unpublished.

Mathur, Aparna. 2019. "Don't Give Up on the Tax Cuts and Jobs Act Just Yet." *AEIdeas*, September 16. https://www.aei.org/economics/dont-give-up-on-the-tax-cuts-and-jobs-act-just-yet.

McLure, Charles E., Jr., and George R. Zodrow. 1987. "Treasury I and the Tax Reform Act of 1986: The Economics and Politics of Tax Reform." *Journal of Economic Perspectives* 1 (1): 37–58.

Mertens, Karel. 2018. "The Near Term Growth Impact of the Tax Cuts and Jobs Act." Federal Reserve Bank of Dallas Working Paper 1803.

Musgrave, Richard A. 1987. "Short of Euphoria." *Journal of Economic Perspectives* 1 (1): 59–71.

Ohrn, Eric. 2019. "The Effect of Tax Incentives on U.S. Manufacturing: Evidence from State Accelerated Depreciation Policies." Journal of Public Economics 180: 104084.

Ohrn, Eric. 2023. "Corporate Tax Breaks and Executive Compensation." *American Economic Journal: Economic Policy* 15 (3): 215–55.

Organization for Economic Cooperation and Development. 2024a. "Investment (GFCF)." doi: 10.1787/b6793677-en. https://data.oecd.org/gdp/investment-gfcf.htm. (accessed on April 26, 2024).

Organization for Economic Cooperation and Development. 2024b. "Gross Domestic Product (GDP)." doi: 10.1787/dc2f7aec-en. https://data.oecd.org/gdp/gross-domestic-product-gdp.htm. (accessed on April 26, 2024).

Page, Benjamin R., Joseph Rosenberg, James R. Nunns, Jeffrey Rohaly, and Daniel Berger. 2017. "Macroeconomic Analysis of the Tax Cuts and Jobs Act." Washington, DC: Tax Policy Center.

Paletta, Damian. 2014. "Paul Ryan to Pursue Business Tax Overhaul in 2015." *Wall Street Journal*, December 2. https://www.wsj.com/articles/BL-WB-51129.

Pechman, Joseph A. 1987. "Tax Reform: Theory and Practice." *Journal of Economic Perspectives* 1 (1): 11–28.

Penn Wharton Budget Model. 2017. "The Tax Cuts and Jobs Act, as Reported by the Conference Committee (12/15/17): Static and Dynamic Effects on the Budget and the Economy." Philadephia, PA: University of Pennsylvania.

Pizzola, Brandon, Robert Carroll, and James Mackie. 2017. "Analyzing the Macroeconomic Impacts of the Tax Cuts and Jobs Act on the US Economy and Key Industries." London: Ernst and Young LP.

Pomerleau, Kyle. 2019. "Comments on Congressional Research Service's Preliminary Analysis of the

TCJA." *Tax Foundation*, May 31. https://taxfoundation.org/blog/comments-congressional-research-analysis-tcja.

Pomerleau, Kyle. 2021. "Biden's Reforms to the Tax Treatment of US Multinational Corporations: The Known and Unknowns" *AEI Economic Perspectives*, July 20. https://www.aei.org/research-products/report/bidens-reforms-to-the-tax-treatment-of-us-multinational-corporations-the-knowns-and-unknowns.

Pomerleau, Kyle. 2022. "Section 199A and 'Tax Parity.'" *American Enterprise Institute,* September 12. https://www.aei.org/research-products/report/section-199a-and-tax-parity.

Pomerleau, Kyle. 2023. "The Tax Cuts and Jobs Act and Recent Corporate Tax Reform Proposals." Speech, Statement before the House Committee on the Budget on Incentivizing Economic Excellence through Tax Policy, American Enterprise Institute, June 22. https://www.congress.gov/118/meeting/house/116137/witnesses/HHRG-118-BU00-Wstate-PomerleauK-20230622.pdf.

Romer, Christina D., and David H. Romer, 2009. "Do Tax Cuts Starve the Beast? The Effect of Tax Changes on Government Spending." *Brookings Papers on Economic Activity* 40 (1): 139–200.

Rosenberg, Joseph. 2013. "Measuring Income for Distributional Analysis." Washington, DC: Tax Policy Center.

Rosenthal, Steven M., 2019. "Post TCJA Bonuses Were Mostly a Timing Shift, Not A Boost in Long-Term Worker Pay." *Forbes*, July 18. https://www.forbes.com/sites/stevenrosenthal/2019/07/18/post-tcja-bonuses-were-mostly-a-timing-shift-not-a-boost-in-long-term-worker-pay/?sh=339a783e247f.

Slemrod, Joel. 2018. "Is This Tax Reform, or Just Confusion?" *Journal of Economic Perspectives* 32 (4): 73–96.

Sullivan, Martin. 2024. "Some TCJA Economics for The Great 2025 Tax Debate." *Tax Notes Federal*, February 5. https://www.taxnotes.com/tax-notes-today-federal/tax-policy/some-tcja-economics-great-2025-tax-debate/2024/02/05/7j4x9.

Tankersley, Jim, and Matt Phillips. 2018. "Trump's Tax Cut Was Supposed to Change Corporate Behavior. Here's What Happened." *New York Times*, November 12. https://www.nytimes.com/2018/11/12/business/economy/trumps-tax-cut-was-supposed-to-change-corporate-behavior-heres-what-happened.html.

Tax Foundation. 2017. *Preliminary Details and Analysis of the Tax Cuts and Jobs Act*. Special Report No. 241. Washington, DC: Tax Foundation.

Tax Policy Center. 2017. "Distributional Analysis of the Conference Agreement for the Tax Cuts and Jobs Act." Washington, DC: Tax Policy Center.

US Department of the Treasury. 2018. "OECD EMTRs and EATRs for 2017." US Department of the Treasury, Washington, DC.

US Department of the Treasury. 2022. "OECD EMTRs and EATRs for 2018." US Department of the Treasury, Washington, DC.

US Senate Committee on Finance. 2015. *International Tax Reform Working Group: Final Report*. Washington, DC: US Senate Committee on Finance.

Viard, Alan D. 2014. "Tax Increases and the Price Level." *Tax Notes*, January 6. https://www.aei.org/articles/tax-increases-and-the-price-level.

Viard, Alan D. 2019. "The Misdirected Debate about the Corporate Tax Cut." *AEIdeas*, October 11. https://www.aei.org/economics/the-misdirected-debate-about-the-corporate-tax-cut.

Walmart. 2018. "Walmart to Raise U.S. Wages, Provide One-Time Bonus and Expand Hourly Maternity and Parental Leave." Walmart, January 11. https://corporate.walmart.com/news/2018/01/11/walmart-to-raise-u-s-wages-provide-one-time-bonus-and-expand-hourly-maternity-and-parental-leave.

White House, and US Department of the Treasury. 2012. *The President's Framework for Business Tax Reform*. Washington, DC: White House and US Department of the Treasury.

White House, and US Department of the Treasury. 2016. *The President's Framework for Business Tax Reform: An Update*. Washington, DC; White House and US Department of the Treasury.

Zandi, Mark. 2017. "US Macro Outlook: A Plan That Doesn't Get It Done." *Moody's Analytics*, December 18. https://www.economy.com/economicview/analysis/299138/US-Macro-Outlook-A-Plan-That-Doesnt-Get-It-Done.

The US Individual Income Tax: Recent Evolution and Evidence

Jon Bakija

Individual income taxation accounts for about half of US federal government revenue (Congressional Budget Office 2024a), and it is the part of the tax system that does the most to reduce economic inequality (Congressional Budget Office 2023b). The Tax Cuts and Jobs Act of 2017 (TCJA) was arguably the most fundamental change to US income taxation in three decades. Almost all of the individual income tax provisions of the TCJA are scheduled to expire after 2025, so the country is once again nearing a crossroads when it comes to tax policy.

This paper assesses the current state of the US federal individual taxation and its recent evolution. How has the design of the individual income tax changed, and how has this affected tax revenues, the distribution of tax burdens, marginal tax rates, and the breadth of the tax base? What were the rationales for the changes, and what does economics have to contribute to the debate over whether the changes were a good idea? What have we learned so far from empirical research on the impacts of recent changes in individual tax policy?

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How the Individual Income Tax Currently Works, and Recent and Scheduled Changes

To begin, let us consider how the federal individual income tax works, what was changed by the Tax Cuts and Jobs Act of 2017, and what is scheduled to change after 2025 if existing provisions of the TCJA are allowed to expire.[1]

The process of calculating individual income tax liability begins with adding up all of the various components of one's income (wages and salaries, interest received, dividends, and so on) to get gross income. Certain forms of what could be considered income in a broader sense—for example, employer contributions for an employee's health insurance premiums or the imputed rent that homeowners do not need to pay—are excluded from gross income reported on the tax return. One then subtracts any applicable adjustments, such as contributions to an Individual Retirement Account, which yields "adjusted gross income," or AGI.

Next, one subtracts exemptions and deductions to get to taxable income. As shown in Table 1, prior to the passage of the Tax Cuts and Jobs Act (and again after it expires), taxpayers could deduct personal exemptions for each of the taxpayer, spouse, and their dependents (often children). The TCJA eliminated personal exemptions. If the TCJA expires, the personal exemption would be restored at a projected value of $5,300 per person in 2026 (and adjusted every year for inflation).[2]

Both before and after the 2017 law, taxpayers could then subtract from their taxable income either a "standard deduction," or the sum of "itemized deductions," and would usually choose whichever is larger. The Tax Cuts and Jobs Act nearly doubled the size of the standard deduction. In 2024, the standard deduction is $14,600 for single taxpayers and $29,200 for married couples filing joint returns. If the TCJA expires, these would decline to a projected $8,300 and $16,600, respectively, in 2026 (again, adjusted for inflation annually).

Four categories of itemized deductions account for the vast majority of their value. First, the deduction for state and local taxes (also known as SALT) allows itemizers to deduct from income their property taxes, plus the larger of income taxes or retail sales taxes. The Tax Cuts and Jobs Act sharply curtailed the itemized deduction for state and local taxes by capping it at $10,000 (not indexed for inflation). Second, itemizers can deduct certain interest payments, notably interest paid on a home mortgage. The TCJA limited itemized deductions for home mortgage interest to the interest on the first $750,000 of mortgage debt for first and second homes (also not indexed for inflation), and eliminated the ability to deduct interest

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[1] The description of individual income taxation for 2024 is current as of May 2024, and does not include the effects of any legislative enactments after May 2024 that might retroactively affect how 2024 income is taxed. Gale et al (2018) and Slemrod (2018) provide accessible overviews of the provisions of the TCJA, and Joint Committee on Taxation (2018) provides a detailed description of the provisions.

[2] The Tax Cuts and Jobs Act also switched to using the chained consumer price index to adjust tax provisions for inflation. This arguably provides a more accurate measure of inflation, but also a generally lower one, which by itself raises revenue relative to prior law by a growing margin over time, and which is one of the few individual provisions of the TCJA *not* scheduled to expire.

Table 1

Selected Federal Individual Income Tax Deductions, Exemptions, and Credits: 2024, and Projected 2026 Values if Individual Provisions of the Tax Cuts and Jobs Act Expire

Individual income tax provision	2024	2026
Personal exemption	$0	$5,300
Standard deduction, single	$14,600	$8,300
Standard deduction, married filing jointly	$29,200	$16,600
Cap on deductible amount of state and local taxes	$10,000	None
Deductible portion of eligible pass-through entity income	20%	0%
Child tax credit amount per child under age 17	$2,000	$1,000
Credit amount per other dependent	$500	$0

Source: Congressional Budget Office (2024c).

Note: Table shows provisions that are scheduled to apply to income earned in 2024 and 2026 based on current law as of May, 2024. 2026 values are identical to pre-TCJA values, except for automatic inflation adjustments to personal exemptions and standard deductions. Dollar values for standard deductions and the personal exemption for 2026 are CBO projections that could change if inflation turns out differently than forecast. Note that some provisions of the income tax, such as standard deductions, take on different values for "heads of household" (mostly single parents) and taxpayers who choose "married filing separately" filing status (which is rare because it is usually disadvantageous). Information on these is omitted here for the sake of brevity.

on home equity loans. Third, itemizers can deduct charitable contributions. Fourth, itemizers can deduct unreimbursed medical and dental expenses in excess of some percentage of adjusted gross income (7.5 percent as of 2024).[3]

Before 2017, both personal exemptions and a portion of certain itemized deductions were gradually phased-out for people with adjusted gross income above certain high thresholds, which was effectively identical to raising marginal tax rates for those individuals. These phase-outs of personal exemptions and itemized deductions were eliminated by the Tax Cuts and Jobs Act, but they are currently scheduled to return in 2026.

Subtracting all adjustments, deductions, and exemptions from gross income produces taxable income. The graduated tax rate schedules shown in Table 2 are then applied to taxable income to determine an initial tax liability. Note that the tax rates shown in Table 2 only apply to the slice of taxable income within that tax bracket, not to the entirety of taxable income. For example, in 2024, for a married couple filing jointly, a 12 percent tax rate applies only to the portion of that couple's taxable income (that is, after deductions are taken into account) between $23,200

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[3] The Tax Cuts and Jobs Act did introduce one major new individual deduction: a deduction for 20 percent of income from "pass-through businesses." These businesses distribute all of their income to their owners and thus are taxed on their individual income tax forms, and are not subject to the corporate income tax. The deduction is phased out above certain income thresholds for certain types of service occupations or industries (such as lawyers and doctors). It is also scheduled to expire after 2025. This provision, and other issues related to business taxation, are discussed by Chodorow-Reich, Zidar, and Zwick in this symposium.

Table 2

Federal Individual Income Tax Brackets and Rates: 2024, and Projected 2026 Values if Individual Provisions of the Tax Cuts and Jobs Act Expire

Tax bracket	Taxable income, bottom of bracket ($)				Tax rate (%)	
	Single, 2024	Single, 2026	Married, 2024	Married, 2026	2024	2026
First	0	0	0	0	10	10
Second	11,600	12,125	23,200	24,250	12	15
Third	47,150	49,250	94,300	98,500	22	25
Fourth	100,525	119,300	201,050	198,800	24	28
Fifth	191,950	248,850	383,900	302,950	32	33
Sixth	243,725	541,000	487,450	541,000	35	35
Seventh	609,350	543,200	731,200	611,000	37	39.6

Source: Congressional Budget Office (2024c).
Note: Table shows provisions that are scheduled to apply to income earned in 2024 and 2026 based on current law as of May 2024. 2026 values are identical to pre-TCJA values except for automatic inflation adjustments to tax brackets. Dollar values for tax brackets for 2026 are CBO projections that could change if inflation turns out differently than forecast. "Married" refers to married filing jointly. Some provisions of the income tax, such as tax brackets, take on different values for "heads of household" (mostly single parents) and taxpayers who choose "married filing separately" filing status (which is rare because it is usually disadvantageous). Information on these is omitted here for the sake of brevity.

and $94,300, while a 10 percent tax rate is still applied to the portion of that couple's taxable income that is below $23,200.

The initial measure of tax liability is subject to additional modifications. Income received from capital gains (the increase in the value of assets over time) is reported on tax returns only when the assets are sold and the gains are "realized." The top federal marginal tax rate on long-term capital gains held for more than one year, and qualified dividends (including the vast majority of dividends paid by corporations subject to the corporate income tax), is currently 20 percent, plus a 3.8 percent tax on net investment income applying to high-income people that was enacted as part of the Patient Protection and Affordable Care Act of 2010. The Tax Cuts and Jobs Act did not change tax rates on capital gains and dividends, but back in 2003, the top marginal income tax rate was reduced from 35 percent to 15 percent for qualified dividends, and from 20 percent to 15 percent for long-term capital gains. Top marginal tax rates on both types of income were raised to their current levels starting in 2013.

Both before and since 2017, individual income tax liability may also be modified by the alternative minimum tax (AMT), which involves calculating an alternative measure of taxable income that that disallows a variety of deductions and applies a large exemption. The taxpayer then pays the larger liability between ordinary income tax and the AMT. The AMT applies graduated rates of 26 percent and 28 percent to its measure of taxable income, but the exemption is phased out above an income threshold that raises the marginal tax rate to 32.5 percent and 35 percent over certain ranges of income. The Tax Cuts and Jobs Act raised the AMT exemption, and the income thresholds above which the AMT exemption is phased-out,

by significant amounts. As a result, the number of taxpayers subject to the AMT declined from over five million in 2017 to just 244,000 in 2018 (Internal Revenue Service 2019; 2020, Table 1.4). Those exemptions and thresholds are scheduled to decline back to their much lower pre-TCJA levels (plus inflation adjustments) starting in 2026.

The next step in the calculation process is to subtract tax credits. Tax deductions and exemptions reduce taxable income; in contrast, a tax credit reduces tax liability dollar-for-dollar. The value of the tax reduction provided by a deduction or exemption is equal to the taxpayer's marginal tax rate times the deduction or exemption, so that it tends to be relatively more valuable for higher-income taxpayers in higher tax brackets, whereas the value of the tax reduction provided by the credit simply equals the value of the credit. In addition, a tax credit can be "refundable" or "nonrefundable." A refundable credit can reduce income tax liability to a negative number, meaning the government pays money to the person. By contrast, a nonrefundable credit cannot reduce income tax liability below zero, and will not result in a net payment from the government.

The two most consequential credits in the individual income tax are the child tax credit, first introduced in 1997, and the Earned Income Tax Credit (EITC), first enacted in 1975 and expanded many times since. The Tax Cuts and Jobs Act increased the child tax credit significantly, but did not change the EITC (aside from changing the price index used to adjust it for inflation).

 Before the 2017 law, the child tax credit was $1,000 for each qualifying dependent child under age 17. It was partly refundable, with the refundable portion equal to the amount by which 15 percent of "earned income" (essentially labor income such as wages and salaries and income from self-employment) exceeded $3,000—in effect, a 15 percent wage subsidy for people in the phase-in range of incomes. The credit was then phased out at higher incomes. To offset the elimination of personal exemptions for dependents, the Tax Cuts and Jobs Act doubled the child tax credit for eligible children under 17 to $2,000, and also introduced a new nonrefundable $500 tax credit for other dependents. In addition, the refundable portion of the child tax credit was equal to the amount by which 15 percent of earned income exceeds $2,500, and is capped at a dollar figure that is temporarily indexed for inflation until it reaches $2,000 per qualifying child (as of 2024, the cap stands at $1,700 per qualifying child). The income threshold above which the child tax credit is phased out was raised. Aside from the cap on the maximum refundable amount, nothing about the child tax credit is automatically adjusted for inflation, before or after the 2017 law.

The Earned Income Tax Credit is fully refundable. Over a phase-in range, the credit is equal to a certain percentage of earned income, where the percentage is an increasing function of number of dependent children, up to three. The credit then plateaus over a range of earned income, and is gradually phased out above a higher income threshold. In 2024, for example, for a married couple with two children, the EITC is 40 percent of every dollar earned from work between $1 and $17,400; it plateaus at $17,400 × 40 percent = $6,960 at incomes between $17,400

and $29,640; and it is then is phased out at a rate of 21.06 cents per dollar of income earned above $29,640. All of the dollar amounts that go into calculating the EITC are indexed for inflation.

The Tax Cuts and Jobs Act also changed the federal estate tax, which is not part of the income tax but instead is imposed on wealth left behind at death (and on certain large gifts given during life). This tax only applies to wealth above a certain level, which was doubled. In 2024, the estate tax exemption stands at $13.61 million, which allows a married couple to pass on twice that amount ($27.22 million) to heirs tax-free. This of course only affects the very upper part of the wealth distribution. Allowing the estate tax provisions to expire would cut the exemption to half that size in real terms after 2025.

Individual Income Tax Revenue

Federal individual income tax revenue was 7.9 percent of GDP on average between fiscal years 1962 and 2017, with many fluctuations but no clear trend over time, and stood at 8.2 percent of GDP in fiscal 2017 (author's calculations based on data in Congressional Budget Office 2024a, Table 2a). Since then, federal individual income tax revenue has fluctuated, not only because of the Tax Cuts and Jobs Act, but also due to the business cycle, the pandemic, wild swings in financial markets, and associated changes in capital gains realizations. It fell to 7.6 percent of GDP in fiscal 2019, but then jumped to 10.2 percent of GDP in fiscal 2022, due mainly to unusually high capital gains realizations as financial markets recovered from the pandemic, before dropping again to 8.1 percent of GDP in fiscal 2023 (Congressional Budget Office 2024a Table 2a; 2024b Table 6).

Congressional Budget Office projections shown in Table 3 suggest that making the individual provisions of the Tax Cuts and Jobs Act permanent would reduce individual income tax revenues by about 1 percent of GDP annually, relative to what would happen otherwise. The marginal tax rate cuts reduce revenue by 0.68 percent of GDP, and the changes to the alternative minimum tax reduce revenue by 0.43 percent of GDP, both in fiscal 2027. Elimination of personal exemptions and curtailing of itemized deductions together raise revenue by 0.94 percent of GDP in fiscal 2027, which is only partly offset by the 0.64 percent revenue loss from the expanded child and dependent tax credits and the larger standard deduction.

The Distribution of Individual Income Tax Burdens

Figure 1 shows estimates from the Congressional Budget Office of average federal individual income tax rates in different slices of the income distribution from 1979 through 2019. Average tax rates are calculated as taxes paid by each household, expressed as a percentage of market income (for example, labor compensation aside from pension contributions, capital and business income, and

Table 3

Revenue Loss or Gain from Making Each Major Individual Component of the Tax Cuts and Jobs Act Permanent, Fiscal Year 2027 (as a percentage of GDP)

Provision	Revenue loss (−) or gain (+) as a % of GDP
Marginal tax rate cuts	−0.68
Expanded child and dependent tax credits	−0.25
Elimination of personal exemptions	0.60
Increased standard deductions	−0.39
Changes to itemized deductions	0.34
Changes to AMT	−0.43
Qualified business income deduction	−0.20
Other changes	−0.10
Sum: total change in revenue	−1.11

Source: Author's calculations based on Congressional Budget Office (2023a; 2023c, Table 1, Row 32).

pension benefits) plus the value of social insurance benefits. The top line represents the average tax rate for households in the top 1 percent of the income distribution, the next highest line labeled p95–p99 represents the average tax rate for households at the ninety-fifth through ninety-ninth percentiles of the income distribution, and so forth.

These estimates suggest that the US individual income tax is progressive, meaning that average tax rates are higher for higher-income people, and that it has become more progressive since 1979. Average tax rates have fallen relatively more since 1979 in the lower parts of the income distribution, due mainly to expansion of the Earned Income Tax Credit and child tax credits, increased standard deductions, and lower statutory tax rates. Average tax rates at the top of the income distribution have fluctuated without a clear trend, although average tax rates on the top 1 percent have been relatively high by historical standards since the increase in top marginal income tax rates enacted in 2013, which was only partly undone by the Tax Cuts and Jobs Act.[4]

The income tax is the main source of progressivity in the federal tax system. The same Congressional Budget Office analysis estimates that in 2019, average tax rates including all federal taxes were 29.9 percent in the top 1 percent of the income

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[4]The federal budget data on tax revenue as a percentage of GDP discussed in the previous section treat the refundable portion of income tax credits as government expenditures rather than tax reductions, whereas the CBO distributional data in Figure 1 treat refundable income tax credits as tax reductions. In addition, the large rise in US income inequality since 1979 caused a growing share of the nation's income to be taxed at the highest income tax rates. These patterns largely explain why income tax revenue as a percentage of GDP exhibited no clear trend in the previous section, despite declining average income tax rates across most of the income distribution in Figure 1, and why the average income tax rate for the top 1 percent exhibits no clear trend, despite large cuts in the top federal marginal individual income tax rate since 1979 (when the top marginal rate stood at 70 percent).

Figure 1

Average Federal Individual Income Tax Rates Across the Income Distribution, 1979–2019
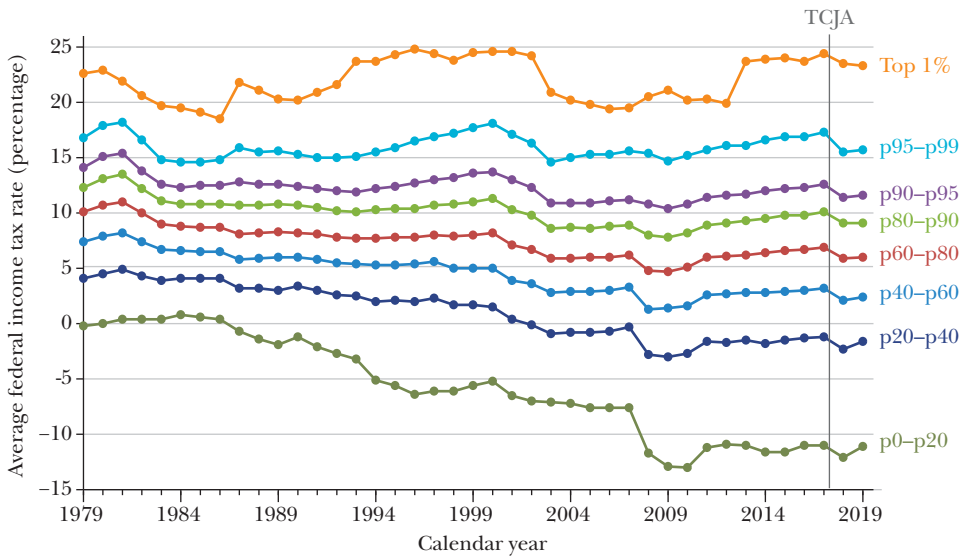
Source: Congressional Budget Office (2023b, Table 9).
Note: Figure depicts estimated average federal individual income tax burden as a percentage of a measure of income including both market income and social insurance benefits, for households in each part of the US income distribution, where "p95–p99" represents households in the 95th through 99th percentiles of the income distribution (the top 5 percent outside the top 1 percent), and so forth.

distribution, 13 percent in the middle quintile, and 0.6 percent in the bottom quintile, suggesting that the overall federal tax system is also quite progressive.

The effects of the Tax Cuts and Jobs Act are visible, if subtle, in Figure 1. Between 2017 and 2018, average tax rates decline by about 1 percentage point in all of the different income groups, except for p95–p99 where the decline is closer to 2 percentage points. Between 2018 and 2019, average tax rates rebound a bit, and do so more in the lower parts of the distribution than in the upper parts of the distribution. With these changes, the reductions in average tax rates from 2017 to 2019 are generally larger for the upper parts of the income distribution than for the lower parts. A broadly similar pattern arises from microsimulation estimates conducted by the Urban-Brookings Tax Policy Center of the distribution of changes in annual tax burdens that would occur in 2026 if the expiring individual income tax and estate tax provisions of the TCJA are made permanent, shown in Table 4. Cuts in average tax rates are larger, and average dollar amounts of tax cuts are much larger, at the top of the income distribution.

The effect of the Tax Cuts and Jobs Act on peoples' well-being will also depend how future taxes and government spending change in response to the revenue losses it causes. If the tax cut is initially financed with increased government borrowing,

Table 4

Distribution of Federal Tax Changes in 2026 That Would Be Caused by Making Individual Income Tax and Estate Tax Provisions of TCJA Permanent

Expanded cash income percentile	Change in average federal tax rate (%)	Average federal tax change ($)
Top 1 percent	−1.5	−48,690
Top 5 percent outside top 1 percent (p95–p99)	−2.3	−14,680
Bottom half of top 10 percent (p90–p95)	−1.3	−4,970
Bottom half of top quintile (p80–p90)	−1.1	−2,800
Second highest quintile (p60–p80)	−1.2	−1,870
Middle quintile (p40–p60)	−1.1	−990
Second lowest quintile (p20–p40)	−0.9	−450
Bottom quintile (p0–p20)	−0.5	−100

Source: Urban-Brookings Tax Policy Center (2022a). Methodology and incidence assumptions are described in Urban-Brookings Tax Policy Center (2022b).

that defers the need to raise taxes or cut government spending, but does not eliminate it. Gale et al. (2018) show that under reasonable assumptions about how future government spending or taxes might change in response to the TCJA, the majority of Americans could end up worse-off as a result.

Effective Marginal Income Tax Rates

Effective marginal income tax rates depend not only on the statutory marginal income tax rates shown in Table 2, but also on exemptions, deductions, credits, and the alternative minimum tax, along with phase-ins and phase-outs of various aspects of these provisions. Estimates from the Congressional Budget Office (2024c), which take these factors into account, suggest that the Tax Cuts and Jobs Act reduced the labor-income-weighted average of effective marginal federal individual income tax rates by about 2 percentage points.

Most states have their own income tax, and the cap on state and local tax deductions in the Tax Cuts and Jobs Act, along with the larger standard deduction (which greatly reduced the fraction of taxpayers who itemize), tends to increase combined federal–state marginal income tax rates. For example, consider how the TCJA affected a top-bracket taxpayer in California. The TCJA reduced the top federal statutory marginal tax rate from 39.6 percent in 2017 to 37 percent in 2018, and the top California statutory marginal income tax rate (including the "mental health services tax") was 13.3 percent in both years. In 2017, this taxpayer would almost certainly itemize, and assuming the taxpayer is not on the alternative minimum tax, the combined federal–state effective marginal tax rate would be $[0.396 + 0.133 \times (1 − 0.396)] \times 100\% = 47.6$ percent, as each dollar of state income tax paid would reduce federal income tax by 39.6 cents because it was

deductible. In 2018, with a binding cap on the deduction for state and local taxes or nonitemization, the effective marginal rate on that same taxpayer rises to $(0.37 + 0.133) \times 100\% = 50.3$ percent, a 2.7 percentage point increase compared to 2017. Similar issues apply in many states that have income taxes, but usually to a lesser degree. This suggests that the average reduction in combined federal–state effective marginal income tax rates caused by the TCJA was probably significantly smaller than the 2 percentage point reduction in federal effective marginal tax rates estimated by the Congressional Budget Office.

The Decline of Itemized Deductions

For a long time, "broaden the tax base and lower marginal rates" has been a sort of mantra for advocates of tax reform. Exceptions to a simple, broad-based tax, such as deductions, exclusions, and credits, are often framed as "tax expenditures" (for an overview, see Burman 2003; Surrey and McDaniel 1985). The tax expenditure concept was introduced to highlight the fact that many deductions, exemptions, exclusions, and credits are effectively like spending programs hidden in the tax code. Labeling such programs as "tax cuts" rather than "government spending" may be politically advantageous in a generally tax-averse country, but runs the risk that policies that are poorly designed and poorly justified tend to stick around because are less transparent and less politically assailable than government spending programs.

Arguably the most consequential base broadening measure in the Tax Cuts and Jobs Act was to greatly reduce the use of itemized deductions, through a large increase in the standard deduction, and caps on the deductions for state and local income taxes and mortgage interest. As shown in Table 5, the share of returns that itemized fell from 31 percent in 2017 to just 9 percent in 2021. Itemization fell most dramatically in the $100,000 to $500,000 AGI range.

In the next sections, I will consider arguments and evidence for and against the major tax expenditures that were significantly affected by recent legislation: itemized deductions for charity, for state and local taxes, and for home mortgage interest. To the extent that these represent adjustments that make the measure of income we use to determine taxes and transfers a more accurate reflection of a person's true economic well-being, such deductions could enhance social welfare. For tax expenditures not justified on those grounds, Kaplow (2017, 2023) argues persuasively that the right way to think about their optimality is to ask whether a revenue-neutral and distribution-neutral change in tax policy that eliminated the tax subsidy would cause an improvement or decline in economic efficiency. For example, an income tax could raise the same revenue, and achieve similar distribution of tax burdens across income classes, either with or without some form of tax subsidy for charitable contributions, simply by making appropriate adjustments to the pattern of marginal tax rates and credits across income classes. For this reason, questions about the optimal level of revenue collection, and optimal distribution of tax burdens across income classes, are completely separable from

Table 5

Percentage of Individual Income Tax Returns Itemizing Deductions, by Income Class and Overall, 2017 and 2021

Adjusted gross income	2017	2021
$5,000 to $100,000	17%	4%
$100,000 to $200,000	76%	19%
$200,000 to $500,000	93%	35%
Over $500,000	93%	59%
All returns	31%	9%

Source: Author's calculations based on data from Internal Revenue Service (2020; 2024, Tables 1.1 and 2.1).

the question of whether a tax subsidy for charity is optimal. The latter thus largely boils down to a question about efficiency. If there is an efficiency rationale, one should also ask whether a tax subsidy or a direct government expenditure program is the best approach.

Charitable Donations

Why have a deduction for charitable donations in the income tax? One possible rationale may be that a tax adjustment for sacrificing some of one's own consumption to help others is in a sense fair, even if the giver experiences a "warm glow" of altruism in exchange, but this is ultimately a difficult philosophical question. Among economists, a more common argument is that charitable donations may deserve support to the extent that they involve positive externalities. The donations benefit not only the donor, but also other people, for example by funding assistance to those in poverty, improved health or education, cultural and natural resources, scientific research, and so forth.

Another way to address these issues is direct government provision financed by taxes. But subsidizing charitable donations can have certain advantages relative to direct government provision. First, if donors receive more utility (in the form of a "warm glow") from their donations than they do from paying taxes, then subsidizing charitable donations may be a relatively more efficient way to address some positive externality and public goods problems. Second, charitable activity and direct government provision may not be perfect substitutes. For example, in a democracy, some public goods only favored by a minority would tend to be underprovided. A subsidy for donations to diverse and decentralized charitable activities can help address that and other issues with centralized government provision. Kaplow (2023, p. 28) argues that when it comes to innovation, "many of the most important advances are attributable to private funding, often supporting research and researchers neglected by government funders," and that "decentralized, privately

funded organizations can be an important counterweight to autocracy and dicta-torship." While there are plenty of good arguments and examples, relatively little formal empirical research has sought to quantify positive externalities from chari-table donations, so that is an important avenue for future research.

The Tax Cuts and Jobs Act dramatically reduced the incentive to donate to charity starting in 2018 for the approximately 20 percent of taxpayers who switched from itemizing deductions to taking the standard deduction. It also slightly reduced incentives to donate for the approximately 10 percent of taxpayers who continued to itemize after the reform, because it lowered their marginal income tax rates. If tax subsidies for charity have the efficiency advantages discussed above, then the magnitude of the welfare loss from removing those tax subsidies would depend on how much charitable giving declined as a result.

It is tricky to learn much about how peoples' donation decisions responded to the reduced incentive to donate just by eyeballing the annual data. My calcula-tions based on data from Giving USA (2024) and US Bureau of Economic Analysis (2024) indicate that individual charitable donations had been on an upward trend relative to GDP, and then dropped from 1.49 percent of GDP in 2016 to 1.40 percent of GDP in 2019, consistent with a response to the reduced incentive to donate. Data for 2017 and 2018 may be contaminated by retiming of donations in anticipation of the Tax Cuts and Jobs Act, but that does not change the impression that donations fell after the TCJA. Individual donations rebounded above pre-TCJA levels in 2020 and 2021 as people contributed to pandemic-related causes and financial markets boomed. These same estimates suggest that individual donations fell back to 1.43 percent of GDP in 2022 and 1.37 percent of GDP in 2023, but these are preliminary estimates based on less reliable data, and may be confounded by other factors such as a post-pandemic decline in giving and large fluctuations in the stock market.

Most econometric research has found that charitable giving is fairly price-elastic, where the price of charitable giving is one minus the tax savings from donating another dollar (for literature reviews, see Bakija 2013; Bakija and Heim 2011). However, much of this research involves serious identification problems. For example, a challenge emphasized by Feenberg (1987) is that in the United States, the price of donations depends on the marginal tax rate, and the marginal tax rate is largely an increasing nonlinear function of income. As a result, disentangling the separate effects of price and income on donations is difficult, and relies on arbitrary assumptions about functional form.

A range of alternative methods have been tried: a typical finding is an elas-ticity of charitable giving with respect to price of around 1 or higher. For example, research that has relied on cross-state variation in the price of donations arising from state tax policies (for example, Feenberg 1987; Bakija 2013), or difference-in-differences variation arising from relative changes in tax incentives for giving over time across states (Bakija and Heim 2011; Duquette 2016), which may be less subject to the identification problems noted above, has tended to estimate

relatively large price elasticities, often around 1 in absolute value or more.[5] My own calculations combining an assumed price elasticity of 1 with Urban-Brookings Tax Policy Center (2017) estimates of the amount of donations, and percentage change in the price of donations caused by the Tax Cuts and Jobs Act, in each part of the income distribution, suggests that the TCJA would cause a 7 percent decline in individual donations.

Understanding the impact of itemization on donation behavior requires data that report charitable donations for both itemizers and nonitemizers over time, which are available in the Panel Study of Income Dynamics (PSID). Using PSID data from tax years 2000 through 2018, Han, Hungerman, and Ottoni-Wilhelm (2023) perform a difference-in-differences comparison, where households that are predicted to switch from itemizing to the standard deduction because of the Tax Cuts and Jobs Act, based on their 2016 characteristics, are the treatment group, and households that are predicted to keep taking standard deduction, or to keep itemizing, both before and after the TCJA, form the control group. Their analysis finds a significant decline in donations for the treatment group compared to the control group, with a particularly large response for those whose itemized deductions before the TCJA were close to, but slightly below, the new higher value of the post-TCJA standard deduction. Among these people, the TCJA did not change their incomes significantly, but caused a large increase in their price of giving. For this group, they estimate a compensated price elasticity of donations of -2.6. After adjusting for retiming of donations into 2017 that may have occurred because of anticipation of the TCJA, they estimate that the TCJA caused a reduction in charitable donations of about $20 billion annually, which would be about 7 percent of donations at 2017 donation levels, very similar to what the evidence discussed earlier would imply.

If charitable donations produce significant positive externalities, and if donation decisions are indeed at least somewhat responsive to the price of donations, then some kind of subsidy for charitable donations is probably efficiency enhancing—but an itemized deduction may not be the best tool. Itemizers are overwhelmingly high-income people, and the value of a tax deduction is larger for people with higher marginal tax rates. The Urban-Brookings Tax Policy Center (2023a) estimates that in 2024, 70 percent of the tax savings from the charitable contribution goes to people in the top 1 percent of the income distribution.

An alternative would be a flat-rate refundable tax credit for charitable donations, which would provide the same subsidy rate to everyone. Batchelder, Goldberg, and Orszag (2006) argue that this policy would be preferable, because there is no evidence that the positive externalities from donations are larger for high-income people than for others. Reich (2018) argues that the "plutocratic bias" in the way we

[5] Similarly, Hickey et al. (2023) exploit difference-in-differences variation in the income-tax price of donations across Canadian provinces (Canada provides a tax credit for donations that does not depend on income, but varies greatly across provinces). They also estimate price elasticities that are generally around 1 or more in absolute value.

currently subsidize donations to charity is bad for democracy, and favors a flat-rate refundable tax credit for donations largely for that reason.

Deductions for State and Local Taxes

The Tax Cuts and Jobs Act had highly disparate effects across high-income people living in different states, largely because of the $10,000 cap on deductions for state and local taxes and the increased standard deduction. Altig et al. (2020) estimate that among the highest-income 10 percent of households, the average tax cut from the TCJA amounted to about 2 percent of consumption in "red" states that tend to vote Republican and have lower state and local taxes, and about 1.2 percent of consumption in "blue" states that tend to vote Democratic and have higher state and local taxes.

One argument for a deduction for state and local taxes is that it appropriately adjusts taxable income for the negative effect of state and local taxes on the taxpayer's economic well-being. However, these costs may be offset to some extent by benefits from state and local government spending: either direct benefits in the form of better roads, parks, schools, and the like, or a "warm glow" from living in a state where redistributive tax and transfer policy does more to provide better economic opportunities for the disadvantaged. Moreover, the taxpayer may have voluntarily chosen to live in that location to get those benefits (Tiebout 1956). To the extent that state and local taxes act like a "user fee" that is offset by the benefits of state and local government, the equity and efficiency rationales for a state and local tax deduction are both weakened.

A deduction for state and local taxes creates an incentive for voters to choose higher levels of state and local government spending than they would otherwise, because the federal deduction makes state and local taxes less expensive for those who itemize. That could lead to inefficient over-spending, except to the extent that it corrects under-spending that would arise because voters do not take into account spillover benefits of government spending to other jurisdictions.

An argument emphasized more recently in the economic literature is that a deduction for state and local taxes can mitigate locational inefficiencies. In an efficient economy, workers should be drawn by higher wages to move from low-productivity to high-productivity areas. However, in the United States, there is a strong correlation across locations between the most productive agglomerations of talent and where state income tax rates are highest and most progressive. In addition, as Albouy (2009) emphasizes, high productivity and high-wage areas also tend to have a high cost of living and high real estate prices (sometimes due to restrictive zoning laws), for which the federal income tax does not adjust. This combination creates an inefficient incentive not to move to these locations, or to move away from them. Deductions for state and local taxes and home mortgage interest can help to offset these inefficient location incentives. Using a general equilibrium model of location choice, Albouy estimates that the deadweight loss arising from inefficient

location decisions in response to federal individual income taxation is equal to 0.23 percent of income in the benchmark case, and would rise to 0.43 percent of income if deductions for state and local taxes and mortgage interest deductions were eliminated.

Other studies have found similar results. Using information on 350 state and local tax changes between 1980 and 2010, Fajgelbaum et al. (2019) estimate the parameters of a general equilibrium model of individual location choice in the United States. They conclude that tax harmonization across states would reduce locational inefficiencies and improve the welfare of workers by 1.2 percent. Conversely, eliminating the deduction for state and local taxes exacerbates these locational inefficiencies by increasing effective tax differentials across states. Moretti and Wilson (2017) study how the migration of "star scientists," who create many new highly-cited patents, responds to relative changes in tax rates over time across US states. They find that the location decisions of this group are highly responsive to taxes. Building on that finding, Coen-Pirani and Sieg (2019) build a general equilibrium model with "agglomeration effects"—that is, positive spill-overs of knowledge across workers who cluster in a particular location. In this model, eliminating the deduction for state and local taxes exacerbates spatial misallocation, with high-skill workers moving away from the cities where they would be most productive.

While certain high-income people, like "star scientists," may be particularly mobile in response to state-level tax differentials, the overall migration response of high-income people to geographic tax differentials is small. Young and Lurie (2022) implement a difference-in-differences analysis of the effect of increased dispersion of effective tax rates across states caused by the Tax Cuts and Jobs Act on cross-state migration of millionaires, using US individual income tax return data on about 450,000 millionaire tax filers per year for tax years 2015 through 2019. Overall, an increased effective tax burden in one's home state had no statistically significant impact on the probability that a millionaire would migrate out of that state; among millionaires that did move, the 2017 law had a statistically significant but very small positive impact on the likelihood that they would move to a lower-tax state. For example, extrapolating their estimates on annual migration flows to a long-run effect suggests that the TCJA would ultimately reduce the population of millionaires in California by 0.5 percent and increase the population of millionaires in Texas by 0.4 percent. This impact on cross-state migration flows might grow over time, but we will not know until more data come in.

While an itemized deduction for state and local taxes could have some modest benefits in terms of location incentives and economic efficiency, it seems a second-best solution. Relying more on the federal government and less on subnational governments for policies involving redistribution or cross-state spillovers, along with tax harmonization across states, could be superior approaches, but would be politically challenging to achieve.

Housing and the Home Mortgage Interest Deduction

The primary rationale for deductibility of interest in an income tax is coherence; that is, interest received counts as positive income, and so interest paid out should count as negative income. While this makes sense in the context of a pure tax on economic income broadly defined, in the context of our actual income tax, two problems arise.

First, a substantial part of the return to investing in an owner-occupied home, the imputed rental value of living in the home, is not included in taxable income. This exclusion reflects both practical administrative difficulties (it can difficult to know the rental value of a home unless it is being rented), and the fact that it would be difficult to convince American voters that the rental value of their homes should be subject to tax. But because the returns to other kinds of investments tend to be subjected to income tax, this creates an inefficient distortion, and we end up with too much investment in owner-occupied housing, and not enough of other kinds of investment. Reducing or eliminating the deduction for mortgage interest may partially offset this distortion.

Second, the US income tax is actually a hybrid between an income tax and a consumption tax, and has been evolving in the direction of a consumption tax over time. In Slemrod and Bakija (2017, pp. 44–47), we estimate that on average from 1987 through 2013, only 25 percent of capital and business income accrued in the United States was reported on individual income tax returns, due to the exclusion of the rental value of owner-occupied housing, tax-preferred retirement savings accounts and pension plans, and many other reasons. If the United States is effectively administering a consumption tax, then interest deductions have no place. Instead, mortgage interest deductions create opportunities for the inefficiencies of tax arbitrage, where taxpayers can reduce their tax bills by borrowing and deducting the interest on their income tax returns, and then using the borrowed funds to invest in assets that yield tax-free returns.

Might positive externalities from homeownership justify some kind of subsidy? Glaeser and Shapiro (2003) describe how homeownership may produce some positive externalities, such as an increase in home maintenance and gardening that could benefit neighbors, or greater political engagement. On the other side, homeownership may reduce geographic mobility in response to economic shocks, and homeowners may be motivated to act through local politics to restrict the supply of housing in order to boost their own home values, which would tend to exacerbate the inefficiencies in peoples' location decisions discussed in the previous section.

Evidence for positive externalities from homeownership is not strong. Engelhardt et al. (2010), using randomized assignment to a subsidized saving program for low-income people in Tulsa, Oklahoma, as an instrument for homeownership, find no evidence for positive impacts of homeownership on any of a large number of outcomes, including voting and political participation, volunteering for community projects, helping neighbors, or home maintenance. On the other hand, Coulson

and Li (2013) find that home prices go up relatively more over time in neighborhoods where homeownership rates increase, compared to other neighborhoods where they do not, and infer positive externalities of about $1,300 per homeowner. However, such estimates could be biased upwards by unobserved factors (like a neighborhood becoming more fashionable over time) that lead to both increased homeownership rates and increased home prices.[6]

Another argument for homeownership subsidies is that owning a home, together with monthly mortgage payments, may serve as commitment devices to help people overcome behavioral economics problems that would otherwise lead to suboptimal saving. In turn, building wealth to draw on for a rainy day, or to serve as collateral for a loan, may help to offset market failures in markets for insurance and credit. A program in Sweden offered some people who were renting government-owned apartments an opportunity to buy their apartments. Sodini et al. (2023) compared their long-term outcomes with similar renters who were not given this opportunity and find positive effects of homeownership on saving, wealth, and consumption smoothing.

There is mixed evidence on the effects of the home mortgage interest deduction on homeownership. One suggestive piece of evidence is that there is little correlation across countries between whether a country allows tax deductibility of mortgage interest and the homeownership rate (Urban-Brookings Tax Policy Center 2020). In more convincing evidence, Gruber, Jensen, and Kleven (2021) take advantage of a Danish tax reform in 1987 that greatly reduced the income tax benefit from the mortgage interest deduction for top-bracket taxpayers, reduced it slightly for middle-bracket taxpayers, and increased it slightly for bottom-bracket taxpayers. Their estimates suggest that the home mortgage interest deduction has no effect on the probability of owning a home, but does induce people to buy larger and more expensive homes and take out more debt than they would otherwise, both of which are sources of inefficiency. They also find evidence that it boosts home prices, which is good for the homeowners, but bad for those looking to buy a home for the first time.

The Tax Cuts and Jobs Act reduced marginal tax subsidies for owner-occupied housing by increasing the standard deduction, by lowering the limit on the size of mortgage debt eligible for the mortgage interest deduction, and by capping the deductions for state and local taxes. The size of the decline in tax subsidies for owner-occupied housing varied greatly across states, depending for example on the design of state tax policy and the pre-reform level of house prices in the state. Hembre and Dantas (2022) take advantage of that fact to use difference-in-differences to estimate the effect impact of the TCJA on homeownership. They estimate that in the first two years after its implementation, the TCJA caused a 0.23 percentage point

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[6]Coulson and Li (2013) use lagged neighborhood characteristics as instruments for the change in homeownership rate, but this may not solve the endogeneity problem if those lagged neighborhood characteristics are systematically related to the unobserved factors that are causing neighborhoods to improve and over time.

decline in the homeownership rate and a 0.28 percentage point decline in the share of people who have mortgages. They also found evidence that larger reductions in the tax subsidy for housing were associated with modestly larger declines in home prices.

All things considered, the efficiency case for subsidizing owner-occupied housing seems considerably weaker than, say, the case for subsidizing charitable contributions. To the extent that there is a case, an itemized deduction for home mortgage interest is a poorly designed policy instrument. In 2024, 76 percent of the tax savings from the home mortgage interest deduction go to people in the top quintile of the income distribution (Urban-Brookings Tax Policy Center 2023b). But there is no evidence that positive externalities from homeownership are greater for higher income people, and the other rationales for subsidizing homeownership noted above are more relevant for lower-income people. Alternative policies that do not encourage indebtedness and are not so focused on high-income people, such as a refundable tax credit for first-time homebuyers, would probably be better (for a discussion of tax policy options for housing, see Harris, Steuerle, and Eng 2013).

The Child Tax Credit and the Earned Income Tax Credit

Arguments about the design of tax policy are always intertwined with arguments over work incentives. In this section, we focus on how the recent shift towards partly- or fully-refundable income tax credits, and away from personal exemptions, has moved the income tax in a more progressive direction and also affected the incentive to work. In the next section, we sketch the issues that arise with behavioral incentives and marginal tax rates at the top of the income distribution.

Both the earned income tax credit and the child tax credit have been expanded multiple times over the past few decades, and versions of them have been introduced into many state income tax systems as well. During the pandemic in March 2021, a Democratic Congress passed and President Biden signed the American Rescue Plan, which temporarily increased the maximum annual child tax credit to $3,000 for children aged 6 to 17 and $3,600 for children under age 6 and made it fully refundable, and also temporarily increased the Earned Income Tax Credit for childless workers (Joint Committee on Taxation 2023). Both child and dependent tax credits and the EITC significantly increase economic resources available to children in low-income families. To the extent that these programs phase-in with earned income, they also move the overall tax-and-transfer system in the direction of improved incentives for employment among low-wage people.[7]

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[7]These policy changes raise the question of to what extent transfers to people at the bottom of the income distribution should be phased-in with labor earnings, as is currently the case with the child tax credit and the EITC, as opposed to being provided to people even if they do not work, as would be the case with a negative income tax, basic income grant, or fully refundable child tax credit. Saez (2002) provides a theoretical analysis comparing a policy like the EITC with a negative income tax or basic income grant system in an optimal income taxation model. He shows that a policy like the EITC can

Numerous earlier studies estimated the impact of the Earned Income Tax Credit on employment, using difference-in-differences strategies that exploit the fact that the EITC was expanded several times historically in a way that increased the incentive to work significantly more for low-education single women with children compared to low-education women without children. For example, Eissa and Liebman (1996), Meyer and Rosenbaum (2001), and Meyer (2002) generally found that EITC increased employment rates significantly.

More recent evidence has been controversial. Kleven (2024) performed difference-in-differences and event study analyses of every federal and state change in earned income tax credit policy since the 1970s. The only change for which he finds robust evidence that the Earned Income Tax Credit is associated with an increase in employment is the particularly large 1993 federal expansion of the EITC—an increase in employment that he associates with the confounding effect of the mid-1990s wave of welfare reform, which allowed state governments to impose time-limits and work requirements on welfare recipients. Schanzenbach and Strain (2021) responded to an earlier version of Kleven's paper showing that if one controls for business cycle effects in a way that allows them to vary depending on whether the household has children, focuses on comparisons between women with low levels of education with and without children, and defines participation in work based on whether survey respondents reported working last week, rather than at all in the past year, then federal EITC expansions in 1975, 1986, 1990, and 1993 all increased the probability of working for low-education mothers. They also perform a difference-in-differences analysis of the 1993 federal EITC expansion using only data from states that did not change their welfare policies around that time, and still find a significant positive impact of the EITC on probability of working for low-education mothers. In the latest version of his paper, Kleven responds by estimating a very wide variety of econometric specifications, and showing that estimates from the Schanzenbach and Strain specifications are outliers in terms of the size of the positive estimated impact of the EITC on employment, suggesting that the results are sensitive to specification choices about which reasonable people can differ.

Whether, and how much, people respond to the incentives created by programs such as the Earned Income Tax Credit may depend on how well-informed they are about the policy, and the evidence on that point is mixed. Based on a randomized experiment where tax preparers gave randomly selected EITC recipients simple and personalized information about the EITC schedule, Chetty and Saez (2013) found no evidence of a greater intensive-margin earnings response in the treatment group compared to the control group. In another approach, Saez (2010) points out that if there is a significant intensive-margin response of hours worked to the EITC, we should see significant bunching of taxpayers at two kink points: one at the end of the phase-in range, and one at the beginning of the phase-out range. He finds

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be better for social welfare than a basic income grant when the labor supply response to incentives is concentrated along the extensive margin (the decision whether to work at all or not) rather than along the intensive margin (the decision about whether to work more or fewer hours).

bunching at the first kink, but only for self-employed people, which he suggests is due to high levels of tax evasion in this group. Chetty, Friedman, and Saez (2013) find that in neighborhoods where knowledge of the EITC is high (proxied by the amount of bunching at the first EITC kink among self-employed taxpayers in the neighborhood), wage-earners also show significant bunching at the kink at the end of the EITC phase-in range. For the United States as a whole, they estimate that the intensive-margin elasticity of earnings with respect to the net-of-tax rate is 0.31 in the phase-in region of the EITC and 0.14 in the phase-out region, which are pretty small. But in neighborhoods that are in the top decile of EITC knowledge, the implied elasticity of earnings with respect to the net-of-tax rate is 0.84 in the phase-in range of the EITC, and 0.29 in the phase-out range. This finding suggests that if more people gradually learn about and understand the incentives in policies like the EITC, the aggregate elasticities of labor force participation and earnings, which are small right now, might grow.

The effects of tax incentives for the working poor may also be heavily influenced by complementary policies. In this journal, Kleven (2014) shows that across high-income countries, there is a counterintuitive negative correlation between the employment rate and the net-of-participation-tax-rate (that is, one minus the tax rate a low-wage worker faces if choosing to work compared to not, taking into account the combined effects of the tax and transfer systems on the incentive to work). For example, the Nordic countries had the highest participation tax rates and the highest employment rates. Kleven shows that the countries with high tax rates (especially the Nordic countries) compensate by funding "participation subsidies," such as public expenditures on childcare, preschool, and elderly care, and argues that these more than offset the negative effects of taxes and transfers on labor supply. Kenworthy (2020) provides more detail on how subsidies for complements to work and active labor market policies are designed and implemented in the Nordic countries, and Luksic (2020) corroborates the importance of these policies for labor supply with an econometric analysis of cross-country panel data.

The 2021 policy change that increased the child tax credit and made it fully refundable reduced the incentive to work, because it temporarily eliminated the 15 percent wage subsidy in the phase-in range. Income effects from the change should also have discouraged work, but on the other hand, the additional income might have helped people overcome credit constraints that would otherwise prevent them from paying for fixed costs of working such as childcare and transportation. Using difference-in-differences analysis comparing how employment changed for people with and without children from before to after the increased fully-refundable child tax credit payments began on a monthly basis in the middle of 2021, Ananat et al. (2023), Enriquez, Jones, and Tedeschi (2023), and Pac and Berger (2024) all find no evidence of any impact of the 2021 changes to the child tax credit on labor supply. As the earlier discussion suggests, the lack of response could reflect unawareness of how incentives had changed, and so might not persist if the policy change were made permanent. Still, together with the other evidence discussed

above, this may suggest that labor force participation elasticities are smaller than previously thought.

A large number of quasi-experimental studies have estimated that programs which increase transfers to disadvantaged families produce substantial positive long-range benefits to children on outcomes such as future earnings, health, longevity, crime, and education (for an overview in this journal, see Aizer, Hoynes, and Lleras-Muney 2022). Garfinkel et al. (2022) use this evidence, along with evidence on administrative costs and deadweight loss from distorting incentives, to construct estimates of the benefits and costs of making the 2021 changes to the child tax credit permanent. They conclude that in the long-run such a policy change "would cost $97 billion per year and generate social benefits of $929 billion per year" (p. 335). While such an enormous estimated payoff should be taken with a grain of salt, it suggests that the potential benefits of reducing child poverty could be quite large. With recent research showing apparently smaller responses of labor supply to incentives among low-income people than previously estimated, effective ways to mitigate the negative effects of work disincentives through subsidies for complements to work, and large benefits of cash transfers for children, the empirical case for something like an expanded and fully refundable child tax credit is stronger than it once was.

Optimal Marginal Tax Rates High in the Income Distribution

Decisions about tax rates at the top of the income distribution seek to strike a balance between the benefits from redistribution, and the costs from distorting behavioral incentives for income-earning efforts. Social welfare gains from redistribution will be limited to the extent that people respond to reduced incentives to earn income, not only through changes in hours worked, but also for example through changes in efforts to gain education, skills, and experience, or changes in occupational choice or entrepreneurship. A key parameter in this literature is the elasticity of taxable income with respect to the net-of-tax rate (one minus the marginal tax rate). Under certain assumptions, this elasticity can capture all of the different ways that taxpayers respond to the incentives created by taxation, especially if the estimates are based on the long-term effects of big changes in incentives. In a critical review of the literature on this topic, Saez, Slemrod, and Giertz (2012) make clear why there are many difficult challenges to obtaining credible estimates of the causal effect of the net-of-tax rate on taxable income earned.

For a relatively transparent example of empirical evidence on the efficiency costs of raising top marginal income tax rates, Piketty, Saez, and Stantcheva (2014) find that across high-income countries, those countries that reduced top marginal income tax rates the most between the 1960s and the 2000s saw the largest increases in pre-tax incomes reported on individual income tax returns in the top 1 percent of the income distribution. This suggests that high-income people did exhibit some kind of behavioral response to the reduced marginal tax rates, and their estimates

imply an elasticity of taxable income for top-bracket taxpayers of about 0.5. On the other hand, the authors find no correlation between which countries had the largest cuts in top marginal income tax rates and which countries had the highest rates of growth in real GDP per capita over the same period. They argue that this pattern suggests much of the rise in top incomes reflected some combination of increased rent-seeking (that is, devoting effort to redistribute income to oneself, rather than producing new economic value), or changes in forms of tax avoidance or evasion that did not show up as changes in GDP. Such factors would tend to imply lower efficiency costs from taxation. Piketty, Saez, and Stantcheva argue that only about 40 percent of their estimated 0.5 elasticity of taxable income represents a response of productive economic activity to incentives. Giertz (2009, p. 127) calculates that the marginal deadweight loss per additional dollar of tax revenue raised from a top bracket taxpayer in the United States, when starting at a 35 percent marginal tax rate, would be about $1.31 if the elasticity of taxable income were 0.5, but only $0.31 if the elasticity of taxable income were 0.2.

Whether it is worth it to make a top-bracket taxpayer worse off by somewhere between, say, $1.31 and $2.31, including the tax paid and the associated deadweight loss, in order to make someone lower-down in the income distribution better off by $1, depends on questions of distributive justice, which might include judgements about how much an additional dollar is worth to each person in terms of social welfare. For example, a utilitarian would favor maximizing the sum of utilities in society, taking account of not only the efficiency costs of taxation, but also diminishing marginal utility—the idea that an additional dollar is worth less in terms of utility or happiness for higher-income people compared to lower-income people, because people meet their most important needs first. Piketty, Saez, and Stantcheva (2014) argue that a utilitarian analysis, taking into account the deadweight costs of redistribution associated with the elasticities of taxable income they estimated, would imply that the social welfare maximizing top marginal individual income tax rate in the United States would be somewhere between 62 percent and 83 percent, depending on how much of the observed response of top incomes to changes in top marginal tax rates is due to tax avoidance or rent-seeking, and how possible it is to reform taxation in order to reduce tax avoidance opportunities.

Simplicity and Compliance Costs

One potentially important advantage of increasing the standard deduction and curtailing the use of itemized deductions is simplification of the taxpaying process and reduction in compliance costs, which include the costs of time, effort, and worry that taxpayers put into record-keeping, figuring out taxes, arranging financial affairs to reduce tax liability, and completing their tax returns, as well as the resource costs of software, accountants, and lawyers devoted to helping people comply with or avoid taxes. The vast majority of those tax compliance costs arise from business taxation (Slemrod and Bakija 2017, Chapter 5), and the 2017 law probably made

these worse. But the increase in the standard deduction and other changes to itemized deductions, as well as the changes to the alternative minimum tax, did probably reduce compliance costs significantly for a subset of taxpayers.

The Tax Cuts and Jobs Act very likely reduced compliance costs for the roughly 20 percent of taxpayers who stopped itemizing deductions because of it. IRS estimates reported in Guyton et al. (2023, p. 10) suggested that for IRS Form 1040 Schedule A, the schedule for computing itemized deductions, the total time required for "recordkeeping," "learning about the law or the form," "preparing the form," and "copying, assembling, and sending the form to the IRS" was 5 hours and 37 minutes.

Benzarti (2020) finds a clever way to estimate the compliance costs of itemizing. It turns out that the share of taxpayers who claim itemized deductions that are less than $2,000 larger than the standard deduction is surprisingly low. The share of taxpayers who claim itemized deductions within $2,000 to $4,000 of the standard deduction is higher than that, and the share claiming itemized deductions within $4,000 to $6,000 of the standard deduction is higher still. Then the share claiming itemized deductions larger than that gradually falls off, as one would expect given the shape of the income distribution, and the association between the expenditures that lead to itemized deductions and income. Whenever the size of the standard deduction changes, the "missing mass" of itemizers with itemized deductions just above the standard deduction moves to just above the new value of the new standard deduction. Benzarti argues that the missing mass probably represents filers who had itemized deductions larger than the standard deduction, but didn't bother to itemize because of the compliance costs. Benzarti uses this data to back out the compliance costs of itemizing for people who are at the margin between itemizing and not, which he estimates are between 0.57 percent and 0.85 percent of adjusted gross income.

Thus, a tradeoff exists between the compliance costs of itemizing, and the benefits to society of some itemized deductions discussed earlier. But it would be possible to design and implement policies that achieve similar benefits for lower compliance costs. For example, a flat-rate refundable tax credit for charitable donations could be implemented for the vast majority of taxpayers who work for an employer through a payroll deduction program. Almunia et al. (2020) describe how this kind of program works in the United Kingdom, but also note that it is currently underutilized.

The other significant simplification in the Tax Cuts and Jobs Act came from changes to the alternative minimum tax, which dramatically reduced the number of taxpayers who were subject to it. The National Taxpayer Advocate (2012, p. 27) reports the IRS estimate that in 2000, taxpayers devoted about 12 hours of time to the alternative minimum tax for every person who paid the tax. While the TCJA's changes to the alternative minimum tax caused significant revenue loss, it would be better in terms of simplicity, transparency, and compliance costs to make up the lost revenue in some other way, such as raising statutory tax rates, than to restore the alternative minimum tax to its previous state.

Conclusion

While this article has addressed many current tax policy issues, it has only scratched the surface of some larger tax policy debates. For example, one of the biggest questions in tax policy is whether we should move the tax system more in the direction of a consumption tax. A consumption tax can be made as progressive as the current income tax (for example, by using the *X*-tax approach suggested by Bradford 1986), while removing the negative impact of the tax system on incentives to save and invest. For an overview of the arguments over the relative merits of consumption taxation versus income taxation, Slemrod and Bakija (2017, and the references cited therein) offers a starting point.

However, the immediate issue is what to learn from the experience since the Tax Cuts and Jobs Act of 2017, and how to deal with the provisions that expire at the end of 2025. Ultimately, one's assessment will vary depending on one's beliefs about distributive justice and the optimal size of government, and one's reading of the evidence. Here are my own opinions.

On the negative side, the individual provisions of the Tax Cuts and Jobs Act reduced annual government revenue by about 1 percent of GDP, in a setting where we are already on track to run large and growing budget deficits into the indefinite future. Any efficiency gains from slightly lower marginal tax rates are probably more offset by the costs of increased borrowing. In distributional terms, the 2017 law cut taxes across the income distribution, with somewhat larger cuts relative to income in the upper-reaches of the income distribution, in a setting with high and growing economic inequality. However, replacing personal exemptions with larger child and dependent tax credits, by itself, moves the tax system in a more progressive direction, and creates a platform for reducing child poverty and economic inequality.

On the positive side, the larger standard deduction simplified the tax system and reduced compliance costs, and is more progressive than the itemized deductions than it replaced. The changes to the alternative minimum tax also reduced compliance costs and tax complexity significantly for millions of taxpayers, and while they reduced revenue, it would be better to make up those revenues with other adjustments. Of the major deductions that became less important, my main concern is the evidence that the Tax Cuts and Jobs Act led to a decline in individual charitable donations of about 7 percent, which involve losses of positive externalities. Perhaps this experience could provide momentum to move to a refundable tax credit system for addressing positive externality problems, rather than a system of income tax deductions.

References

Aizer, Anna, Hilary Hoynes, and Adriana Lleras-Muney. 2022. "Children and the US Social Safety Net: Balancing Disincentives for Adults and Benefits for Children." *Journal of Economic Perspectives* 36 (2): 149–74.

Albouy, David. 2009. "The Unequal Geographic Burden of Federal Taxation." *Journal of Political Economy* 117 (4): 635–67.

Almunia, Miguel, Irem Guceri, Ben Lockwood, and Kimberley Scharf. 2020. "More Giving or More Givers? The Effects of Tax Incentives on Charitable Donations in the UK." *Journal of Public Economics* 183: 104114.

Altig, David, Alan J. Auerbach, Patrick C. Higgins, Darryl R. Koehler, Laurence J. Kotlikoff, Michael Leiseca, Ellyn Terry, and Yifan Ye. 2020. "Did the 2017 Tax Reform Discriminate against Blue-State Voters?" *National Tax Journal* 73 (4): 1087–1108.

Ananat, Elizabeth, Benjamin Glasner, Christal Hamilton, and Zachary Parolin. 2023. "Effects of the Expanded Child Tax Credit on Employment Outcomes: Evidence from Real-World Data." NBER Working Paper 29823.

Bakija, Jon. 2013. "Tax Policy and Philanthropy: A Primer on the Empirical Evidence for the United States and its Implications." *Social Research: An International Quarterly* 80 (2): 557–84.

Bakija, Jon, and Bradley T. Heim. 2011. "How Does Charitable Giving Respond to Incentives and Income? New Estimates from Panel Data." *National Tax Journal* 64 (2.2): 615–50.

Batchelder, Lily L., Fred T. Goldberg Jr., and Peter R. Orszag. 2006. "Efficiency and Tax Incentives: The Case for Refundable Tax Credits." *Stanford Law Review* 59 (1): 23–76.

Benzarti, Youssef. 2020. "How Taxing Is Tax Filing? Using Revealed Preferences to Estimate Compliance Costs." *American Economic Journal: Economic Policy* 12 (4): 38–57.

Bradford, David F. 1986. *Untangling the Income Tax.* Cambridge, MA: Harvard University Press.

Burman, Leonard E. 2003. "Is the Tax Expenditure Concept Still Relevant?" *National Tax Journal* 56 (3): 613–27.

Chetty, Raj, John N. Friedman, and Emmanuel Saez. 2013. "Using Differences in Knowledge across Neighborhoods to Uncover the Impacts of the EITC on Earnings." *American Economic Review* 103 (7): 2683–2721.

Chetty, Raj, and Emmanuel Saez. 2013. "Teaching the Tax Code: Earnings Responses to an Experiment with EITC Recipients." *American Economic Journal: Applied Economics* 5 (1): 1–31.

Coen-Pirani, Daniele, and Holger Sieg. 2019. "The Impact of the Tax Cut and Jobs Act on the Spatial Distribution of High Productivity Households and Economic Welfare." *Journal of Monetary Economics* 105: 44–71.

Congressional Budget Office. 2023a. *Budgetary Outcomes under Alternative Assumptions about Spending and Revenues: Supplemental Data.* https://www.cbo.gov/publication/51134.

Congressional Budget Office. 2023b. *The Distribution of Household Income in 2020: Supplemental Data.* https://www.cbo.gov/system/files/2023-11/59509-supplemental-data.xlsx

Congressional Budget Office. 2023c. *Baseline Projections.* May. https://www.cbo.gov/system/files/2023-05/51118-2023-05-Budget-Projections.xlsx

Congressional Budget Office. 2024a. *Historical Budget Data.* February. https://www.cbo.gov/system/files/2024-02/51134-2024-02-Historical-Budget-Data.xlsx

Congressional Budget Office. 2024b. *Revenue Projections, by Category.* February. https://www.cbo.gov/system/files/2024-02/51138-2024-02-Revenue.xlsx

Congressional Budget Office. 2024c. *Tax Parameters and Effective Marginal Tax Rates.* February. https://www.cbo.gov/system/files/2024-02/53724-2024-02-Tax-Parameters.xlsx

Coulson, N. Edward, and Herman Li. 2013. "Measuring the External Benefits of Homeownership." *Journal of Urban Economics* 77: 57–67.

Duquette, Nicolas J. 2016. "Do Tax Incentives Affect Charitable Contributions? Evidence from Public Charities' Reported Revenues." *Journal of Public Economics* 137: 51–69.

Eissa, Nada, and Jeffrey B. Liebman. 1996. "Labor Supply Response to the Earned Income Tax Credit." *Quarterly Journal of Economics* 11 (2): 605–37.

Engelhardt, Gary V., Michael D. Eriksen, William G. Gale, and Gregory B. Mills. 2010. "What Are the Social Benefits of Homeownership? Experimental Evidence for Low-Income Households." *Journal of Urban Economics* 67 (3): 249–58.

Enriquez, Brandon, Damon Jones, and Ernie Tedeschi. 2023. "The Short-Term Labor Supply Response to the Expanded Child Tax Credit." *AEA Papers and Proceedings* 113: 401–05.

Fajgelbaum, Pablo D., Eduardo Morales, Juan Carlos Suárez Serrato, and Owen Zidar. 2019. "State Taxes and Spatial Misallocation." *Review of Economic Studies* 86 (1): 333–76.

Feenberg, Daniel. 1987. "Are Tax Price Models Really Identified: The Case of Charitable Giving." *National Tax Journal* 40 (4): 629–33.

Gale, William G., Hilary Gelfond, Aaron Krupkin, Mark J. Mazur, and Eric Toder. 2018. "A Preliminary Assessment of the Tax Cuts and Jobs Act of 2017." *National Tax Journal* 71 (4): 589–612.

Garfinkel, Irwin, Laurel Sariscsany, Elizabeth Ananat, Sophie Collyer, Robert P. Hartley, Buyi Wang, and Christopher Wimer. 2022. "The Benefits and Costs of a Child Allowance." *Journal of Benefit-Cost Analysis* 13 (3): 335–62.

Giertz, Seth H. 2009. "The Elasticity of Taxable Income: Influences on Economic Efficiency and Tax Revenues, and Implications for Tax Policy." In *Tax Policy Lessons from the 2000s*, edited by Alan D. Viard, 101–136. Washington, DC: AEI Press.

Giving USA. 2024. *The Annual Report on Philanthropy for the Year 2023.* McLean, VA: Giving USA Foundation. https://www.givingusa.org.

Glaeser, Edward L., and Jesse M. Shapiro. 2003. "The Benefits of the Home Mortgage Interest Deduction." *Tax Policy and the Economy* 17: 37–82.

Gruber, Jonathan, Amalie Jensen, and Henrik Kleven. 2021. "Do People Respond to the Mortgage Interest Deduction? Quasi-Experimental Evidence from Denmark." *American Economic Journal: Economic Policy* 13 (2): 273–303.

Guyton, John, Pat Langetieg, Pete Rose, Brenda Schafer, Sherri Edelman, Andres Garcia, and Molly Stasko. 2023. *Taxpayer Compliance Burden.* Internal Revenue Service Publication 5743 (Rev. 4-2023). Washington, DC: Department of the Treasury.

Han, Xiao, Daniel Hungerman, and Mark Ottoni-Wilhelm. 2023. "Tax Incentives for Charitable Giving: New Findings from the TCJA." Unpublished.

Harris, Benjamin H., C. Eugene Steuerle, and Amanda Eng. 2013. "New Perspectives on Homeownership Tax Incentives." *Tax Notes*: 1315–32.

Hembre, Erik, and Raissa Dantas. 2022. "Tax Incentives and Housing Decisions: Effects of the Tax Cut and Jobs Act." *Regional Science and Urban Economics* 95 (July): 103800.

Hickey, Ross, Brad Minaker, A. Abigail Payne, Joanne Roberts, and Justin Smith. 2023. "The Effect of Tax Price on Donations: Evidence from Canada." Melbourne Institute Working Paper 02/23.

Internal Revenue Service. 2019. *Statistics of Income—2017 Individual Income Tax Returns.* Publication 1304 (Rev. 09-2019). Washington, DC: Department of the Treasury.

Internal Revenue Service. 2020. *Statistics of Income—2018 Individual Income Tax Returns.* Publication 1304 (Rev. 09-2020). Washington, DC: Department of the Treasury.

Internal Revenue Service. 2024. *Statistics of Income—2021 Individual Income Tax Returns.* Publication 1304 (Rev. 4-2024). Washington, DC: Department of the Treasury.

Joint Committee on Taxation. 2018. *General Explanation of Public Law 115-97.* JCS-1-18. Washington, DC: US Government Publishing Office.

Joint Committee on Taxation. 2023. *General Explanation of Tax Legislation Enacted in the 117th Congress.* JCS-1-23. Washington, DC: US Government Printing Office.

Kaplow, Louis. 2017. "A Distribution-Neutral Perspective on Tax Expenditure Limitations." *Tax Policy and the Economy* 31: 161–88.

Kaplow, Louis. 2023. "Optimal Income Taxation and Charitable Giving." NBER Working Paper 31752.

Kenworthy, Lane. 2020. *Social Democratic Capitalism.* New York: Oxford University Press.

Kleven, Henrik Jacobsen. 2014. "How Can Scandinavians Tax So Much?" *Journal of Economic Perspectives* 28 (4): 77–98.

Kleven, Henrik Jacobsen. 2024. "The EITC and the Extensive Margin: A Reappraisal." NBER Working Paper 26405.

Luksic, Jan. 2020. "The Extensive Macro Labor Supply Elasticity: Integrating Taxes and Expenditures." *European Economic Review* 121: 103325.

Meyer, Bruce D. 2002. "Labor Supply at the Extensive and Intensive Margins: The EITC, Welfare, and Hours Worked." *American Economic Review* 92 (2): 373–79.

Meyer, Bruce D., and Dan T. Rosenbaum. 2001. "Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers." *Quarterly Journal of Economics* 116 (3): 1063–1114.

Moretti, Enrico, and Daniel J. Wilson. 2017. "The Effect of State Taxes on the Geographical Location of Top Earners: Evidence from Star Scientists." *American Economic Review* 107 (7): 1858–1903.

National Taxpayer Advocate. 2012. *2012 Annual Report to Congress.* Vol. 1. Washington, DC: Internal Revenue Service.

Pac, Jessica, and Lawrence M. Berger. 2024. "Quasi-experimental Evidence on the Employment Effects of the 2021 Fully Refundable Monthly Child Tax Credit." *Journal of Policy Analysis and Management* 43 (1): 192–213.

Piketty, Thomas, Emmanuel Saez, and Stefanie Stantcheva. 2014. "Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities." *American Economic Journal: Economic Policy* 6 (1): 230–71.

Reich, Rob. 2018. *Just Giving: Why Philanthropy Is Failing Democracy and How It Can Do Better.* Princeton, NJ: Princeton University Press.

Saez, Emmanuel. 2002. "Optimal Income Transfer Programs: Intensive versus Extensive Labor Supply Responses." *Quarterly Journal of Economics* 117 (3): 1039–73.

Saez, Emmanuel. 2010. "Do Taxpayers Bunch at Kink Points?" *American Economic Journal: Economic Policy* 2 (3): 180–212.

Saez, Emmanuel, Joel Slemrod, and Seth H. Giertz. 2012. "The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review." *Journal of Economic Literature* 50 (1): 3–50.

Schanzenbach, Diane Whitmore, and Michael R. Strain. 2021. "Employment Effects of the Earned Income Tax Credit: Taking the Long View." *Tax Policy and the Economy* 35: 87–129.

Slemrod, Joel. 2018. "Is This Tax Reform, or Just Confusion?" *Journal of Economic Perspectives* 32 (4): 73–96.

Slemrod, Joel, and Jon Bakija. 2017. *Taxing Ourselves: A Citizen's Guide to the Debate over Taxes.* 5th ed. Cambridge, MA: MIT Press.

Sodini, Paolo, Stijn Van Nieuwerburgh, Roine Vestman, and Ulf von Lilienfeld-Toal. 2023. "Identifying the Benefits from Homeownership: A Swedish Experiment." *American Economic Review* 113 (12): 3173–3212.

Surrey, Stanley S., and Paul R. McDaniel. 1985. *Tax Expenditures.* Cambridge, MA: Harvard University Press.

Tiebout, Charles M. 1956. "A Pure Theory of Local Expenditures." *Journal of Political Economy* 64 (5): 416–24.

Urban-Brookings Tax Policy Center. 2017. "T17-0336—Effective Marginal Tax Benefit of Charitable Contributions Under Current Law and Conference Agreement for H.R. 1, The Tax Cuts and Jobs Act; By Expanded Cash Income Percentile, 2018." December 21. https://www.taxpolicycenter.org/model-estimates/charitable-contributions-and-tcja-nov-2017/t17-0336-effective-marginal-tax-benefit.

Urban-Brookings Tax Policy Center. 2020. "Do Existing Tax Incentives Increase Homeownership?" In *Tax Policy Center Briefing Book.* Updated May 2020. https://www.taxpolicycenter.org/briefing-book/do-existing-tax-incentives-increase-homeownership.

Urban-Brookings Tax Policy Center. 2022a. "Table T22-0144—Make Individual Income Tax and Estate Tax Provisions in the 2017 Tax Act Permanent." November. https://www.taxpolicycenter.org/model-estimates/make-individual-income-tax-and-estate-tax- provisions-2017-tax-act-permanent-1.

Urban-Brookings Tax Policy Center. 2022b. "Brief Description of the Tax Model." Updated March 9. https://www.taxpolicycenter.org/resources/brief-description-tax-model.

Urban-Brookings Tax Policy Center. 2023a. "Table T23-0065—Tax Benefit of the Deduction for Charitable Contributions under Current Law, by ECI Percentile, 2024." June 12. https://www.taxpolicycenter.org/model-estimates/itemized-deductions-june-2023/t23-0065-tax- benefit-charitable-deduction.

Urban-Brookings Tax Policy Center. 2023b. "Table T23-0063—Tax Benefit of the Deduction for Mortgage Interest under Current Law, by ECI Percentile, 2024." June 12. https://www.taxpolicycenter.org/model-estimates/itemized-deductions-june-2023/t23-0063-tax-benefit-mortage-interest-deduction.

US Bureau of Economic Analysis. 2024. "Table 1.1.5 Gross Domestic Product." https://apps.bea.gov/.

Young, Cristobal, and Ithai Lurie. 2022. "Taxing the Rich: How Incentives and Embeddedness Shape Millionaire Tax Flight." Unpublished.

Lessons from the Biggest Business Tax Cut in US History

Gabriel Chodorow-Reich, Owen Zidar, and Eric Zwick

I n 2017, the United States passed the biggest business tax cut in its history—the Tax Cuts and Jobs Act—which was projected to reduce corporate tax revenue by $100 to $150 billion per year for a decade (Joint Committee on Taxation 2017; Congressional Budget Office 2018). The key provisions included cutting the top statutory tax rate on corporate income from 35 to 21 percent, allowing firms to write off equipment purchases immediately (rather than depreciating them more slowly), and introducing a new regime for taxing foreign source income, along with several other changes. Proponents of the legislation highlighted the potential for lower business taxes to boost investment, wages, and US competitiveness—even to generate additional revenues to offset some of its costs. Skeptics emphasized that tax cuts increase the deficit and primarily benefit high-income people and otherwise-nontaxable owners, including foreigners, university endowments, and pension funds.

This paper provides a framework for assessing the corporate taxation aspects of the Tax Cuts and Jobs Act. We describe the nature of this historic policy shock, summarize the state of knowledge on its costs and benefits, and discuss implications for the future of business tax policy in the United States. We build on empirical work since the passage of the 2017 legislation, including recent and not-yet published research, as well as earlier findings. We describe not only partial equilibrium results, but also aggregate effects on investment, tax revenue, and GDP. We compare

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these actual aggregate outcomes to the predictions of policymakers. We focus here on domestic effects; the companion paper in this symposium by Kimberly Clausing considers international issues.

We draw five lessons. First, and most obvious, large corporate tax cuts are expensive and increase the deficit substantially; specifically, the reform reduced corporate tax revenue by 40 percent of the pre-reform level. Second, taxes matter for corporate investment. Firms facing larger corporate tax cuts invested more than firms facing smaller cuts. Three approaches—using a quantitative macro model that incorporates actual firm-level responses and noncorporate sectors, comparing investment of US firms to similar non-US firms, and comparing aggregate investment to pre-reform forecasts—all indicate positive responses in total tangible corporate investment of 8 to 14 percent. This response was far too small to offset the direct cost of the reform. Third, domestic tax treatment of profits abroad can have important effects on investment at home; for example, provisions that increase foreign investment by US-based multinationals also boost their domestic operations. Fourth, the effects on economic growth and wages were smaller than advertised. Model-based predictions—disciplined to fit actual short-run investment effects—indicate a long-run increase in wages equivalent to $750 at the time of the law's passage. This impact is roughly an order of magnitude below the $4,000 to $9,000 range predicted before the passage of the law by the Council of Economic Advisers (2017). Fifth, the economic bang for the fiscal buck varies across different tax provisions. For example, it matters whether corporate tax reform encourages new capital via investment incentives, rather than by enriching old capital via corporate income tax rate cuts.

Policy Context

Business taxation involves trade-offs. Total tax receipts from corporate and pass-through income tax receipts equaled 2.9 percent of GDP in 2017. In addition to providing tax revenue, other benefits of taxing business income include reducing the scope for tax avoidance and evasion (which tend to rise with the gap between the tax rate on capital and labor income) and improving post-tax equity (because business owners as a group tend to have higher incomes and wealth). Furthermore, only one-quarter of US corporate equity is owned by those who pay US taxes on dividends and capital gains (Rosenthal and Mucciolo 2024). The corporate tax therefore provides an indirect method of annual taxation of equity held by foreigners, nonprofits, and pensioners. On the other side, the main cost of taxing business income is the disincentive to accumulate capital, start new businesses, and grow existing ones, which ultimately results in lower national income.

As business tax policy seeks to balance these issues, four main considerations arise.

1) What should the rate structure of the corporate income tax look like? On the eve of the Tax Cuts and Jobs Act of 2017, the US top income bracket statutory

Figure 1
Time Series of Statutory Corporate Tax Rates in Some High-Income Countries
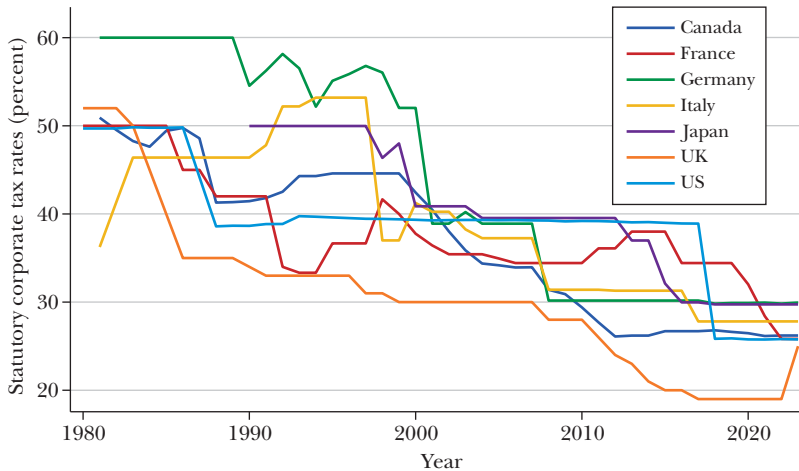
Source: Tax Foundation. Corporate Tax Rates Around the World, 2023, at https://taxfoundation.org/data/all/global/corporate-tax-rates-by-country-2023/.
Note: This figure plots the evolution of the statutory corporate tax rate for each country in the G7.

corporate rate was 35 percent and had not changed from 1993 to 2017. The top rate had previously fallen from 46 percent to 40 percent in the Tax Reform Act of 1986 and further to 34 percent in 1988. At that time, the United States had the second-lowest corporate rate among the group of comparison countries shown in Figure 1. Between 1988 and 2017, every other country in this group reduced its top corporate rate, such that in 2017 the United States had the highest corporate tax rate among this group.

2) What expenses should a business be allowed to deduct from revenues to arrive at taxable income? A common pattern across countries is that firms are allowed to deduct costs such as wages or the cost of goods sold immediately while spreading the cost of new capital investment over several years. Some expenses like research and development activity receive additional tax credits to encourage innovation. Many countries also allow firms to deduct part or all of interest payments.

There is a lively debate over the relative roles of corporate income tax rates versus expanded incentives for investment. One view is that, in general, the best way to increase competitiveness is to broaden the corporate tax base by limiting deductions and lowering the statutory tax rate. An alternative view is that a targeted approach is better. Broadening the corporate tax base raises the cost of capital and discourages new investment for firms that might be especially responsive to taxes. In this view, lowering the tax rate for everyone is a blunt instrument: while a lower rate does make new investments more attractive, it also boosts the after-tax returns to

past investments (so-called "old capital"). Paying more for past investment is unattractive because it spends resources for activity it cannot change. In other words, it is a transfer from taxpayers to capital owners, with little bang for the buck in terms of new economic activity. This alternative view suggests that a combination of higher corporate tax rates and incentives for investment might make sense.

Prior to the Tax Cuts and Jobs Act, the United States had relatively generous depreciation allowances, as businesses could deduct 50 percent of new equipment investment immediately ("bonus depreciation") before deducting the remainder according to the normal IRS cost recovery schedules. However, even after accounting for the generosity of expensing and other credits and deductions, Foertsch (2018) finds the United States in 2017 had among the highest effective tax rates on new investment in the OECD (although this conclusion is somewhat sensitive to the treatment of property and wealth taxes).

3) How does the corporate income tax system apply to a firm's foreign source income? Before the Tax Cuts and Jobs Act, the United States operated a "world-wide" system that included the foreign income of US multinationals. But it allowed firms to (indefinitely) defer paying tax until they repatriated this income from their foreign subsidiaries. By contrast, at that time, other high-income countries all operated "territorial" systems that only taxed domestic income. These differences persisted against a backdrop in which deepening globalization drove corporate strategy, investment, and location decisions, and tax competition among countries raised concerns that firms could shift much of their income to avoid tax. At a fundamental level, the question is whether corporate taxation should be based on where goods and services are produced (source-based), where they are sold (destination-based), or where the owners live (residence-based)?

4) At what level is business income taxed? The US system distinguishes between "C corporations" and "pass-through" firms such as sole proprietorships, partnerships, and "S corporations." C corporations include all publicly-traded firms, as well as some privately-held firms. These firms face the corporate income tax. Pass-throughs include many architecture firms, physician offices, auto dealerships, beverage distributors, consulting and law firms, and other small- and mid-market regional businesses. The income of these firms "passes through" each year to the owners' personal income. As a result, the owners pay individual income tax on profits each year, and so pass-through firms do not face corporate income tax. Pass-through firms make up about 95 percent of all firms, but they account for only about half of business income.

Well before the Tax Cuts and Jobs Act of 2017, both political parties had at different times altered or put forward proposals to reform business taxation. For example, during the Bush administration, the Job Creation and Worker Assistance Act of 2002 introduced "bonus depreciation" as a stimulus incentive for new investment, which continued in some form for every year (except 2005–2007) up until the 2017 tax legislation. During the Obama administration, the White House

released a framework for business tax reform that called the existing US tax system "uncompetitive and inefficient." The proposal included reducing the top corporate rate to 28 percent, ending bonus depreciation, limiting the deductibility of interest expenses, and creating a new minimum tax on foreign source income (White House and Department of the Treasury 2012).

The stated objective of the Trump administration and supporters of the Tax Cuts and Jobs Act of 2017 was to increase global competitiveness and boost investment. The reform's architects emphasized the need to align the US system with other countries by lowering the statutory rate and moving to a territorial system (Council of Economic Advisers 2018). The Act also reduced tax rates for pass-throughs, with the goal of maintaining approximate parity in effective rates between C corporations and pass-throughs, thereby discouraging pass-throughs from reorganizing as private C corporations to reduce their tax burdens. Another factor was political pressure, as the pass-throughs represent a politically powerful constituency of "small" businesses with substantial sway in Congress (Atkinson and Lind 2018).

A Framework for the Effect of Business Taxes on Investment and Wages

In the canonical neoclassical model of investment, a firm chooses capital and hires workers to maximize the payout to the firm's owners. The economic incentives from corporate taxes can be summarized by two tax parameters governing the investment decision: a marginal tax rate on income from new investment (denoted by τ) and a cost-of-capital subsidy (denoted by Γ) that incorporates the present value of depreciation deductions and any investment tax credits.

Figure 2 illustrates the firm's decision problem. A firm with a capital stock of K has pre-tax earnings of $F(K)$ and after-tax profits of $(1 - \tau)F(K)$, shown by the solid blue curve. To maintain its capital stock, the firm must pay a per-unit-of-capital user cost of $(1 - \Gamma)R$, which gives the slope of the dashed red line. The user cost has the interpretation of the cost of buying a unit of capital, using it for a period, and then selling the remaining (non-depreciated) capital in the next period. Investment incentives lower the user cost because they reduce the effective acquisition cost of capital by a fraction Γ. Without investment tax credits, this fraction Γ is equal to the product of the income tax rate on new investment τ and the present discounted value of depreciation deductions, which is usually denoted by z (for example, Zwick and Mahon 2017). The optimal choice of capital, K^*, maximizes the difference between the blue curve and the red line, shown in Figure 2 by the vertical dashed line at K^*.

This simple framework shows that either more generous investment incentives or a lower tax rate on profits will induce the firm to maintain a higher stock of capital. Indeed, the tax incentives for investment can be conveyed in a single expression, given by the ratio of the price of capital net of the cost-of-capital subsidy to the net-of-corporate-tax rate—that is, $(1 - \Gamma)/(1 - \tau)$.

Figure 2
Optimal Capital Choice Equates Marginal Benefit and Cost of Capital
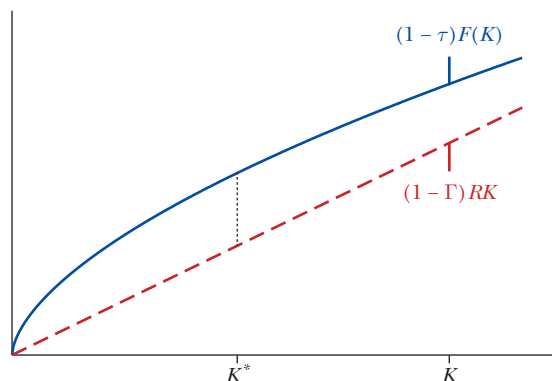
Source: Authors' calculations.
Note: This figure demonstrates the optimization problem a firm faces when determining its capital stock *K*. Firms maximize the difference between after-tax profits (the blue line) and cost of capital (the red line) at K^*.

How much a policy change will stimulate investment therefore depends on the change to this wedge and how quickly the pre-tax marginal benefit decreases as firms accumulate capital, which in turn depends on considerations such as diminishing returns to scale or the nature of product demand. The implications for wages in turn follow because higher levels of capital-per-worker raise the marginal product of labor.

We highlight six extensions to this baseline model which help to bring it closer to the real-world complexity: multinational production, adjustment costs, financing structure, heterogeneous capital types, intangibles, and pass-throughs and nontaxed sectors.

First, one can extend the canonical model for multinational firms to include both domestic and foreign capital as factors in the production function (Chodorow-Reich et al. 2024). With interdependence, changes to the tax code that affect the user cost or return to foreign capital also affect domestic investment and production. For example, if higher foreign capital makes domestic capital more productive, then provisions of the Tax Cuts and Jobs Act that lower the cost of capital can result in higher domestic as well as foreign investment. Incorporating these effects for multinationals increases the response of domestic investment.

Second, capital accumulation takes time, and so does the process of adjustment to a tax change, due to the pace of managerial decision-making, procurement delays, and general time-to-build. Evaluating the 2017 tax legislation in summer 2024 thus necessarily requires some extrapolation from the short-run effects that we can observe already to the long-run accumulation of capital. Investment models bridge this difference by incorporating adjustment costs to investment or capital that determine the rate of convergence to the long run.

Third, corporate tax rate changes affect incentives for debt financing because of the deductibility of interest costs. With a lower rate, each dollar of deduction realizes smaller tax savings, reducing the tax incentive of debt-financed investment. This additional margin can mean that the effective increase in investment incentives is smaller than one might predict from the decline in corporate tax rates alone. A smaller effective increase in investment incentives lowers the responsiveness of investment.

Fourth, the canonical model has one type of capital, but in practice firms make decisions for many types of capital. National income accountants classify capital into the broad categories of structures, equipment, and intellectual property. Each type has its own user cost, which varies with the economic depreciation rate as well as due to tax provisions that only apply to some types of capital. For example, the "bonus depreciation" provisions apply to equipment, but not structures. In addition, different types of capital interact in production. Complementarity between equipment and structures means that incentivizing one can boost investment in the other. Likewise, complementarity between foreign and domestic capital can make domestic investment responsive to foreign tax incentives.

Fifth, and relatedly, intangible capital can affect the mapping between tax policy and investment. Intangible capital broadly defined includes intellectual property as well as factors not included in national income accounting, such as brand equity and managerial capacity. Intangible capital can facilitate profit shifting; for example, a firm might hold intellectual property in a tax haven country allowing it to allocate profits to the tax haven, even if the actual production and sales happen elsewhere. If firms used this approach before the 2017 law to avoid corporate taxes, then reducing tax rates might have a smaller effect on domestic investment.

Finally, the corporate income tax only applies to C corporations, and not to other sectors that accumulate capital. This general point was recognized as early as the canonical Harberger (1962) model of corporate tax incidence in an economy with a corporate and noncorporate (housing) sector. Lowering the corporate tax reallocates capital into the corporate sector from the noncorporate sector, which reduces the return to all capital owners in both sectors. Similar forces apply to the pass-through sector. When the 2017 tax law cut tax burdens by relatively more in the corporate sector, capital may have shifted from the pass-through sector to the corporate sector.

Quantifying the Business Tax Shock in the Tax Reform and Jobs Act

Quantifying the size of the 2017 tax change requires joint consideration of several provisions of the new law. We first describe seven main components, and then offer some estimates of their combined effect on marginal tax rates and the cost of capital. For additional details on corporate income tax components of the Tax Reform and Jobs Act of 2017, useful starting points are Auerbach (2018) and Gale et al. (2019).

First, the 2017 law changed the tax rate for C corporations. The new law replaced a nonmonotonic corporate income tax rate schedule culminating in a headline rate of 35 percent for the top income bracket with a single rate of 21 percent.

Second, owners of pass-through businesses received a rate cut due to the reduction in personal income tax rates, which ranged from 0 to 4 percentage points (as discussed in Jon Bakija's paper on individual taxation in this symposium). In addition, Section 199A of the 2017 law provided a further 20 percent rate reduction for qualified pass-through income for low- and medium-income owners or for businesses engaged in certain activities delineated in the law. In particular, the rule excluded "specified service trades or businesses," with the goal being to prevent high-income service workers such as doctors and lawyers from receiving the lower tax rate (Goodman et al. 2019).

Third, across both C corporation and pass-through corporate forms, firms could deduct 100 percent of their investment for some types of property for the first five years. This provision is referred to as "expensing" investment, because the total costs of an investment are treated like a current year expense rather than spread over time as the investment depreciates. After five years, expensing was phased out at a rate of 20 percentage points per year.

Fourth, to encourage firms to locate intangible capital like intellectual property and brand names in the United States rather than in a "tax haven" country with lower corporate tax rates, the 2017 law introduced a new deduction of 37.5 percent (falling to 21.875 percent in 2026) of a firm's Foreign Derived Intangible Income (FDII), defined as the export share of a firm's income in excess of 10 percent of its domestic tangible capital.

Fifth, to offset some of the cost of these provisions, the Tax Cuts and Jobs Act included base broadeners. The new law ended the ability of C corporations to "carry back" losses to reduce income tax in previous years and limited to 80 percent of income the deduction for losses carried forward to offset corporate income in future years. It repealed the Domestic Production Activities Deduction, in which firms in certain industries (like manufacturing and construction) could claim a deduction based on domestically-produced income. It introduced a limit for interest deductions of 30 percent of economic income for firms with receipts above $25 million. And it weakened incentives for research and development spending by stipulating that as of 2022 companies could no longer deduct their full costs of research and development (R&D) immediately and instead must spread the deduction over five years.

Sixth, the 2017 law eliminated the corporate alternative minimum tax, which involved an alternative set of calculations about corporate income, with its own rules and rates.

Finally, the Tax Cuts and Jobs Act also changed the rules for taxing the foreign source income of US firms. Although the changes that affect foreign firms and investors are discussed in more detail in the paper by Clausing in this symposium, we review them briefly here because they also may affect domestic investment activity. In the previous system, firms paid US taxes (in excess of credits claimed for foreign taxes paid) when they repatriated foreign income. The reform allows businesses

to immediately deduct 100 percent of dividends paid by foreign subsidiaries. This change effectively makes the US corporate tax system "territorial"—that is, it taxes only corporate income earned in the United States—but with two exceptions. First, in recognition of the build-up of deferred dividends from past years at many multinationals, the Tax Cuts and Jobs Act included a "toll tax" of between 8 and 15.5 percent (with the higher rate applying to cash holding and the lower rate to other assets) on the existing stock of deferred dividends, which firms can pay over eight years. Second, to mitigate the incentive for firms to report all their profits in tax havens, the reform introduced a tax on Global Intangible Low-Taxed Income (GILTI) of 10.5 percent (increasing to 13.125 percent in 2026). This tax applies to income earned abroad in excess of 10 percent of foreign tangible capital, with firms allowed to offset their GILTI tax by 80 percent of foreign taxes paid.

Analyzing the effect of these changes in tax rates requires distinguishing among statutory, average, and marginal tax rates. The *statutory tax rate* is the rate for the relevant bracket of the income tax schedule, the *average tax rate* is the share of income paid in taxes, and the *marginal tax rate* corresponds to the τ that governs marginal investment decisions, which is how much tax the firm has to pay if it earns another dollar of income. These rates differ under a non–flat tax schedule, if a firm has nonpositive taxable income, or because of deductions or credits that change with the marginal dollar of income.

Chodorow-Reich et al. (2024) report changes in marginal rates for mid-size and large C corporations resulting from changes to the corporate income tax rate schedule; the repeal of the corporate alternative minimum tax and the Domestic Production Activities Deduction; the limits on loss carrybacks and carryforwards; and rules on the taxation of Foreign Derived Intangible Income. To account for the dynamics introduced by carrybacks and carryforwards of losses, they simulate income paths and use of credits and deductions using firm-level tax return data from the US Treasury. They estimate marginal tax rates by perturbing the income paths by $1,000 of additional corporate income in the current year and calculating the change in the present value of taxes. They also estimate the changes to the cost-of-capital subsidy using firm-specific information on investment types together with type-specific changes in the present value of depreciation allowances.

The left-hand bars in Figure 3 plot the estimates for the marginal effective corporate tax rate, which falls by around 10 percentage points—smaller than the 14 percentage point statutory cut in the top corporate tax rate. The right-hand bars show the estimated change in the cost-of-capital subsidy Γ. For physical capital, this term depends primarily on the regime governing depreciation deductions. The average firm had a domestic cost-of-capital subsidy of 24 percent before the 2017 law, which fell by 8.5 percentage points. While the change from 50 percent "bonus depreciation" to full expensing increases Γ, the reduced marginal tax rate decreases the tax savings from each dollar of depreciation allowances.

Putting together these changes into a total tax wedge for tangible capital, Chodorow-Reich et al. (2024) find a decline in the composite tax term $(1 - \Gamma)/(1 - \tau)$ of about 4.5 percentage points for the average C corporation when

Figure 3
Average Effects of the TCJA on Marginal Tax Rates and Cost-of-Capital Subsidies
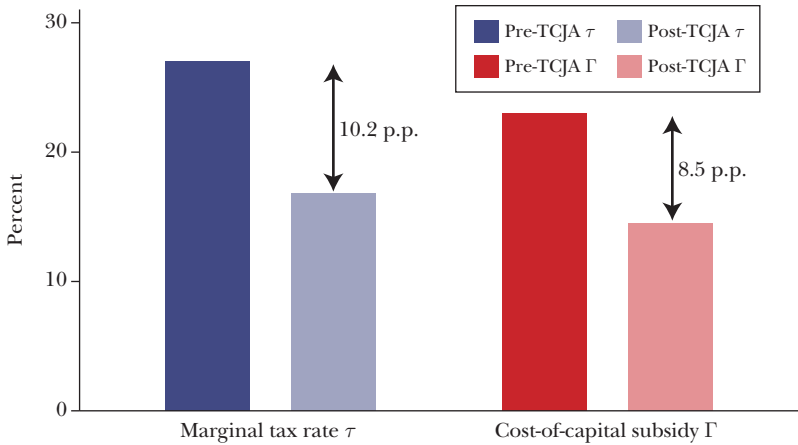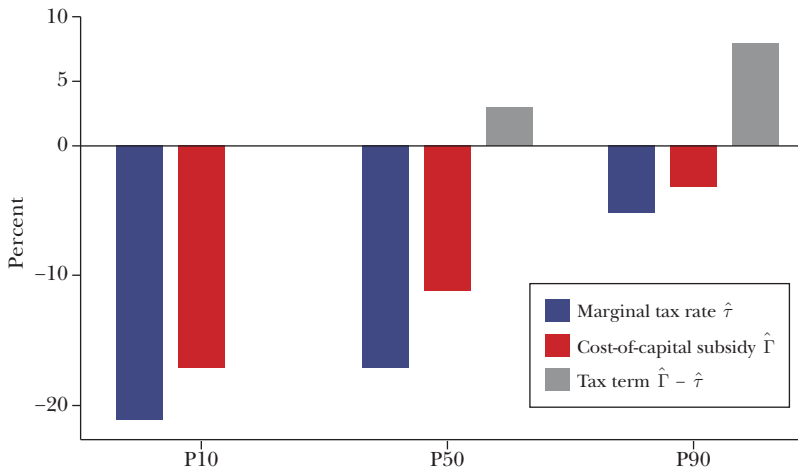

Source: Chodorow-Reich et al. (2024).
Note: This figure plots the average value of τ (the marginal tax rate) and Γ (the cost-of-capital subsidy) before and after the Tax Cuts and Jobs Act. The black bidirectional arrows indicate the change (in percentage points) in τ and Γ. The tenth and ninetieth percentiles refer to the average change among firms in the neighborhood around the tenth and ninetieth percentiles. We report these local averages (rather than the percentile values directly) to comply with IRS disclosure rules.

weighted by assets. Barro and Furman (2018) estimate larger changes in the tax wedges for equipment and structures of around 10 percentage points for each. The differences are due to differences in methodology: Chodorow-Reich et al. use marginal effective tax rates, instead of statutory rates, and use a baseline of 50 percent bonus depreciation. But even with the smaller estimates, the tax reform represented the largest shock to the domestic tax term since the 1980s.

Figure 4 shows that the changes in the marginal rate, effective cost-of-capital subsidy, and composite tax term varied across firms. For the marginal rate, firms at the tenth percentile experienced a decline in the marginal "keep rate" $1 - \tau$ of more than 20 percent, the median firm experienced a decline of 17 percent, and firms at the ninetieth percentile experienced declines of less than 5 percent. This heterogeneity reflects different use of credits and deductions and propensity to have negative taxable income. Dobridge et al. (2023) complement this analysis by reporting changes in average tax rates across the size distribution of C corporations. They point out that many smaller C corporations experienced increases in their average tax rates, because for these firms, the 2017 law replaced a tax schedule with a 15 percent rate on the first $50,000 of income with the flat 21 percent rate.

Firms also display substantial heterogeneity in the change in Γ, due to differences in the types and share of investment previously eligible for bonus depreciation. The new deduction for Foreign Derived Intangible Income also reduces the effective Γ for some firms; because the deduction only applies to income in excess of

Figure 4
Heterogeneous Effects of the Tax Cuts and Jobs Act

Note: This figure plots the change in the marginal rate ($\hat{\tau}$), effective cost-of-capital subsidy ($\hat{\Gamma}$), and composite tax term ($\hat{\Gamma} - \hat{\tau}$) at the tenth, fiftieth, and ninetieth percentiles.

10 percent of domestic tangible capital, an additional dollar of capital mechanically reduces this deduction. Overall, the percent change in the composite tax term is zero for the bottom decile of firms, 3 percent for the median firm, and above 8 percent for the top decile of firms.

Table 1 shows the average tax term change across industries. In general, industries with higher domestic shares of activity and more long-lived investment saw larger changes in the tax term. Other provisions of the 2017 law that led to substantial differences across industries include the altered tax treatment of research and development and of pass-through firms.

The cost-of-capital changes discussed so far pertain to physical investment in equipment and structures. Regarding research and development spending, the effective subsidy changed through two main channels. First, the switch from immediate to a five-year period for deducting research and development expenses increases the effective cost-of-capital of R&D in the long run, although over 2018–2021 it may have incentivized firms to "pull forward" R&D expenditure if they anticipated the less favorable treatment to come. Second, both the change in the corporate rate and expensing affect the generosity of the existing Research and Experimentation (R&E) tax credit. Because firms cannot simultaneously expense R&D for tax purposes and also claim the full R&E credit, they typically reduce the credit amount by the statutory corporate rate. However, with R&D expensing now spread over five years, this limit binds much less tightly, increasing the effective R&E credit rate. Barro and Furman (2018) calculate that on net the user cost of R&D increases by 9 percent as a result.

Table 1
Tax Changes by Industry

| Industry (NAICS) | Code | Tax term $(1 - \Gamma)/(1 - \tau)$ | | | Observations |
		Pre	Post	% Change	
Management of companies	55	1.13	1.07	−4.8%	884
Accommodation and food	72	1.09	1.05	−4.1%	214
Utilities	22	1.07	1.02	−3.9%	141
Transport and warehousing	49	1.08	1.04	−3.8%	33
Manufacturing	31	1.07	1.03	−3.7%	434
Retail trade	44	1.08	1.04	−3.7%	476
Wholesale trade	42	1.07	1.03	−3.4%	1,207
Manufacturing	32	1.05	1.02	−3.1%	1,002
Manufacturing	33	1.05	1.02	−3.0%	1,944
Real estate	53	1.06	1.03	−3.0%	190
Retail trade	45	1.06	1.03	−3.0%	115
Health care	62	1.06	1.03	−2.8%	167
Transport and warehousing	48	1.04	1.02	−2.7%	261
Information	51	1.04	1.01	−2.5%	628
Mining, oil, and gas	21	1.03	1.01	−1.8%	224

Source: Chodorow-Reich et al. (2024).
Note: This table contains data on the average value of the composite tax term before and after the TCJA for different industries. Industries are determined by two-digit NAICS code. The fifth column contains data on the percent change in the tax term within that industry. The sixth column contains data on the number of firms in that industry in the full sample.

Regarding tax treatment of pass-throughs, the key question is whether certain provisions will be allowed to expire as scheduled. In their "law-as-written" scenario, Barro and Furman (2018) estimate that the Tax Cuts and Jobs Act increases their user cost of capital by 1.3 percent. This increase comes mostly from an increase in the marginal tax rate on individual income, from the elimination of the Domestic Production Activities Deduction, and from a change in how the tax brackets creep up with inflation. However, in their "provisions permanent" scenario, which keeps in place the relevant provisions that are scheduled to expire, they estimate that pass-through user costs of capital fall by 5.1 percent from lower marginal income tax rates and the 20 percent deduction for some pass-through income. This change is approximately half the size of their estimate for C corporations.

Signatures in the Macroeconomic Data

We now turn to the effects of the Tax Cuts and Jobs Act of 2017 on investment, wages, output, and tax revenue. To set the stage, Figure 5 plots the time

Corporate Income Tax Revenue and Investment Around the Tax Cuts and Jobs Act of 2017
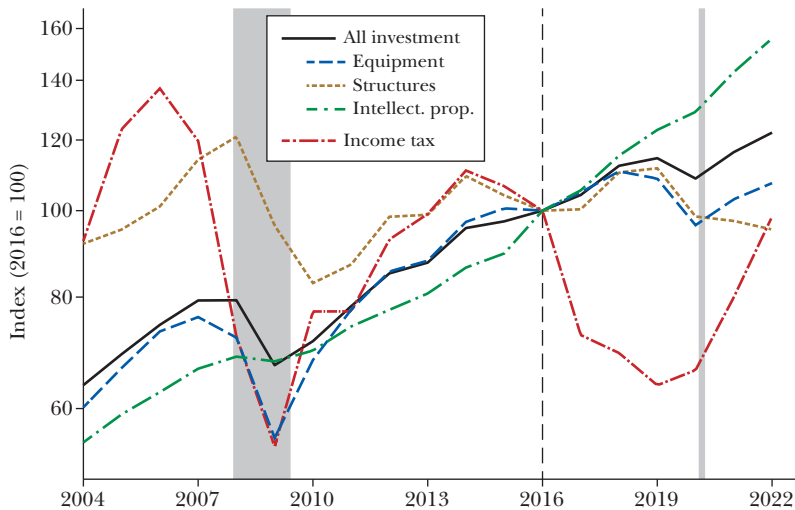
Source: The series for investment and its components come from BEA (2024a) table 4.8 (lines 17–20) and include investment of both C and S corporations. The series for income tax comes from BEA (2024b Table 3.2 (line 8) and includes only corporate income taxes and hence omits taxes paid by owners of S corporations.
Note: The BEA series assigns taxes to the year in which the income occurred and hence reassigns the Section 965 "toll tax" payments to previous years. Each line shows a series in constant prices (using own deflators for investment and the GDP price index for income tax revenue) and indexed to equal 100 in 2016.

paths of corporate investment (C corporations and S corporations) and tax revenue (C corporation only). Each line shows a series in constant prices (using own deflators for investment and the GDP price index for income tax revenue) and indexed to equal 100 in 2016, the last full year before the passage of the law.[1]

The solid black line shows the trajectory of total corporate investment, which rose after 2017 at a broadly similar pace to the years prior. The series also illustrates that corporate investment is highly volatile and cyclical, which makes it difficult to discern the impact of the 2017 law on investment from the time series alone.

The dashed blue, dotted gold, and dash-dot green lines show, respectively, the trajectories of the major components of investment: equipment, structures, and intellectual property investment. The fastest growth both before and after 2017 occurred within intellectual property, which received the smallest boost from the tax change, and shows no clear break in trend. Both equipment (starting in 2017) and structures (starting in 2018) appear to have higher investment after the Tax Cuts

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[1] While the law was passed in December 2017, certain provisions including bonus depreciation were made retroactive to October.

and Jobs Act than the trend lines from the years immediately preceding would have predicted. In fact, averaged over 2017:Q4–2019:Q4, nonresidential equipment and structures investment (including non-corporate) exceeds the out-of-sample forecast from a univariate regression on four quarterly lags by 5.2 percentage points. As another comparison, the change in total non-residential investment from 2017:Q4 to 2019:Q4 of 8.9 percent exceeds the pre-TCJA July 2017 "Tealbook" forecast of the staff of the Federal Reserve by 4.6 percentage points. However, the volatility of these components cautions against strong conclusions based on the time series evidence alone.

The dash-dot red line shows the path of corporate tax revenue. Despite a strong macroeconomy, real corporate revenue fell in 2019 by 36 percent relative to 2016. Corporate tax revenue then increased substantially in 2021 and 2022, coinciding with high corporate profits during that time.

Of course, these aggregate series reflect not only the effects of the Tax Cuts and Jobs Act on investment and revenue, but also the effects of other shocks from spending policy, trade, monetary policy, the COVID pandemic, and so on. The presence of other macroeconomic shocks further complicates inference of the causal effect of the 2017 law on investment or revenue from the aggregate time series. We therefore turn to two alternative approaches: one based on past estimates or model calibrations, and the other comparing firms facing different tax shocks within the same post-law-change macroeconomic environment.
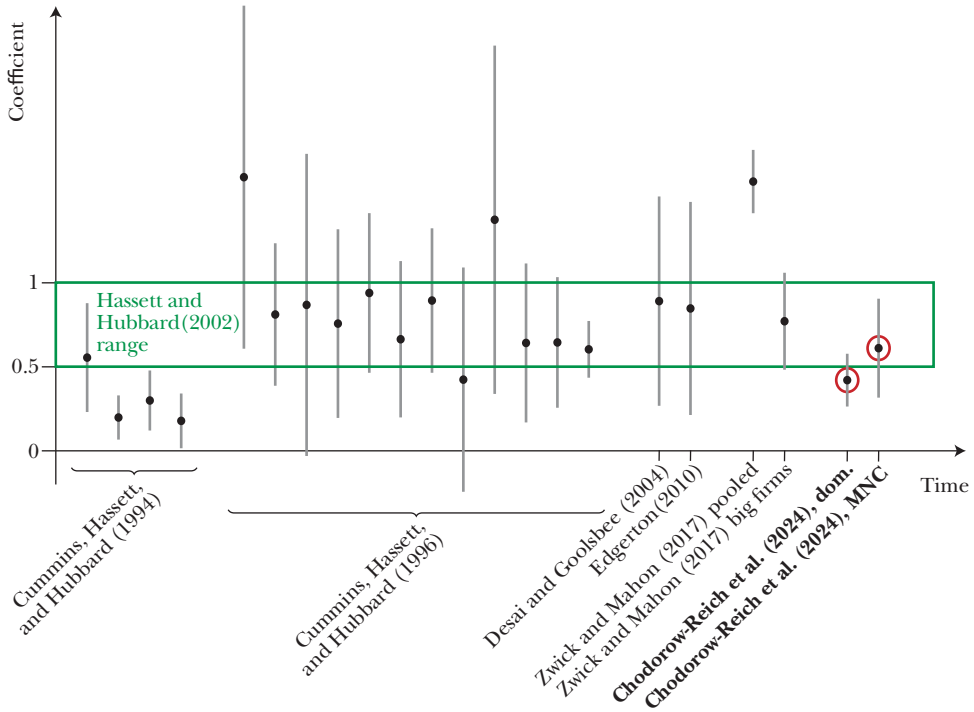
Estimates of the Effect of Tax Changes on Domestic Investment Prior to the Law's Passage

One approach to estimating the investment effects of the Tax Cuts and Jobs Act is to multiply the changes to the user cost of capital from the 2017 law by the relevant elasticities from historical data or from a calibrated model.

Earlier research has used previous tax reforms to estimate the response of investment to changes in the tax wedge. These studies exploit variation across firms and industries in exposure to the tax reforms; for example, how the tax term $(1 - \Gamma)/(1 - \tau)$ varies according to differences in the types of capital on which these firms rely. Figure 6 plots some estimates of this statistic from this literature, ordered by publication date. Cummins, Hassett, and Hubbard (1994) pioneered this approach using US tax reforms from the 1960s through the 1980s. They found coefficients of the investment-to-capital ratio with respect to the tax term in the 0 to 0.5 range. Cummins, Hassett, and Hubbard (1996) present estimates in the 0.5 to 1.5 range using a series of international tax reforms. Hassett and Hubbard (2002) survey the literature and offer a "consensus" range of 0.5 to 1. Desai and Goolsbee (2004) and Edgerton (2010) find estimates slightly below 1 using US tax reforms through the 1990s. Zwick and Mahon (2017) focus on bonus depreciation reforms in the 2000s and find similar estimates for big firms. They find larger effects in a

Figure 6
A History of Estimates of the Tax Term $(1 - \Gamma)/(1 - \tau)$ on the Investment-to-Capital Ratio

Source: Authors' calculations.
Note: This figure plots estimates of the effect of changes of the tax term on the investment-to-capital ratio. Confidence intervals are provided in gray. The estimates are ordered along the *x*-axis by publication date. The green box indicates the "consensus" range proposed by Hassett and Hubbard (2002).

sample that includes many smaller private firms, which are more responsive and likely to be financially constrained.

The Council of Economic Advisers (2018) analyzes the likely effects of the new law by appealing to these historical estimates. Specifically, CEA (2018) refers to the Hassett and Hubbard (2002) range as indicating an "estimated user-cost elasticity of investment at about −1.0, consistent with the neoclassical benchmark. These estimates imply that a tax change that lowers the user cost of capital by 10 percent would raise demand for capital by up to 10 percent."[2] However, the coefficients reported in Figure 6 all correspond to short-run, cross-firm or cross-industry responses of

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[2] The "neoclassical benchmark" refers to a long-run unitary user cost elasticity of the capital-output ratio under a Cobb-Douglas production function (for example, see Caballero 1999). This is different from the

investment to tax changes, which may differ from the long-run, general equilibrium changes because of short-run adjustment costs and the fixed supply of factors such as labor in the aggregate. The calculation in CEA (2018) does not account for these differences.

Imposing the first-order condition of a cost-minimizing firm relating output elasticities to cost shares provides an alternative means to calibrate the effects of user cost changes on capital accumulation. Barro and Furman (2018) perform this calculation averaging over five different types of capital—equipment, structures, residential rental property, R&D intellectual property, and other forms of intellectual property—and arrive at an elasticity of −1.6 for the capital-to-labor ratio with respect to the user cost, and of −0.6 for output per worker (see also Auerbach 2018).[3]

Starting from either historical reforms or a calibrated model, one needs measures of the effect of how the Tax Cuts and Jobs Act affected the user cost to predict the likely effect of the law. Applying a user cost elasticity of −1 to a user cost change of −10 percentage points, CEA (2018) finds a predicted increase of 10 percent of the capital stock. Applying a user cost elasticity of −1.6 to a similar-sized user cost change, Barro and Furman (2018) find a predicted increase of 14 percent of corporate equipment capital and 16 percent of corporate structures capital in a scenario with no phase-out of any provisions. Replacing the 10 percentage point user cost change with the 4 percentage point change in Chodorow-Reich et al. (2024) scales down the predicted changes in the capital stock commensurately.

Furthermore, these predictions apply to different sectors of the economy. Council of Economic Advisers (2018) predicted an increase of the total capital stock, rather than just the capital stock in the corporate sector.[4] The total capital stock includes capital in the noncorporate sector, which experienced a smaller shock and also may respond differently, especially in general equilibrium.

Ideally, one would apply different elasticities for the pass-through sector because these firms tend to operate in different industries and at different scales than traditional C corporations. The literature is relatively less developed here. Giroud and Rauh (2019) use state-level tax changes to study establishment and employment responses for C and S corporations that operate in multiple states. They find smaller elasticities for pass-throughs than C corporations. DeBacker et al. (2018, 2019) study how pass-through activity responds to a 2012 Kansas tax cut and find limited evidence of real responses.

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elasticity of capital alone, which under a Cobb-Douglas production function has an elasticity with respect to the user cost of larger than one (see the next footnote).

[3] To understand the Barro and Furman (2018) elasticity, consider a production function $Y = K^{\alpha_K} L^{\alpha_L}$. In general equilibrium with fixed labor (normalized to 1), the first order condition for the marginal product of capital is $\alpha_K K^{\alpha_K - 1} = UserCost$, giving a user cost elasticity of the capital-labor ratio of $-1/(1 - \alpha_K)$. Barro and Furman set $\alpha_K = 0.38$, giving an elasticity of roughly 1.6.

[4] Barro and Furman (2018) estimate that the corporate sector represents 39 percent of value added, the pass-through sector represents 36 percent, and the nonbusiness sector (government, households, and nonprofits) represents the remaining 25 percent.

Short-Run and Partial Equilibrium Effects on Corporate Activity

As data have become available since 2017, we can study the short-run effects of the Tax Cuts and Jobs Act on various corporate outcomes more directly. Recent studies exploit cross-sectional research designs to isolate the impact of the reform from other simultaneous nontax shocks. We focus on studies using administrative tax data to measure exposure to the reform and firm-level outcomes.[5] Of course, these studies generally only have a few years of data since 2017 and before the effects of the pandemic in 2020, so their reduced-form empirical results measure the short-run response to the reform.[6]

Research Designs

One approach to estimating the effect of the change in the corporate rate is to compare the outcomes of C corporations, which benefited from the reduction in the top bracket corporate rate from 35 percent to 21 percent, to S corporations, which experienced a smaller rate cut. Kennedy et al. (2023) perform this analysis. This approach has the advantage of holding fixed the changes that affect both types of corporations, such as expensing and many international provisions. It has the limitation that the largest US companies are predominantly C corporations, for which S corporation comparison firms cannot be used. An alternative "exposure approach" compares C corporations that experienced bigger and smaller tax shocks. Chodorow-Reich et al. (2024) implement this design by measuring the shocks from different tax provisions separately, including the novel international provisions that primarily affect the largest firms. To study the effect of lowering the interest deduction cap, Goodman et al. (2024) compare outcomes at small firms (which were not affected by the change in the cap) and large firms and across firms with high and low interest expenses.

In the case of pass-through firms, Goodman et al. (2021) exploit variation across industries in exposure to the pass-through tax cut, which excluded some firms from benefitting. One limitation of the paper, which is the best evidence on the issue to date, is that some of the outcomes have pre-trends, which make inference more difficult. That said, there is no evidence of an investment response within this sample.

C Corporation Investment

Differing methods of estimating the effect of the Tax Cuts and Jobs Act on investment reach similar results, within the range of previous studies but at the lower end. Kennedy et al. (2023) estimate a semi-elasticity of the investment-to-capital

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[5] Chodorow-Reich et al. (2024) show that investment as reported on corporate tax returns closely tracks corporate investment in the Bureau of Economic Analysis Fixed Asset Accounts.

[6] See the TJCA Effects Tracker by Jeff Hoopes for a more comprehensive catalogue of studies at https://tax.kenaninstitute.unc.edu/what-do-we-know-about-the-effects-of-the-tax-cuts-and-jobs-act/. These include Garcia-Bernardo, Janský, and Zucman (2022) on profit shifting, Hanlon, Hoopes, and Slemrod (2019) on corporate earnings statements, and many other studies.

ratio of 0.44 with respect to the net-of-corporate-tax rate. Chodorow-Reich et al. (2024) also estimate the effects of the log change in the tax term on the investment-to-capital ratio and find 0.52. These estimates of 0.44 and 0.52 are in the range, but on the lower end of earlier estimates from the literature that we depict in Figure 6.

In partial equilibrium results, Chodorow-Reich et al. (2024) report that domestic investment of firms with the mean tax change increased 20 percent versus a no-change baseline. An intriguing result in their study is that domestic investment responds to the change in the taxation of foreign income, which supports the idea that foreign and domestic capital act as complements in multinational production (Desai, Foley, and Hines 2009).

While Chodorow-Reich et al. (2024) do not specify the tax incentives for research and development directly, they do ask how it responds to changes in marginal tax rates and the cost-of-capital firms with big and small changes to those tax terms. They find short-run effects on R&D expenses of 14 percent for multinational firms experiencing the mean tax shock relative to firms with no tax change. For domestic firms, they find a 4.2 percent increase.

C Corporation Wages

Kennedy et al. (2023) estimate that wages increase by around $700 more (around 1 percent of baseline wages) for C corporations than S corporations because of the tax change. They also find that most of these wage gains occur at the top of the wage distribution.

Chodorow-Reich et al. (2024) estimate short-run impacts on labor compensation, which is the product of earnings per worker and the number of workers. They do not distinguish between wage gains and employment increases due to the substantial measurement difficulties involved with being able to identify firm–worker links for C corporations, especially those with complex structures and those that use payroll processors that can make it hard to isolate earnings and employment for each firm. They estimate labor compensation increases around 2 percent for domestic firms experiencing the mean tax change relative to firms with no change. Their estimates for multinationals are not statistically significant. The broad similarity between the estimate of worker-level gains and in the total compensation response in these two studies bolsters their credibility. Yet, it bears repeating that these are relative wage responses across firms and do not directly answer the question of how aggregate wages changed; in the extreme case of a frictionless, competitive labor market in which all firms pay the same wage, a cross-firm research design would never uncover any effect on wages.

Pass-Throughs

Goodman et al. (2021) find little evidence that the pass-through business tax cuts cause real economic responses in investment, employment, and wages. Historical estimates of weaker elasticities to tax shocks for pass-throughs support this conclusion. When combined with the concentration of pass-through income

at the top of the income distribution (Smith et al. 2019), the pass-through firm provisions probably delivered quite concentrated gains at the top of the income distribution.

Stock Prices

Evidence on how tax changes affect stock prices will depend on investor time horizons and how well they understood the reform during the debate. In addition, the response to the tax rate change mixes forward- and backward-looking effects, because lower tax rates benefit both new capital and the return on capital already in place.

Public companies that faced higher effective tax rates prior to the Tax Cuts and Jobs Act and thus were more likely to benefit from a broad rate reduction have large cumulative stock price gains in the wake of the 2016 election and during the next year of tax policy debate. For example, Wagner, Zeckhauser, and Ziegler (2018a, b) find that cumulative stock prices increase around 0.1 percent per percentage point reduction in the effective corporate tax rate, and the aggregate stock market tended to outperform on days when high-taxed firms outperformed. Other studies have generally found consistent results, with some disagreement based on methodology (for example, Blanchard et al. 2018; Gaertner, Hoopes, and Williams 2020; also compare Borochin et al. 2021).

Using an alternative approach, Chodorow-Reich et al. (2024) combine their measurement of tax shocks and their estimated investment response to these shocks. They compute predicted investment effects for each firm and ask whether firms with larger investment effects due to the Tax Cuts and Jobs Act also experienced larger stock price growth during the reform debate. They find an excess cumulative return of high-exposure versus low-exposure firms of 8 to 12 percent.

Long-run and General Equilibrium Effects on Corporate Activity and Tax Revenues

The difference between firm-level and economy-wide responses arises because variables that an individual firm may treat as exogenous in its decision process, such as the wage, interest rate, or aggregate income, are determined endogenously in general equilibrium. The difference between the short-run and long-run response arises because of adjustment costs that spread out the response over time and because some of the law's provisions change over time.

Effects on Investment

A first straightforward approach to aggregation of investment across firms involves considering aggregate supply elasticities of capital and labor, and then iterating on firm-level factor demand as wages and the cost of capital change. Chodorow-Reich et al. (2024) implement such an approach for an inelastic aggregate labor supply, but assume no crowd-out in the markets for capital goods or

the interest rate.[7] They also calibrate adjustment costs to match standard dynamics found in the literature and assume all the Tax Cuts and Jobs Act provisions in place for 2018 become permanent. They find that the general equilibrium crowding out from higher wages reduces the long-run increase in domestic corporate capital from 13 percent to 7 percent.[8] In the short run, domestic investment of C corporations rises by roughly 12 percent.

With a similar model and their user cost elasticities (based on pre-2017 evidence), Barro and Furman (2018) estimate long-run general equilibrium outcomes. They predict an increase in C corporation capital per worker of 6.7 percent under the law-as-written and 12.7 percent if all provisions become permanent. Their calibration of a larger user cost change and larger capital elasticity in the production function and their incorporation of non–C corporation provisions explains much of the difference with Chodorow-Reich et al. (2024). They estimate the pass-through law as written would reduce output per worker in the pass-through sector by 0.8 percent (whereas the analogous C corporation provisions would raise output per worker by 8.1 percent). They find a wage response of 0.9 percent in the law as written scenario, and 3.1 percent in the provisions permanent scenario.

A second approach to incorporating general equilibrium price and income changes is to compare US firms to non-US counterparts. In an exercise with US and Canadian publicly-traded firms, Crawford and Markorian (2024) find higher investment growth at US firms after the 2017 law, especially those firms more likely to benefit from bonus depreciation or with international operations. Chodorow-Reich et al. (2024) synthetically match publicly-traded US firms to foreign-headquartered firms. They find global investment increases among US firms by about 17 percent in years immediately after the reform, and that some of the most important industries contributing to those gains were utilities and manufacturing. The finding of a global investment response higher than the domestic response is in accord with

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[7]Allowing for crowd-out in the market for capital goods or for higher deficits to raise interest rates would reduce the growth and investment effects. While Goolsbee (1998) found that the price of capital goods responded strongly to tax incentives for investment, his evidence was sharply disputed by House, Mocanu, and Shapiro (2022). Regarding interest rates, below we report an average increase in the deficit due to the Tax Cut and Job Act's business provisions of roughly 0.6 percent of GDP per year over the first decade. Although the causal relationship between interest rates and deficits is difficult to determine precisely, applying a conventional parameterization of 25 basis points increase in the interest rate per 1 percentage point increase in the deficit/GDP ratio (Laubach 2009) would imply interest rates increase by 10–20 basis points. In the formula for the long-run capital stock, the sum of the interest rate r and the depreciation rate δ multiply the tax term. Taking a 6 percent interest rate and a 10 percent depreciation rate, a 15 basis point increase in the interest rate increases this sum by 0.94 percent, potentially offsetting perhaps one-fifth of the 4.4 percent reduction in the tax term.

[8]As discussed in footnote 3, in a model of domestic-only firms with a capital elasticity in the revenue function of α_K, the general equilibrium long-run elasticity of capital to the user cost is $-1/(1 - \alpha_K)$. Given a labor share of 0.65, Chodorow-Reich et al. (2024) recover a value of α_K of roughly 0.25 from their cross-firm evidence. Multiplying the user cost decline of roughly 4.4 percentage points by $1/(1 - 0.25)$ implies an increase of 5.8 percent; the difference between this calculation and the 7 percent reported in the text comes from the response to the changes to taxation of foreign income and the inclusion of the noncorporate sector.

the cross-firm evidence in Chodorow-Reich et al. (2024) of foreign investment responding positively to incentives in the new international regime.

A third approach involves comparing actual investment to a plausible baseline forecast if the Tax Cuts and Jobs Act had not become law. Furno (2023) develops such a baseline by aggregating firm-level forecasts of key variables made by stock market analysts prior to the law's passage. While actual pre-tax income in 2018 and 2019 closely tracks analysts' forecasts, investment (as well as payouts to shareholders) sharply exceeded even the upper range of forecasts. Averaged over 2018–2019, global investment rises by about 14 percent above the forecast path.

These distinct approaches to arriving at economy-wide outcomes each have advantages and pitfalls. Imposing general equilibrium market clearing in a fully specified model ensures consistency with the cross-firm evidence and allows for extrapolation to the long run. However, it necessarily misses any unmodeled forces. For example, the short-run increase in aggregate demand from higher investment might increase employment and output, while in the medium and long run higher deficits might increase interest rates and dampen the aggregate investment response. Comparisons of US firms to foreign firms or to pre-2017 forecasts offer a more direct approach that includes all domestic general equilibrium forces, but they cannot separately identify the effects of the Tax Cuts and Jobs Act from other concurrent macroeconomic shocks. They also make it difficult to isolate the role of independent provisions of the reform. But taken together, the finding of a positive corporate investment response in the broad range of 8 to 14 percent across these methodological approaches reinforces the conclusion of a positive macroeconomic investment response to the Tax Cuts and Jobs Act.[9]

Because aggregate investment in Figure 5 stayed on its pre-reform trend, these estimates suggest that investment would have declined in the absence of the Tax Cuts and Jobs Act. This decline is consistent with evidence in Kennedy et al. (2023) that investment rates of S corporations were substantially lower in the post-reform period. Specifically, they show net investment rates decline from around 7.5 percent to around 3.25 percent between 2015–2016 and 2018–2019. Some of this decline could be due to reallocation to C corporations, which enjoyed a larger tax cut, from pass-throughs, which did not get as large of a rate reduction. Other macroeconomic forces, including rising interest rates, shocks to oil prices, and trade disruptions, could also have contributed to an overall decline in investment in the absence of the reform.

Effects on GDP

Moving from the response of investment to an implied change in GDP requires determining the capital response by sector, the output elasticity of capital, and

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[9] Note that these effects apply to different subsets of investment, and do not imply that total investment economy-wide increased by 10 to 15 percent. For example, the synthetic control approach examines investment of a subset of public companies for which there are good matches. This sample is smaller than total US investment.

sectoral shares in GDP. As noted already, Chodorow-Reich et al. (2024) find that the changes to the effective corporate rate, FDII (to tax Foreign Derived Intangible Income), GILTI (to tax Global Intangible Low-Taxed Income), and full expensing for C corporations together cause a long-run increase in domestic corporate capital of 7 percent. Assuming a similar depreciation profile and investment elasticity of non-corporate business as domestic corporate business, the long-run effect on domestic business capital in their framework becomes 4.6 percent.[10] Because Goodman et al. (2024) find no effect of the interest deduction limitation on investment in their study of pass-through firms, this 4.6 percent increase represents the total response to the business provisions of the Tax Cuts and Jobs Act.

The corresponding increase in business value-added is smaller, because aggregate labor is inelastic and because of decreasing returns to scale. Accounting for these effects, the long-run increase in business value-added is 1.2 percent. Finally, since the business sector is about three-quarters of GDP, this magnitude implies a long-run increase in GDP of roughly 0.9 percent. Most of this increase occurs within the first ten years, implying an increase in the growth rate of GDP of roughly 0.1 percentage points per year over that horizon.

A long-run increase in GDP of, say, 1 percent implies an increase in wages of roughly the same magnitude. Evaluated at the 2017 average compensation level of $77,000 per employee, this effect would imply an increase in labor income of less than $1,000 per employee, far smaller than the prediction of $4,000 to $9,000 in wage gains predicted by the Council of Economic Advisers (2017). This conclusion echoes the prediction in Furman (2017), who noted that the Council of Economic Advisers forecast would require higher aggregate wage income of "between 275 percent to 550 percent of the total cost of the $200 billion (per year) corporate tax cut—implying a supply effect that's more than a little far-fetched."

Effects on Tax Revenue

Both corporate and individual income tax revenue changed because of the Tax Cuts and Jobs Act. The change to corporate income tax revenue reflects both the mechanical changes to the tax code—holding fixed corporate capital and profits—and the dynamic response of corporate capital and profits to the reform. The Chodorow-Reich et al. (2024) general equilibrium model captures both components and finds an immediate reduction in corporate revenue of more than 40 percent in response to the corporate tax changes. This large decline mirrors the decline in actual corporate revenue of 35 percent shown in Figure 5. Over time, the dynamic response of the capital stock and corporate income offsets some of this decline, but even ten years after the reform, the corporate revenue reduction

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[10] Chodorow-Reich et al. (2024) do not estimate the impact of the reform on domestic investment by foreign multinationals operating in the United States. Their estimate effectively assumes these firms face the same shocks and generate the same response as the US C corporation sample.

remains 41 percent (recall that this paper also assumes that the depreciation provisions remain permanent).[11]

The relatively muted dynamic feedback response of corporate tax revenue occurs for two reasons. First, the scale of the investment response—positive, but not enormous–precludes very large changes to corporate profits. Second, the shift to expensing of investment means that the higher investment required to build and maintain a higher capital stock also directly reduces taxable corporate income.

The changes to individual income tax revenue related to taxation of business income reflect three main forces: (1) higher labor income from wage growth, (2) payout taxes on higher distributions from C corporations, and (3) payout taxes on profits of S corporations. The Chodorow-Reich et al. (2024) model incorporates the responses along all three margins to the corporate tax changes and finds that they offset 1.5 percent of the corporate revenue loss in the first year and 6.3 percent by year ten after the reform. This modest offset mostly occurs through personal rather than corporate income tax revenue.

Combining the output and revenue responses gives rise to a tax multiplier. The ratio of the annual average change in output to the annual average change in revenue over the first ten years provides one natural summary measure. In the Chodorow-Reich et al. (2024) model, average GDP over the first ten years is 0.44 percent higher due to the corporate provisions, while the ten-year revenue decline is 39.6 percent of pre-TCJA corporate revenue, or about 0.63 percent of GDP per year. Taking the ratio gives a ten-year average multiplier of roughly two-thirds.

Evaluating the Business Income Provisions One at a Time

Inspired by Auerbach (2018, Table 1) in this journal, who lists five key parts of the Tax Cuts and Jobs Act and their predicted economic effects, Table 2 highlights the estimated effects of each provision.

1) Reduced Business Tax Rates. Kennedy et al. (2023) show how the distribution of average income tax rates changes for both C corporations and S corporations from 2016 to 2019. A little under 40 percent of C corporations face a near zero rate (due to tax losses from a range of factors such as high costs or expensing large investments), and most other firms face tax rates near the

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[11] A full accounting of the sharp uptick in corporate tax revenue in the data in 2021 and 2022, as shown in Figure 5, goes beyond the scope of this article. Overall, pre-tax domestic corporate profits relative to GDP unexpectedly increased during this period; the Congressional Budget Office (2018) forecasts that the ratio of corporate profits to GDP would fall by 1.25 percentage points from 2018 to 2022, while in fact this ratio rose by 1.70 percentage points. An unexpected one-third increase in the profit share could explain the uptick in tax revenue. Because the 2018 CBO forecast came after the passage of Tax Cuts and Jobs Act, it seems plausible the increase in the profit share occurred as the result of other factors, perhaps related to the pandemic. Another potential explanation is an inbound profit-shifting response to the reform and subsequent changes in other countries' regimes.

Table 2
Effects on Investment and Economic Activity by TCJA Provision

Provision	Economic impact		Citation
	Investment	Tax revenue	
Corporate rate cut	Increased	Decreased	Chodorow-Reich et al. (2024); Kennedy et al. (2023)
Expensing	Increased	Decreased	Chodorow-Reich et al. (2024)
Interest limitations	Minimal	Increased	Goodman et al. (2024)
GILTI (global intangible low-taxed income)	Increased	Increased	Chodorow-Reich et al. (2024)
FDII (Foreign derived intangible income)	Ambiguous	Decreased	Chodorow-Reich et al. (2024)

Source: Authors' analyses of Chodorow-Reich et al. (2024), Kennedy et al. (2023), and Goodman et al. (2024).
Note: This table summarizes the predicted economic impact of each of the five listed provisions on investment and tax revenue. Citations for each of the predictions are provided in the fourth column.

top rate, which fell by 14 percentage points. For S corporations, they show similarly that there is a range of income tax rates but the modal rate is the top tax rate. Across the distribution, they estimate that average tax rates fall by around 5 percentage points (or by 20 percent relative to the 25 percent pre-reform baseline) more than they do for S corporations. Based on this larger reduction in corporate tax rates for C corporations than S corporations, they estimate that investment in C corporations increases by 2.9 percent relative to S corporations, while tax revenue declines.

Chodorow-Reich et al. (2024) isolate the effect of changes in the marginal effective tax rate τ, which falls by about 10 percentage points (or nearly 40 percent relative to the pre-reform baseline of 27 percent for the average firm). They find an increase in total capital accumulation of 3.4 percent after ten years from the rate cuts alone, around half the 5.9 percent increase when accounting for all the provisions collectively. Tax revenue declines by around one-third due to the rate cuts alone. Cutting the tax rate is the most expensive provision in terms of cost per unit of capital accumulation.

2) Expensing. By holding tax rates constant at their pre-reform value, Chodorow-Reich et al. (2024) model the effect of expensing alone. This exercise results in a domestic cost of capital subsidy Γ that increases, rather than decreases when all of the Tax Cuts and Jobs Act provisions are included. Expensing increases investment, resulting in 1.7 percent more capital after ten years. Tax revenue decreases by 12.4 percent due to expensing. Over ten years, expensing delivers half the capital accumulation for one-third of the cost of the rate cut.

3) Limiting Interest Deductions. To estimate investment effects, Goodman et al. (2024) compare two groups of high-interest firms: big firms and small firms that are exempt from the interest limitations. They find no effect on investment and can rule out investment changes exceeding 5 percent with more than 95 percent confidence. They also document that the interest limitation raises tax revenue.

4) Global Intangible Low-Taxed Income. The GILTI provision applies a 10.5 percent tax that applies to income exceeding 10 percent of foreign tangible capital. Because tangible income is calculated as 10 percent of tangible capital, increasing foreign tangible capital shrinks the tax base for GILTI. These incentives for foreign capital accumulation can boost domestic investment when foreign and domestic capital are complements. Chodorow-Reich et al. (2024) estimate that GILTI modestly boosts domestic capital accumulation by 0.9 percent over ten years, while also raising revenue.

5) Foreign Derived Intangible Income. The FDII provision subsidizes exports by allowing firms to deduct their export share of domestic income in excess of 10 percent of domestic tangible capital. This provision lowers the tax rate, but also increases the cost of capital (because having more tangible capital shrinks the tax base for FDII) in a manner that depends on each firm's export share, and so its overall effect on investment is ambiguous. Krull and Wu (2023) find suggestive evidence that the FDII provisions increased investment, but caution that this result is "sensitive to model specification." In terms of tax revenue, the Joint Committee on Taxation (2017) estimated that it would reduce tax revenue.

Finally, another provision that Auerbach (2018) highlights is a minimum tax on domestic earnings referred to as the base erosion and anti-abuse tax (BEAT). This provision imposes a tax on payments from US firms to foreign affiliates above 3 percent of total deductions. Auerbach concludes that BEAT likely reduces investment and raises tax revenue. Scorekeepers also estimate that BEAT would raise tax revenue. Research studies on the impact of BEAT remain to be written.

The Policy Path Forward

To reduce the budgetary cost of the bill as projected into the future, the Tax Cuts and Jobs Act legislated that many of its provisions would expire. While the cut in the corporate tax rate from 35 percent to 21 percent was made permanent, expensing started phasing down in 2023 by 20 percentage points each year. Beginning in 2026, the 20 percent deduction for qualified business income in Section 199A will expire. Expenses for research and development will start receiving less favorable tax treatment as of 2022. Instead of being able to be immediately deducted, they must be amortized over five years.

The overall fiscal picture of the US government looks worse than it did during the 2017 tax debate. Extending all or most of the provisions in the Tax Cuts and Jobs

Act and letting the rate cut remain will be costly relative to the growth effects these tax cuts buy. In addition, the TCJA was passed during a period of exceptionally low interest rates, a regime from which the US economy appears to have since transitioned. The interest rate environment affects tax policy in several ways (Auerbach and Gale 2022). Deficit-financed tax cuts will crowd out investment more strongly when the Federal Reserve faces a sharper trade-off on its dual mandate of low inflation and full employment. Furthermore, with higher inflation and nominal interest rates, an overly generous expensing regime without interest limitations can lead to negative effective marginal rates for investment. Conversely, the switch to amortization of research and development expenses is more costly to firms in a higher-rate environment.

One takeaway from the Tax Cuts and Jobs Act is that some of the expired and expiring provisions, such as accelerated depreciation, generate more investment per dollar of tax revenue than do other provisions. We conjecture that research and development provisions would look similar, though leave a more confident conclusion on this point to future research. By contrast, the tax cuts to pass-through firms look quite unattractive: they are especially expensive in terms of how much investment they encourage, put pressure on the system by encouraging recharacterization of high-tax labor income in the form of a pass-through firm, and are perhaps the most regressive provisions in the entire bill.

Reforming international provisions that discourage investing in the United States—via tangible capital-based limitations like those in Foreign Derived Intangible Income and Global Intangible Low-Taxed Income—would likely result in more domestic investment. At the same time, provisions that encourage foreign capital accumulation by US firms can have domestic spillovers.

The expiring provisions of the Tax Cuts and Jobs Act will create pressure to revisit these topics, and avoiding the path of least political resistance—just renewing all the provisions—will be a challenge. The previous major business tax reform was the Tax Reform Act of 1986, which also benefited from unique historical features (Birnbaum and Murray 1988). In that case, raising corporate taxes occurred with bipartisan cooperation under an extremely popular second term president and as part of a package that reduced individual taxes. But both large corporations and smaller pass-through firms are powerful constituencies.

References

Atkinson, Robert D., and Michael Lind. 2018. *Big is Beautiful: Debunking the Myth of Small Business.* Cambridge, MA: MIT Press.

Auerbach, Alan J. 2006. "Who Bears the Corporate Tax? A Review of What We Know." *Tax Policy and the Economy* 20: 1–40.

Auerbach, Alan J. 2018. "Measuring the Effects of Corporate Tax Cuts." *Journal of Economic Perspectives* 32 (4): 97–120.

Auerbach, Alan J., and William G. Gale. 2022. "Tax Policy Design with Low Interest Rates." *Tax Policy and the Economy* 36 (1): 93–121.

Barro, Robert J., and Jason Furman. 2018. "The Macroeconomic Effects of the 2017 Tax Reform." *Brookings Papers on Economic Activity* 49 (1): 257–345.

Birnbaum, Jeffrey, and Alan Murray. 1988. *Showdown at Gucci Gulch: Lawmakers, Lobbyists, and the Unlikely Triumph of Tax Reform.* New York: Vintage.

Blanchard, Olivier, Christopher G. Collins, Mohammad R. Jahan-Parvar, Thomas Pellet, and Beth Anne Wilson. 2018. "A Year of Rising Dangerously? The US Stock Market Performance in the Aftermath of the Presidential Election." *Journal of Policy Modeling* 40 (3): 489–502.

Borochin, Paul, Murat Alp Celik, Xu Tian, and Toni M. Whited. 2021. "Identifying the Heterogeneous Impact of Highly Anticipated Events: Evidence from the Tax Cuts and Jobs Act." Unpublished.

Bureau of Economic Analysis. 2024a. "Title: Fixed Asset Accounts." https://apps.bea.gov/national/FixedAssets/Release/TXT/FixedAssets.txt.

Bureau of Economic Analysis. 2024b. "Title: National Income and Products Accounts." https://apps.bea.gov/national/Release/txt/NipaDataA.txt.

Caballero, Ricardo. 1999. "Aggregate Investment." In *Handbook of Macroeconomics,* Vol. 1, edited by John B. Taylor and Michael Woodford, 813-862. Amsterdam: Elsevier.

Chodorow-Reich, Gabriel, Matthew Smith, Owen M. Zidar, and Eric Zwick. 2024. "Tax Policy and Investment in a Global Economy." NBER Working Paper 32180.

Chodorow-Reich, Gabriel, Owen Zidar, and Eric Zwick. 2024. "Replication data for: Lessons from the Biggest Business Tax Cut in US History." American Economic Association [publisher], Interuniversity Consortium for Political and Social Research [distributor]. https://doi.org/10.3886/E202721V1.

Congressional Budget Office. 2018. The Budget and Economic Outlook: 2018 to 2028. Washington, DC: Congressional Budget Office.

Council of Economic Advisers (**CEA**)**.** 2017. *Economic Report of the President.* Washington, DC: US Government Printing Office.

Council of Economic Advisers (**CEA**)**.** 2018. *Economic Report of the President.* Washington, DC: US Government Printing Office.

Crawford, Steven, and Garen Markarian. 2024. "The Effect of the Tax Cuts and Jobs Act of 2017 on Corporate Investment." *Journal of Corporate Finance* 87.

Cummins, Jason G., Kevin A. Hassett, and R. Glenn Hubbard. 1994. "A Reconsideration of Investment Behavior Using Tax Reforms as Natural Experiments." *Brookings Papers on Economic Activity* 25 (2): 1–74.

Cummins, Jason G., Kevin A. Hassett, and R. Glenn Hubbard. 1996. "Tax Reforms and Investment: A Cross-Country Comparison." *Journal of Public Economics* 62 (1–2): 237–73.

DeBacker, Jason, Lucas Goodman, Bradley T. Heim, Shanthi P. Ramnath, and Justin M. Ross. 2018. "Pass-Through Entity Responses to Preferential Tax Rates: Evidence on Economic Activity and Owner Compensation in Kansas." *National Tax Journal* 71 (4): 687–706.

DeBacker, Jason, Bradley T. Heim, Shanthi P. Ramnath, and Justin M. Ross. 2019. "The Impact of State Taxes on Pass-Through Businesses: Evidence from the 2012 Kansas Income Tax Reform." *Journal of Public Economics* 174: 53–75.

Desai, Mihir A., C. Fritz Foley, and James R. Hines Jr. 2009. "Domestic Effects of the Foreign Activities of US Multinationals." *American Economic Journal: Economic Policy* 1 (1): 181–203.

Desai, Mihir A., and Austan Goolsbee. 2004. "Investment, Overhang, and Tax Policy." *Brookings Papers on Economic Activity* 35 (2): 285–355.

Dobridge, Christine L., Patrick Kennedy, Paul Landefeld, and Jacob Mortenson. 2023. "The TCJA and Domestic Corporate Tax Rates." FEDS Working Paper 2023-78.

Edgerton, Jesse. 2010. "Investment Incentives and Corporate Tax Asymmetries." *Journal of Public Economics* 94 (11–12): 936–52.

Foertsch, Tracy. 2018. "OECD Effective Corporate Tax Rates for New Investment." Unpublished.

Furman, Jason. 2017. "No, the GOP Tax Plan Won't Give You a $9,000 Raise." *Wall Street Journal*, October 22. https://www.wsj.com/articles/no-the-gop-tax-plan-wont-give-you-a-9-000-raise-1508702509.

Furno, Francesco. 2023. "The Macroeconomic Effects of Corporate Tax Reforms." Working paper.

Gaertner, Fabio B., Jeffrey L. Hoopes, and Braden M. Williams. 2020. "Making *Only* America Great?

Non-US Market Reactions to US Tax Reform." *Management Science* 66 (2): 687–97.

Gale, William G., Hilary Gelfond, Aaron Krupkin, Mark J. Mazur, and Eric J. Toder. 2019. "Effects of the Tax Cuts and Jobs Act: A Preliminary Analysis." *National Tax Journal* 71 (4): 589–612.

Garcia-Bernardo, Javier, Petr Janský, and Gabriel Zucman. 2022. "Did the Tax Cuts and Jobs Act Reduce Profit Shifting by US Multinational Companies?" NBER Working Paper 30086.

Giroud, Xavier and Joshua Rauh. 2019. "State Taxation and the Reallocation of Business Activity: Evidence from Establishment-Level Data." *Journal of Political Economy* 127 (3): 1262–1316.

Goodman, Lucas, Adam Isen, Jordan Richmond, Matthew Smith. 2024. "Tax Policy, Investment, and Firm Financing: Evidence from the U.S. Interest Limitation." Unpublished.

Goodman, Lucas, Katherine Lim, Bruce Sacerdote, Andrew Whitten. 2019. "Simulating the 199A Deduction for Pass-through Owners." Office of Tax Analysis Working Paper 118.

Goodman, Lucas, Katherine Lim, Bruce Sacerdote, Andrew Whitten. 2021. "How Do Business Owners Respond to a Tax Cut? Examining the 199A Deduction for Pass-through Firms." NBER Working Paper 28680.

Goolsbee, Austan. 1998. "Investment Tax Incentives, Prices, and the Supply of Capital Goods." *Quarterly Journal of Economics* 113 (1): 121–48.

Hanlon, Michelle, Jeffrey L. Hoopes, and Joel Slemrod. 2019. "Tax reform made me do it!" *Tax Policy and the Economy* 33 (1): 33–80.

Harberger, Arnold C. 1962. "The Incidence of the Corporation Income Tax." *Journal of Political Economy* 70 (3): 215–40.

Hassett, Kevin A., and R. Glenn Hubbard. 2002. "Tax Policy and Business Investment." In *Handbook of Public Economics,* Vol. 3, edited by Alan J. Auerbach and Martin Feldstein, 1293–1343. Amsterdam: Elsevier.

House, Christopher L., Ana-Maria Mocanu, and Matthew D. Shapiro. 2022. "Stimulus Effects of Investment Tax Incentives: Production versus Purchases." NBER Working Paper 23391.

House, Christopher L., and Matthew D. Shapiro. 2008. "Temporary Investment Tax Incentives: Theory with Evidence from Bonus Depreciation." *American Economic Review* 98 (3): 737–68.

Joint Committee on Taxation. 2017. "Macroeconomic Analysis of the Conference Agreement for H.R.1, the 'Tax Cuts and Jobs Act.'" JCX-69–17.

Kennedy, Patrick J., Christine Dobridge, Paul Landefeld, and Jake Mortenson. 2023. "The Efficiency-Equity Tradeoff of the Corporate Income Tax: Evidence from the Tax Cuts and Jobs Act." Unpublished.

Krull, Linda K., and Juan Wu. 2022. "Changes in US Multinational Firms' Investment and Income Shifting after the 2017 Tax Cuts and Jobs Act (TCJA)." Unpublished.

Laubach, Thomas. 2009. "New Evidence on the Interest Rate Effects of Budget Deficits and Debt." *Journal of the European Economic Association* 7 (4): 858–85.

Rosenthal, Steven M., and Livia Mucciolo. 2024. "Who's Left to Tax? Grappling With a Dwindling Shareholder Tax Base." *Tax Notes.* April 8. https://www.taxpolicycenter.org/taxvox/whos-left-tax-grappling-dwindling-shareholder-tax-base.

Smith, Matthew, Danny Yagan, Owen Zidar, and Eric Zwick. 2019. "Capitalists in the Twenty-First Century." *Quarterly Journal of Economics* 134 (4): 1675–745.

Wagner, Alexander F., Richard J. Zeckhauser, and Alexandre Ziegler. 2018a. "Company Stock Price Reactions to the 2016 Election Shock: Trump, Taxes, and Trade." *Journal of Financial Economics* 130 (2): 428–51.

Wagner, Alexander F., Richard J. Zeckhauser, and Alexandre Ziegler. 2018b. "Unequal Rewards to Firms: Stock Market Responses to the Trump Election and the 2017 Corporate Tax Reform." *AEA Papers and Proceedings* 108: 590–96.

White House and Department of the Treasury. 2012. "The President's Framework for Business Tax Reform." https://home.treasury.gov/system/files/131/OTA-Report-Business-Tax-Reform-2012.pdf.

Zwick, Eric, and James Mahon. 2017. "Tax Policy and Heterogeneous Investment Behavior." *American Economic Review* 107 (1): 217–48.

US International Corporate Taxation after the Tax Cuts and Jobs Act

Kimberly A. Clausing

The root dilemma that informs the past, present, and future of US international taxation is the tension between two desiderata: protecting the corporate tax base from erosion and ensuring the competitiveness of US multinational firms in the world economy.

While the US international tax system experienced large changes under the Tax Cuts and Jobs Act of 2017 (TCJA), this seemingly inevitable dilemma was preserved. Both before and after the legislation, there were dual, competing concerns that foreign income was favorably treated relative to US income (fueling offshoring of production, profit-shifting to lower-tax jurisdictions, and domestic tax base erosion), and that US multinationals were tax-disadvantaged, weakening their competitive position.

The policy problem of corporate tax base erosion ultimately stems from the inherent difficulty of establishing the location of income in a world where tax rates differ across jurisdictions, incentivizing the mobility of income toward lightly taxed locations. When businesses are multinational and governments are not, there needs to be some compelling answer to the question of *where* corporate income is truly earned and taxable. Yet that question has no simple answer. If additional profit is earned due to the multinational nature of operations, where does such profit truly

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belong? If both supply and demand sides of the market generate value and profit, which side of the market should tax the resulting profit?

In a world of complex supply chains and intangible economic value, firms have ample opportunity to make tax-motivated decisions about where to locate income. It has long been the practice of international tax law to insist that transactions among affiliates of multinational firms should take place at "arm's length," which essentially means that internal transactions of multinational firms should be priced as if they were external transactions. But in practice, "transfer pricing" methods for placing value on internal firm transactions leave companies with substantial discretion regarding the location of their profits. In global operations with myriad cross-border transactions, such discretion is often employed toward tax-minimization ends.

In seeking to address both tax base erosion and the competitiveness of US-based multinational companies, the Tax Cuts and Jobs Act walked a fine line, one that ultimately illuminated the core dilemma between these two goals. As discussed below, different TCJA provisions both raised and lowered tax burdens on foreign income, with the net effect depending on circumstances of individual firms. Thus, TCJA reforms had indeterminate effects and left many observers with the same root worries they had previously.

This article begins by exploring these two policy goals: protecting the corporate tax base from erosion and ensuring the competitiveness of US multinational firms in the world economy. It then considers the international tax provisions of the Tax Cuts and Jobs Act and the research estimating their effects. Since TCJA is not occurring in a vacuum, the following section describes the "Pillar 2" international tax agreement, an important change in the international tax system. As countries implement the "Pillar 2" country-by-country minimum tax on multinational income of 15 percent, this agreement has the potential to disrupt long-standing arguments about international corporate taxation, in part by alleviating the root policy dilemma between competitiveness and tax base protection.

The Root Dilemma of International Taxation

Revenue Loss and Tax System Integrity

Multinational corporations have a substantial ability to use accounting mechanisms that shift the location of profits to lower-tax jurisdictions. A recent report from the OECD indicates that, worldwide, over $2 trillion of multinational corporate income is taxed at a rate lower than 15 percent (Hugger et al. 2024). The report estimates that internationally coordinated "Pillar 2" minimum taxation could reduce the extent of profit-shifting by about 50 percent, increasing corporate tax revenues across nearly all country groups (beyond a handful of small, low-tax jurisdictions), raising between $155 billion and $192 billion per year.

The tax-driven distortions in how multinational firms report their income are readily apparent across many different sources of data. For example, Figure 1 shows

Figure 1

Profits of Large Multinational Firms Relative to GDP, by Country Groups

Panel A. Income groups

Panel B. Effective tax rate groups
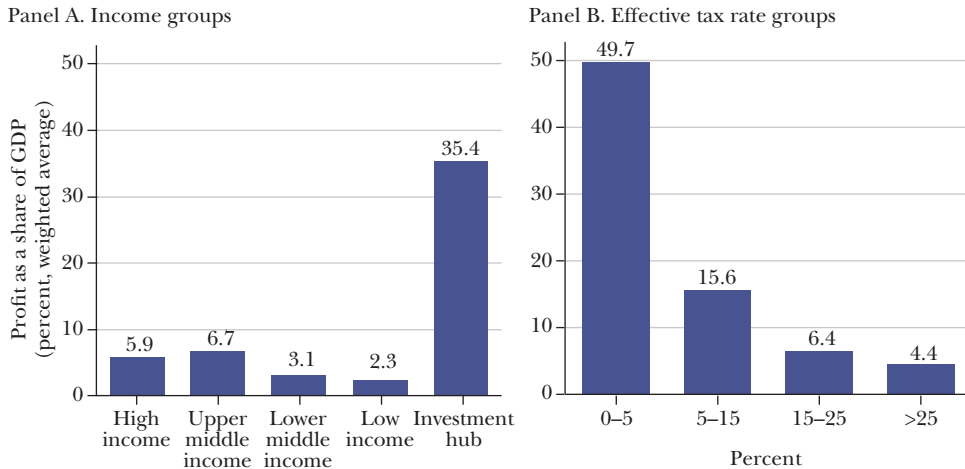
Source: OECD analysis in Hugger et al. (2024). Recreated with permission. See Annex E of OECD (2024) for descriptions of the income and "effective tax rate" groups.
Note: This figure shows that lower effective tax rate country groups have higher multinational firm profits (as a share of GDP) than higher effective tax rate country groups. Investment hub jurisdictions—frequently very low tax jurisdictions—also show much higher profit ratios.

OECD analysis of where large multinational companies report income (Hugger et al. 2024). In jurisdictions with tax rates below 5 percent, the profits of multinational enterprises relative to GDP average an astonishing 50 percent. In higher-tax countries, with tax rates over 15 and 25 percent, multinational profits are 6 and 4 percent of GDP, respectively. Also, multinational profits appear to be a particularly low share of GDP in lower-income countries; these countries likely face the largest revenue losses from profit-shifting relative to the size of their economies (Crivelli, de Mooij, and Keen 2016).

In the United States, research indicates large magnitudes of profit-shifting, and related, large revenue gains from international tax reforms that would move toward a country-by-country minimum tax, reduce the amount of foreign income exempt from US tax, and raise the minimum tax rate. In 2020 and 2021, ten-year revenue estimates of such reforms ranged from $442 billion to $692 billion (for example, US Department of the Treasury 2021, 2023a; Joint Committee on Taxation 2021a; Tax Policy Center analysis in Mermin et al. 2020; American Enterprise Institute analysis in Pomerleau and Seiter 2020; see also Clausing 2020a, b).

There has been controversy about the scale of profit-shifting as well as the data used in some prior analyses.[1] There is inherent muddiness in these

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[1] Data in this area vary in many ways: country coverage (with some series covering very few low-tax jurisdictions, and others allowing far more coverage), whether the data risk "double-counting" some

analyses, given the details of international tax avoidance and the complexity of the financial arrangements—including mind-numbingly complicated chains of ownership with inconsistent tax and legal treatment. However, official scorekeepers at the Joint Committee on Taxation and the US Treasury, as well as tax experts at the OECD, have long understood the nuances of the data in this area. Their estimates are the best that we have. In addition, a wide range of academic estimates also indicate that the size of the profit-shifting problem is large.[2]

A final puzzle concerns the relatively stable corporate tax revenues in many countries in recent years, given the large size of the profit-shifting and corporate tax base erosion problem. The simple answer to this puzzle is that corporate profits have been rising strongly in the last few decades (for example, Fuest, Hugger, and Wildgruber 2022). In the United States, corporate profits have increased sharply as a share of GDP over the prior two decades, while corporate tax revenues have been stable or falling. An important explanation for this disconnect is the growing importance of foreign income for corporations, including the misreporting of foreign income (Congressional Budget Office 2023).[3]

Beyond lower corporate tax revenues, profit shifting and corporate tax base erosion affect the ability of tax systems to reach capital income at all, as well as the efficiency and progressivity of tax systems. In the United States, more than 70 percent of equity income goes untaxed by the US government at the individual level (Rosenthal and Burke 2020; Burman, Clausing, and Austin 2017), because so much of US stock is owned by retirement funds, nonprofits, and foreign investors. Even in the case of taxable accounts, capital gains from stock ownership are taxed only when realized, and thus benefit from tax deferral, and capital gains are not taxed at all if they are left as a bequest or donated to charity. The corporate tax therefore remains the only tool for reaching a large share of capital income.

The corporate tax is more progressive than most sources of tax revenue, including both the labor income tax and the payroll tax, so a shift away from taxing corporate income will tend to reduce the progressivity of tax systems. Mainstream models of corporate tax incidence put the vast majority of the burden (75–82 percent) on capital or shareholders, rather than labor, whereas alternative tax instruments burden labor disproportionately (Joint Committee on Taxation 2013; US Treasury analysis in Cronin et al. 2013; Congressional Budget Office 2012; Tax Policy Center analysis in Nunns 2012). Because income from capital

income, whether the data allow the separation of companies with losses (which can otherwise distort effective tax rate calculations), the degree of aggregation, and important definitional and scope distinctions. My preferred approach is to use a number of these data series in order to create upper- and lower-bounds for the profit shifting problem (Clausing 2020a, and online Appendix A on data controversies in particular). For the US economy, this approach generates a wide range of estimates of corporate tax base erosion, but all of the estimates are quite large.

[2] For examples, see Clausing (2020a), Garcia-Bernando and Janský (2024), Guvenen et al. (2022), and Samarakoon (2023); see also the extensive literature cited within these pieces.

[3] Another reason for the discrepancy is that the United States has a large "pass-through" business sector, in which such firms are required to distribute profits each year to the owners (who then pay individual income tax), rather than paying corporate tax.

and rents (that is, above normal returns to capital) are both concentrated at the top of the income distribution, the relative burdens on such income streams have important implications for the distribution of the tax burden. For example, the top 1 percent of the US income distribution receives 12 percent of all labor income, but 52 percent of positive capital income (US Department of the Treasury 2023b).

The efficiency implications of the corporate tax are potentially more difficult to tease out. While a tax that burdens the return to capital may lower capital formation (and thus wages), a tax that falls on above-normal returns is more efficient than most taxes, because it is unlikely to distort economic decisions. Evidence indicates that the corporate tax base in the United States has a large overlap with a tax on above-normal returns to capital, and further, the overlap is even larger for multinational companies (Power and Frerick 2016; Fox 2020). Further, in recent decades, market concentration has been steadily increasing, implying that the corporate tax of today may be both more efficient and more progressive than in prior times (Clausing 2024), because a larger share of the tax base is comprised of above-normal returns.[4]

Competitiveness: What Is It, and When Does It Matter?

"Competitiveness" is often poorly defined, but the US business community has typically used the term to describe a comparative assessment of US multinational company tax burdens relative to those faced by foreign competitors, particularly when operating in foreign markets. For instance, such a yardstick may be relevant in global merger and acquisition bids. In the years preceding the Tax Cuts and Jobs Act of 2017, a nearly constant lament of US multinational firms was that the relatively high US statutory rate of 35 percent, alongside the US system of "worldwide taxation" in which foreign income of affiliates of US multinational companies abroad was taxed when repatriated to the United States, combined to place US companies at a disadvantage.

This competitiveness claim is tricky to evaluate. While the US government taxed profits upon repatriation and the US statutory rate was relatively high, few US multinational companies paid tax at anywhere near the full statutory rate. Comparisons of average rates actually paid were ambiguous, with some studies finding a relatively high rate for US multinationals (Markle and Shackelford 2012; Allen and Morse 2019), and others finding rates that were comparable or lower than those faced by competitors abroad (Overesch, Schenkelberg, and Wamser 2018; Overesch, Reichert, and Wamser 2023; Joint Committee on Taxation 2021b; Bergin 2021).

In the years prior to the 2017 tax legislation, one consideration was the large build-up in unrepatriated foreign earnings. Since the US corporate tax was not levied until repatriation, companies were incentivized to delay repatriation in the hope of lower tax rates down the road due to a temporary holiday or a change in

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[4]Above-normal returns can result from market power, temporary market advantages, risk, and other factors; these factors are not always easy to distinguish. However, most sources of above-normal returns imply that the corporate tax is more efficient than a tax on the normal return to capital. For a detailed discussion of this question, see Clausing (2024).

the tax system.[5] But concerns about earnings being "trapped" offshore were more perception than reality. In financial markets, companies could create the equivalent of a tax-free repatriation by borrowing against their foreign earnings and assets (generating interest deductions that offset the tax on foreign interest), as many companies did at the time. Further, while offshore earnings could not be returned to shareholders until tax was paid, they could be invested in US assets, so the total supply of capital in US markets was likely unaffected by repatriation tax; instead, it was determined by the relative investment returns on assets. Still, the reality of some companies arranging their affairs to avoid tax due on repatriation, while lobbying in the meantime for holidays or new tax systems, was far from ideal. Estimates of the stock of offshore earnings for US Fortune 500 companies as of 2017 were about $2.6 trillion (Shaxson 2019).

While international tax competitiveness is a valid criterion, it is less of a concern for those companies that wield substantial market power, as do many US multinational companies. By many metrics, the US multinational corporate community was (and is) immensely successful, dominating lists of the world's top companies such as the Forbes Global 2000 with an outsized share of the world's profits, market capitalization, and revenues, relative to the US share of global GDP (Clausing 2017).

Also, the notion of competitiveness itself has multiple interpretations and meanings. For instance, from a national welfare perspective, we might instead be concerned about the competitiveness of the US *location* as a place for US multinational companies to operate. Under that metric, one might be wary of putting a thumb on the scale in favor of foreign income over US income, and instead support a rule where US firms face the same level of taxation regardless of their location decisions.

Further, broader notions of national competitiveness determine how a country succeeds in the world economy. Economic fundamentals—such as investment in human and physical capital, infrastructure, institutional strength, macroeconomic policy management, and the climate for innovation and entrepreneurship—drive national standards of living to a far greater extent than the nuances of international tax rules.

Key International Taxation Elements of the Tax Cuts and Jobs Act

Heading into the 2017 tax legislative process, many observers of the US international tax system felt that it was in desperate need of reform—albeit for different reasons. Public Law 115-97, typically referred to as the Tax Cuts and Jobs Act, enacted the most transformative change in US corporate tax policy since at least the Tax Reform Act of 1986. It combined large corporate tax cuts with three new, largely untested, international tax provisions that altered the tax treatment of multinational company income.

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[5] If the tax rate is constant and assumed to be enduring, the tax incentive to keep earnings offshore disappears, because only the relative rates of return will affect the decision, as the US tax will be paid once at that given rate regardless (Hartman 1985).

Table 1
Key International Corporate Tax Provisions

	Before passage of the Tax Cuts and Jobs Act	After passage of the Tax Cuts and Jobs Act	10-year Joint Committee on Taxation revenue score, $billions
Statutory corporate rate	35 percent	21 percent	−1,349 (net: −654)
Tax treatment of foreign income	No tax until repatriation, then 35 percent rate minus credit for foreign taxes paid	Not taxable unless subject to minimum tax	−224
Global minimum tax (GILTI)	N/A	0 until threshold, then 10.5 percent; up to 13.125 percent if blended with income from higher tax countries; rates increase after 2025, to 13.125/16.4 percent	112
Foreign-Derived intangible income deduction (FDII)	N/A	Tax preference for profits from export sales above threshold	−64
Base erosion and anti-abuse tax (BEAT)	N/A	An add-on minimum tax when payments to foreign related parties exceed threshold	150

Source: Joint Committee on Taxation (2017).
Note: This table describes the main international corporate tax provisions in TCJA and the JCT revenue score of these provisions at the time of TCJA's passage.

Table 1 summarizes the provisions most relevant to the taxation of multinational companies. The first two rows of the table show that the Tax Cuts and Jobs Act met the key business community goals of lowering the corporate tax rate and transitioning to a (purportedly) territorial system that exempts foreign income from taxation; these changes both reduced corporate tax revenue.

However, considering the full impact of the international tax provisions in the Tax Cuts and Jobs Act, the United States effectively moved from one hybrid system to another. Under the pre-TCJA (purportedly) worldwide system, very little tax was collected on foreign income, and tax on foreign income was not levied until repatriation.

Under the current tax system, some foreign income is exempt from US taxation, but some foreign income is subject to US tax immediately (without deferral) through the GILTI minimum tax (for "global intangible low-taxed income"). For those multinational companies that had achieved the lowest tax rates offshore prior to the Tax Cuts and Jobs Act, the new system actually increased the US tax burden

on foreign income (Dharmapala 2018). In the end, the circumstances of particular companies determine which system has more worldwide reach.

The GILTI minimum tax is levied on foreign income wherever it is earned, but with a 50 percent deduction, so at half the US corporate tax rate. In addition, foreign income is only taxed in cases when foreign earnings exceed a 10 percent return on tangible assets and are lightly taxed abroad. The tax burden abroad is assessed based on a global average tax rate. Thus, foreign income below a certain return on tangible assets or solely booked in countries with tax rates above the threshold may not trigger US corporate taxation; in other cases, the GILTI tax applies.

The GILTI tax comes with some perverse incentives (as I have described in detail in Clausing 2020a). First, exempting the first 10 percent of return on foreign tangible assets from US taxation encourages investment offshore. Second, because "global intangible low-taxed income" is assessed based on an average tax rate offshore, it effectively encourages *both* high-tax and low-tax foreign income relative to domestic income. For example, if a company earns $1 in Japan or France, it generates tax credits that it can use to offset GILTI tax that would be due on income earned in low-tax jurisdictions. Both high-tax and low-tax streams of foreign income can be blended, and together taxed at about half the US domestic rate. (This assumes that the company does not have more foreign tax credits than needed, referred to as an "excess credit" position.)

The foreign-derived intangible income (FDII) deduction is an export subsidy provision. It was meant as a "carrot" to accompany the "stick" of the GILTI minimum tax. If a US company has high returns relative to its US-based tangible assets, it can claim a deduction for the part of those excess returns that is attributed to export income.

This deduction reduces tax rates for mobile income earned by US companies, but it too has some perverse incentives. Because the foreign-derived intangible income deduction applies to excess returns relative to domestic tangible assets, greater domestic tangible assets (holding constant other factors) will decrease the FDII deduction, thus discouraging US investment. Further, by providing a lower tax rate for profits above some threshold return on assets, FDII provides lighter tax treatment for excess profits. However, efficiency considerations imply that we should tax excess profits at a higher, not a lower, rate, since such taxes are less distortionary (for a more detailed discussion of this well-known result, see Clausing 2024).

Finally, because the foreign-derived intangible income deduction makes favorable tax treatment contingent on exports, it is inconsistent with World Trade Organization rules prohibiting export subsidies, subjecting it to possible challenges.

A final novel international provision of the Tax Cuts and Jobs Act is the base erosion anti-abuse tax (BEAT). BEAT was aimed at the profit-shifting of foreign multinational companies, though it also affects US-based multinational companies. This provision applies to large multinational corporations with gross sales over $500 million, in situations where firms make substantial payments to related foreign entities (excepting costs of goods sold), recognizing that such payments can be used

to shift income out of the US tax base. The BEAT minimum tax should provide an incentive for reduced profit-shifting to low-tax locations.

Alongside the provisions of Table 1, the Tax Cuts and Jobs Act includes a one-time "repatriation tax" to accompany the transition toward a "territorial" tax system. This one-time tax was levied on the unrepatriated earnings of US multinational companies at a rate of 8 or 15.5 percent, depending on the liquidity of the stock of foreign earnings. This provision is a tax reduction relative to prior law, under which repatriation of earnings would have generated US tax at the full US tax rate (at 35 percent), less foreign tax credits. The transition tax does not generate revenue on an ongoing basis (although it is payable over eight years), and it has no incentive effects (because it is a tax on prior earnings).[6]

Consequences of the International Corporate Provisions of the Tax Cuts and Jobs Act

Studies of the effects of the Tax Cuts and Jobs Act should be viewed with a degree of caution. For instance, various provisions change over time, including business tax provisions that affect the timing of investment expense deductions, the tax treatment of research and development, the extent of interest deductibility, and the tax rates for the global intangible low-taxed income minimum tax and the foreign-derived intangible income deduction. When provisions are scheduled to become less favorable over time (as is the case with the above examples), modelling their effects is difficult, because some businesses may operate under the assumption that temporary provisions will be extended, whereas others may assume that provisions evolve as written in the law.[7] If a favorable tax provision is temporary, firms may move activity into periods where tax treatment is lighter, confounding analyses regarding the provision's effectiveness.

The time period since 2018 is also riddled with complicating macroeconomic factors, including disruptions to trade caused by trade conflicts between the Trump administration and key trading partners, the enormous disruption of the pandemic, and the unclear macroeconomic impact of the large policy response to the pandemic. In addition, the last few years have featured the higher inflation rates of 2021 and 2022, the higher interest rates of 2022 and 2023, and developments abroad including the war in Europe (from February 2022 onwards) as well as other geopolitical shocks. Of particular importance here, this time period also included an international tax agreement in 2021, with a large number of important countries announcing implementation steps in 2022 and beyond. With such cautions duly

[6]The constitutionality of this tax is being challenged in the case of *Moore v. United States*, which was heard by the US Supreme Court in December 2023. A decision is expected by summer 2024. The amicus curiae brief files in the case are available at https://www.supremecourt.gov/docket/docketfiles/html/public/22-800.html.
[7]A legislative effort to extend several of these business tax provisions passed the House of Representatives on January 31, 2024. As of this writing, it was unclear if the extensions would pass the Senate.

noted, this section will review the evidence on the effects of the international corporate tax provisions in the Tax Cuts and Jobs Act.

Revenue

The final column of Table 1 showed revenue estimates from the Joint Committee on Taxation (2017) for the main international provisions in the Tax Cuts and Jobs Act; these estimates were made before the law was implemented. The total score for the international provisions (excluding the transition tax) reflects the expectation of approximate revenue neutrality. On one side, there were projected revenue increases from the minimum corporate taxes imposed by the global intangible low-taxed income and the base erosion anti-abuse tax. On the other side, there were projected revenue losses from the move to exempt foreign income from US tax unless it falls under those minimum taxes, and from the foreign-derived intangible income deduction.

Figure 2 shows revenue from the international tax provisions so far (again excluding the transition tax). The lighter bars show the total revenues inclusive of the foreign-derived intangible income deduction, and the darker bars the revenues without FDII, focusing on provisions affecting revenue from foreign affiliates of US multinational enterprises. The changes in the Tax Cuts and Jobs Act seem to have led to a small increase in the tax revenue collected from US foreign affiliates, with lower revenues overall once the FDII deduction is included.

A few patterns in specific provisions are notable. First, the base erosion anti-abuse tax appears, at first glance, to be underperforming revenue expectations, with less than $6 billion in collections over 2018–2020, in contrast to Joint Committee on Taxation (2017) forecast estimates of $18 billion for the same period. Still, BEAT may have acted to discourage profit shifting out of the US economy by foreign multinationals (Dowd, Landefeld, and Mortenson 2023), rather than collecting revenue directly. However, there is also evidence that firms have been reclassifying costs in a tax avoidance response to BEAT (Laplante et al. 2023).

Second, the foreign-derived intangible income deduction appears more expensive than anticipated, losing about $50 billion in total revenue over the period 2018–2020 (Penn Wharton Budget Model 2023). In contrast, the Joint Committee on Taxation estimate implied a revenue gain in early years, due to effects on the overall corporate tax base. While revenue loss from the deduction can be offset by a larger corporate tax base, estimates for repealing FDII suggest that the provision may be more costly than originally scored; for example, Joint Committee on Taxation (2021a) scored the revenue from repealing FDII over 2021–2031 at $224 billion.

Third, the combination of the higher revenues from the global intangible low-taxed income minimum tax and the lower revenues from exempting other foreign income was estimated to lose about $10–$15 billion in the early post-TCJA years. However, international revenues from US foreign affiliates appear to have increased modestly, indicating that the GILTI minimum tax may have outperformed expectations (perhaps because foreign profits in low-tax locations were higher than originally thought), that territorial reforms were less expensive than the Joint Committee on Taxation (2017) anticipated, or some combination of both effects.

Figure 2

Penn-Wharton Budget Model Analysis of Revenues from Provisions of the Tax Cuts and Jobs Act
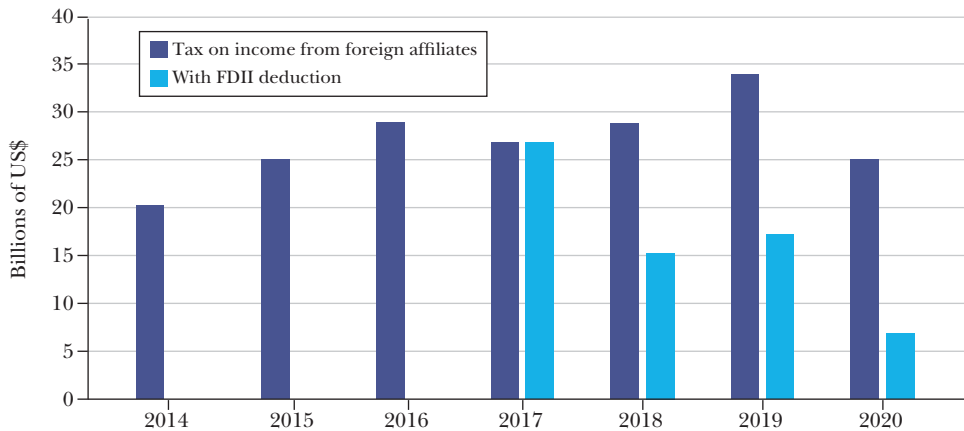
Source: Penn Wharton Budget Model (2023).
Note: This figure shows the evolution of tax revenues related to some international tax provisions in TCJA.

Finally, the one-time transition tax on accumulated earnings discussed above can be paid over eight years, at an increasing rate over time, if taxpayers elect to do so. Transition tax revenues in 2020 were very similar to their prior Joint Committee on Taxation (2017) projections, but revenues in earlier years were far lower, perhaps reflecting the fact that more taxpayers than expected elected to spread out their transition tax payments over time.

In total, the international provisions of Tax Cuts and Jobs Act appear likely to provide less revenue than was expected when the legislation was passed. Kysar (2020) argues that part of the gap may have occurred because implementing regulations were more generous to taxpayers than the Joint Committee on Taxation may have assumed. It is also possible that tax planning adaptation to the new regime was more aggressive than expected. It will take time and further research to sort out the net effect of these provisions.

Beyond the international provisions, the large corporate tax rate cut reduced government revenues substantially (as discussed in greater detail in this symposium by Chodorow-Reich, Zidar, and Zwick). Simple averages show corporate tax revenue as a share of GDP declining from 1.7 percent in the five years before the Tax Cuts and Jobs Act to 1.1 percent in the five years since then, despite surging corporate profits in recent years.[8]

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[8] Data are from FRED, the St. Louis Federal Reserve Bank's economic data database; the series is tax receipts on corporate income (FCTAX) relative to GDP. FRED data also show surging corporate profits (relative to GDP) after 2020.

Offshoring and Profit Shifting

The international corporate tax provisions of the Tax Cuts and Jobs Act have potentially ambiguous effects on incentives for offshoring and profit shifting, as described above. On one side, the corporate rate reduction and the foreign-derived intangible income deduction should both encourage more income and activity in the United States; on another side, the fact that many companies no longer need to worry about possible US tax on foreign income upon repatriation should encourage greater investment abroad.

The global intangible low-taxed income minimum tax has ambiguous effects relative to prior law. The current application of a minimum tax may raise the tax burden on foreign income for those companies that had the lowest tax rates offshore before the passage of the Tax Cuts and Jobs Act (Dharmapala 2018; Clausing 2020a); this feature should reduce profit shifting. However, because GILTI is calculated based on the average tax burden of *all* foreign sources of income, and this pool of foreign income receives a 50 percent deduction relative to domestic income, that encourages companies to earn income offshore, in *both* high- and low-tax countries.

Given these confounding effects, the overall impact of Tax Cuts and Jobs Act on profit shifting becomes an empirical question. Since the passage of the TCJA, the evidence indicates only modest changes in the pattern of US multinational foreign income.

For instance, Garcia-Bernando, Janský, and Zucman (2022) show a small decrease in the share of foreign income for US multinationals in the wake of the Tax Cuts and Jobs Act, seemingly accounted for by the actions of six companies. Some of these effects, however, may be due to foreign governments closing some widely used tax loopholes (for the closure of the "double Irish" loophole, see Samarakoon 2023). Garcia-Bernando, Janský, and Zucman also find little effect of the TCJA on the share of foreign profit earned in the lowest-tax countries, as well as some evidence suggesting that companies became more sensitive to tax rate differentials in the wake of TCJA. Work in this area is ongoing. A large literature, beginning with Dowd, Landefeld, and Moore (2017), has emphasized that the tax elasticities of profit reported with respect to tax rates are likely to be nonlinear, so the profit-shifting reduction from the 14 percentage point lower corporate rate may be far less than what would be implied from the elasticities observed with respect to the lowest tax rate jurisdictions.

US multinationals continue to book disproportionate amounts of profit in the lowest tax-rate jurisdictions. As Figure 3 shows, disproportionate amounts of US multinational companies' foreign income are booked in the lowest tax jurisdictions based on data from the Bureau of Economic Analysis and the Internal Revenue Service; these locations often account for a tiny share of US multinational foreign employment. Figure 3 reports multiple data sources, given the imperfections of data series in this area.

As one example, US pharmaceutical companies report very little US profit, earning the vast majority of their profit offshore (Setser 2023), despite very high US sales and notoriously high US pharmaceutical prices. These data are compatible

Figure 3
Share of US Multinational Income and Employment in Low-Tax Jurisdictions, 2020
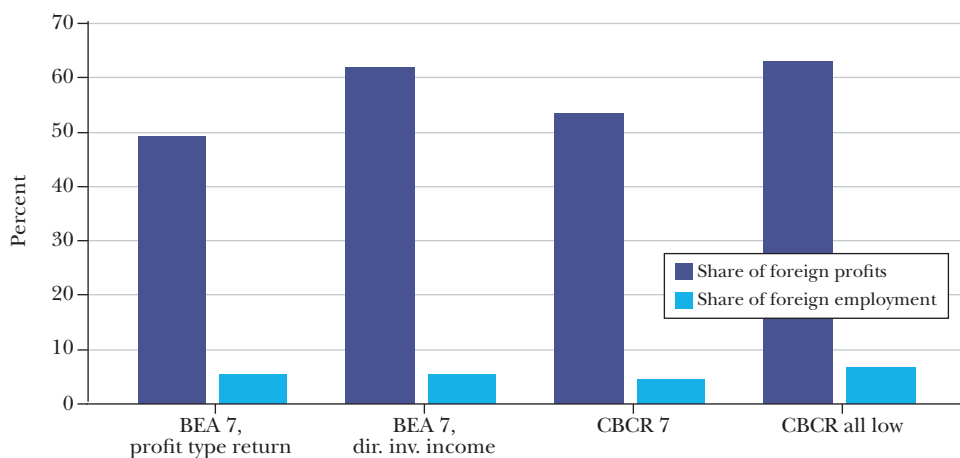
Source: BEA (2020) and IRS (2022).
Note: The first three series show data on different data series from the BEA (profit type return and direct investment income) and the IRS (country by country reporting—CBCR—profit) for seven traditional low-tax jurisdictions that have hosted a lot of income in the past; these are Bermuda, the UK Caribbean Islands (Caymans), Ireland, Luxembourg, Netherlands, Singapore, and Switzerland; the final series includes IRS CBCR data on other jurisdictions with average tax rates below 10 percent. These data series have important definitional differences. For example, the BEA direct investment income series is after-tax, whereas the others are before-tax; this will mechanically increase the low-tax share for that series (due to the smaller tax bite in low-tax jurisdictions). The country-by-country data are relatively new, and they include valuable information about many low-tax rate jurisdictions that are missing from other data sources. However, despite clarifying instructions, there likely remains some double-counting of income in those data; although it remains unclear how such double-counting would affect these shares.

with recent analyses by the OECD that show vastly higher profitability of multinational enterprises in the lowest tax rate jurisdictions; a group of about ten such jurisdictions are the destination for about 90 percent of shifted profit (Hugger et al. 2024, Figure 7).

Regarding the offshoring of real activity, it is possible that the global intangible low-taxed income minimum tax would encourage tangible investments offshore, because GILTI exempts the first 10 percent return on foreign tangible assets from US taxation. The size of such tax incentives will depend on the interaction of individual company circumstances, national tax codes, and other factors including the effects of the international tax agreement (discussed below). However, several studies provide early evidence linking the overall tax incentives of the Tax Cuts and Jobs Act to strong foreign tangible investment by US multinational companies (for example, Dharmapala 2024; Atwood et al. 2020; Chodorow-Reich et al. 2024; Huang, Osswald, and Wilson 2023; Beyer et al. 2021). How foreign investment affects domestic investment remains a topic for more research.

Corporate Control, Mergers, and Acquisitions

The extent to which the US corporate tax code disadvantaged US multinationals relative to their competitors prior to the Tax Cuts and Jobs Act is contested. As noted earlier, the pre-TCJA status quo featured both relatively low US corporate tax revenues and a relatively high US statutory rate, and studies that compared average tax rates for US and foreign multinational companies produced mixed results. There is a consensus that TCJA caused *overall* reductions in average tax rates for US multinational companies. However, the treatment of the *foreign* income of US multinationals was far more subtle, such that the change in the tax burden on foreign income depended on company circumstances, especially the geographic distribution of their income sources abroad.

It was unclear a priori how foreign mergers and acquisitions by US multinational companies would evolve in the wake of Tax Cut and Jobs Act. Before the 2017 law, the large stock of unrepatriated earnings gave US multinational companies an artificial incentive to invest abroad, because reinvested earnings would not trigger US taxation, and companies may have hoped that the repatriation tax would eventually diminish or disappear. The artificial incentive to reinvest foreign earnings in active businesses offshore was removed with TCJA, but TCJA also removed concern that the resulting foreign income would generate US taxation, beyond the burdens of the global intangible low-taxed income minimum tax. In a discussion of the empirical evidence on this question, Dharmapala (2024) notes that in studies that controlled for other factors, the period after TCJA was associated with a general decline in US acquisitions abroad.

Whether that finding should be interpreted as a good or bad outcome depends on whether US foreign investment was artificially high or not prior to 2017, which is unclear. While the net change in the tax burden on foreign income due to Tax Cuts and Job Act was ambiguous, there is some evidence that acquisitions fell more steeply for those companies with a larger foreign presence that were likely to be subject to the GILTI minimum tax (Dharmapala 2024). This suggests that the competitiveness of these companies in global merger and acquisition markets was not improved by TCJA.

Investment, Wages, and Growth

In this symposium, the contribution by Chodorow-Reich, Zidar and Zwick focuses on the effects of the corporate tax changes on domestic investment levels in more detail. Indeed, a central motivation of the corporate and international tax provision in the Tax Cuts and Jobs Act was to increase investment, worker wages, and growth. Proponents of the legislation predicted a $4,000 to $9,000 increase in wages from the legislation, due to increased capital formation that would be spurred by lower tax rates (Council of Economic Advisors 2017), as well as growth effects that would offset much of its fiscal cost. At the time, however, most of the literature predicted far more modest effects (Gale et al. 2018).

Now, more than five years passing since implementation of the Tax Cuts and Jobs Act, research has begun to clarify the effects of TCJA on wages, investment, and

growth, generally finding meager effects but also raising some important puzzles. For example, the aggregate data show very little discernible break in the trend of investment and wage growth post-TCJA, whereas a few studies have identified more robust investment effects for typical firms.

Most studies indicate little overall effect of the Tax Cuts and Jobs Act on investment, wages, and growth. There was little surge in investment, research and development, or inward foreign direct investment attributable to TCJA (Kopp et al. 2019; Matheson et al. 2022; Gale and Haldeman 2021; Furman 2020), whereas corporations did increase stock buybacks, dividends, and retained earnings.

Consistent with prior evidence on the repatriation holiday in the American Jobs Creation Act of 2004, as well as the logic discussed above, there is also little evidence that the repatriation of offshore funds fueled investment growth in the United States (Albertus, Glover, and Levine forthcoming; Dharmapala 2024).

However, two recent studies suggest that the Tax Cuts and Jobs Act may have boosted investment for typical firms. (Kennedy et al. 2023; Chodorow-Reich et al. 2024). Both find important effects on investment from the tax cuts, although these changes do not translate into broadly shared economic gains; about 80 percent of the benefit goes to the top 10 percent of the distribution (Kennedy et al. 2023) and implied wage effects are small overall.[9]

Given the lack of clear effects of the Tax Cuts and Jobs Act on aggregate investment, these studies raise some puzzles. One possible resolution may come from the role of the largest corporations. According to IRS data on corporate returns in 2019, less than one-half of one percent of C corporations account for more than 85 percent of the tax base. Thus, understanding the behavior of this small slice of the corporate community is important. Because large companies are more likely to have market power, their behavior may respond differentially to the investment incentives of TCJA; evidence indicates that industries with higher mark-ups show less investment and wage responses to corporate tax cuts (Kopp et al. 2019). Further, as described above, large multinational firms may be experiencing contradictory effects on their incentives, due to the complicated effects of the international tax provisions in the TCJA.

It is difficult to analyze the largest corporations: after all, careful econometric methods require large sample sizes, and it is difficult to identify control groups for the largest firms. Regression results report the responsiveness of a typical firm, capturing important behavioral characteristics of such firms. However, it is more difficult to investigate the behavior of the small number of observations that nonetheless drive the vast majority of corporate taxation.

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[9] There are also important issues regarding how the Tax Cuts and Jobs Act is financed. If tax cuts are deficit-financed, as they were in TCJA, "crowding out" effects (that occur when investment is deterred by higher interest rates) could offset the investment gains shown in such studies.

The International Tax Agreement and the Future of US International Taxation

The world has not stood still during US international tax reforms. For decades, the international community has strived to tackle the problems of international tax competition, profit shifting, and corporate tax base erosion. The OECD had organized multiple efforts aimed at coordinated reform. In 2013–2015, the Base Erosion and Profit Shifting (BEPS) project suggested guidelines for incremental improvements in 15 action areas; the guideline documents reached nearly 2,000 pages. This effort worked with the "G20" group of countries (made up of 19 countries and the European Union, together representing about 85 percent of global GDP), and with a broader "inclusive framework" group that totaled about 60 countries at the time (OECD 2015).

While "BEPS 1.0" led to progress on data collection, and some incremental improvements in rules, it did not attempt a fundamental transformation of international tax principles. In the aftermath of BEPS 1.0, there was little diminution in profit shifting or corporate tax base erosion, and BEPS 1.0 left issues surrounding digital taxation for later.

A second round of negotiations, "BEPS 2.0," was meant to tackle these remaining issues; this negotiation also expanded to include more countries. It took some time to gather steam, and seemed to languish in 2019 and 2020, but in 2021 it moved rapidly. By fall 2021, more than 135 jurisdictions representing about 95 percent of the world economy undertook a political agreement to transform the future of international taxation.

Parameters of the International Agreement

The basic parameters of the Base Erosion and Profit Shifting agreement are two-fold. "Pillar 1" would reallocate some portion of the multinational company tax base toward market jurisdictions. Pillar 1 is still in process and will not be discussed in detail here, but it takes a "formulary approach" to taxing multinational income—that is, it uses a formula to allocate some portion of profits across countries, depending on the destination of sales. Its scope would apply to the largest and most profitable multinational companies.

"Pillar 2" of the agreement includes a country-by-country minimum tax of 15 percent on multinational company income, regardless of where it is reported. In December 2022, the European Union unanimously agreed to implement this minimum tax; other countries, including South Korea, Japan, Australia, Canada, and the United Kingdom, have also recently moved toward implementation. Based on current implementation plans, OECD researchers have concluded that 90 percent of the multinational companies that are in the scope of the agreement will be covered by its provisions (Hugger et al. 2024).

The Pillar 2 agreement is complex, like many aspects of international taxation, but it contains features that ensure that income of large multinational company is taxed at some minimum rate. For more detail on the agreement's provisions, see

Clausing (2023) and OECD (2021), alongside updates on the OECD BEPS website at https://www.oecd.org/tax/beps/.

The collective action of Pillar 2 is enhanced by the inclusion of an enforcement mechanism known as the Undertaxed Profits Rule. Once some countries implement the agreement, the Undertaxed Profits Rule provides a strong incentive for nonadopters to implement. The rule levies a top-up tax on companies that are residents in nonadopting countries (including their foreign subsidiaries), if such companies choose to operate in adopting country markets.

This provision helps adopting countries protect their tax base from erosion due to the actions of multinational companies based in nonadopting countries. For instance, if Japan adopts a Pillar 2 minimum corporate tax and the United States does not, US multinational companies in Japan may shift income out of Japan (toward low-tax jurisdictions), eroding the Japanese tax base and putting Japanese companies at a relative disadvantage. However, under the agreement, the Undertaxed Profits Rule allows adopting countries to top-up the tax burden of companies operating in their market, even if such companies are based in nonadopting countries. Because the top-up tax will be paid to the adopting countries, it creates a strong incentive for countries to adopt, so that they receive the resulting tax revenue.

Strengths and Weaknesses of the International Approach

Coordinating principles of international minimum taxation may sound like a sacrifice of tax sovereignty, but the constraint of the global minimum tax only binds those governments that seek to levy rock-bottom tax rates on their companies. In addition, competition to offer lower corporate tax rates itself may erode tax autonomy, because it leaves many governments reluctant to tax mobile capital income, and troubled by competitiveness concerns should they attempt to tackle corporate tax base erosion unilaterally.

While the global corporate minimum tax may seem like a blunt rule, it acknowledges the profound difficulty of implementing the "arm's length" standard, as well as the near impossibility of tax authorities matching the sophistication of corporate tax departments and accounting firms, in the face of large tax rate differentials and strong profit-shifting incentives. A coordinated minimum tax approach provides a brake on the forces of tax competition, by limiting tax rate differentials and the resulting profit-shifting incentives. Analysis by OECD staff estimates that the internationally coordinated minimum tax will dramatically reduce the extent to which multinational income is taxed at rates below 15 percent, from over $2 trillion each year taxed below that rate in 2017–2020, to about $650 billion taxed below that rate (Hugger et al. 2024).

That said, this agreement will not end tax competition. Governments will still have the option of supporting their companies directly with cash grants or refundable tax credits, or indirectly with infrastructure support, without the effects of those subsidies being completely clawed back by minimum taxes. (Rules about allowable subsidies under the World Trade Organization may in some cases provide a response to such concerns.) Still, subsidies are more difficult for governments

to employ than tax cuts, because it is far more difficult to "send checks" to the most profitable companies in the world than to allow tax preferences that are often opaque and mysterious to outside observers.

The globally agreed corporate minimum tax rate has a relatively low rate of 15 percent. While this is a higher rate than some predicted going into the agreement, it is still significantly lower than the current US domestic corporate tax rate (21 percent) as well as many corporate tax rates implemented throughout the world. Also, the minimum tax includes "substance-based carve outs" that may allow some local return on tangible assets and payroll to be exempt from the minimum tax. While these features weaken the minimum tax regime, the minimum tax nonetheless remains sharply different from the prior (nearly nonexistent) limits on international tax competition, whereby any jurisdiction could completely exempt all mobile profits from taxation.

While the agreement will not end the tax advantages of multinational companies, it does narrow them. Further, the agreement demonstrates, in a time of increasing nationalism and skepticism of global institutions, the ability of nations to forge an important economic pact, recasting international tax rules toward the aim of better tax systems.

Similarities and Differences from the US Approach

The international Base Erosion and Profit Shifting (BEPS) agreement has some conceptual similarities to the US approach in the Tax Cuts and Jobs Act. For example, the global intangible low-taxed income minimum tax has similarities to the Pillar 2 tax; both entail headquarters countries topping-up the tax paid by their resident companies that report lightly taxed earnings offshore. The Undertaxed Profits Rule also has elements that are reminiscent of the base erosion anti-abuse tax; both were intended to address the profit shifting behavior of foreign-headquartered multinational companies.

However, the differences are notable, too. The GILTI minimum tax is applied based on the average tax burden on foreign income, whereas the Pillar 2 tax is applied on a country-by-country basis. This distinction is important, because the country-by-country feature makes the Pillar 2 minimum tax much stronger. Without that feature, low-tax (or even zero-tax) countries have an incentive to lure tax base from higher-tax locations, and any minimum tax due as a result can often be offset by tax credits from operations in higher-tax countries. In contrast, under a country-by-country system, the income earned in a low-tax country faces a top-up tax regardless of other foreign operations. In the wake of Pillar 2 implementation, many low-tax countries will have strong incentives to increase their tax rates, because firms will pay tax at 15 percent regardless. This lifting of the "bottom" tax rate substantially lessens the pressures of tax competition.[10]

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[10] This feature also makes multinational companies more sensitive to the higher tax rates of some foreign investment locations, because such locations no longer generate useful tax credits for offsetting minimum tax, as they do under a globally-blended system (Clausing 2020a). This consideration comes

The country-by-country feature of the Pillar 2 minimum tax is also a sticking point that prevents the global intangible low-taxed income minimum tax from conforming (or being close enough) to the globally-adopted minimum tax to "turn off" the Undertaxed Profits Rule. As a consequence, some US-based multinational companies may end up paying Undertaxed Profits Rule tax to foreign governments, absent future US legislation.

The US Congress did impose a new corporate alternative minimum tax as part of the Inflation Reduction Act of 2022, levied at 15 percent on the book income of the largest US companies, and the GILTI minimum rate is scheduled to increase in 2026. However, both taxes are applied on a globally-blended basis, rather than on a country-by-country basis, so they do not conform with Pillar 2.

By standing outside the international coordinated approach, the United States has ended up with a system in which it applies three separate unilateral taxes to US multinational firms: the GILTI minimum tax, the base erosion anti-abuse tax, and the new corporate alternative minimum tax. At the same time, US multinationals will face the coordinated Pillar 2 approach in many jurisdictions abroad, which will subject some firms to Undertaxed Profits Rule taxation.

What Comes Next for US International Taxation?

The US government will face a forcing moment for tax policy by the end of 2025, when many provisions of the Tax Cuts and Jobs Act (although not most corporate ones) expire. Policymakers on both sides of the aisle have expressed interest in extending some of these provisions, yet deficits and debt are both at historically high levels, and the price tag of a full extension would reach about $4.5 trillion (Congressional Budget Office 2024). One way or another, Congress will confront difficult tradeoffs.

With regard to the international corporate provisions that are the focus here, it is relatively straightforward to imagine enacting a country-by-country minimum tax to comply with Pillar 2, by reforming the global intangible low-taxed income minimum tax to levy it on a country-by-country basis at a rate of at least 15 percent. Depending on policy goals, such a reform could be designed to be either revenue-neutral or revenue-increasing. There are many proposals for increasing revenue in this space (such as Clausing and Sarin 2023; US Department of the Treasury 2021, 2023a), but there are also ample business tax cuts that could be used to achieve revenue-neutrality alongside a revenue-raising GILTI minimum tax reform.

Whatever the details of US adoption, Pillar 2 arguably addresses a long-stated concern of the US business community—that is, by raising the lowest possible tax rate levied on the competitors of US multinational companies, the agreement reduces the fear that US taxation of foreign income will generate competitiveness problems for US multinational companies. The US government can hope for improvement in

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with both upsides and downsides. From the perspective of high-tax countries hosting foreign multinational companies, this effect increases the tax sensitivity of part of their tax base. From the perspective of home countries, however, this effect reduces the tax bias in favor of foreign income relative to domestic income.

both corporate tax base protection and US multinational competitiveness, if the rest of the world raises corporate tax rates. With the widespread adoption of the Pillar 2 agreement, that is what just happened.

Of course, one can also imagine scenarios where the US government responds to the full implementation of the Pillar 2 agreement with intransigence, perhaps even threatening trade conflicts in response. But ultimately, the US business community may value the simplification potential of a more predictable and stable international tax regime, alongside reduced international frictions.

Concluding Observations

A small number of large corporations have disproportionate economic heft; these companies are also far more likely to be multinational companies. According to the IRS Statistics of Income database (IRS 2022), fewer than 1,800 US corporations, less than one-half of 1 percent of corporations, account for 87 percent of the corporate tax base in 2019. Indeed, one-tenth of 1 percent of all corporations, or about 350 firms, accounts for nearly 70 percent of the tax base.[11] These large firms have more margins to respond to taxation, including (for multinational firms) the ability to shift profits to more lightly taxed offshore destinations. Perhaps not coincidentally, large firms also have lower tax burdens than small firms, exacerbating industry concentration and market power (Clausing 2024).

This concentration of the corporate tax base has implications for both policy and research. For smaller firms that do not earn above-normal profits, higher corporate taxes are more likely to burden normal returns to capital, affecting investment and the capital stock. This suggests that corporate tax reformers might want to undertake policies that minimize distortions to investment, even in the context of revenue-raising corporate tax reform. (For example, a higher rate, alongside more generous investment expensing and tighter limits on interest deductions, can move the corporate tax system in that direction.)

In contrast, large multinational companies earning above-normal profits will make other tradeoffs important. A high corporate rate may encourage profit shifting and offshoring, eroding the US corporate tax base. Although taxing above-normal profits (or rents) is more efficient than taxing normal returns to capital, it may be difficult to tax such rents if they are highly mobile. Understanding the behavior of large multinational companies may also prove difficult to researchers, since small sample sizes and data constraints make common identification strategies more difficult.

Traditionally, those who worried about US corporate tax base erosion due to the profit-shifting of multinational companies suggested unilateral responses to this problem, including unilateral adoption of minimum taxes. But the business

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[11] These ratios are relative to corporations with positive tax liability. Including those that do not report positive taxable income would make an even smaller share of firms accountable for these large shares of the tax base.

community raised concerns that these policy options would harm the competitiveness of US multinational firms relative to their peers headquartered in more permissive tax regimes. Such concerns made it difficult for US policymakers to satisfy key policy goals: clamping down on profit-shifting would raise competitiveness worries, but being too responsive to competitiveness worries would spur further tax base erosion (by further lightening the tax burden on foreign income).

The Pillar 2 international tax agreement does not offer an end to all tax competition pressures, but it does change the stark nature of this dilemma. Coordinated minimum taxation shrinks tax differentials between home tax rates and the lowest rate abroad, enabling governments to better set corporate tax policy based on domestic policy goals. As US policymakers contemplate reform of international corporate taxation in the years ahead, traditional tax policy dilemmas will be less stark. While the Base Erosion and Profit Shifting agreement and the Pillar 2 rules can be improved over time, they illustrate the importance of international economic cooperation in addressing global collective action problems.

References

Albertus, James, Brent Glover, and Oliver Levine. Forthcoming. "The Real and Financial Effects of Internal Liquidity: Evidence from the Tax Cuts and Jobs Act." *Journal of Financial Economics*.

Allen, Eric J., and Susan C. Morse. 2019. "Does Parenting Matter? US Parents, Non-US Parents, and Global Firm Taxes." *Journal of Law, Finance, and Accounting* 4 (2): 239–90.

Atwood, T. J., Jimmy Downes, Jodi Henley, and Mollie Matthis. 2020. "The Impact of US Tax Reform on US Firm Acquisitions of Domestic and Foreign Targets." Unpublished.

Bergin, Tom. 2021. "Insight: Even after Biden Tax Hike, US Firms Would Pay Less than Foreign Rivals." *Reuters*, June 22. https://www.reuters.com/world/us/even-after-biden-tax-hike-us-firms-would-pay-less-than-foreign-rivals-2021-06-22.

Beyer, Brooke, Jimmy Downes, Mollie Mathis, and Eric T. Rapley. 2021. "Early Evidence on the Use of Foreign Cash Following the Tax Cuts and Jobs Act of 2017." Unpublished.

Bureau of Economic Analysis (BEA). 2020. "International Trade & Investment." Washington, DC: US Department of Commerce. https://www.bea.gov/data/intl-trade-investment.

Burman, Leonard E., Kimberly A. Clausing, and Lydia Austin. 2017. "Is US Corporate Income Double-Taxed?" *National Tax Journal* 70 (3): 675–706.

Chodorow-Reich, Gabriel, Matthew Smith, Owen Zidar, and Eric Zwick. 2024. "Tax Policy and Investment in a Global Economy." NBER Working Paper 32180.

Chodorow-Reich, Gabriel, Owen Zidar, and Eric Zwick. 2024. "Lessons from the Biggest Business Tax Cut in US History." *Journal of Economic Perspectives* 38 (3).

Clausing, Kimberly A. "Testimony of Kimberly A. Clausing before the Senate Committee on Finance." Speech, October 3, 2017. https://www.finance.senate.gov/imo/media/doc/Clausing%20SFC%20Testimony%2010.3.17.pdf.

Clausing, Kimberly A. 2020a. "Profit Shifting before and after the Tax Cuts and Jobs Act." *National Tax Journal* 73 (4): 1233–66.

Clausing, Kimberly A. 2020b. "Five Lessons on Profit Shifting from the US Country by Country Data." *Tax Notes* 169 (9): 925–40.

Clausing, Kimberly A. 2023. "The International Tax Agreement of 2021: Why It's Needed, What It Does, and What Comes Next?" PIIE Policy Brief 23-4.

Clausing, Kimberly A. 2024. "Capital Taxation and Market Power." *Tax Law Review.*

Clausing, Kimberly A., Edward Kleinbard, and Thornton Matheson. 2016. "US Corporate Income Tax Reform and Its Spillovers." IMF Working Paper 16/127.

Clausing, Kimberly A., and Natasha Sarin. 2023. "The Coming Fiscal Cliff: A Blueprint for Tax Reform in 2025." Unpublished.

Congressional Budget Office. 2012. *The Distribution of Household Income and Federal Taxes, 2008 and 2009.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2023. *Trends in Corporate Economic Profits and Tax Payments, 1998 to 2017.* Washington, DC: Congressional Budget Office.

Congressional Budget Office. 2024. *Budgetary Outcomes under Alternative Assumptions about Spending and Revenues.* Washington, DC: Congressional Budget Office

Council of Economic Advisers. 2017. *Corporate Tax Reform and Wages: Theory and Evidence.* Washington, DC: Executive Office of the President of the United States.

Crivelli, Ernesto, Ruud de Mooij, and Michael Keen. 2016. "Base Erosion, Profit Shifting, and Developing Countries." *FinanzArchiv* 72 (3): 268–301.

Cronin, Julie Anne, Emily Y. Lin, Laura Power, and Michael Cooper. 2013. "Distributing the Corporate Income Tax: Revised US Treasury Methodology." *National Tax Journal* 66 (1): 239–62.

Dharmapala, Dhammika. 2018. "The Consequences of the Tax Cut and Jobs Act's International Provisions: Lessons from Existing Research." *National Tax Journal* 71 (4): 707–28.

Dharmapala, Dhammika. 2024. "The Consequences of the 2017 US International Tax Reform: A Survey of the Evidence." *International Tax and Public Finance.* https://doi.org/10.1007/s10797-023-09823-8.

Dowd, Tim, Paul Landefeld, and Anne Moore. 2017. "Profit Shifting of US Multinationals." *Journal of Public Economics* 148: 1–13.

Dowd, Tim, Paul Landefeld, and Jacob Mortenson. 2023. "The BEAT and US Corporate Taxes." Unpublished.

Fox, Edward. 2020. "Does Capital Bear the US Corporate Tax After All? New Evidence from Corporate Tax Returns." *Journal of Empirical Legal Studies* 17 (1): 71–115.

Fuest, Clemens, Felix Hugger, and Susanne Wildgruber. 2022. "Why Is Corporate Tax Revenue Stable While Tax Rates Fall? Evidence from Firm-Level Data." *National Tax Journal* 75 (3): 481–515.

Furman, Jason. 2020. "Prepared Testimony for the Hearing 'The Disappearing Corporate Income Tax.'" Speech, US House of Representatives Committee on Ways and Means Hearing, February 11, 2020. https://www.piie.com/sites/default/files/documents/furman2020-02-11.pdf.

Gale, William G., Hilary Gelfond, Aaron Krupkin, Mark J. Mazur, and Eric Toder. 2018. "A Preliminary Assessment of the Tax Cuts and Jobs Act of 2017." *National Tax Journal* 71 (4): 589–612.

Gale, William G., and Claire Haldeman. 2021. "The Tax Cuts and Jobs Act: Searching for Supply-Side Effects." *National Tax Journal* 74 (4): 895–914.

Garcia-Bernardo, Javier, and Petr Janský. 2024. "Profit Shifting of Multinational Corporations Worldwide." *World Development* 177: 106527.

Garcia-Bernardo, Javier, Petr Janský, and Gabriel Zucman. 2022. "Did the Tax Cuts and Jobs Act Reduce Profit Shifting by US Multinational Companies." NBER Working Paper 30086.

Gravelle, Jane G., and Donald J. Marples. 2019. *The Economic Effects of the 2017 Tax Revision: Preliminary Observations.* CRS Report R45736. Washington, DC: Congressional Research Service.

Guvenen, Fatih, Raymond J. Mataloni Jr., Dylan G. Rassier, and Kim J. Ruhl. 2022. "Offshore Profit Shifting and Aggregate Measurement: Balance of Payments, Foreign Investment, Productivity, and the Labor Share." *American Economic Review* 112 (6): 1848–84.

Hartman, David G. 1985. "Tax Policy and Foreign Direct Investment." *Journal of Public Economics* 26 (1): 107–21.

Huang, Jing, Benjamin Osswald, and Ryan J. Wilson. 2023. "The Effect of US Tax Reform on US R&D-Intensive Multinational Companies." Unpublished.

Hugger, Felix, Ana Cinta González Cabral, Massimo Bucci, Maria Gesualdo, and Pierce O'Reilly. 2024. "The Global Minimum Tax and the Taxation of MNE Profit." OECD Taxation Working Paper 68.

Internal Revenue Service (IRS). 2022. *Corporate Income Tax Returns Complete Report 2019.* Washington, DC: Internal Revenue Service.

Joint Committee on Taxation. 2013. "Modeling the Distribution of Taxes on Business Income." JCX-14-13.

Joint Committee on Taxation. 2017. "Estimated Budget Effects of the Conference Agreement for H.R.1, the Tax Cuts and Jobs Act." JCX-67-17.

Joint Committee on Taxation. 2021a. "Letter to Senator Sanders." https://www.sanders.senate.gov/wp-content/uploads/For-the-99.5-Act-JCT-Score.pdf.

Joint Committee on Taxation. 2021b. "US International Tax Policy: Overview and Analysis." JCX-16-21.

Joint Committee on Taxation. 2022. "Estimates of Federal Tax Expenditures for Fiscal Years 2022–2026." JCX-22-22.

Kennedy, Patrick, Christine Dobridge, Paul Landefeld, and Jacob Mortenson. 2023. "The Efficiency-Equity Tradeoff of the Corporate Income Tax: Evidence from the Tax Cuts and Jobs Act." Unpublished.

Kopp, Emanuel, Daniel Leigh, Susanna Mursula, and Suchanan Tambunlertchai. 2019. "US Investment Since the Tax Cuts and Jobs Act of 2017." IMF Working Paper 19/120.

Kysar, Rebecca. 2020. "The New Tax Legislative and Regulatory Process." *National Tax Journal* 73 (4): 1135–62.

Laplante, Stacie Kelley, Christina Lewellen, Dan Lynch, and David M. P. Samuel. 2023. "'Just BEAT It' Do Firms Reclassify Costs to Avoid the Base Erosion and Anti-abuse Tax (BEAT) of the TCJA?" WU International Taxation Research Paper 2021-03.

Markle, Kevin S., and Douglas A. Shackelford. 2012. "Cross-Country Comparisons of Corporate Income Taxes." *National Tax Journal* 65 (3): 493–527.

Matheson, Thornton, Alexander Klemm, Laura Power, and Thomas Brosy. 2022. "The Impact of the Tax Cuts and Jobs Act on Foreign Investment in the United States." IMF Working Paper 22/79.

Mermin, Gordon B., Janet Holtzblatt, Surachai Khitatrakun, Chenxi Lu, Thornton Matheson, and Jeffery Rohaly. 2020. "An Updated Analysis of Former Vice President Biden's Tax Proposals." Unpublished.

Nunns, James. 2012. *How TPC Distributes the Corporate Income Tax.* Washington, DC: Tax Policy Center.

OECD. 2015. "OECD/G20 Base Erosion and Profit Shifting Project Explanatory Statement and 2015 Final Reports." https://www.oecd.org/ctp/beps-2015-final-reports.htm.

OECD. 2021. *Two-Pillar Solution to Address the Tax Challenges Arising from the Digitalisation of the Economy.* OECD/G20 Base Erosion and Profit Shifting Project. Paris: OECD Publishing.

OECD. 2024. *Corporate Tax Statistics 2023.* Paris: OECD Publishing.

Overesch, Michael, Leon G. A. Reichert, and Georg Wamser. 2023. "The Effects of the Tax Cuts and Jobs Act on the Tax-Competitiveness of Multinational Corporations." CESifo Working Paper 10310.

Overesch, Michael, Sabine Schenkelberg, and Georg Wamser. 2018. "Do US Firms Pay Less Tax than Their European Peers? On Firm Characteristics, Profit Shifting Opportunities, and Tax Legislation as Determinants of Tax Differentials." CESifo Working Paper Series 6960.

Penn Wharton Budget Model. 2023. "Did the Tax Cuts and Jobs Act of 2017 Increase Revenue on US Corporations' Foreign Income?" Policy Brief. https://budgetmodel.wharton.upenn.edu/issues/2023/10/12/did-tcja-increase-revenue-on-us-corporation-foreign-income.

Pomerleau, Kyle, and Grant M. Seiter. 2020. "An Analysis of Joe Biden's Tax Proposals, October 2020 Update." American Enterprise Institute. https://www.aei.org/wp-content/uploads/2020/10/An-Analysis-of-Joe-Biden%E2%80%99s-Tax-Proposals-October-2020-Update.pdf.

Power, Laura, and Austin Frerick. 2016. "Have Excess Returns to Corporations Been Increasing over Time?" *National Tax Journal* 69 (4): 831–46.

Rosenthal, Steven M., and Theo Burke. 2020. "Who's Left to Tax? US Taxation of Corporations and Their Shareholders." Unpublished.

Samarakoon, Navodhya. 2023. "The Effect of the Closure of the Double Irish Loophole on the Location of US Multinational Companies' Profits." Unpublished.

Setser, Brad W. 2023. "Cross-Border Rx: Pharmaceutical Manufacturers and US International Tax Policy." Speech, Senate Committee on Finance Hearing, Washington, DC, May 11, 2023. https://www.finance.senate.gov/imo/media/doc/Setser%20Senate%20Finance%20Testimony.pdf.

Shaxson, Nicholas. 2019. "Tackling Tax Havens." *Finance and Development.* September, 6–10.

US Department of the Treasury. 2021. *General Explanations of the Administration's Fiscal Year 2022 Revenue Proposals.* Washington, DC: US Department of the Treasury.

US Department of the Treasury. 2023a. *General Explanations of the Administration's Fiscal Year 2024 Revenue Proposals.* Washington, DC: US Department of the Treasury.

US Department of the Treasury. 2023b. "Distribution Table: 2023 002." https://home.treasury.gov/system/files/131/Distribution-of-Income-by-Source-2023.pdf.

Are Opportunity Zones an Effective Place-Based Policy?

Kevin Corinth and Naomi Feldman

When Congress passed and President Trump signed into law the Tax Cuts and Jobs Act at the end of 2017, most attention centered on the reduction in the corporate tax rate and overhaul of the individual tax code. Few noticed a provision added at the last minute establishing a new place-based policy in the United States called Opportunity Zones.

The basic idea for Opportunity Zones was hatched several years earlier by tech entrepreneur Sean Parker (a Napster cofounder and early Facebook stakeholder). He provided startup funds for a small think tank called the Economic Innovation Group to develop the idea into a policy. The think tank in turn enlisted a bipartisan and influential group of academic economists for partnership and oversight. Although Opportunity Zones were introduced on a bipartisan basis as a bill in the US House and Senate in 2016, they flew largely under the radar. Most of the key Congressional and White House players in the debate over what became the Tax Cuts and Jobs Act of 2017 had little awareness of Opportunity Zones when the other provisions of the bill were being drafted and debated. It was only when Senator Tim Scott (R-South Carolina) pushed for their inclusion, along with Congressional

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leaders and later President Trump, that Opportunity Zones were added to the larger tax bill late in 2017.

Place-based policies are motivated by the desire to address disparities and stimulate economic development in specific geographic areas that suffer from disadvantage and underinvestment, which, at least in theory, could bolster economic growth of the nation as a whole and reduce strain on public benefit programs. The breadth and size of the problems facing distressed areas—the disconnection of nondisabled men from the labor force, a swelling drug epidemic, and persistent stagnation—have disrupted the long-held view among many economists that policies should seek to help people, not places. But while economists increasingly discussed what government could or should do to help left-behind areas and their residents, there was no consensus on what policies would work. A checkered history of place-based policies, suggesting at best mixed evidence on positive outcomes, warranted skepticism of simply expanding existing policies (Bernstein and Hassett 2015).

Opportunity Zones broke from previous place-based tax policies, many of which allocated investment incentives through government-approved entities on the basis of intentionally chosen characteristics.[1] Instead, Opportunity Zones sought to relax tight government control over the place and form of investment. They offered uncapped tax incentives for individual investors to reinvest unrealized capital gains in a large swath of areas across the country. Whether a more flexible, market-driven approach could improve on the previous track record of place-based tax policies was put to the test. Now, seven years after the inconspicuous beginning of Opportunity Zones, a growing body of evidence has emerged, offering lessons for future place-based policies. Overall, a substantial amount of investment has flowed to the designated areas under the policy; however, aside from potentially important effects on residential real estate, it is unclear whether this represents additional investment that would not otherwise have occurred, and the evidence on benefits to residents of these areas is limited.

Previous Place-Based Policies

From an economic perspective, several rationales might justify place-based government intervention, as opposed to policies that aim more directly at supporting people. First, the workers or firms that locate in a specific area can create externalities for others nearby. For example, positive externalities ("agglomeration economies") arise from workers sharing information and from firms colocating to create a thick market of potential workers, while negative externalities can arise due to congestion (Glaeser 2010). For this reason, subsidizing location in areas with greater net positive externalities could produce efficiency

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[1] For a detailed history of the development of the Opportunity Zone policy, see Wessel (2021).

gains, boosting productivity in targeted regions and the nation as a whole. Second, place-based policies can serve as insurance to protect residents against local shocks that make living in a given area less desirable over time, especially if moving costs are substantial (Gaubert, Kline, and Yagan 2021). Third, policies that seek to address externalities resulting from nonwork—such as greater reliance on transfer programs—may have more impact in areas where employment levels are currently lower, and could ultimately reduce strain on federal assistance programs. Austin, Glaeser, and Summers (2018) argue that this final motivation for place-based policies is the most compelling, given the inability to identify which places have higher net externalities due to agglomeration, and because insuring places is less efficient than insuring the income of individuals.[2]

An alternative approach to improving the outcomes of residents in distressed areas is to facilitate their movement to other areas, which can expand employment opportunities for adults and improve the long-run outcomes of children (Chetty, Hendren, and Katz 2016). Such a policy could act as a form of insurance by offsetting the moving costs of escaping an area suffering from negative local shocks, and in addition, address externalities from nonwork. But scaling up such a policy could be problematic, due to the potentially large monetary and nonmonetary costs of moving, and housing supply constraints in many high opportunity areas that cause greater in-migration to make housing less affordable. Thus, place-based policies may still be warranted.

In addition to rationales for place-based policies in general, there may be rationales for such policies that encourage private investment in particular, as Opportunity Zones seek to do. While subsidizing private investment in places with irreparably weak institutions and other "fundamentals" is unlikely to spur broader economic development, it is possible that a surge in private investment could move some distressed areas out of a "bad equilibrium" in which a lack of private investment reduces the local tax base and reduces the likelihood of both public and private investment in the future (Bernstein and Hassett 2015). Increased investment at scale could move these distressed areas into a new equilibrium characterized by greater private investment, greater tax revenue, and better public infrastructure. A different type of place-based policy focuses on allocating federal investments (as opposed to encouraging private investment) to specific entities in specific places. For example, the National Science Foundation seeks to create "regional innovation centers" that will foster technological innovation in left-out areas. While policies that direct public investment in specific areas can address some of the same rationales, in this section we focus on place-based policies that encourage private investment.

US policymakers have enacted a series of place-based tax policies in recent decades, as listed in Table 1. Notable earlier programs include Empowerment Zones and Enterprise Communities, both established in 1993, and the New Markets Tax

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[2] In this journal, see Bartik (2020) for a review of place-based policies focused on job creation specifically. For a review in the same issue of place-based policy efforts in Europe, see Ehrlich and Overman (2020).

Table 1

Major Federal Place-Based Policies

Program	Year established/ expired	Tax incentives
Empowerment Zones	1993/2025	Federal income tax credit, accelerated depreciation, bond financing, capital gains deferral
Enterprise Communities	1993/2009	Job creation credits, property tax abatements, sales tax reductions, investment credits
Renewal communities program	2000/2009	Job creation credits, augmented Section 179 deduction, reduced capital gains on qualified assets, bond financing tax credits
New markets tax credit	2000/—	Investors in qualified Community Development Entities receive a tax credit totaling 39 percent of the total investment spread over seven years.
Opportunity Zones	2017/—	Temporary deferral of capital gains from rolled-over assets and reinvested in a Qualified Opportunity Fund, partial reduction of deferred gains due to partial step-up in basis and a tax exclusion for new capital gains from the investment.

Source: Authors' creation.

Credit, established in 2000. These programs vary in their approach, coverage, and regulatory framework, though all broadly aim to promote economic growth and employment in distressed areas. Estimates of the effects of these earlier programs are mixed. Neumark and Simpson (2015) present a comprehensive summary of place-based policies and what we have learned from earlier programs. As the authors note, going forward, it is essential to gain a deeper understanding of the features that make these policies more or less effective and to reconcile the existing research findings. For example, some evidence suggests positive outcomes associated with infrastructure expenditure, as well as investments in higher education and university research, likely due to the public-goods nature of these policies.

Despite having similar end goals of improving the economic outcomes of distressed areas, there are significant differences in implementation and incentive structure among the various programs. For example, the Opportunity Zone policy aims to harness the unrealized capital gains of the private sector by offering deferrals and exclusions for capital gains taxation when gains are reinvested in so-called Qualified Opportunity Funds, which is an investment vehicle organized as a corporation or partnership to facilitate investment in Opportunity Zones. This structure stands in contrast to the typical incentive structure of previous federal place-based tax policies, which often focused on reducing the upfront costs associated with employment or initial investment. In particular, the New Markets Tax Credit program allocates tax credits to specialized financial institutions known as Community Development Entities that then use these tax credits to attract capital from private investors, including banks and corporations, who provide funds in exchange for the credits. The raised funds are then invested by the Community Development

Entities in businesses or real estate projects within low-income areas, often through loans or equity investments. Investors receive a tax credit equal to 39 percent of their investment, distributed over seven years. This further differs from other programs like Empowerment Zones and Enterprise Communities that offer a mix of tax incentives, grants, streamlined regulations, and infrastructure investments to encourage business investment and job creation in economically distressed areas. These incentives include employment and investment tax credits, accelerated depreciation, and capital gains exclusion, among others. In return, businesses are encouraged to reinvest in the local community through job training programs and community development projects.

Another important change with Opportunity Zones as compared to some other programs is the role of the federal (or local) government in the investment process. Beyond setting the requirements for eligibility that piggy-backed off previous place-based policies, government involvement in Opportunity Zones is comparatively minimal. For comparison, the New Markets Tax Credit involves multiple stages of application, evaluation, investment, and compliance to ensure that the funds are directed to eligible projects and effectively contribute to the economic development of low-income communities and is subject to a Congressional legislative cap. None of these apply to Opportunity Zone investments.

The differing design of incentives across the programs is likely to shape their ultimate outcomes. For example, the Opportunity Zone incentive that rewards long-held investments with larger capital gains may have outcomes focused in real estate development, because these investments more easily satisfy the minimal requirements necessary to receive the tax benefits, whereas programs that subsidize upfront investment costs or hiring could encourage other types of business development and job creation.

Overall, the evidence on the effectiveness of Enterprise Communities and Empowerment Zones on improving socioeconomic outcomes in struggling communities is mixed. Ham et al. (2011) study state and federal programs and find positive impacts on local labor markets and poverty, though the effects vary widely across states and for the state programs, Neumark and Young (2019) show that data problems and selection drive most of the positive outcomes and Neumark and Young (2021) find no evidence of longer-run effects. Busso, Gregory, and Kline (2013) study federal Empowerment Zones and find substantial job growth, but Reynolds and Rohlin (2015) suggest that the zones primarily benefited higher-income households. Freedman (2012) studies the New Markets Tax Credit using a regression discontinuity design and finds modest positive effects in distressed communities. Some of the positive effect is due to compositional changes in neighborhood residents rather than gains for existing residents. The Community Development Financial Institutions Fund, which administers the New Markets Tax Credit program, regularly publishes reports on the program's impact. These reports generally show that the program has been successful in attracting investment to low-income communities and creating jobs. However, it is unclear whether these investments would have occurred in any case or whether the policy was crucial on the margin.

The Opportunity Zones Policy

The two major components of the Opportunity Zone policy are the rules for initially selecting Opportunity Zones, and the rules that dictate the tax incentives for investing in them.

Rules for Selecting Opportunity Zones

The US Census Bureau divides the country into "census tracts," which are designed to contain 1,200 to 8,000 residents: as a result, census tracts range in geographic area from the size of a neighborhood in densely populated parts of cities to much larger areas in rural parts of states. The eligibility criteria for census tracts to be designated as Opportunity Zones largely follow the criteria for census tracts that can receive investment from the earlier New Markets Tax Credit, while also extending potential eligibility to census tracts contiguous to selected low-income tracts. Specifically, a census tract was eligible to be selected if: (a) it had an official poverty rate of at least 20 percent; (b) it had a median family income below 80 percent of the median family income in the state or metropolitan area; or (c) it was contiguous with a selected census tract meeting one of the conditions in (a) or (b), and also had a median income less than 125 percent of the qualifying census tract. A maximum of 5 percent of a state's Opportunity Zones could be designated on the basis of contiguity.

Out of approximately 73,000 census tracts in the United States, 42 percent were eligible to be selected as Opportunity Zones based on their median family income or poverty rate (conditions a and b), and an additional 14 percent were potentially eligible if a contiguous tract were selected (condition c).[3] The Tax Cuts and Jobs Act allowed each state governor to designate up to 25 percent of eligible census tracts as Opportunity Zones. Governors were required to submit their selections for Opportunity Zones to the US Treasury within 90 days, which limited the time for a highly informed selection process, especially given that Opportunity Zones were included only at a late stage in the legislative process and with little attention until after the bill was passed (Wessel 2021).

States varied widely in their approaches. For example, several states including California, Michigan, Nevada, and Vermont solicited public input on an initial set of potential Opportunity Zones (Wessel 2021). Some states relied heavily on quantitative data to target areas with higher levels of distress or more investment potential. As demonstrated by Frank, Hoopes, and Lester (2022), political alliances also played a role, with governors 8 percent more likely to select a census tract as an Opportunity Zone if the state representative shared the governor's political party.

Rules for Tax Incentives from Investing in Opportunity Zones

In addition to prescribing the process for designating Opportunity Zones, the Tax Cuts and Jobs Act also laid out what qualifies as an Opportunity Zone

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[3] See CFDI (2024) for list of eligible and selected Opportunity Zones.

investment—and the associated tax benefits. Those who invest unrealized capital gains in Opportunity Zones via Qualified Opportunity Funds could defer any taxes owed on the original capital gain for as long as the investment remains in the Qualified Opportunity Funds, through the end of 2026. If the investment remains in the Qualified Opportunity Funds for at least five years, then 10 percent of the original capital gain is excluded from taxation, and if the investment remains for at least seven years, then 15 percent of the original capital gain is excluded from taxation. After 2026, the original capital gains must be realized and taxes paid. Furthermore, any capital gains accrued based on the investment in the Qualified Opportunity Fund (above the original capital gain) are not subject to any taxation if the investment in the Qualified Opportunity Fund is maintained for at least ten years. In addition to capital gains tax, this allows investors to forgo payment of the net investment income tax and taxes on "depreciation recapture" (that is, tax owed when an individual deducts depreciation of an asset over time, but then sells the asset for more than its adjusted cost basis).

The rules regarding what investment is eligible for tax benefits hinged on quantifying certain aspects of the statute. For example, the statute requires that "substantially all" of the property of the Qualified Opportunity Fund be tangible, which the US Treasury defined as 70 percent. The Treasury's proposed rules were made public in October 2018 and made final in December 2019. This delay in finalizing the rules for determining what investment qualifies could have dissuaded some early investment.

## Which Areas Were Selected as Opportunity Zones?

A necessary condition for success of the Opportunity Zones policy is that it increases private investment in distressed areas. Whether Opportunity Zones were successful in attracting investment to distressed areas depends on first, whether distressed areas were selected as Opportunity Zones, and second, whether investment ultimately flowed to the selected distressed areas. This section focuses on the first question. In the following section we turn to the second question regarding investment.

As described previously, Congress adopted a variant of the eligibility conditions used for the New Markets Tax Credit, which ultimately led 31,848 (43 percent) of census tracts to be deemed eligible, not counting the 10,312 "contiguous" tracts that could potentially be selected if an eligible bordering tract was selected as well. State governors ultimately nominated 8,764 census tracts as Opportunity Zones, which were published by the US Treasury on July 9, 2018. Every state and two-thirds of counties had at least one census tract selected as an Opportunity Zone (Corinth and Feldman 2023).

In Figure 1, the solid black line depicts the extent to which the census tracts designated as Opportunity Zones were drawn from the lower end of the income distribution, by indicating the share of census tracts in each percentile of the census tract median income distribution that were selected. For context, the twentieth

Figure 1

Share of Census Tracts Selected as Opportunity Zones, by Percentile of Census Tract Median Income
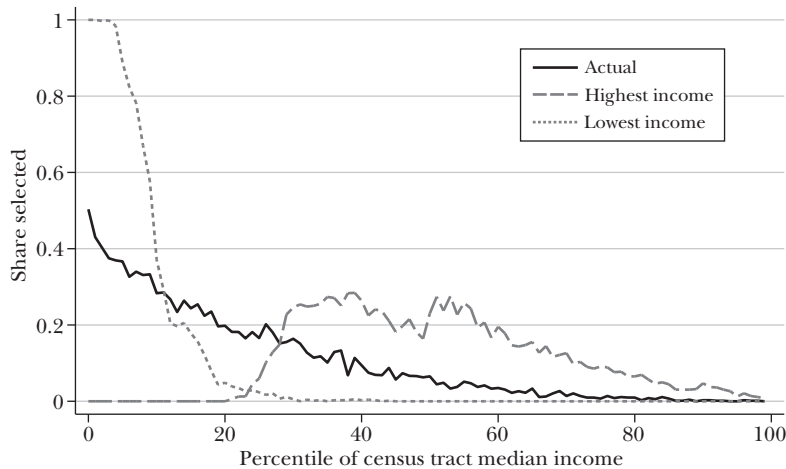
Source: US Census Bureau (2024), CFDI (2023), and authors' calculations
Note: Figure plots census tracts based on their percentile in the distribution of median income over all census tracts. The solid black line plots the share of census tracts in a given percentile that were selected as Opportunity Zones. The gray dashed (dotted) line plots the share of census tracts that would have been selected as Opportunity Zones if each state governor selected the same number of census tracts as they actually chose, but selected the highest (lowest) income census tracts possible. The dashed line allows governors to select contiguous tracts of selected low-income tracts, up to the maximum number of contiguous tracts. We select the highest income contiguous tracts that are contiguous to the highest income low-income tracts, ensuring our algorithm is not first order stochastically dominated by another set of tracts that could have been selected instead (for example, it is possible that an unselected low-income tract has a contiguous tract that has a higher median income than one of the tracts we ultimately select as an Opportunity Zone; however, the low-income tract itself will have a lower income than all of the tracts we selected).

percentile census tract has a median household income of $37,679, the fortieth percentile census tract has a median household income of $49,267, and the sixtieth percentile census tract has a median household income of $61,429, as of 2013–2017 and expressed in 2017 dollars (US Census Bureau 2024). The solid black line is generally decreasing with income percentile, implying that census tracts with lower median incomes were more likely to be designated as Opportunity Zones. The probability of selection as an Opportunity Zone was about 50 percent at the very bottom percentile, 20 percent at the twentieth percentile, 10 percent at the fortieth percentile, and close to zero percent at the sixtieth percentile and above.

The gray dotted line represents a hypothetical scenario in which each state designated as Opportunity Zones the census tracts with the lowest possible median incomes of those eligible. The gray dashed line represents an alternative hypothetical scenario in which each state designated as Opportunity Zones the eligible census tracts with the highest possible median income. In other words, if actual selections

(black solid line) lined up exactly with the gray dotted line, that would indicate that state governors selected the census tracts with the lowest possible median incomes, conditional on the tracts made eligible. If actual selections lined up exactly with the gray dashed line, that would indicate that state governors selected the eligible census tracts with the highest possible median incomes.
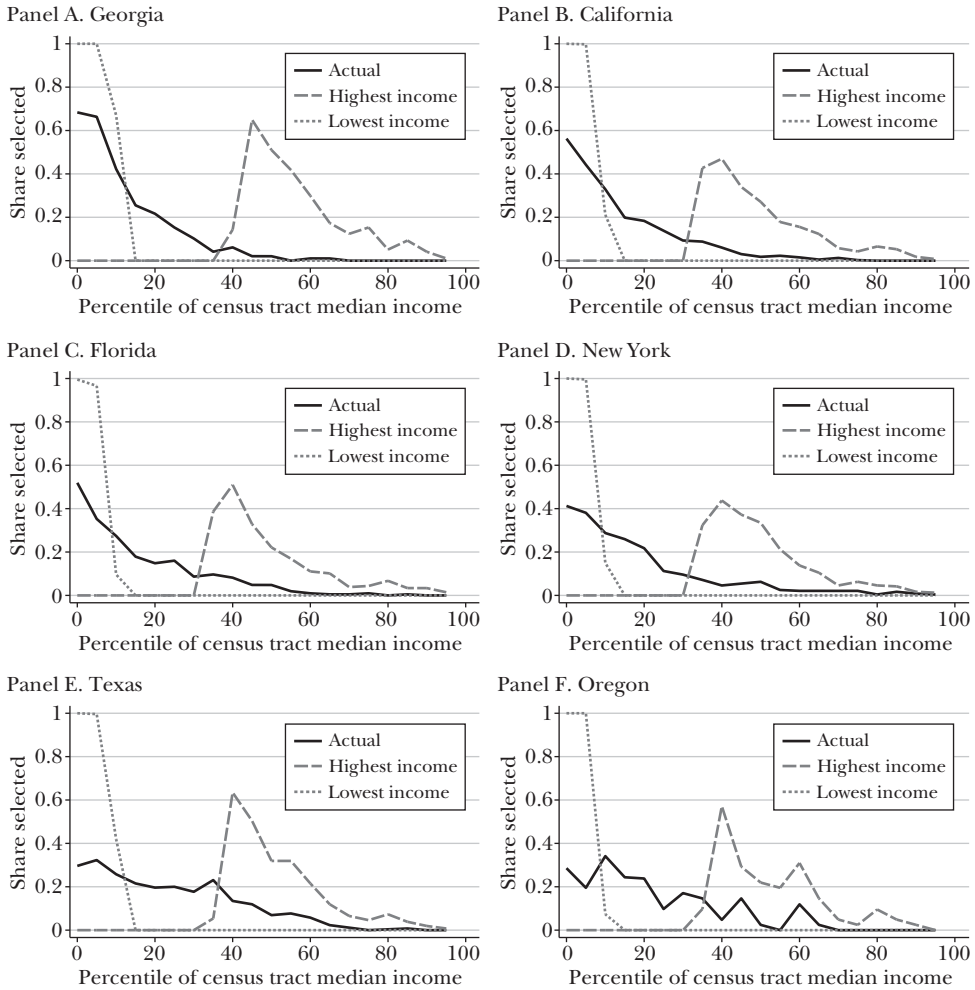
Clearly, Congress allowed states substantial flexibility between these extremes to choose their Opportunity Zones. Overall, states chose 58 percent of Opportunity Zones from census tracts in the bottom income quintile. Conversely, states selected only 15 percent of Opportunity Zones from the top three quintiles. Four census tracts were selected as Opportunity Zones despite having a median income of more than $125,000, placing them in the top 5 percent of census tracts nationally. Three of the top four census tracts are located in New York City and of these, each qualified because of their contiguity with another tract with a sufficiently low median income, and one attracted controversy for being a candidate for a second headquarters for Amazon in 2018. The fourth census tract, with the highest median income among all selected tracts, is in Washington, DC, and contains the now-abandoned former stadium of the Washington professional football team, which is slated to be replaced with either a new stadium or other development.

States varied widely in the extent to which they targeted their most distressed areas. Figure 2 shows for six states the share of census tracts in each percentile of census tract median income in the state that were actually selected (black line) and which could have been selected if either the highest (gray dashed line) or lowest (gray dotted line) income eligible tracts were selected. For example, Georgia stands out because it could have selected Opportunity Zones almost exclusively from the top three quintiles of its census tracts, but in practice, it selected Opportunity Zones overwhelmingly from the bottom quintile. California also more heavily targeted distressed areas than most other states, though to a lesser extent than Georgia. Florida and New York were closer to the norm among all states.

Texas and Oregon are examples of states that did less than most states to target their most distressed census tracts. Texas was nearly as likely to select census tracts from around the fortieth percentile as it was to select census tracts from the bottom of the distribution. Oregon selected a significant share of its Opportunity Zones from the middle of the distribution or higher.

Ultimately, the Opportunity Zone rules in the Tax Cuts and Jobs Act gave states considerable flexibility, and most states used this flexibility to leave out a substantial share of the most distressed areas and to choose instead a significant number of census tracts from the middle of the distribution that probably should not be classified as distressed. Selecting a group of Opportunity Zones that contains even a relatively small number of nondistressed areas can still heavily distort the effects of the policy away from the most distressed areas, because the tax break may encourage private investment flows in the nondistressed areas instead. Finally, we note that it is not obvious that investment should always go to the most distressed areas and any deviation from this group of census tracts is undesirable. Instead, investment should ideally balance need with a higher probability of success as captured by a social

Figure 2

Share of Census Tracts Selected as Opportunity Zones, by Percentile of Census Tract Median Income in State

Panel A. Georgia

Panel B. California

Panel C. Florida

Panel D. New York

Panel E. Texas

Panel F. Oregon

Source: US Census Bureau (2024), CFDI (2023), and authors' calculations

Note: Figure plots census tracts based on their percentile in the distribution of median income over all census tracts within a given state. The black line plots the share of census tracts in a given percentile that were selected as Opportunity Zones. The gray dashed (dotted) line plots the share of census tracts that would have been selected as Opportunity Zones if each state governor selected the same number of census tracts as they actually chose, but selected the highest (lowest) income census tracts possible. For further details, see Figure 1 notes.

return on investment. This, however, is not necessarily prioritized or known by the private investor, though state governors may attempt to guide investors towards selecting certain tracts for targeted investment.

Investment in Opportunity Zones

A causal effect of Opportunity Zones on driving additional private investment is a necessary (but not sufficient) condition for a successful policy. After all, if the Opportunity Zone policy did not drive increased investment in designated areas, then it is unlikely to have had other effects on economic outcomes. In this section, we first characterize the nature and magnitude of the Opportunity Zone investment incentives. We then document the Opportunity Zone investment that has occurred and whether the policy induced additional investment. Of course, a successful place-based policy also requires that the additional investment leads to improved outcomes, which might be measured by employment, wages, and income of those living in these areas—a topic we tackle in the following main section.

Characterizing the Opportunity Zone Tax Incentives

The Opportunity Zone tax incentive can be illustrated with an example in Figure 3, which compares the tax implications of investing in Opportunity Zones compared to investing elsewhere. We begin by assuming that an individual realizes a $1 million capital gain in 2019. An investor who realizes that capital gain and then reinvests it outside the Opportunity Zone (right-hand side of the diagram) would pay a tax of $238,000, reflecting the 20 percent long-term capital gains tax rate plus an additional 3.8 percent tax on net investment income. Then, an investor who made an additional gain of $737,000 over the next ten years (based on a 7 percent annual rate of return), and realized that additional gain in 2029, would pay an additional $175,000 in capital gains taxes. The final value of the investment after ten years is $1.32 million, reflecting a 32 percent nominal return on investment.

If this investor had instead reinvested the original $1 million gain in an Opportunity Zone (left-hand side of diagram), the capital gains tax on the original gain would be deferred until 2026. The investor would also reduce the tax burden by 15 percent by maintaining the Opportunity Zone investment for seven years and so at that time would pay only $202,000 in taxes on the original capital gain, while paying an additional $63,000 tax on the withdraw by realizing capital gains on the reinvestment after seven years. The remaining $1.34 million value of the Opportunity Zone reinvestment would grow to $1.64 million by 2029, and the investor would pay no additional tax on the capital gain because it was held for at least ten years. The nominal return on investment is thus 64 percent, double the rate of return on investment of newly realized capital gains without the benefit of the policy. The difference could be larger if the investor reduced their tax liability during this period based on depreciation of the asset, because they could avoid the tax based on depreciation recapture by investing in an Opportunity Zone. At the same time, the difference could be smaller if the investor had a lower capital gains tax rate based on income and filing status.

This stylized example provides a convenient illustration of the wide and uncertain range of potential costs to the government of Opportunity Zones. In the diagram, the total tax paid in the absence of Opportunity Zones is $413,000,

Figure 3

Hypothetical Tax Benefits from Investment in Opportunity Zones

2019
Realize $1M capital gain

2019
Pre-tax value: $1M
Reinvest $1M in OZs, and defer tax on original gain
After-tax value: $1M

2019
Pre-tax value: $1M
Reinvest $762K in non-OZs, and pay $238K tax on original gain
After-tax value: $0.76M

2026
Intermediate value: $1.61M
Withdraw $265K from OZ reinvestment, with $63K paid as tax on withdraw and $202K paid as tax on original gain
Remainder in OZ investment: $1.34M

2029
Pre-tax value: $1.64M
Pay no additional tax on gain from OZ reinvestment held for 10 years
After-tax value: $1.64M
Return on investment: 64%

2029
Pre-tax value: $1.5M
Pay $175K tax on gain from reinvestment
After tax value: $1.32M
Return on investment: 32%

Source: Authors' creation.
Note: We assume an annual rate of return of 7 percent. Capital gains are assumed to be taxed at a rate of 23.8 percent, except when otherwise reduced by the Opportunity Zone tax provisions. The portion of the original gain subject to taxation is reduced by 15 percent if the Opportunity Zone investment is held for at least seven years.

while the total tax paid in Opportunity Zones is $265,000, a difference of $148,000. This implies that the government cost of Opportunity Zones is 14.8 percent of total Opportunity Zone investment. However, this calculation assumes that every million dollars of existing capital gains invested in Opportunity Zones would have still been realized in the absence of the policy, an unrealistic assumption as capital gains taxes can be avoided by holding them until death and receiving a step up in basis and escaping estate taxation. In the extreme case in which none of the capital gains invested into Opportunity Zones would have been subject to taxation in the absence of the policy, the government receives additional revenue of $265,000 per million dollars of Opportunity Zone investment, implying a negative cost of 26.5 percent of total Opportunity Zone investment. Because $44 billion of qualifying investment was made into Opportunity Zones in 2019 and 2020 (Coyne and Johnson 2023),

this would imply that Opportunity Zone investment in those two years could have cost the government as much as $6.5 billion or brought in additional revenue of as much as $11.7 billion.

We emphasize that these magnitudes are only illustrative of the wide range of potential costs of the policy, because the values do not account for somewhat different tax benefits for Opportunity Zone investment made in 2019 versus 2020, heterogeneity in the rate of return on investment, and the different tax brackets of investors, among other factors.

We can also use the hypothetical example in Figure 3 to illustrate the types of investment likely to be induced by the Opportunity Zones policy. This example assumes that the rate of return on the investment is the same inside and outside of Opportunity Zones. However, one motivation behind a place-based policy like Opportunity Zones is that the rate of investment is lower in these areas, which is why a policy response is needed. Thus, a key question concerns the incentives that arise in a setting where investments in Opportunity Zones yield lower rates of return.

To gain insight into this point, Figure 4 illustrates the subsidy from the Opportunity Zones policy, for different pre-tax annual rates of return on investment in Opportunity Zones, ranging from 3 percent to 9 percent as indicated on the horizontal axis. The figure holds fixed the pre-tax annual rate of return on investment outside of Opportunity Zones at 7 percent. Thus, the pre-tax annual rate of return on investment is lower in Opportunity Zones at all points to the left of the vertical line at 7 percent, which are the investments the policy is intended to induce. The vertical axis denotes the percentage point difference in the post-tax return on investment after ten years. Thus, a positive value means that the post-tax return on investment in Opportunity Zones is higher than in non–Opportunity Zones. We define the "subsidy" as the additional return to the investor of investing in Opportunity Zones relative to other areas that results from the policy.[4]

Consider first the previous example shown in Figure 3 in which investment both inside and outside Opportunity Zones has a pre-tax annual rate of return of 7 percent. With the Opportunity Zone legislation, the investment in the Opportunity Zone will have a 32 percentage point greater post-tax return on investment after ten years than investment outside of Opportunity Zones, as indicated by the solid line in Figure 4. Because there would be no difference in the post-tax return on investment without the policy (as indicated by the dashed line), the subsidy is equal to 32 percent of the initial investment, the gap between solid line and dashed line.

But what if the returns inside Opportunity Zones are different than returns outside of Opportunity Zones? If for example, the pre-tax annual rate of return on investment is 6 percent in Opportunity Zones, then without the policy (dashed line) the post-tax return on investment after ten years would be 10 percentage points lower in Opportunity Zones. But with the policy (solid line), the post-tax return

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[4]As seen in Figure 4, this is not equivalent to the reduction in taxes paid.

Figure 4

Percentage Point Difference in Post-tax Return on Investment from Investing in Opportunity Zone versus Non–Opportunity Zone, by Pre-tax Rate of Return on Opportunity Zone Investment
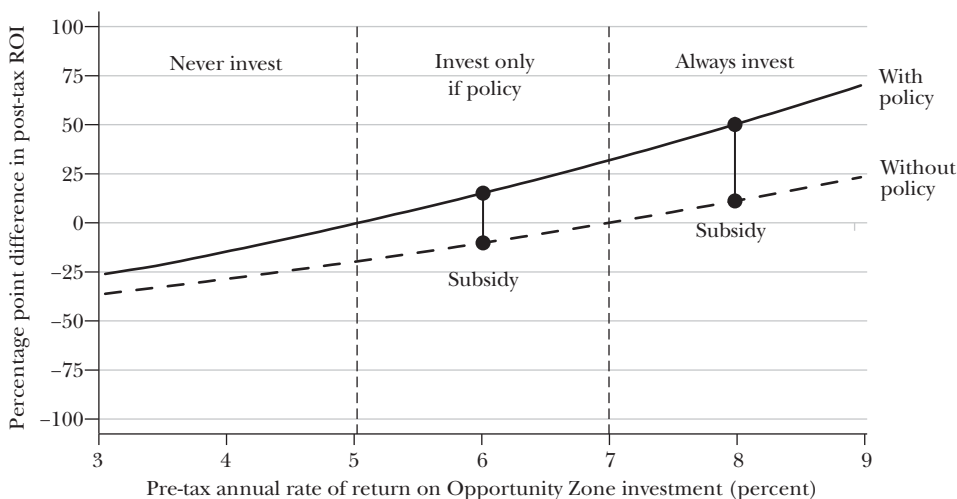
Source: Authors' creation.

Note: Capital gains are assumed to be taxed at a rate of 23.8 percent, except when otherwise reduced by the Opportunity Zone tax provisions. Pre-tax annual rate of return is assumed to be 7 percent in non–Opportunity Zones, and as shown by the horizontal axis for Opportunity Zones. Post-tax rate of return in Opportunity Zones and non–Opportunity Zones accounts for taxes paid on original capital gain and any taxes on gain from the new investment. Investment is assumed to be made in 2019 and thus qualify for the full 15 percent reduction in the original gain subject to taxation when paid in 2026. Investment held in Opportunity Zones for 10 years or more qualifies for the elimination of capital gains tax on the new investment. Vertical axis indicates the difference in the post-tax return on investment in Opportunity Zones versus the post-tax return on investment in non–Opportunity Zones, per dollar of original capital gains.

on investment would be 15 percentage points higher, for an effective subsidy of 25 percent of the initial investment. If the pre-tax annual rate of return on investment is 8 percent in Opportunity Zones, the subsidy would be a larger 39 percent of the initial investment. The higher the pre-tax rate of return in Opportunity Zones, the higher the subsidy.

Figure 4 also informs the types of Opportunity Zone investments that are likely to occur. Investment in Opportunity Zones with a pre-tax annual rate of return below 5 percent will not occur regardless of the policy, because even when the policy is in effect the post-tax return on investment is lower inside Opportunity Zones than outside them (because the solid line is below zero percent). Investment in Opportunity Zones with a pre-tax annual rate of return above 7 percent will occur regardless of the policy and thus provide a windfall for investors, because the post-tax return on investment is higher in Opportunity Zones even without the policy

(because the dashed line is above zero percent). Investment in Opportunity Zones will only be induced by the policy if the pre-tax annual rate of return is between 5 percent and 7 percent.

The relatively narrow window of investments induced by Opportunity Zones, in addition to the fact that the subsidy is largest for investment that would have occurred regardless of the policy, suggests that much of the Opportunity Zone tax benefit is likely to go to investments that would have occurred anyway. Some additional investments that were on the margin of being worthwhile could also occur in the absence of Opportunity Zone tax benefits, although they will need to be large enough in scale to outweigh the transaction costs of identifying Qualified Opportunity Funds and ensuring compliance with relevant tax rules. We can rule out the possibility that the Opportunity Zone tax incentives will encourage investment in places where the economic return is substantially less than a normal rate of return. In addition, more uncertainty is likely to reduce the likelihood of investment, because the lower subsidy in cases of lower rates of return will exacerbate the downside risk. Areas that are less distressed or already improving may have greater certainty of a positive return and thus may be the areas where Opportunity Zone investment is more likely. Similarly, investment in residential real estate may be more likely than in sectors where returns are less certain.

The actual window of investments induced by Opportunity Zones may be even narrower than the figure implies. One reason is that investments made after the 2019 scenario depicted in the figure will receive fewer tax benefits and thus the subsidy will be lower. Another reason is that the longer investment is held beyond ten years, a higher than 5 percent rate of return is needed in Opportunity Zones to make the investment more profitable than investing outside Opportunity Zones. Finally, as previously discussed, not all capital gains invested into Opportunity Zones are likely to have been realized in the absence of the policy, and so the subsidies shown may overstate the reward to the investor.

Documenting Opportunity Zone Investment

Empirical research has sought to measure the quantity of investment in Opportunity Zones and where that investment was made, and also to find ways to determine the extent to which that investment was caused by the Opportunity Zone policy.

We can compare total investment for Opportunity Zones and the earlier New Markets Tax Credit. As mentioned above, Coyne and Johnson (2023) estimate about $44 billion has been invested in Qualified Opportunity Funds from 2019 to 2020. In contrast, New Markets Tax Credit allocatees invested about $62.5 billion in Qualified Low-Income Community Investments over fiscal years 2003 to 2021 (CFDI 2023). Focusing just on fiscal years 2019 and 2020, New Markets Tax Credit allocatees invested $6.5 billion. Thus, the amount of investment under Opportunity Zones tax incentives is several times larger than its most comparable program over the same period.

The data for Coyne and Johnson (2023) were assembled from tax forms filed by Qualified Opportunity Funds, which require reporting on the census tracts

where investments were made. They find that investment was disproportionately concentrated among eligible census tracts with higher levels of median income. The 20 percent of selected census tracts with the highest median income levels received 34 percent of Opportunity Zone investment through 2020. Investment was spread relatively evenly among the remaining 80 percent of census tracts, with between 15 and 19 percent of Opportunity Zone investment taking place in each of the bottom four quintiles of the median income distribution. Another indication that Opportunity Zone investment is flowing to areas with a higher rate of return is that Opportunity Zone investment was disproportionately made in places with higher home prices. Coyne and Johnson (2023) calculate that the average dollar of Opportunity Zone investment went to a census tract with a median home value that was 78 percent higher than in eligible Opportunity Zones that received no investment. Also, before being designated as Opportunity Zones, the areas receiving Opportunity Zone investment were already improving more quickly—in terms of income, poverty, unemployment, home values, and education—than the Opportunity Zones that received no investment.

Within the category of designated Opportunity Zones, investment flowed to areas that were already relatively better off and already improving more quickly. Still, these areas were typically worse off than census tracts not eligible to become an Opportunity Zone. To the extent that this investment would not have occurred in the absence of the Opportunity Zone policy, it may still have benefited residents.

Answering how much Opportunity Zones boosted investment, compared to a counterfactual without the policy, is difficult. It requires constructing a control group that mimics the investment that would have occurred in Opportunity Zones if they had not been selected. One approach is to use eligible but not selected census tracts as the control group, and attribute any difference in investment trends after Opportunity Zones were designated to the policy change. However, the fact that Opportunity Zones were improving more quickly than otherwise eligible areas before the policy took effect can make it difficult to determine whether the difference between Opportunity Zones and eligible but not selected census tracts was caused by the policy.

Corinth and Feldman (2023) address this issue by comparing census tracts that were just barely eligible to be selected as an Opportunity Zone with census tracts that were just barely not eligible—a regression discontinuity design. There is no reason to think that these census tracts were meaningfully different from one another on any dimension, and which side of the eligibility threshold on which they fell was essentially random. The authors exploit this feature of the policy design by comparing the investment in tracts barely eligible to tracts barely not eligible to estimate the causal effect of the policy on investment. Their data capture the universe of real estate transactions valued over $2.5 million. Coyne and Johnson (2023) find that most Opportunity Zone investment has gone into real estate, and so any investment effect is most likely to occur within the real estate sector.

Within the real estate sector, Corinth and Feldman (2023) find no evidence of a causal effect of Opportunity Zone eligibility on commercial investment between

2018 and 2022. However, they find potentially important effects on investment in multifamily housing in certain years, including in 2021 and 2022 following the worst effects of the COVID-19 pandemic. Using a different method which compares selected Opportunity Zones to eligible but not selected census tracts, Wheeler (2022) also finds that the Opportunity Zone policy increased the likelihood of new residential development projects in a collection of large cities. He also finds a smaller (in percentage point terms) but statistically significant effect on the likelihood of new commercial development. It is unclear whether the different result for commercial development is a result of bias from using eligible but not selected tracts as a control group, despite potential underlying differences with Opportunity Zones, the lower statistical power of the regression discontinuity design, differences in the underlying sample, or other methodological differences. But ultimately, the evidence of an effect on residential investment seems robust. Investing in apartments in areas with relatively high and rising home prices may allow investors the scale and certainty that makes investment worthwhile, given the Opportunity Zone incentives. Nonetheless, it is less likely that investment in multi-family housing contributes as directly to overall economic development in distressed areas. This finding also stands in contrast to arguments made at the time of Tax Cuts and Jobs Act's passage that Opportunity Zone incentives would facilitate investment in businesses that would have important effects on employment and other improvements.

Downstream Outcomes

While Opportunity Zones were designed as direct incentives for private investment, their ultimate purpose was to promote broader economic prosperity in distressed areas and to improve the well-being of residents, along with the productivity and fiscal health of the nation as a whole. Evidence on this broader question, at least to date, suggests limited effects.

One area in which positive effects might be expected soon after Opportunity Zone designation is in home prices. To the extent that the Opportunity Zone policy led potential home buyers to anticipate increased prosperity in an Opportunity Zone in the future as a result of increased investment, they should have been willing to pay more for housing in the near term. Thus, whether home prices rose after Opportunity Zones were designated is a test of the policy's anticipated effects. Chen, Glaeser, and Wessel (2023) find little if any effect of Opportunity Zones on home prices, and potentially even modest price declines in Opportunity Zones with low employment levels. They speculate that the price decline could be due to expectations of increased housing supply in Opportunity Zones, which is consistent with their additional finding that residential building permits increased modestly in Opportunity Zones relative to eligible but not selected census tracts.

In terms of promoting more downstream outcomes such as employment, wages, household incomes, and economic activity in general, there is little evidence

of positive effects to date. Using individual-level data from the American Community Survey through 2019, Freedman, Khanna, and Neumark (2023) test the initial impact of Opportunity Zone designation on resident well-being. They detect no impacts of Opportunity Zones on employment, earnings, or poverty rates. Relying on a near universe of online job postings from Burning Glass Technologies, available at the zip code level through March 2020, Atkins et al. (2023) find no overall increase in job postings in zip codes that overlap with at least one Opportunity Zone, although they find small effects in certain types of areas (that is, urban areas and areas with a larger black population). Finally, in the study mentioned earlier with a regression discontinuity design, Corinth and Feldman (2023) find no evidence of a causal effect on various dimensions of economic activity, such as business formation and spending based on MasterCard data. One exception to studies finding limited effects is Arefeva et al. (2024), who find that employment rates in Opportunity Zones rose substantially as soon as 2019, the first year with significant Opportunity Zone investment (see Coyne and Johnson 2023), implying fast deployment of capital into previously unplanned projects requiring large numbers of workers. Future research will be needed to reconcile the findings of the early research on Opportunity Zones to determine their effect on downstream outcomes.

The mostly limited evidence for positive impacts of Opportunity Zones on resident wellbeing or other downstream outcomes, at least to date, is consistent with a relatively limited investment response in sectors most relevant for workers. Ultimately, Opportunity Zones were designed in a way that provided the largest tax incentives for investment that would have occurred anyway. Opportunity Zones also incentivized some investment that would not have otherwise occurred, but only if it had close to the rate of return it could have received outside the Opportunity Zone. The empirical evidence to date is consistent with these implications of the program's design. The causal effect of Opportunity Zones on investment appears relatively limited, except in the case of residential investment, where returns may be more certain over the long-run. There is limited evidence that the investment effect that occurred has translated into broader improvements to resident well-being, the ultimate goal of the Opportunity Zone policy. Wessel (2021) offers examples of projects such as storage centers and apartment buildings for students, which may be less likely to drive employment growth. While there are likely specific examples in which the policy-induced investment would not have otherwise occurred and that resident well-being will improve as a result, this does not necessarily appear to be the norm to date. Of course, it may take more time for the effects of increased investment to translate into broader changes in wellbeing (Fikri and Glasner 2023). It will be important to continue to monitor the effects on investment, economic development, and resident well-being in the years to come so that we may have a more informed view of the effects of Opportunity Zones on distressed neighborhoods. This includes any effects on the housing market and geographic sorting. To the extent that increased investment in multi-family housing does not crowd out other housing construction, the expanded supply could relieve pressure on home price increases in gentrifying areas. To the extent that increased multi-family investment increases home prices

without adding to overall housing supply, it could make housing less affordable for renters while increasing the wealth of existing homeowners.

Implications for Future Place-Based Policies

What implications does the experience with Opportunity Zones offer for designing future policies that attempt to reduce geographic disparities in well-being by providing tax incentives for investment? We focus on two criteria: targeting distressed areas and improving the outcomes of residents in those areas.

Targeting Distressed Areas

The central purpose of place-based policies is to improve the outcomes of economically distressed neighborhoods or regions. Contrary to early concerns that Opportunity Zones would ultimately benefit relatively better off areas, investment in Opportunity Zones has disproportionately flowed to the lowest income census tracts for the country as a whole. In Figure 5, we plot mean investment in Opportunity Zones for census tracts in various median income buckets, without conditioning on the presence of Opportunity Zone investment, designation as an Opportunity Zone, or eligibility to be an Opportunity Zone. Thus, this figure evaluates the targeting of the Opportunity Zone policy as a whole, incorporating the initial decision by Congress to make certain areas eligible, the decisions by state governors to designate certain eligible areas as Opportunity Zones, and the decisions by private investors to invest in certain Opportunity Zones. In the lowest median income bucket, including census tracts with median household incomes as of 2013–2017 (in 2017 dollars) of less than $21,000, the average census tract received about $1.1 million of Opportunity Zone investment annually. That is close to twice the Opportunity Zone investment received by census tracts with median incomes between $21,000 and $29,000, over three times that received by census tracts with median incomes between $29,000 and $46,000, and over ten times that received by census tracts with median incomes above $46,000.[5]

As shown in Figure 5, Opportunity Zone investment is only modestly less targeted at lower income census tracts than New Markets Tax Credit investment. For example, census tracts with median incomes below $21,000 ($42,000) received 10 percent (55 percent) of Opportunity Zone investment compared to 14 percent (72 percent) of New Markets Tax Credit investment. This pattern holds despite the fact that Opportunity Zone investments are constrained only by the census tracts that were eligible and ultimately chosen by state governors. In contrast, each New Markets Tax Credit project had to be separately approved by authorities. An

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[5]We rely on publicly reported data from Coyne and Johnson (2023) on Opportunity Zone investment. We note that H.R. 7467, introduced in the United States House of Representatives in April 2022, would require Treasury to make census tract level investment, among other items, publicly available. Such reporting would be highly beneficial for purposes of evaluating the Opportunity Zones policy.

Figure 5

Mean Annual Investment by Census Tract Median Income, Opportunity Zones and New Markets Tax Credit, 2019–2020

Panel A. Opportunity Zones

Panel B. New markets tax credit
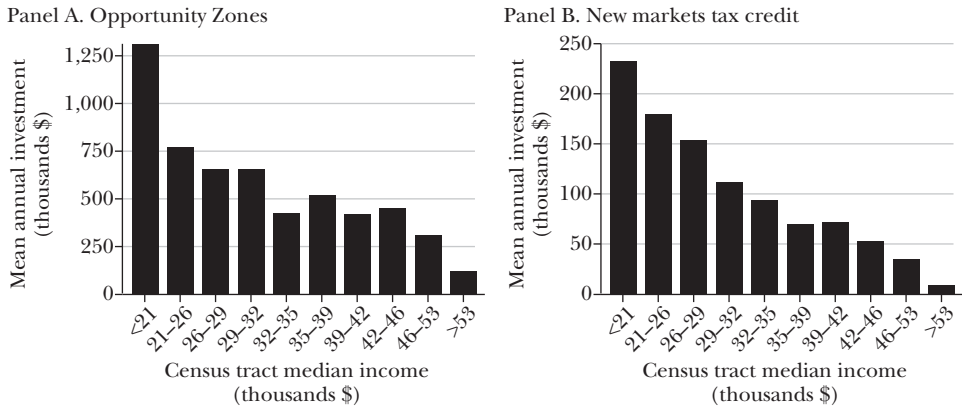
Source: US Census Bureau (2024), CFDI (2023), Coyne and Johnson (2023), and authors' calculations.
Note: Figure plots mean Opportunity Zone investment (panel A) and mean New Markets Tax Credit investment (panel B) by census tract median income, for the period 2019–2020. The amount of Opportunity Zone investment shown is the amount of qualified Opportunity Zone property as of 2020, which includes a small amount of investment made in 2018 in the initial months after zones were designated. Means are calculated over all census tracts in each bucket, regardless of whether a tract received or was eligible for investment. Median income buckets are defined based on the results in Coyne and Johnson (2023) which reported dollars of Opportunity Zone investment in each decile of the Opportunity Zone distribution, but not the full census tract distribution.

important lesson is that allowing for substantial flexibility does not necessarily undermine targeting relative to a more centralized and prescriptive approach. At the same time, the Opportunity Zone policy as a whole was not as targeted as it could have been. Over half of all census tracts were originally made eligible to potentially be designated as Opportunity Zones. In many states, state governors could have selected a substantially more distressed set of census tracts than they actually did.

Policymakers could improve the targeting of future place-based policies by further restricting the set of eligible areas; for example, limiting the contiguity condition for Opportunity Zones, increasing the poverty rate limit, or decreasing the median income limit. If states are to play a role in the selection of areas, they could be provided more time and resources to design a more careful selection; indeed, the process could be overseen by the US Treasury to ensure it meets the goal of targeting and relies on evidence about the places most likely to benefit from increased investment. At the same time, if a policy only provides incentives for investment in highly distressed areas that are unlikely to receive investment regardless of the incentive, then such a policy is doomed to fail. The ideal is to identify areas where the marginal social product of capital is higher than the private value, and to provide sufficient incentives to induce investment.

Improving Outcomes of Residents in Targeted Areas

For a policy that provides incentives for investment in distressed areas to succeed, then (1) the policy needs to induce investment that would not otherwise have occurred, and (2) the induced investment must improve the outcomes of distressed areas, preferably in a cost-effective way that does not harm other distressed areas.

Designing a policy to reward investment that would not have otherwise occurred is difficult, because policymakers cannot observe a counterfactual world without the policy. Instead, policymakers must rely on crude criteria, such as targeting the incentive to places that are more distressed or perhaps have received less investment in the past. Such criteria can be applied at the geographic level, in the case of Opportunity Zones, or at both the geographic and the investment level, in the case of the earlier New Markets Tax Credit. When policymakers or their designees select specific investments for rewards, they can rely on the characteristics of the investment and investor to try to assess whether it would have occurred in the counterfactual world without the policy. At the same time, the individuals and systems charged with selecting individual investors may have imperfect information and conflicting motivations, so it is not necessarily the case that more centralized approaches will more effectively reward investment that would not otherwise have occurred.

Opportunity Zones were designed in a way that rewarded investment that would otherwise have occurred in the policy's absence. Qualified Opportunity Funds have no obligation to invest in marginal projects, nor are there rules that attempt to make this more likely. This design choice was intentional design, given that Opportunity Zones sought to remove the layers of red tape, oversight, and complexity that can hamstring place-based investment incentive programs (Bernstein and Hassett 2015). But it does come with a potential cost in providing windfalls for investment that would have occurred anyway. Another lesson of the Opportunity Zones experience is that more attention should be paid to finding ways of ensuring that a greater share of investment benefiting from the policy is caused by the policy, without necessarily centralizing investment decisions to central authorities that can stifle participation and have its own problems in identifying productive projects that would not have otherwise occurred. Policymakers could strengthen incentives for inframarginal investment in Opportunity Zones. For example, one simple reform could provide greater forgiveness of the tax on the original capital gain, which would disproportionately increase the reward for investments with a somewhat lower private rate of return, but a potentially substantial social rate of return.

Even if a place-based policy induces investment, it will succeed only if that investment improves the outcomes of residents in distressed areas. For example, it is possible that new investment projects induced by the policy ultimately fail because of a skills mismatch with the existing workforce, a lack of necessary infrastructure for the particular project, or other factors. Alternatively, it is certainly plausible that Opportunity Zone investments that are induced by the policy and succeed on their

own terms do not ultimately benefit area residents. For example, Wessel (2021) documents the case of an investor who sets up a Qualified Opportunity Fund to open a storage facility, which employs a minimal number of workers and is likely to have little impact on the area economy. The mostly limited evidence for significant improvements for Opportunity Zone residents suggests that any investment induced by the policy has not necessarily improved Opportunity Zones resident outcomes, at least so far. Policymakers could consider restricting tax benefits to project types that employ a substantial number of workers.

Finally, residents of targeted areas should be helped without hurting residents of other distressed areas. To the extent that place-based tax incentives move investment from one distressed area to another, it will not improve overall welfare. Designating Opportunity Zones at the census tract level, a relatively fine geographic area, could potentially make negative spillover effects more likely. At the same time, providing state governors with autonomy to select Opportunity Zones—at least in theory—allowed them to select groups of contiguous tracts when appropriate, as long as each tract qualified. Thus, one approach may simply be to offer governors better information on the implications of Opportunity Zone selection for potential spillover effects, prior to the selection process.

References

Arefeva, Alina, Morris A. Davis, Andra C. Ghent, and Minseon Park. 2024. "The Effect of Capital Gains Taxes on Business Creation and Employment: The Case of Opportunity Zones." Unpublished.

Atkins, Rachel M. B., Pablo Hernández-Lagos, Cristian Jara-Figueroa, and Robert Seamans. 2023. "JUE Insight: What Is the Impact of Opportunity Zones on Job Postings?" *Journal of Urban Economics* 136: 103545.

Austin, Benjamin A., Edward L. Glaeser, and Lawrence H. Summers. 2018. "Jobs for the Heartland: Place-Based Policies in 21st Century America." *Brookings Papers on Economic Activity* 49 (1): 151–232.

Bartik, Timothy J. 2020. "Using Place-Based Jobs Policies to Help Distressed Communities." *Journal of Economic Perspectives* 34 (3): 99–127.

Bernstein, Jared, and Kevin A. Hassett. 2015. *Unlocking Private Capital to Facilitate Economic Growth in Distressed Areas.* Washington, DC: Economic Innovation Group.

Busso, Matias, Jesse Gregory, and Patrick Kline. 2013. "Assessing the Incidence and Efficiency of a Prominent Place Based Policy." *American Economic Review* 103 (2): 897–947.

CFDI. 2023. "Community Development Financial Institutions Fund FY 2023 New Markets Tax Credit Public Data Release: 2003–2021." https://www.cdfifund.gov/documents/data-releases. (accessed December 28, 2023).

CFDI. 2024. "Community Development Financial Institutions Fund, Opportunity Zones Resources." https://www.cdfifund.gov/opportunity-zones (accessed on April 30, 2024).

Chen, Jiafeng, Edward L. Glaeser, and David Wessel. 2023. "JUE Insight: The (Non-)effect of Opportunity Zones on Housing Prices." *Journal of Urban Economics* 133: 103451.

Chetty, Raj, Nathaniel Hendren, and Lawrrence F. Katz. 2016. "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment." *American Economic Review* 106 (4): 855–902.

Corinth, Kevin, and Naomi E. Feldman. 2023. "The Impact of Opportunity Zones on Commercial Investment and Economic Activity." IZA Discussion Paper 15247.

Corinth, Kevin, and Naomi Feldman. 2024. "Replication data for: Are Opportunity Zones an Effective Place-Based Policy." American Economic Association [publisher], Inter-university Consortium for Political and Social Research [distributor]. https://doi.org/10.3886/E204121V1.

Coyne, David, and Craig E. Johnson. 2023. "Use of the Opportunity Zone Tax Incentive: What the Tax Data Tell Us." Unpublished.

Ehrlich, Maximilian v., and Henry G. Overman. 2020. "Place-Based Policies and Spatial Disparities across European Cities." *Journal of Economic Perspectives* 34 (3): 128–49.

Fikri, Kenan, and Benjamin Glasner. 2023. "Are Opportunity Zones Working? What the Literature Tells Us." *Economic Innovation Group*, October 12. https://eig.org/opportunity-zones-research-brief.

Frank, Mary Margaret, Jeffrey L. Hoopes, and Rebecca Lester. 2022. "What Determines Where Opportunity Knocks? Political Affiliation in the Selection of Opportunity Zones." *Journal of Public Economics* 206: 104588.

Freedman, Matthew. 2012. "Teaching New Markets Old Tricks: The Effects of Subsidized Investment on Low-Income Neighborhoods." *Journal of Public Economics* 96 (11): 1000–1014.

Freedman, Matthew, Shantanu Khanna, and David Neumark. 2023. "JUE Insight: The Impacts of Opportunity Zones on Zone Residents." *Journal of Urban Economics* 133: 103407.

Gaubert, Cecile, Patrick M. Kline, and Danny Yagan. 2021. "Place-Based Redistribution." NBER Working Paper 28337.

Glaeser, Edward L. 2010. *Agglomeration Economics.* Chicago: University of Chicago.

Ham, John C., Charles Swenson, Ayşe İmrohoroğlu, and Heonjae Song. 2011. "Government Programs Can Improve Local Labor Markets: Evidence from State Enterprise Zones, Federal Empowerment Zones and Federal Enterprise Community." *Journal of Public Economics* 95 (7): 779–97.

Neumark, David, and Helen Simpson. 2015. "Place-Based Policies." In *Handbook of Regional and Urban Economics*, Vol. 5, edited by Gilles Duranton, J. Vernon Henderson, and William C. Strange, 1197–1287. Amsterdam: North-Holland.

Neumark, David, and Timothy Young. 2019. "Enterprise Zones, Poverty, and Labor Market Outcomes: Resolving Conflicting Evidence." *Regional Science and Urban Economics* 78: 103462.

Neumark, David, and Timothy Young. 2021. "Heterogeneous Effects of State Enterprise Zone Programs in the Shorter Run and Longer Run." *Economic Development Quarterly* 35 (2): 91–107.

Reynolds, C. Lockwood, and Shawn M. Rohlin. 2015. "The Effects of Location-Based Tax Policies on the Distribution of Household Income: Evidence from the Federal Empowerment Zone Program." *Journal of Urban Economics* 88: 1–15.

US Census Bureau. 2024. "American Community Survey 5-year Public Use Microdata Samples, 2013–2017." https://data.census.gov (accessed May 2, 2024).

Wessel, David. 2021. *Only the Rich Can Play: How Washington Works in the New Gilded Age.* New York: PublicAffairs.

Wheeler, Harrison. 2022. Locally Optimal Place-Based Policies: Evidence from Opportunity Zones. Unpublished.

Seeking the "Missing Women" of Economics with the Undergraduate Women in Economics Challenge

Tatyana Avilova and Claudia Goldin

The economics undergraduate major has traditionally been large and popular at most of the highest-ranked US undergraduate institutions. It has also been predominantly male. In 2013, when the project we will describe was first conceived, there were almost three male economics majors for every female major, relative to overall numbers of male to female bachelor's degrees across the United States. Yet, female undergraduates had greatly increased as a fraction of all college students; in fact, their numbers exceeded those of male undergraduates around 1980 (in this journal, Goldin, Katz, and Kuziemko 2006). Economics was seemingly ignoring the change in student representation and not considering ways to attract more women. At that time, Goldin was the incoming president of the American Economic Association, and she raised the issue in various ways. She was soon persuaded by the Alfred P. Sloan Foundation to create a program to encourage more women to major in economics.

To prepare for this undertaking, Goldin obtained administrative data for a highly ranked undergraduate institution, dubbed "Adams College." In 2013, the fraction female among its economics majors was 0.35, similar to the ratio at Adams's

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peer institutions. At a number of institutions, incoming first-year students are asked, before they arrive at the college, what they believe their primary major will be. At Adams, twice as many men as women listed economics as their most probable primary major. Similar results held for its peer institutions. Therefore, even before students unpacked their bags, the die had been cast: two men planned to major in economics for every woman who did the same. The first lesson from the Adams data was that useful treatments must occur soon after students arrive on campus.

In 2014, we commenced work on a far-reaching project we termed the *Undergraduate Women in Economics* (UWE, pronounced "you") *Challenge*. The project was conceived as a randomized controlled trial, and it eventually included 88 schools (20 randomly chosen to be "treatment" schools and 68 in the control group). Its purpose was to understand why women were not majoring in economics to the same extent as were men and to create and evaluate "light-touch" and inexpensive interventions to address that gender gap.

We have written several papers about the reasons for creating the program, its implementation, and many offshoots of the program, and we will draw to some extent on those earlier papers here (Avilova and Goldin 2018, 2020; Goldin 2015). Now that undergraduate cohorts treated by the interventions have graduated, we can provide an assessment using nationwide data from the National Center for Education Statistics.

We begin describing the gender gap among economics majors and its trend across the last 35 years. We discuss in detail how the *UWE Challenge* was set up. We review some of the hypotheses, both from participants in the study and from the broader literature, on why a gender gap exists for economics majors. We then turn to the actual interventions. The bottom line is that UWE interventions were effective in increasing the fraction of female BAs who majored in economics relative to men in liberal arts colleges. Large universities as a group did not show an impact of the treatment. However, among the universities that implemented their own interventions as randomized control trials (what we call "RCTs within the RCT"), UWE interventions were moderately successful in encouraging more women to major in economics. We will speculate about why the interventions worked in some institutions but not in others, including the likelihood that control schools—which had already expressed interest in exploring ways to encourage more women to major in economics—may also have made efforts to increase women's enrollment in economics after being assigned to the control group.

The Gender Gap for Undergraduate Majors in Economics

Data on bachelor's degrees granted (either a Bachelor of Arts or a Bachelor of Science) and choice of college major are available from the Integrated Postsecondary Education Data System (IPEDS), which in turn is based on interrelated surveys conducted annually by the National Center for Education Statistics. Figure 1 shows the fractions of male and female students graduating from one of

Figure 1

Fraction Economics Majors among BAs by Gender for Top-100 Universities and Liberal Arts (LA) Colleges: 1985 to 2020
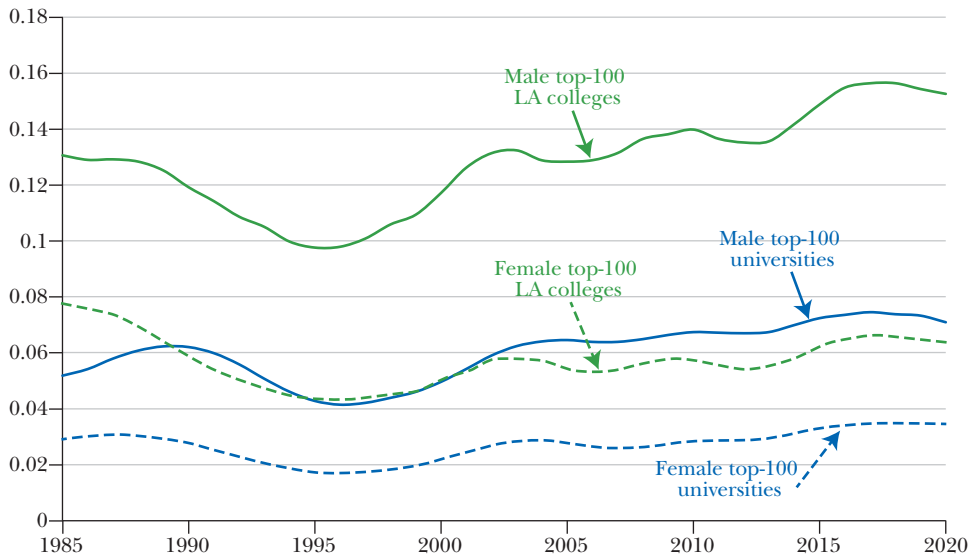
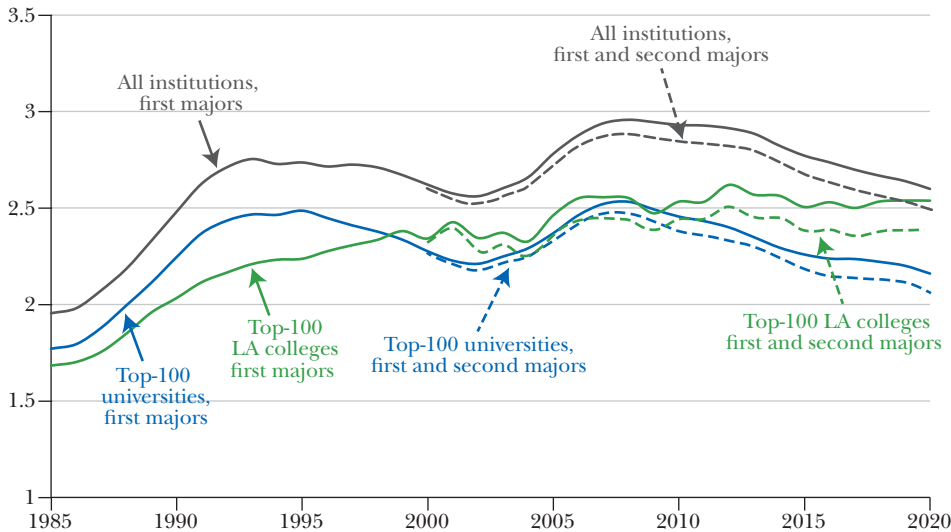*Source:* NCES, IPEDS online.
Note: The lists of "top-100" institutions (universities or liberal arts colleges) are from the combined 2011 and 2013 *US News & World Report* rankings. Both first and second economics majors are included (second majors are reported in the IPEDS data starting in 2001). Economics includes all fields under NCES CIP code 45.06. Years are from 1984 to 2021 and a three-year centered moving average is computed resulting in data for 1985 to 2020.

the top-100 universities or top-100 liberal arts colleges who majored in economics since 1985. Our definition of an economics major is that the field is included in National Center for Education Statistics (NCES) Classification of Instructional Programs code 45.06, which does not include business majors. We will soon see that even though our UWE program was open to all institutions, the vast majority with sufficient economics majors were in one of the two top-100 groups.

The gap in majors between men and women is clear from Figure 1. Around 6.5 percent of women BAs at the top-100 liberal arts colleges majored in economics in 2020, but 15.3 percent of men did. For the top-100 universities, the figures are 3.4 percent for women and 7.1 percent for men. Another feature of the graph is that there does not appear to be much overall change across the 35-year period for female economics majors. Although all the lines increase from the mid-1990s to the present, the increase followed an earlier decrease. The figures for men in both types of institutions are, however, significantly higher in 2020 than in 1985.

Our preferred measure of the gender gap in undergraduate economics majors will be the ratio of the male to female fractions just mentioned, for each type of

Figure 2
Male to Female Conversion Ratios: 1985 to 2020

Note: The male to female conversion ratio is given by $\left[\frac{\sum_i Male\_Economics\_Majors_{iy}/\sum_i Female\_Economics\_Majors_{iy}}{\sum_i Male\_BAs_{iy}/\sum_i Female\_BAs_{iy}}\right]$, which is the ratio of male to female economics majors divided by the ratio of male to female BAs across the institutions (i) included in each of the three groups in each year (y). Therefore, it is a national average for these institutions and aggregates all students. For the "top-100" groups, see note for Figure 1. "All" is for the entire United States. Solid lines give the conversion rate for the "first majors" only and dashed lines give the number for "first" and "second" majors, starting in 2001 (when the IPEDS began to report data on second majors). Note that adding second majors generally decreases the conversion ratio since relatively more women have economics as a second major. Schools are included only if they granted an undergraduate degree in economics. Economics includes all fields under NCES CIP code 45.06. The number of schools in each year for "all institutions" varies from about 1,500 to 1,900, and the average across the years is 1,758. Years are from 1984 to 2021 and a three-year centered moving average is computed resulting in data for 1985 to 2020.

institution or for all institutions. For example, in 2020 our measure of the gender gap would be (15.3/6.5) = 2.35 for top liberal arts colleges and (7.1/3.4) = 2.1 for top universities. When we analyze institutions separately, we will use a variant of the measure that uses the ratio of female to total majors, rather than female to male majors. Because these measures are scaled by the number of degree recipients, they show the extent to which male or female or all undergraduates are "converted" into economics majors. In consequence, we call the measure the "conversion ratio." In the example just given for liberal arts colleges, this means that in 2020, 2.35 times more men than women majored in (or were converted to) economics, adjusting for the greater number of female bachelor's degrees overall.

Figure 2 shows the conversion ratio for all institutions of higher education, as well as separately for the top-100 universities and top-100 liberal arts colleges presented in Figure 1. A complexity arises in the data that we highlight here. We have referred to the concept of a "major." But schools have increasingly allowed students to have double (or even triple) majors. Thus, total bachelor's degrees will not equal the sum of all majors when each graduate is allowed to have more than one major. The IPEDS began collecting information on multiple majors in 2001.

Majors are designated in the Integrated Postsecondary Education Data System as "first" and "second," even if representatives from economics departments have told us that majors at their institutions are of equal importance for each graduate and that there are no firsts or seconds. To explore whether the addition of second majors matters to the conversion rate, the solid lines of Figure 1 give only the "first" major and the dashed lines include both majors, "first" and "second," after 2001. We provide both to show that the differences are small but that women, more than men, take an additional major in economics when given the option.[1] Therefore, the number of male to female economics majors decreases somewhat when all majors are included rather than just the first major. It is not clear to us how the IPEDS allocates majors between first and second major when the institution treats them equally.[2] However, we will focus on the results for both majors, because the two lines are sufficiently similar.

In the most recent years, the number of male to female economics majors (adjusted for the number of BAs) exceeded 2.5 across all institutions, 2.35 for top liberal arts colleges, and 2.1 for top universities. As we noted before, these are the ratios of the fractions given in Figure 1 and demonstrate that men at US institutions outnumber women as economics majors more than 2.5 to 1.

The fraction of male and female BAs who majored in economics fluctuated across the 35-year period and, in consequence, so did the conversion rate. Although the proportion of women choosing to major in economics is higher now than 20 years ago in 2002, we are back to the levels achieved a decade earlier, in 1992. But in the last decade shown, with the exception of liberal arts colleges, there has been a relative increase in female economics majors. The Great Recession of 2007–2009 apparently led to an increase in economics majors in general, as economics often seems to attract more majors when the economy is malfunctioning

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[1] When the IPEDS first reported multiple majors in 2001, about 10 percent of all economics majors in our 88-school sample took it as a second major. At that time, the figure was about the same for men and women. But by 2021, about 19 percent of all female economics majors (first plus second) had economics as their second major, whereas 14 percent of the men did. The difference is even greater in the 23 liberal arts colleges in our sample, for which 24 percent of all female economics majors in 2021 had economics as their second major whereas 17 percent of the men did.

[2] The 2022/2023 IPEDS instructions do not include a clear way for schools to list double majors. The instructions are: "Double Majors: When a student receives a single degree with majors in two (or more) program specialties, report the degree in one program (1st major); you should report the second program specialty as a second major" (NCES 2022–2023). There is no guidance regarding which program to put first and second. If these are listed alphabetically, first majors will be a biased group. See also the discussion in Stock (2017).

in headline-grabbing ways. But the Great Recession also seems to have increased the *relative* number of female economics majors, except at liberal arts colleges.

The Birth of UWE

Given the historically low numbers of women relative to men in undergraduate economics, it is surprising how little attention was given to the subject. For example, in 1988, the American Economic Association (AEA) created the Commission on Graduate Education in Economics (COGEE) chaired by Anne Krueger (Goldin was one of the twelve members). The 18-page report allotted one paragraph to the fraction female among graduate students and applauded the increase of women among doctorates, which was 9 percent in 1977 but 19 percent in 1986. A smattering of articles explored why the representation of women in the undergraduate major had been low (for example, Canes and Rosen 1995; Dynan and Rouse 1997; Kahn 1995). The AEA Committee on the Status of Women in the Economics Profession (CSWEP) has collected survey data on the representation of women at different stages of the economics academic pipeline, including undergraduates, for several decades (Siegfried 2007). However, there was no major effort, of which we are aware, to change the status quo.

In the summer 2014, the Alfred P. Sloan Foundation generously funded a grant through the National Bureau of Economic Research that enabled the implementation of a randomized controlled trial, later named the *Undergraduate Women in Economics* (UWE) *Challenge*. The purpose of the randomized controlled trial was to uncover why women do not major in economics to the same degree as men and to assess what could be done about the disparity.[3]

In January 2015, UWE sent a letter, by email, to the department chair (or the undergraduate program coordinator) of every US college and university that had graduated at least 15 economics majors on average between the 2010–2011 and 2012–2013 academic years, asking if their department was willing to implement a set of interventions meant to increase the number of female majors.[4] Although there were around 1,600 institutions at that time that granted a bachelor's major in economics, only 344 met our criterion on the number of majors (and also being coeducational). In addition, we did not have correct email addresses for all departments and many of our emails did not reach the intended person. Despite that, we received 167 affirmative responses, an astonishingly large number.

The letter we sent listed the most recent conversion rate at that institution, because it was discovered that many department chairs and undergraduate program directors did not know about the large gender imbalance at their schools. The heads of the departments or undergraduate programs were also asked if they would

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[3] Tatyana Avilova was hired as the project manager for two years and then matriculated as a graduate student in economics at Columbia University, from which she received her PhD in 2022.

[4] Because Goldin was based at Harvard University, it was omitted from the sample.

be willing to cooperate in the collection of aggregated data that would not require Institutional Review Board approval. Finally, they were told that they would be given $12,500 if they were selected to be part of the program and were informed that the funds could be used in any reasonable way that might further the stated objective. A list of possible light-touch (and inexpensive) interventions was included (see Appendix 1 for the letter and the list of interventions).

The exceptionally large number of positive replies allowed us to limit the sample to 88 schools with a larger aggregate number of economics majors (around 30) and a modicum of female majors. The 88-school sample, therefore, is not a small group of volunteer institutions. The group from which the 88 were drawn was large among US institutions granting a bachelor's in economics. By excluding schools with very few economics majors, most of our sample schools were in the top-100 universities or top-100 liberal arts colleges. (However, it should be noted that although the aggregate number of majors among the sample institutions was increased, the fraction of bachelor's majoring in economics in many of the schools was still occasionally quite small.)

Of the 88 schools in the sample, 20 were randomly chosen as treatments, and the rest became controls. For the randomization process, the schools were ordered from highest to lowest ranked using a combination of the 2011 and 2013 *US News & World Report* rankings and then divided into four "clusters" or strata of 22 schools ($22 \times 4 = 88$). The selection involved taking five schools *randomly* from each of four clusters. Appendix 2 lists the schools in the treatment and control groups and the method used to select the treatments. We will return to the issue of clusters again in the empirical estimation, although because we randomized within the cluster they should not have any meaningful significance with regard to the treatment variable. Their relevance is that the clusters enabled us to obtain a highly diverse sample of treatment schools, even though there are only 20 in the group. Seven of the 20 are state flagship institutions, four are large state universities, five are small liberal arts colleges, three are Ivy League institutions, and one is a large private institution. A few have business schools with undergraduate programs that include an economics major.

In spring 2015, UWE leadership met with primary investigators (faculty and teaching staff) of the 20 treatment schools to discuss what might work at their institutions. During the following academic year, treatment institutions used the funding and guidance from the project organizers to propose and initiate interventions that would disproportionately increase the number of female economics majors. The treatment institutions were encouraged, although not obligated, to continue the interventions going forward, but funding was provided only in the treatment year.[5]

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[5] In fall 2018/winter 2019, remaining funds from the Sloan grant were made available to the schools as mini-grants for additional interventions. Six schools received grants ranging from $1,500 to $3,000. One treatment school (University of Central Florida) was granted a one-year extension to begin the program due to a personnel problem.

Why Are Women Underrepresented as Economics Majors?

The experiences of the schools in the *UWE Challenge* and their undergraduates revealed several issues concerning the provision of accurate information to all students about economics and regarding the career possibilities of an economics major.

One set of issues involves the considerable lack of knowledge about the field of economics among undergraduates. For example, many potential majors did not know that economics concerns subjects such as economic development, health, education, inequality, economic history, and population change and thought that economics was mainly or solely the study of financial markets.[6] That view often dissuades women from majoring in economics, at the same time that it encourages men to do so.[7] Another little-known fact is that there is a large and causal earnings premium for majoring in economics, independent of gender (Black, Sanders, and Taylor 2003; Bleemer and Mehta 2022).

A second set of issues is that underrepresentation can feed on itself. If fewer women are already economics majors, the field may seem less welcoming to women considering the field. Given the history of fewer women economics majors, there are also fewer women as economics alumnae or economics faculty, which again can make it harder for women who might be interested in economics to commit to the major. We also learned from many faculty and students that because economics is considered a conservative major and is criticized (unfairly, in our opinion), female undergraduates (who may be more sensitive than their male counterparts) could be dissuaded by some of their peers from majoring in the field. Economics clubs, for women or for all undergraduates, can provide strength in numbers and help foster a more welcoming environment.

Third, an often-heard hypothesis for fewer women majoring in economics is that it is rooted in less interest or ability in mathematical reasoning. However, the data from Adams College were clear: mathematical ability had little to do with the initial decision to major in economics and with the choice of an eventual major. This evidence is backed up by the fact that the fraction of female majors in economics is lower than in some fields of science, technology, engineering, and mathematics (in this journal, Bayer and Rouse 2016). Indeed, it does not appear that differences in aptitude, earlier course performance, or demographic characteristics play an important role in the fraction of women relative to men majoring in economics (Emerson, McGoldrick, and Siegfried 2018).

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[6] The recognition that undergraduates do not know the range of careers, led the American Economic Association to produce the video, "Economics: it's much more than you think." The AEA video is at https://www.aeaweb.org/resources/students/careers/video/career-in-economics.

[7] In this way, gender imbalances also change the nature of economics, especially at the PhD level, since women and men gravitate to different fields within economics. On differences in economics fields by gender, see Fortin, Lemieux, and Rehavi (2021). On differences in opinions about economic policy by gender, see May, McGarvey, and Whaples (2014).

Finally, women's greater sensitivity to feedback from grades appears to be an important factor that has led many to exit the field after taking the principles sequence, even when they have the *same* grades as men who remain with the major. Grading in economics is often akin to grading in the hard sciences, and less generous than grading in other social sciences or the humanities. Women who take principles but do not eventually major in the subject are disproportionately among those who obtained a grade below an A− in the course (Goldin 2015). The relationship holds even among those who, when entering college, gave economics as their probable major.

At "Adams," 43 percent of the male students who received an A in the introductory course eventually majored in economics and 41 percent of the female students did. But 40 percent of the men who received a B+ eventually majored in economics, whereas 26 percent of the women did. The difference is even greater for those who got a B. Male undergraduates at "Adams" majored in economics almost regardless of their grade in principles. Therefore, conditional on the grade received, female students have a far steeper gradient (in other words, greater "grade sensitivity") regarding their likelihood of majoring in economics. Similar results have been found by Patnaik et al. (2023) for the University of Wisconsin–Madison and by Antman, Skoy, and Flores (2022) for the University of Colorado Boulder. Butcher, McEwan, and Weerapana (in this journal, 2014) show how a college-wide anti-grade inflation policy increased economics majors at an all-women's college.

It is possible that female students work harder in subjects at which they excel (or are told they excel), whereas male students take subjects they know will eventually benefit them. Female students may seek more comfort in their selection of a major, whereas male students stick with their goal even if they do poorly. Another possibility is that female students consider their grade in an introductory course to be an indicator of their future success in the discipline, whereas male students do not interpret it as such.

One factor seemed clear and imperative. Because majoring in economics requires taking many courses in sequence, accurate information about the major must be delivered early for it to have an impact on the choice of major.

Light-Touch Interventions and Their Effects on Choice of Economics as a Major

Types of Interventions

Most randomized controlled trials have specific treatments. But one size would not fit all the circumstances of our treatment institutions, which varied by size, resources, commitment of faculty, and the use of instructors and adjuncts. Instead, a list of potential light-touch and inexpensive treatments in three (somewhat overlapping) areas was assembled (again, see Appendix 1 for a fuller list) and treatment schools were requested to use several of them. Some schools designed their own inspired by the proposed interventions. Treatment schools submitted proposals and

progress reports, and these have informed our knowledge of the treatments each used. The treatments can be broadly grouped into three categories.

(1) *Better Information*: These interventions were meant to provide more accurate information about economics and the career paths open to economics majors. Treatment schools in this category held pre-major department information sessions. Some created eye-catching flyers to give to first-year and upper-class students, either at academic fairs or at pre-major advising meetings. Some schools ensured that female professors, instructors, and/or upper-year students were at informational fairs. Prominent female alumnae, especially those working in exciting and diverse fields, were invited to speak at events.

(2) *Mentoring and Role Models*: The intent of these interventions was to create networks among students and to show support for their decision to major in the field. Many of the treatment schools initiated "Undergraduate Women in Economics" clubs and the *UWE Challenge* sponsored several regional conferences. Departments organized clubs that either focused on recruiting women to economics or opened membership to all students but made promoting diversity in economics a central mission. The clubs were resource-intensive but appeared to be useful at both the larger departments and the liberal arts colleges. Schools that regularly had seminars invited more female speakers. The online Appendix lists many of the undergraduate conferences that were sparked by the *UWE Challenge*. Departments were encouraged to create programs to hire undergraduate research assistants, particularly women.

(3) *Instructional Content and Presentation Style*: These interventions were intended to improve economics courses (primarily introductory courses, but not only those) to make them more relevant to a wider range of students. Four treatment schools (Connecticut College; University of California, Berkeley; University of Connecticut; and University of Richmond) created courses that expanded the topics discussed to demonstrate the wide range of economics and its broad concern with individual well-being.

Many schools also used a variety of nudge methods to encourage students. If women are more dissuaded from majoring in economics when they get below an A− in the principles course, then a treatment that involves sending an email to all B+ or B students after the midterm explaining that economics is difficult and that they received a very good grade should positively impact women more than men.

The Randomized Controlled Trial

The UWE randomized controlled trial began in fall 2015. The target treatment group consisted of first-year undergraduates and sophomores who had not yet selected their majors. Even juniors and seniors could have been "treated" if the treatments incentivized them to change their major to economics or to declare

a second major in economics. Much would have depended on the type of treatment, whether it was part of a class (such as having a female guest lecturer in principles) or a broader department event.

Again, schools elected to have a variety of treatments, some of which would have had an impact on all undergraduates and some of which would have affected only students in certain courses, such as principles. It is possible that majors graduating as early as the 2015–2016 academic year could have been "treated." However, most of the impact would have been experienced among those who entered as first-years during the treatment year and graduated in academic year 2018–2019 or later, and for the existing sophomores, those graduating in academic year 2017–2018 or later. Of course, because many students take more than four years to complete their bachelor's degree, the impact of the treatment could last beyond the cohorts' expected graduation years.

To provide some broader empirical context to the analysis, Figure 3, panel A, graphs the fraction female among economics majors in the 88 institutions in the analysis sample from 2001 to 2021 and separately for the 23 liberal arts colleges and the 65 universities. Note that the institution is the unit of analysis in Figure 3 and all institutions are treated equally. (This is in contrast to Figures 1 and 2, in which students are aggregated by type of institution.) The fraction female among economics majors by institution in Figure 3, panel A, varies from around 0.29 to 0.32 and is higher for the liberal arts colleges than the others. The fraction declined leading up to 2008 and then rose somewhat. (Our measure here uses both "first" and "second" majors, for students with more than one major.)

But again, the fraction of *all* undergraduates and among *all* bachelor's who are female also increased in this period and varied across institutions. Thus, we calculate a version of the conversion ratio used earlier. In this case, we calculate the share of female economics majors out of total female bachelor's degrees and divide by the share of total economics majors out of total bachelor's degrees. We use this version when individual schools are the unit of observation (here and in our regression analysis), because the number of female economics majors in some schools will be fairly small, and the earlier conversion ratio from Figure 2 is highly sensitive to observations with a very small number of female economics majors.

This alternative conversion ratio is graphed in panel B of Figure 3. The level varies from around 0.52 to 0.62, and the time trend, not surprisingly, is similar to that for the fraction female among economics majors. This ratio is, like that in panel A, higher for the liberal arts colleges.

Table 1 summarizes our evaluation of our year-long interventions and whether they increased the adjusted ratio of female majors to all majors. We present the analysis in a series of four regressions. Data for all 88 schools are included in column 1; liberal arts colleges (five treatments and 18 controls) are in column two; all institutions other than the liberal arts colleges (15 treatments and 50 controls) are in columns 3 and 4.

The first two rows of Table 1 show, for purposes of context, the average value of the dependent variable, which is the total conversion ratio, and the average value

**Fraction Female and Female to Total Conversion Ratio:
88 Treatment and Control Schools, 2001–2021**

Panel A. Fraction female among economics majors in the 88 treatment and control schools

Panel B. Conversion ratio of female BAs relative to total BAs among the 88 treatment and control schools
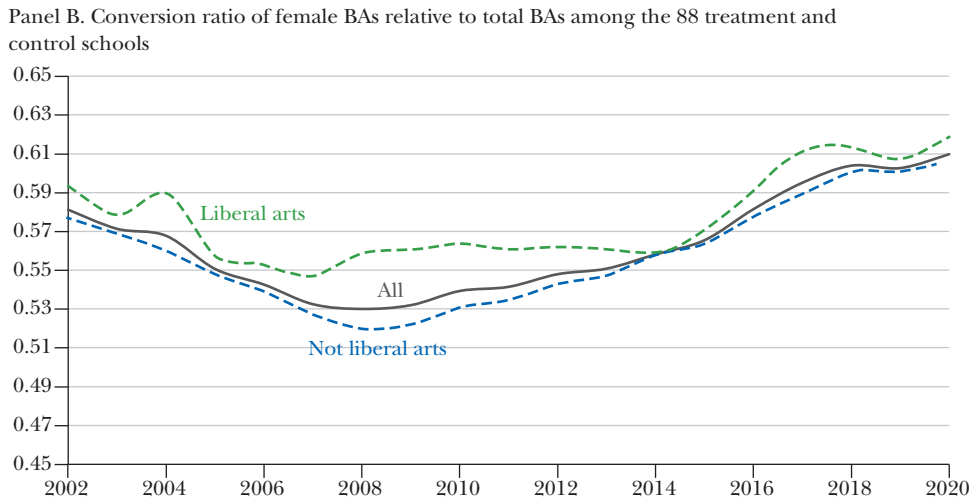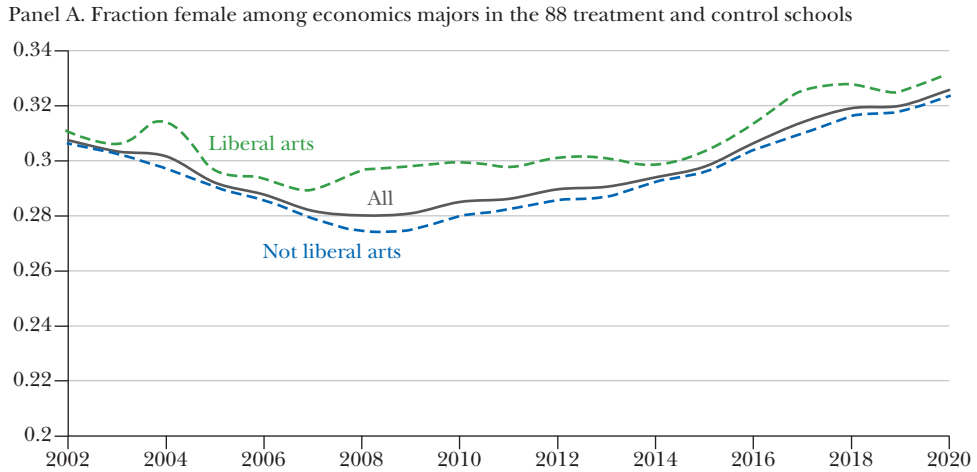
Source: See Table 1.
Note: School data are not weighted and each institution is an observation. Part B: Conversion ratio is given by $\left[\frac{(Female\_Econ\_Majors/Total\_Econ\_Majors)}{(Female\_BAs/Total\_BAs)}\right]_{iy}$ and is the dependent variable in Table 1 (includes double majors since 2001). All series are three-year centered moving averages.

of the female share of economics majors. These averages, not unsurprisingly, are similar across the four columns.

We set the variable *Treatment* equal to one for each of the treatment schools and zero for the controls. The variable *Post* is set equal to one in each of the post-treatment academic years from academic years 2017–2018 to 2020–2021 (because of the small number of observations in each year, we follow this approach rather

Table 1

Evaluating the UWE Treatment on the Female to Total Conversion Ratio

	All institutions (1)	Liberal arts colleges (2)	All except LA colleges (3)	All except LA colleges (4)
Mean of the dependent variable	0.567	0.580	0.562	0.562
Mean of (female econ/total econ)[a]	0.300	0.308	0.297	0.297
Treatment school	0.0051 (0.0087)	0.0332 (0.0160)	−0.0109 (0.0103)	0.00811 (0.0128)
Post	0.0479 (0.0171)	0.0210 (0.0229)	0.0630 (0.0235)	0.0715 (0.0238)
Treatment × post	0.0127 (0.0197)	0.101 (0.0353)	−0.0169 (0.0234)	−0.0511 (0.0291)
Own RCT				−0.0471 (0.0185)
Own RCT × post				0.0846 (0.0426)
Liberal arts	−0.139 (0.0138)			
Public	0.0250 (0.0144)		0.0577 (0.0159)	0.0560 (0.0159)
log(Total BAs)	−0.0599 (0.00861)	−0.0473 (0.0228)	−0.0646 (0.00962)	−0.0635 (0.00962)
Constant	1.106 (0.0640)	0.858 (0.140)	1.167 (0.0716)	1.154 (0.0718)
R^2 (adjusted)	0.287	0.132	0.338	0.341
Number of observations	1,848	483	1,365	1,365

Source: NCES, IPEDS; first and second majors combined.
Note: Standard errors are in parentheses. Dependent variable is the female to total ($=$ female $+$ male) conversion ratio defined as $\left[\frac{(Female\_Econ\_Majors/Total\_Econ\_Majors)}{(Female\_BAs/Total\_BAs)}\right]_{iy}$ for each institution (i) in year (y). Treatment $= 1$ for the 20 treatment schools (see Appendix 1). The sample is from AY 2000-01 to AY 2020-21. Post $= 1$ for AY 2017-18 to AY 2020-21. Own RCT $= 1$ for the six treatment schools that did their own RCTs (see text): Colorado State University; University of California, Santa Barbara; University of Illinois Urbana-Champaign; University of Colorado Boulder; Southern Methodist University; and University of Wisconsin–Madison. Treatment was delayed for one year at the University of Central Florida, and the Post indicator has been changed accordingly. "Cluster" dummies (see Appendix 2) and their interaction with Post are included in all columns (see the online Appendix for the coefficients). Observations $=$ number schools $\times$ years.
[a] The fraction of all economics majors who are female, *not* scaled by the fraction of BAs who are female. See also Figure 3, panel A.

than doing an event study estimating separate effects for each of the years). The key variable for interpreting our results is the interaction (*Treatment × Post*), where the coefficient measures whether the conversion ratio at the treatment schools shows a meaningful change in the after-treatment period relative to the controls, as in a standard difference-in-differences analysis.

The main finding in Table 1 is that a treatment effect of the UWE intervention is discernable and substantial for the liberal arts colleges (column 2), but not for the

entire group of treatment schools (column 1) or the non–liberal arts institutions more broadly (column 3). The coefficient on (*Treatment × Post*) for the liberal arts colleges is 10 percentage points or 17 percent of the mean for the dependent variable. However, for the entire sample, the coefficient on (*Treatment × Post*) is only about 1.3 percentage points (with a large standard error) or 2 percent of the mean for the dependent variable, and for the "All Other" sample the coefficient on (*Treatment × Post*) is negative—and not statistically significant in either case.

Before discussing potential reasons for the different impact by type of institution, it will be useful to mention the other control variables. All columns include a variable to adjust for the total size of the institution as measured by (log) bachelor's degrees granted. When relevant we also include a variable for whether the school is a liberal arts college, and whether the school is public or private. Note that the coefficient on liberal arts college in column 1 is negative because of the addition of the log of bachelor's degrees and the cluster dummies. The negative coefficient on the log of bachelor's degrees is also why the constant term is large (there are no schools with just a few students!). None of these controls has much, if any, impact on the coefficient of interest, that on (*Treatment × Post*).

We turn now to the interesting findings in column 2. One possible reason for the larger effect of treatments in the liberal arts colleges is their higher faculty–student ratio. In addition, the greater commitment from those faculty to the treatments may have enhanced the effects at liberal arts colleges. Several of the larger universities that attempted multiple interventions struggled to get broader faculty buy-in, despite the enthusiasm of the faculty and staff who were directly involved in the *UWE Challenge.* Most faculty participated in one-time interventions, but were less enthusiastic about those that demanded continued commitment. Department chairs at larger institutions were more likely to express concern about increased burdens on their female and underrepresented minority faculty.

Liberal arts colleges had other advantages as well. Their smaller size made it easier to reach potential majors. The relative size of the major may have also made a difference. In 2020, for example, just one out of every 200 bachelor's degrees at the University of Central Florida, the largest of the treatment institutions, majored in economics, and 1 out of 100 did so at Illinois State University. At the University of California, Berkeley, 1 out of 12 majored in economics, and at Princeton, 1 out of 10 did. But at Williams College and Connecticut College, 1 in 5 graduates majored in economics. (Again, anyone with an economics major is included in these computations, even if they had another major as well.)

Adding to the problems of attracting more majors at large universities is the fact that in some public universities (such as the University of California, Berkeley), total enrollment in economics is limited by the institution. Also, some larger state universities have sizeable and prestigious (compared to other programs at the school) undergraduate business majors that compete directly with economics as a major.

But although there are ample reasons why the light-touch interventions could have reached too few undergraduates at some of the larger institutions, six

of the treatment universities did their own randomized controlled trial and evaluated them using administrative records from the schools (for which they each had approval from their own Institutional Review Board). We will discuss these randomized controlled trials (we called them "RCTs within the RCT"), and their findings, in more detail below. The deliberate implementation of experimental treatments and the presence of invested faculty may have enhanced the effect of the UWE treatment.

Here, we explore this possibility in column 4 of Table 1, where we have added a dummy variable (*Own RCT*) for the six treatment institutions that implemented their own UWE trials in the form of a randomized control trial within their own institution and interacted it with *Post*. The effect of their trial on the impact of the UWE intervention was 8.5 percentage points, or about 15 percent of the mean of the dependent variable. Note that all of the six are treatment schools. We do not have enough information about the control schools to include a similar variable, although we will discuss interventions by the few we have learned about. It should also be noted that the six treatment institutions had been below-average regarding their conversion rate (the coefficient on *Own RCT* is negative) and may have been prompted to do their own randomized controlled trial by a sense that they were laggards and that there was low-hanging fruit.

We should note an important, but not easily resolved, issue with our conclusion about the liberal arts colleges. First, our estimation for the five liberal arts colleges in the treatment group indicates that the increase in the conversion ratio preceded the treatment period. (The online Appendix provides a graph of the year dummies interacted with the treatment dummy.) There appear to be parallel trends for treated and untreated liberal arts colleges from 2001 to 2011, but from 2012 to 2014, the five liberal arts colleges in the treatment group show a higher conversion ratio before the treatments even began. We have sought to understand these anomalous findings, but given the size of our sample, we cannot.

Randomized Control Trials within the Challenge

As we noted above, six treatment schools—Southern Methodist University; University of Wisconsin–Madison; Colorado State University; University of California, Santa Barbara; University of Illinois Urbana-Champaign; and University of Colorado Boulder—executed their own randomized controlled trials. These interventions had mixed results.

Two of the most successful randomized controlled trials focused on role model interventions. At Southern Methodist University, Porter and Serra (2020) ran a field experiment to evaluate the effect of visits from two female alumnae of the economics department. This role model intervention increased the fraction of women taking the intermediate course within a year by 11 percentage points (on a base of 12 percent) and increased the fraction of women majoring in economics by more than 6 percentage points (on a base of less than 9 percent). These effects seem very large, perhaps because the two visitors were carefully selected by considering their occupations, appreciation for the field of economics, communication

skills, and overall "charisma."[8] There was no statistically significant effect on male students.

Building on the Porter and Serra (2020) findings, Patnaik et al. (2023) implemented a similar intervention at the University of Wisconsin–Madison and confirmed that an alumni visit can encourage female students to persist in economics by increasing their likelihood of taking an intermediate microeconomics course. Furthermore, they show that the effect is strongest when there is a gender match: a female role model increases the likelihood that female students take intermediate microeconomics by 5.0 percentage points (on a base of 12 percent), with no effect on male students. A male role model increases taking intermediate microeconomics for male students by 8.1 percentage points (on a base of about 23 percent), with no effect on female students. In addition, the effect of the role models, all of whom were white and two of whom worked at a Wisconsin-based company, was strongest for white, in-state Wisconsin residents.

The four remaining randomized controlled trials used informational nudge interventions. One achieved great success at attracting women to the field, whereas the others, for various reasons, did not.

At Colorado State University, Li (2018) tested the effect of three interventions in two of our three categories: better information and mentoring. Students in the principles course were first randomized to receive information about potential career paths and earnings of economics majors. The treated students were further randomized to receive information about the grade distribution in the course, and female students who received a grade above the median for the course were randomized to receive an additional (nudge) message encouraging them to major in economics. Finally, all female students, regardless of their grade, were randomized to participate in peer mentoring activities throughout the semester. The aggregate impact of the treatments on the decision to major in economics was substantial. The largest effect was for female students with grades in economics principles above the median: their probability of declaring economics as a major in the following year increased by 5.4 to 6.3 percentage points, a substantial change given baseline levels of around 15 percent.

At the University of California, Santa Barbara, in an experiment by Bedard, Dodd, and Lundberg (2021), principles students who earned a C or higher were sent personalized emails after the final exam inviting them to attend an informational session about the major. All students who earned a B or higher were randomized to receive an additional nudge message of encouragement to major in economics. The nudge message increased the number of women in the Economics and Accounting major and the number of men in the Economics major (generally perceived to be the more rigorous of the two). But overall, the authors did not find a statistically significant aggregate effect for the probability that a male or female student would choose any one of the economics majors. Although the heterogeneity analysis is

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[8] Both alumnae visited all treatment classes, so it is not possible to disentangle their individual effects on the treated students.

imprecise due to small sample sizes, they did find that nudges were effective in increasing the fraction of students majoring in Economics and Accounting among Hispanic students, especially women.

At the University of Illinois Urbana-Champaign, Halim, Powers, and Thornton (2022) compared the effect of a nudge message that emphasized either the earnings benefits or the wide career benefits of majoring in economics. They found that neither treatment message had an effect on female students' propensity to take another economics course or their likelihood of majoring in economics. Likewise, they found no effect on men's likelihood of majoring in economics, although the earnings-information treatment did increase the probability that male students would take another economics course by 3.2 percentage points (on a base of 63 percent).

At the University of Colorado Boulder, Antman, Skoy, and Flores (2022) tested the effect of two interventions: one that elicited students' beliefs about their relative performance in a microeconomics principles course they recently took and another that elicited their beliefs *and* provided information about their actual relative performance in that course. The authors found that women in the first treatment group were about 16 percentage points (on a base of 8.3 percent) *less* likely to major in economics, consistent with the idea that women are more sensitive to grades than are men. Women in the second treatment group were no more likely to major in economics than women in the control group, suggesting that accurate information about relative performance counteracted the negative impact of asking students to recall their actual grade and then self-evaluate their relative performance. Both interventions, oddly enough, substantially increased men's probability of dropping out of college (!), but had no effect on either men's likelihood of majoring in economics or women's decision to drop out.

Three of the six randomized controlled trial interventions had large positive effects on female majors, and those that leveraged successful alumnae did best. Although these experiments were not uniformly successful in encouraging more women to major in economics, they were, in their defense, all creative and inexpensive interventions that built on the findings of the UWE project.

More important is the fact that faculty at these six institutions were more dedicated to the cause of advancing undergraduate women in economics. That may be why our investigation of the impact of the UWE treatment reveals that these six schools had a boost in the female to total conversion ratio in the post-treatment period.

Interventions at Control Schools

Our 88-school study sample consisted of institutions that had expressed interest in an initiative to encourage more women to major in economics. All the schools—both control and treatment institutions—received our suggested interventions, although the control group did not receive further guidance, nor opportunities to network with other departments, nor funding from the *UWE Challenge*.

However, other published work suggests that, consistent with their initial interest, at least some of the control institutions dedicated time and resources to addressing the gender gap in economics with methods resembling those at the treatment schools. At Oregon State University, a UWE control school, Pugatch and Schroeder (2021) found that simple nudge emails were enormously successful at encouraging students to major in economics. However, these interventions increased the majors only of the male students. Bayer, Bhanot, and Lozano (2019) conducted a field experiment at nine liberal arts colleges, testing the effects of one nudge message encouraging students to major in economics and of another message about the diversity of topics studied by economists. They found a positive and moderately significant effect of the broader message on students' likelihood of completing another economics course, but no difference by gender. We do not know the identity of the treatment schools in their study, but Bayer and Bhanot are both at Swarthmore College, a UWE control school.

Faculty at three other control institutions either used administrative data to learn about the factors that affect students' choice of major or conducted overviews of initiatives to encourage more women to join and persist in economics. At Georgetown University, Kugler, Tinsley, and Ukhaneva (2021) find that while women and men are equally likely to change majors in response to poor grades in relevant courses, women are more likely than men to switch out of male-dominated majors in science, technology, engineering, and mathematics. Using Wellesley College data, Butcher, McEwan, and Weerapana (2023) highlight the effect of the all-female liberal arts college environment on women's choice of mathematically-intensive fields. In this journal, Buckles (2019) presents a review of recent efforts to encourage women to join and persist in economics at all levels, from K–12 students to undergraduate students to associate professors.

Increased efforts among control schools, which we applaud, may also help explain the lack of statistically significant effects of the interventions in the analysis of our full sample. It may also help to account for the positive and significant coefficient on *Post* in all columns of Table 1—that is, there seems to be improvement over the years after the start of the *UWE Challenge*.

Progress Reports and Best Practices

All treatment schools submitted reports by spring 2016 describing their progress with interventions, obstacles encountered, and impressions of accomplishments. In 2018, seven treatment schools submitted reports on their judgment of "best practices" for encouraging women to major in economics: Brown University, Southern Methodist University, University of Richmond, University of Wisconsin–Madison, Washington and Lee University, Williams College, and Yale University. Based on this combined feedback, we classified interventions as either "effective"

or "ambiguously effective." We describe these interventions in this section, with further details provided in the online Appendix.

Interventions classified as "effective" included invited speaker sessions and the formation of student clubs. The speaker and role model interventions included inviting well-known alumni to speak in principles courses (Patnaik et al. 2023; Porter and Serra 2020), increasing the number of female speakers in regularly scheduled seminars, and organizing a trip to a nearby Federal Reserve Bank. Student clubs focused on promoting women in economics or on diversity more broadly and were among the most widely implemented interventions. Faculty advisers remarked that identifying charismatic alumni takes time, as the speakers may need to be vetted in interviews. However, once connections with alumni are established, repeat visits can be relatively low cost. Faculty also gave overwhelmingly positive feedback about the ability of the clubs to foster lasting connections among students.

Interventions aimed at improving curriculum and pedagogy are the most labor intensive. Several schools offered new economics courses that applied economics to topics such as health, crime, marriage, and housing—courses that often offered possibilities for research in the local area. Finally, several schools implemented more targeted first-year/pre-major advising. For example, several departments worked with their registrar's office or career services office to improve the pre-major advising system and to correct misinformation being shared about the economics discipline with undeclared students.

Not all attempts by our treatment institutions to encourage more female economics majors were successful. "Ambiguously effective" interventions that received mixed feedback from the schools included email nudges targeting either incoming first-years (to encourage them to take an introductory course in economics) or students at the end of their principles of economics course (to encourage them to take more courses/to major in economics). However, most schools that implemented this intervention did report some positive feedback, and two schools that ran their own randomized controlled trial found causal evidence that for some groups of women nudges increase the number of women majoring in economics (Li 2018; Bedard, Dodd, and Lundberg 2021).

In the category of interventions that focused on building community and support networks (included in the "mentoring and role model" group), the success of the initiatives relied on student buy-in. Tutoring services were typically reported as being successful. Online forums that allowed students to ask homework- and lecture-related questions or facilitated coordination of shared tutoring services or textbook costs were widely utilized.

Capacity constraints can pose a serious obstacle to growing the economics major. Economics is already among the largest majors on many campuses, and departments are often wary of increasing demands on faculty or overcrowding gateway courses. Initiatives that created opportunities for students to meet faculty outside of the classroom and additional research opportunities were received enthusiastically by students, but such interventions increased time commitments

for faculty, often more so for economics professors who were female or from under-represented minority groups.

An important conclusion from the "Adams" data was that interventions must occur soon after undergraduates arrive on campus, if not before. One of our treatment schools received permission from the admissions office to include information about the economics major in the welcoming packet sent to the incoming students before their first semester. The department noted a disproportionate increase in principles course enrollment among women that year. A UWE club at another school designed a successful outreach program specifically targeted at high school students in the area. Professional and scholarly associations of economists would do well to consider more systematic interventions at the high school level.

The *Undergraduate Women in Economics Challenge* tested whether a variety of low-cost and light-touch efforts could move the needle on female representation among undergraduate economics majors. There is evidence that it did. Interpreting the details of such experiments is undeniably tricky, given that all the schools in both treatment and control groups volunteered to participate in the challenge and comparable treatments were available to any school wishing to fund them. In fact, the *UWE Challenge* seemed to have sparked many economics departments, including some in our control group, to be less complacent about attracting only a large, if disproportionately male, number of majors, and to focus on attracting a more diverse group. If our efforts have led to a recognition of a range of low-cost ways that curriculum and advising can be altered to attract the group that now makes up the majority of bachelor's degrees—women—we will have succeeded admirably.

Appendix 1

Sample Invitation Letter for the Undergraduate Women in Economics Challenge
(**Sent to Economics Departments at the 344 Institutions that Graduated at Least 15 Econ BAs, on Average, between AY 2010–2011 and AY 2012–2013**)

Undergraduate Women in Economics

January 23, 2015

Dear Professor Claudia Goldin,

We are inviting your economics department at Adams College to participate in an exciting initiative we are calling the *Undergraduate Women in Economics Challenge*.

The aim of the Challenge is to encourage undergraduate women to major in economics. **The Challenge will provide $12,500 per school** to implement interventions designed to fulfill this aim. Schools will be given guidance, but the precise interventions will be left up to the department's discretion. This initiative is funded by the Alfred P. Sloan Foundation through the National Bureau of Economic Research and endorsed by the American Economic Association.

We believe that the relative lack of women in economics needs to be addressed. Nationwide there are about three males for every female student majoring in economics and this ratio has not changed for more than 20 years. **At your institution, there were 1.89 male economics graduates for every female economics graduate.**[1] Although we cannot identify just one explanation for why gender differences persist, our Board of Experts from across the country met recently to figure out the common causes of this problem across institutions. You now have the opportunity to make your department part of the solution.

All we ask, at this point, is for you (or another person in your department or undergraduate office) to express an interest in joining the Challenge. We will choose, at random, at least 20 schools for the treatment group from among those that express an interest, with the remaining schools serving as the control group. The awarded funds can be used in a variety of ways to implement interventions targeting areas such as information, role models, and content and style of teaching. Examples of interventions are included on the following page. Participating institutions will submit a brief progress report every three months and provide information on the number and gender of students declaring majors (and eventually graduating from the institution) after the intervention. Upon the completion of the Challenge, data on the numbers of economics majors in the treatment and control groups will be collected and analyzed to assess the program.

If you are interested in participating in the Challenge, **please reply to this e-mail by February 13, 2015.** We will respond to all applications by February 27, 2015.

Regards,

Claudia Goldin
Henry Lee Professor of Economics, Harvard University
AEA President, 2013

Tatyana Avilova
Project Director, Undergraduate Women in Economics, NBER

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[1] $\dfrac{\text{(Male Econ BAs)}/\text{(Total Male BAs)}}{\text{(Female Econ BAs)}/\text{(Total Female BAs)}}$ using US Dep. of Educ. data, averaged over 2011 to 2013.

Potential Interventions Devised by the UWE Team and Board of Experts

UWE

Potential Interventions

Better Information	Mentoring and Role Models	Content and Presentation Style
Without accurate information about the broader application of economics (e.g., beyond finance and consulting), women are more likely to major in less rigorous fields, often within the social sciences or humanities.	Women are more sensitive to their grades in introductory courses when choosing their major than are men. The creation of networks among students within the department and showing support for their decision to major in the field has been effective in recruiting underrepresented minorities.	On average, female undergraduates are less confident about their quantitative skills than are men even if they are equally able and prepared. Their lack of confidence may diminish their belief that economics fits their personal strengths and abilities.
Use the *UWE-AEA Video* (to be produced by the AEA before Fall 2015) during freshman orientation week to highlight key points about the major, including: • The many applications of economics; • The diversity of its practitioners; and • The range of potential careers. • Also use the video at the start of the introductory course, post it on the course website, and include it on the department's website. Augment the material provided on your department's website or in printed pamphlets to highlight information such as: • Subfields and upper-level courses; • Various career options and course requirements for the different career tracks; and • How economics relates to other fields and majors, and the high return to an economics degree. Guest speakers in lecture and other times: • Invite alumni working in diverse fields to talk about their jobs and interests. • Have talks during campus open days, e.g., freshman parents' weekend. • Guest speakers in lecture classes should include diverse faculty in terms of gender, race and field. • Recruit faculty, from non-business/non-finance fields, who are inspirational and approachable.	Mentoring: • Increase the number of female TAs/grad students/older undergrad mentors for students in intro and intermediate courses. • Make a video of your alumni talking about their work involving economics, even though "economist" may not be in their job title. • Facilitate opportunities for research and collaboration with the faculty. • Help students find summer jobs that value economics, are dynamic, and include human contact. Creating student learning communities: • Encourage coffee/study breaks in the economics department lounge. • Organize student groups to work with the department to create talks and conferences on diverse topics. • Connect with students through social media. Faculty lunches: • Have informal lunches with professors and TAs. • Pick faculty who specialize in diverse areas of economic research (e.g., health, labor, education, environmental, econ history, behavioral, corporate finance). Student counseling: • Offer faculty counseling at midterms and other grade times (research papers, presentations, etc.). Convey that making mistakes is often part of learning economics.	Add modules and case studies to introductory and intermediate courses. Use more evidence-based material in teaching. • Present information through real-world examples that cover diverse subfields in economics and related disciplines. • Include study results and also information on the researchers who did the work and how they became interested in the subject. Invite the researchers to give a lecture. • Help faculty communicate more clearly and encourage more evidence-based theory courses. Support independent/group projects in various sub-fields (e.g., health, education, poverty, crime, inequality, sports). • Have students interview community residents about issues in recent economics news (e.g., pay-day loans; Affordable Care Act; student debt) and how they have been affected. • Coordinate community service opportunities that apply economic concepts and tie into course material. Make sections more conducive to learning for students with different skill levels, styles of learning, and interests. • Separate sections based on students' quantitative experience, not by ability. • If sections are heavily skewed by gender, deliberately change the gender mix and collect data on grades and drop-off rates.

Appendix 2: Treatment and Control Schools (= Liberal Arts College; # = Public Institution)*

20 Treatment Schools in Alphabetical Order

Brown University
#Colorado State University (Fort Collins)
*Connecticut College
#Illinois State University
Princeton University
Southern Methodist University
*St. Olaf College
#University of California, Berkeley
#University of California, Santa Barbara
#University of Central Florida
#University of Colorado Boulder
#University of Connecticut
#University of Hawaii, Manoa
#University of Illinois Urbana-Champaign
*University of Richmond
#University of Virginia
#University of Wisconsin-Madison
*Washington and Lee University
*Williams College
Yale University

68 Control Schools in Alphabetical Order

American University
*Amherst College
Boston College
Boston University
Brandeis University
Brigham Young University
*Bucknell University
*Carleton College
Case Western Reserve University
*Centre Colleg
*Claremont McKenna College
#Clemson University
*Colby College
*College of the Holy Cross
*Colorado College
Cornell University

Dartmouth College
*Davidson College
*Dickinson College
Duke University
#George Mason University
George Washington University
Georgetown University
*Gettysburg College
#Indiana University, Bloomington
*Lafayette College
Massachusetts Institute of Technology
#Michigan State University
*Middlebury College
Northeastern University
Northwestern University
#The Ohio State University
#Oregon State University
#Rutgers University-New Brunswick
#SUNY at Binghamton
*St. Lawrence University
Stanford University
#Stony Brook University
*Swarthmore College
#Temple University
#Texas A&M University
Texas Christian University
#Texas Tech University
Tulane University
*Union College
#University of Arizona
#University of California, Davis
#University of California, San Diego
University of Chicago
#University of Delaware
#University of Houston
#University of Kansas
#University of Kentucky
#University of Maryland at College Park
#University of Michigan
#University of Missouri, Columbia
#University of North Carolina at Chapel Hill

University of Notre Dame	#University of Vermont
#University of Oklahoma	Vanderbilt University
#University of Pittsburgh	Wake Forest University
#University of Tennessee	*Wesleyan University
#University of Texas at Austin	*Wheaton College
#University of Utah	

Method for Selecting the Treatment Group from the Sample of 88 Schools

Rankings of universities and liberal arts colleges are from the 2011 and 2013 *US News & World Report*. The rankings for these two groups of institutions are separate, meaning that there is a #1 . . . #N for each group. We concatenated these lists, so that the top university and the top liberal arts college would both be #1 and so on down the list. This meant, given our criteria concerning the size of the major, that we had far fewer liberal arts colleges than universities but that the liberal arts colleges would be relatively high in our rankings.

We then divided the group of 88, that had responded favorably to our initial note and that had a sufficiently large group of economics majors (graduating 30 BAs or more on average between 2011 and 2013), into four groups of 22, from the highest to the lowest with regard to our rankings. We randomly selected five schools from each group of 22. Each of the groups of 22 is called a "cluster" and we have added a dummy variable for the cluster in the regressions and interacted it with either the "post" period or the year, depending on the specification.

We chose the selection method within these "clusters" to ensure, given our small treatment sample of 20, that we had schools across the distribution of rankings. The method, in addition, guaranteed that we had a substantial number of liberal arts colleges (23 in the sample group of 88 and 5 in the treatment group), many of the largest universities in the US, as well as several state flagship institutions, several Ivies, and a private university. The list of schools in each cluster can be found in Avilova and Goldin (2024).

References

Antman, Francisca M., Evelyn Skoy, and Nicholas E. Flores. 2022. "Can Better Information Reduce College Gender Gaps? The Impact of Relative Grade Signals on Academic Outcomes for Students in Introductory Economics." https://spot.colorado.edu/~antmanf/Antman-Skoy-Flores-GenderUWE.pdf.

Avilova, Tatyana, and Claudia Goldin. 2018. "What Can UWE Do for Economics?" *AEA Papers and Proceedings* 108: 186–90.

Avilova, Tatyana, and Claudia Goldin. 2020. "What Can UWE Do for Economics?" In *Women in Economics*, edited by Shelly Lundberg, 43–50. London: CEPR Press.

Avilova, Tatyana, and Claudia Goldin. 2024. "Replication data for: Seeking the 'Missing Women' of Economics with the Undergraduate Women in Economics Challenge." American Economic Association [publisher], Inter-university Consortium for Political and Social Research [distributor]. https://doi.org/10.3886/E201186V1.

Bayer, Amanda, Syon P. Bhanot, and Fernando Lozano. 2019. "Does Simple Information Provision Lead to More Diverse Classrooms? Evidence from a Field Experiment on Undergraduate Economics." *AEA Papers and Proceedings* 109: 110–14.

Bayer, Amanda, and Cecilia Elena Rouse. 2016. "Diversity in the Economics Profession: A New Attack on an Old Problem." *Journal of Economic Perspectives* 30 (4): 221–42.

Bedard, Kelly, Jacqueline Dodd, and Shelly Lundberg. 2021. "Can Positive Feedback Encourage Female and Minority Undergraduates into Economics?" *American Economic Association Papers and Proceedings* 111: 128–32.

Black, Dan A., Seth Sanders, and Lowell Taylor. 2003. "The Economic Reward for Studying Economics." *Economic Inquiry* 41 (3): 365–77.

Bleemer, Zachary, and Aashish Mehta. 2022. "Will Studying Economics Make You Rich? A Regression Discontinuity Analysis of the Returns to College Major." *American Economic Journal: Applied Economics* 14 (2): 1–22.

Buckles, Kasey. 2019. "Fixing the Leaky Pipeline: Strategies for Making Economics Work for Women at Every Stage." *Journal of Economic Perspectives* 33 (1): 43–60.

Butcher, Kristin F., Patrick J. McEwan, and Akila Weerapana. 2014. "The Effects of an Anti-Grade Inflation Policy at Wellesley College." *Journal of Economic Perspectives* 28 (3): 189–204.

Butcher, Kristin F., Patrick McEwan, and Akila Weerapana. 2023. "Women's Colleges and Economics Major Choice: Evidence from Wellesley College Applicants." NBER Working Paper 31144.

Canes, Brandice J., and Harvey S. Rosen. 1995. "Following in Her Footsteps? Faculty Gender Composition and Women's Choices of College Majors." *Industrial and Labor Relations Review* 48 (3): 486–504.

Dynan, Karen E., and Cecilia Elena Rouse. 1997. "The Underrepresentation of Women in Economics: A Study of the Undergraduate Economics Students." *Journal of Economic Education* 28 (4): 350–68.

Emerson, Tisha L. N., KimMarie McGoldrick, and John J. Siegfried. 2018. "The Gender Gap in Economics Degrees: An Investigation of the Role Model and Quantitative Requirements Hypotheses." *Southern Economic Journal* 84 (3): 898–911.

Fortin, Nicole, Thomas Lemieux, and Marit Rehavi. 2021. "Gender Differences in Fields of Specialization and Placement Outcomes among PhDs in Economics." *AEA Papers and Proceedings* 111: 74–79.

Goldin, Claudia. 2015. "Gender and the Undergraduate Economics Major: Notes on the Undergraduate Economics Major at a Highly Selective Liberal Arts College." https://scholar.harvard.edu/goldin/background-facts.

Goldin, Claudia, Lawrence F. Katz, and Ilyana Kuziemko. 2006. "The Homecoming of American College Women: The Reversal of the College Gender Gap," *Journal of Economic Perspectives* 20 (4): 133–56.

Halim, Daniel, Elizabeth T. Powers, and Rebecca Thornton. 2022. "Gender Differences in Economics Course-Taking and Majoring: Findings from an RCT." *American Economic Association Papers and Proceedings* 112: 597–602.

Kahn, Shulamit B. 1995. "Women in the Economics Profession." *Journal of Economic Perspectives* 9 (4): 193–205.

Krueger, Anne O. 1991. "Report of the Commission on Graduate Education in Economics." *Journal of Economic Literature* 29 (3): 1035–53.

Kugler, Adriana D., Catherine H. Tinsley, Olga Ukhaneva. 2021. "Choice of Majors: Are Women Really Different from Men?" *Economics of Education Review* 81: 102079.

Li, Hsueh-Hsiang. 2018. "Do Mentoring, Information, and Nudge Reduce the Gender Gap in Economics Majors?" *Economics of Education Review* 64: 165–83.

May, Ann Mari, Mary G. McGarvey, and Robert Whaples. 2014. "Are Disagreements among Male and Female Economists Marginal at Best? A Survey of AEA Members and Their Views on Economics and Economic Policy." *Contemporary Economic Policy* 32 (1): 111–32.

National Center for Education Statistics (NCES). 2022–2023. "2022–23 Survey Materials: Instructions." IPEDS Data Collection System. https://surveys.nces.ed.gov/ipeds/public/survey-materials/instructions?instructionid=30080 (accessed June 16, 2023).

National Center for Education Statistics. 2004–2023. "Integrated Postsecondary Education Data System: Completions: Awards/degrees conferred by program (6-digit CIP code), award level, race/

ethnicity, and gender, 1984–2021." Washington, DC: United States Department of Education. https://nces.ed.gov/ipeds/datacenter/DataFiles.aspx (accessed June 19, 2024).

Patnaik, Arpita, Gwyn C. Pauley, Joanna Venator, and Matthew J. Wiswall. 2023. "The Impacts of Same and Opposite Gender Alumni Speakers on Interest in Economics." NBER Working Paper 30983.

Porter, Catherine, and Danila Serra. 2020. "Gender Differences in the Choice of Major: The Importance of Female Role Models." *American Economic Journal: Applied Economics* 12 (3): 226–54.

Pugatch, Todd, and Elizabeth Schroeder. 2021. "Promoting Female Interest in Economics: Limits to Nudges." *AEA Papers and Proceedings* 111: 123–27.

Siegfried, John J. 2007. "Trends in Undergraduate Economics Degrees, 1991–2006." *Journal of Economic Education* 38 (3): 360–64.

Stock, Wendy A. 2017. "Trends in Economics and Other Undergraduate Majors." *American Economic Review* 107: 644–49.

US News & World Report. 2011. *Best Colleges.* Washington, DC.

US News & World Report. 2013. *Best Colleges.* Washington, DC.

Valuing Identity in the Classroom: What Economics Can Learn from Science, Technology, Engineering, and Mathematics Education

Sergio Barrera, Susan Sajadi, Marionette Holmes, and Sarah Jacobson

In recent decades, science, technology, engineering, and mathematics have worked with some success to increase the participation of groups historically underrepresented in these fields. For example, as shown in Figure 1, from 1996 to 2022, women, people of underrepresented racial minority groups of all genders, and women from racial minority groups saw increased attainment of undergraduate degrees in these fields, although they still lag behind the population of those groups attaining social science degrees and their representation in the general population (for example, in the 2020 Census, women made up 50.9 percent, and racial minorities 32.2 percent, of the US population).[1] This increased attainment is due in part

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[1] In this paper, we will use the phrase "underrepresented racial minority" to refer to students who identify as Black or African American, Hispanic or Latina/o/x, or Native American. More generally, we use phrases like "groups" or "identities historically underrepresented" in the field to refer to demographic groups that participate in the field in question at rates below their representation in the population. Most of our examples revolve around improving participation of women and underrepresented racial

Figure 1

Representation of Women and Underrepresented Racial Minorities in Economics as Compared to Fields in Science, Technology, Engineering, and Mathematics
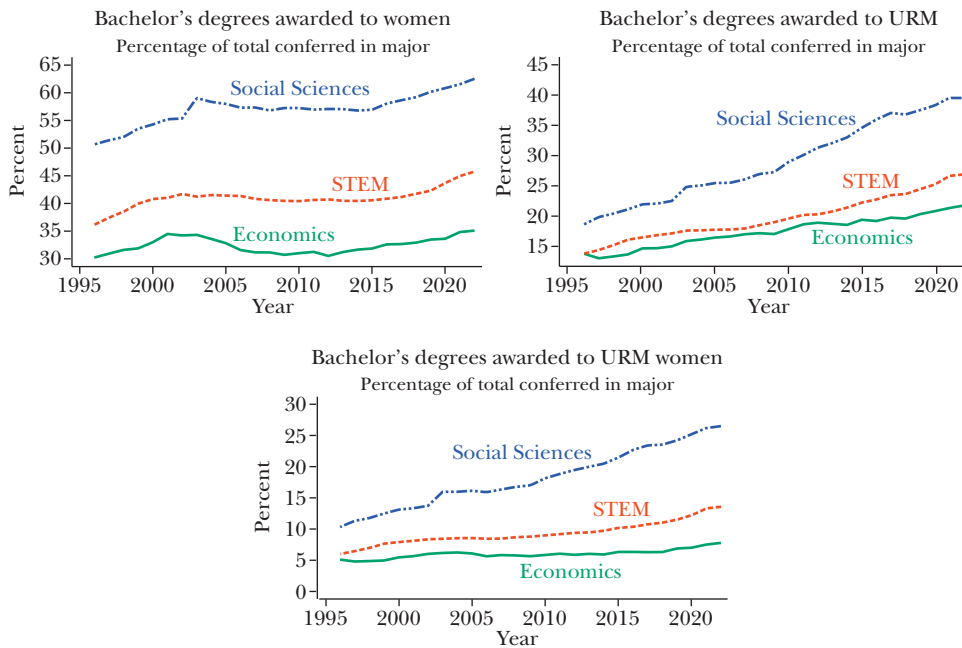
Source: Authors' calculations from the Integrated Postsecondary Education Data System (IPEDS) at the National Center for Education Statistics.
Note: Social Sciences does not include Economics majors. "URM" stands for underrepresented racial minority, and comprises those who identify as Black, Hispanic, and American Indian. Data are restricted to US citizens and permanent residents.

to the fields of science, technology, engineering, and mathematics putting substantial resources into innovation, testing, and propagation of new teaching methods. This discipline-based education research has provided an extensive evidence base identifying many teaching methods that reduce achievement and retention gaps (Fairweather 2010; National Academies of Sciences, Engineering, and Medicine 2011).

Figure 1 also compares the attainment of degrees in economics to these other fields and shows that economics lags behind. Women's achievement of undergraduate degrees starts remarkably lower and hovers, flat, between 30 and 35 percent of economics majors, while underrepresented racial minorities start at a similar level to science, technology, engineering, and math, but grow at a much slower rate, and racial minority women see little improvement in economics over the decades. These

minority groups, as those dimensions of underrepresentation have been most widely studied. The Census number includes "Some Other Race," as well.

gaps have received critical attention (for example, Chari 2023; Hoover and Washington 2023), with many causal factors and solutions identified (for example, Bayer, Hoover, and Washington 2020).

However, one cause may be as simple as our teaching methods: economics simply has not put much effort into developing and adapting teaching methods that improve learning across the board and reduce demographic learning gaps, including those with regard to race and gender. Most instructors still primarily use old-fashioned teaching methods (Asarta, Chambers, and Harta 2021), largely because the costs of changing are seen as too burdensome (Goffe and Kauper 2014). Because innovative and effective teaching methods have been pioneered in other fields, the adoption of these techniques represents a tremendous opportunity for economics.

In this essay, we argue that because economics faces underrepresentation problems similar to those faced by science, technology, engineering, and mathematics fields, economists have much to learn from the teaching innovations that have been pioneered in those fields. We frame our suggestions around the idea of *economics identity*, which is the extent to which a student feels like they are the type of person who is or can be an economist. This focus is inspired by the idea of discipline-specific identity development, like engineering identity (Godwin 2016; Godwin et al. 2016), science identity (Carlone and Johnson 2007), and physics identity (Hazari et al. 2010). This research finds that whether a student develops a sense that they are a "science and technology person" depends on a student's *interest* in the field of study, their sense of their own *competence* or performance in the field, and their experience of *recognition* for performing well in the discipline.

A growing education literature shows that a strong identity in the fields of science and technology is positively associated with career aspirations, a sense of belonging, and persistence in the field (Godwin et al. 2016; Verdín et al. 2018; Hazari et al. 2010). Students who see little overlap between their own identity and their perception of scientists perform worse and are less likely to persist (Archer and DeWitt 2016), but if the development of the student's identity in the field is encouraged, they aspire to and achieve more (Hernandez et al. 2013).

The ideas in this article should help economics instructors develop students' sense of economics identity, so that their students can see themselves as part of economics. When we hope students will continue with the study of economics, we are hoping they will choose to add "economist" to their set of identities, that is, that the student will come to see a strong alignment between their perception of who they themselves are and who "an economist" is.[2]

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[2]Alternatively, the approaches we discuss in this article can be thought of as ways of showing prospective economists that the present value of the stream of net benefits from doing economics is better than the best alternative option. Their perception of this value will be crucially influenced by the interaction of their other identity and personal characteristics, including demographics as well as skills and cultural assets, and the signals they receive by way of their early experiences in economics. The education literature in the fields of science, technology, engineering, and mathematics calls this "expectancy-value theory" (Wigfield 1994).

We will discuss four ideas from the education literature in fields of science, technology, engineering, and mathematics: active and collaborative learning, role model interventions, modernized design of assessments and feedback, and culturally relevant, responsive, and sustaining pedagogy. In each section, we frame how the idea works in the context of economics identity, share evidence regarding efficacy, and give examples of how it has been and can be used in economics. We also provide an array of ways to make changes large and small, ranging from a broader course redesign to a relabeling of examples used in lectures and problem sets, to ensure that we offer some changes every instructor can make. Our suggestions take the curriculum requirements for an economics major as fixed, though we will return to this point in the conclusion. We also include suggestions likely to be effective at different levels, from introductory to advanced courses, though the biggest "bang for the buck" may come from using them in introductory classes, because that is the widest part of the funnel of students entering economics.

Active and Collaborative Learning

A common definition of active learning is that it "engages students in the process of learning through activities and/or discussion in class, as opposed to passively listening to an expert. It emphasizes higher-order thinking and often involves group work" (Freeman et al. 2014). Thus, active learning is also often collaborative, but it need not be. It comprises ideas as simple as quick think-pair-share exercises, in which students are prompted to first think on their own, then briefly discuss with a partner, and then share with the classroom (Kaddoura 2013). At the other end of the spectrum, it includes extensive course redesigns to "flip the classroom" so that students watch video lectures outside of class and do active learning exercises in class (Bishop and Verleger 2013).

Collaborative learning brings together groups of learners to solve problems together (Barkley, Cross, and Major 2004). As such, collaborative learning is necessarily active, but also provides extra benefits by developing personal and professional skills relating to collaboration as well as bringing diverse voices into the classroom.

The use of active and collaborative learning draws on theories from the learning sciences (National Research Council 2000), which emphasize the importance of learners actively constructing knowledge based on their existing experiences and mental models, and the importance of social interaction in learning. These theories, therefore, support collaborative pedagogical strategies that rely on peer engagement, cooperative problem solving, and relevance to the learner.

Neither collaborative learning nor active learning may appear to be per se about identity. However, by making each student an active agent in their own learning, these types of pedagogy make it easier for students to envision the discipline as part of their identity. Active and collaborative learning may also let students who have community-oriented value systems feel that the field is a place where they can

express their personal identity, as these tools may provide a sense of community in the classroom (Eddy and Hogan 2014).

Theory and Evidence on Active Learning and Collaborative Learning

Active and collaborative learning have been studied for decades in science, technology, engineering, and mathematics, with rigorous experimental trials showing that these techniques reduce learning gaps between demographic groups, while also improving learning overall. Some of the evidence comes from studies of individual classes. For example, in a study of about 1,000 students in an introductory biology class, Starr et al. (2020) use structural equation modeling to conclude that active and collaborative learning both help students in general and are effective at promoting identity formation in science, technology, engineering, and mathematics for students from underrepresented racial minority groups. In a study of students in an introductory evolutionary biology and biodiversity course at Cornell University (required for biology majors), Ballen et al. (2017) find that active and collaborative learning boost student engagement and provide opportunities for students to receive recognition from others for their work. They also find that active and collaborative learning increase students' confidence in their own competence (or "self-efficacy"), while helping to close the learning gap between underrepresented racial minorities.

A meta-analysis of the research on active learning by Freeman et al. (2014) examines 225 experimental studies conducted in science, technology, engineering, and mathematics courses.[3] The active learning interventions in the courses in these studies vary widely. However, the study estimates clear benefits for students who engage in active learning, with almost a half of a standard deviation improvement in assessments; in addition, students in traditional lecture formats are 1.5 times more likely to fail the course. These effects are similar in magnitude across fields of science, technology, engineering, and mathematics—including a social science sibling discipline of economics, psychology. While active learning benefits all students, it particularly benefits students who face additional barriers. Theobald et al. (2020) conducted a meta-analysis of 15 studies that looked at exam scores and 26 studies that looked at course failure as outcomes. They focus on classes taught by the same instructor but in both traditional lecturing and active learning formats. They found that active learning reduces exam achievement gaps for underrepresented students (racial minorities and low-income students) by 33 percent and course failure gaps by 45 percent.

Small group learning in particular can promote greater academic achievement, more favorable attitudes toward learning, and increased persistence through courses and programs in science, technology, engineering, and mathematics, as Springer, Stanne, and Donovan (1999) conclude from a meta-analysis of studies

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[3]A related idea is "authentic learning," in which students learn how to do, and then complete, tasks which are either actually relevant to real-world outcomes or are directly analogous to such tasks, such as using authentic science practice in classroom experiments (Starr et al. 2020).

from the previous two decades. One way to do small-group learning is through a jigsaw approach (Aronson et al. 1978), in which each student develops a piece of the "puzzle" independently and all students must share knowledge to build their understanding. Over 100 types of collaborative learning for different classroom settings have been documented (Kagan 1994).[4] The use of teams or groups in learning is so common in these fields that methods of creating and managing teams, and evaluating work therein, have been developed: in engineering, for example, where students often work on design teams, a tool called CATME (Comprehensive Assessment of Team-Member Effectiveness) is often used. Tools of this type automatically create student groups based on criteria (such as demographics, schedule, skills, personality traits, learning styles, leadership preferences, or custom items) and rules (for example, positive or negative correlation) chosen by the instructor, with default settings based on findings from research (Layton et al. 2010). This research shows that poor group formation can do more harm than good: isolating marginalized students on teams often causes them to be silenced. This is why it is best for groups to be designed carefully, rather than assigned randomly or, worse, self-selected by students. Group design should ensure that minoritized or marginalized students are not isolated on teams whenever possible.

While the evidence for active learning is strong, Theobald et al. (2020) caution that active learning interventions cannot be successful without careful design of course elements, including scaffolded assignments that keep students working hard toward goals, nor without a culture of inclusion in the classroom. This indicates that active learning and culturally relevant and responsive pedagogy, which we discuss later in this paper, should be implemented hand in hand, as they can be complements in improving student learning. Similarly, poorly designed collaborative learning can backfire when the cognitive costs of working together are too high, students are too sensitive to each other's feedback, or students choose to free-ride (Nokes-Malach, Richey, and Gadgil 2015).

What Might Active and Collaborative Learning Look Like in Economics?

Economics instructors still typically make little or no use of active learning (Sheridan and Smith 2020), though there is evidence that a trend of adoption of these techniques is slowly beginning (Asarta, Chambers, and Harter 2021). Still, economists can look to several excellent published examples of the use of these techniques within economics from recent years, ranging from large-scale to small-scale interventions. Indeed, Zhang, Jacobson, and Zhu (2022) show how different active learning techniques, as implemented in an intermediate macroeconomics course, may be useful for different desired learning outcomes, as well as how these techniques compare to each other and more traditional teaching techniques. Their

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[4]A repository for active learning techniques and ways to engage students more actively in the classroom is maintained at the Science Education Research Center "SERC For Higher Ed" portal at Carleton College: https://serc.carleton.edu/highered/index.html#teaching.

Figure 2
Impact of Active and Learning and Relevant Material on Gender and Racial Achievement Gaps
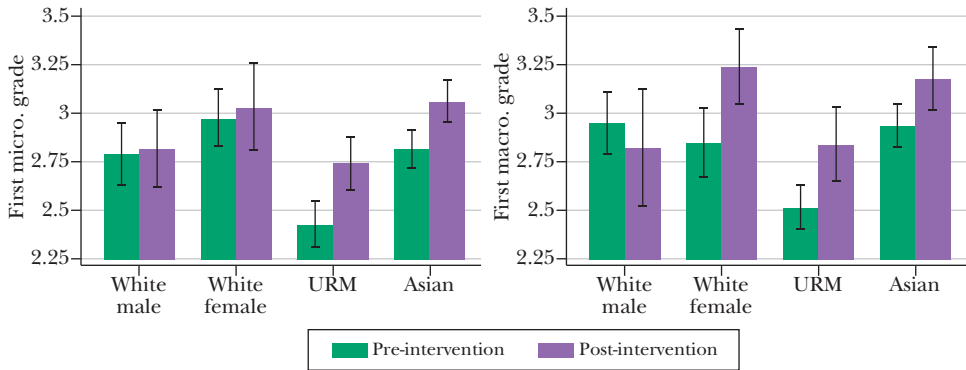
Source: Avery et al. (2024).
Note: This figure shows mean grades pre- and post-intervention by ethnicity (and by gender for white students) for Introductory Microeconomics (left) and Introductory Macroeconomics (right), for a full sample of students who took an introductory economics course between Fall 2015 and Fall 2019.

examples include small group discussions, debates, requiring peer advice on a project, simulations, and games.

For an instructor willing to engage in an entire course redesign, "flipping" the course, so that students watch recorded videos at home and engage in active learning in the classroom, can be successful in economics. Caviglia-Harris (2016) finds experimentally that a flipped principles of microeconomics course can improve student learning as compared to a traditional format.

Avery et al. (2024) integrate a variety of active and collaborative learning exercises into recitation sections for introductory microeconomics and macroeconomics classes.[5] The activities examined include group work analyzing data, current events, or case studies, as well as reading discussions and classroom simulations. The experimental intervention, which also included facets relating to the use of relevant material (which we discuss further later in this paper), reduced or eliminated gender gaps in grades and improved performance for racial minority students, as shown in Figure 2.

There are many small ways to work active learning into a class period or part of a class period. For example, innumerable classroom games have been designed to engage students in (often incentivized) interactions with the models under study in economics, including a classic pit market game (in this journal, Holt 1996) and public good game (Holt and Laury 1997). Examples can be as complex as

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[5]An example recitation plan is available at https://www.malloryavery.com/research.

a spatially-aware land use game (Dissanayake and Jacobson 2016) that takes up a whole period or a fishery game that runs through the whole semester (Secchi and Banerjee 2019), or can be as quick and simple as a game of rock-paper-scissors while discussing mixed strategies in game theory.[6] These games are often collaborative, and reflection after gameplay can bring in student voices and perspectives in ways that treat the students' observations as assets, reinforcing their sense of belonging and self-efficacy.

The jigsaw approach introduced earlier has been deployed in economics to engage students in active, collaborative learning. Button et al. (2021) describe a "jigsaw literature review" assignment used in seven different upper-level economics electives that requires students who have independently read different research papers to bring what they have learned together and create a synthesis so that all can attain a more complex, nuanced understanding of the evidence on controversial topics like racial bias in policing.

The simplest active learning technique might be the "Do Now," common in classes at the elementary and secondary level. In this technique, the instructor assigns a quick exercise for students to work through on their own, typically at or near the start of class. After students have attempted the problem, the instructor debriefs. This step can take the place of the instructor working on a problem on the board. Collins (2020) provides an example, with thoughts about implementation, for an undergraduate econometrics class.

Collaborative learning can also be leveraged in outside-of-class work, such as during problem sets. Students often work together on problem sets by default; this can be excellent for collaborative learning, but self-formed study groups outside of class can leave students from identities underrepresented in the class at a disadvantage, as they may have weaker networks with other economics students. Therefore, instructors can consider taking an active role in assigning study groups in which students can work outside of class.

For group work inside or outside of the class period, as discussed above, mindful team design is important, whether for problem sets or in-class activities. Instructors of modest-sized classes can use information from pre-course surveys (Wirth and Perkins 2005)[7] to create groups, or if groups are created randomly, to adjust them manually to ensure students with underrepresented identities are not isolated; for larger classes, instructors can use flexible platforms such as CATME Team-Maker.[8] Self-selected groups can create an array of problems—reinforcing inequities, further isolating some students, and degrading rather than

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[6]One source of games designed for economics classes is the service Moblab, which requires a subscription. Free sources that provide games include https://serc.carleton.edu/econ/experiments/examples.html, https://economics-games.com/, and https://veconlab.econ.virginia.edu/.

[7]For advice on creating an effective pre-course survey, see https://poorvucenter.yale.edu/strategic-resources-digital-publications/managing-classroom/developing-pre-course-survey and https://dl.sps.northwestern.edu/blog/2018/04/write-pre-course-survey-questionnaire/.

[8]The CATME tool can be accessed here: https://info.catme.org/features/team-maker/. Another tool for group formation, which is free, is https://groupeng.org/.

reinforcing a feeling of community in the classroom—and should be avoided (as discussed in Layton et al. 2010). When assigning groups, however, instructors should not state that they are treating any demographic group differently, as this can make minoritized students feel like they are in a "spotlight" (McLoughlin 2005).

Role Model Interventions

Role models are "individuals who can positively shape a student's motivation by acting as a successful exemplar" (Gladstone and Cimpian 2021). Role models need not have extensive or even personal relationships with a student for the student to benefit from exposure to them. Rather, a role model is a person with whom a student identifies and in whom they can "see themselves," often (though not always) because of a shared identity trait. When a student observes a role model demonstrating expertise and success in a field, that can provide evidence against any mistaken belief they may have that people like them would have a hard time making it in that field.

Theory and Evidence on Role Model Interventions

Role models, especially in-group role models, may work by addressing social identity threats, which come into play in education when a student discerns that their identity is devalued in a classroom or a field of study. Identity threats can undermine confidence (which can have impacts such as decreased performance due to increased anxiety) and interest, both of which deter identity development in a given field.[9]

A number of reviews and meta-analyses have studied the evidence on how role models might affect learning and persistence in science, technology, engineering, and mathematics. The evidence has been mixed, often suggesting that role models work in some contexts but not others; the overall lesson is that well-designed role model interventions are worthwhile, but implementation must be thoughtful.

In a review of research-based role model interventions that leverage counter-stereotypical role models in education to address gender gaps, Olsson and

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[9] Stereotype threat "is a situationally-based meta-cognitive phenomenon, borne out of an awareness of the meaning and value of one's social identity in a particular context, which, in turn, impacts people's social cognitive processes and their downstream motivation, performance, and behavior" (Murphy, Taylor, and Steele forthcoming, p. 9). For the original stereotype threat studies, see Steele and Aronson (1995), as well as Steele (1997) and Steele, Spencer, and Aronson (2002). Sackett, Hardison, and Cullen (2004) clarify some popular misunderstandings about stereotype threat. Murphy, Taylor, and Steele (forthcoming) note that performance on intellectual tests has been a main focus of stereotype threat research, but survey other scholarship showing how it can affect "broader outcomes related to people's motivation and ability to succeed and thrive in domains where they are negatively stereotyped"; this literature finds that negative cues from situations can, by way of stereotype threat, affect interest, aspirations, sense of belonging, and persistence in a field (pp. 11–12). Interestingly, one experimental intervention (Alston et al. 2022) finds that students at a historically Black university may not be subject to stereotype threat.

Martiny (2018) show that even brief exposure to women in certain roles in the fields of science, business, and law can have a significant impact in the short-run on women by changing stereotype-based thoughts that women do not exist in a field. However, the interventions may not work if the student does not perceive themselves as similar to the role model. For example, if a role model's educational background is different from the student's, the intervention may be ineffective, because role model interventions work better the more the student can identify with the exemplar.

In a meta-analysis of 45 lab and field studies across 35 papers, Lawner et al. (2019) study the effectiveness of interventions using role models with a demographic match on women and racial minority students' performance and interest in science, technology, engineering, and mathematics classes. The results are mixed between null and positive effects, but the meta-analysis identifies several cases in which role models, in some cases physically present in the classroom and in other cases only experienced through video or audio recordings, improve (at least slightly) the performance and interest of women and racial minority students. Interestingly, the degree of interaction a student has with a role model does not always moderate the role model effect: in some cases, a brief exposure to a role model can be highly effective.

Gladstone and Cimpian (2021) offer another meta-review of 55 studies. Analyzing the patterns of mixed results across the studies, they develop four evidence-based recommendations for role model interventions in classes in science, technology, engineering, and mathematics: (1) role models should be clearly successful and competent; (2) role models should be portrayed as meaningfully similar to students; (3) while anyone can be a role model, the most effective role models come from groups that are traditionally underrepresented in the discipline; and (4) students should be able to see the success of the role model as attainable for them as well.

When role model interventions do work, they can be quite effective. A common theme is that role models from underrepresented demographic groups particularly improve outcomes for students from matching demographics, but students who are not from the same demographic groups also benefit. For example, Fairlie, Hoffmann, and Oreopoulos (2014) use administrative data from a large community college to find that the racial achievement gap declined by 3.9 to 7.7 percent of a standard deviation in course grades when racial minority students are taught by instructors who are also from racial minority groups.

As another example, Stout et al. (2011) study students in fields of science, technology, engineering, and mathematics at a large university. They experimentally either introduced students to men or women who they believed to be advanced peers majoring in the field or had the students read descriptions of male or female professionals in the field. They find that while in-group role models do not eliminate women students' stated belief in stereotypes (because, they theorize, these were students who had already selected and committed to these majors), they nonetheless promote women's identity formation and commitment to pursuing careers in these fields.

As noted above, role model interventions do not necessarily need to be extensive to have an effect. For example, a simple role model intervention called "Scientist Spotlight" assignments (Schinske et al. 2016) prove effective in an introductory biology class at a diverse community college. In these spotlights, students read about a scientist (the set of which showcase diversity on many dimensions) and answer short writing prompts about the scientist's research and "the types of people who do science." In a similar vein, Herrmann et al. (2016) have students in an introductory psychology or chemistry class read a letter from a woman graduate student describing her experiences in the introductory course. Similarly, Agurto et al. (2022) has women engineering students give presentations at high schools about their experiences in the major.

In-group role models may be particularly effective for students with high academic performance. Using 2007 data from the US Air Force Academy, where the student population consists entirely of high achievers but has a striking gender imbalance (only 17 percent women), Carrell, Page, and West (2009) find that women professors offering the exact same math and science curriculum have minimal impact (as compared to professors who were men) on men, but improve women students' performance significantly, reducing the gender gap in grades by approximately two-thirds. In the context of the US Military Academy at West Point, Kofoed and McGovney (2019) find that when students are assigned a mentor who shares their demographic characteristics, they are more likely to choose the occupational path of that mentor.

How Can Role Models Be Used in Economics?

Economists can implement role model interventions in their own departments and classes.[10]

One method is to leverage older students as role models for younger students. Porter and Serra (2020) show that a brief visit to an introductory economics class by a woman student who had successfully completed the course in the past increases the likelihood that a current woman student chooses to major in economics by a whopping 8 percentage points, almost doubling the baseline level, as shown in Figure 3. Alumni could be invited to perform a similar function, whether in person or through virtual visits, allowing a wider set of possible visitors.

Professors can also expose students to a variety of different potential role models through other media, similar to the "Scientist Spotlight" intervention discussed above. The American Economic Association produces a video titled "A Career in Economics. . . It's Much More Than You Think!" in which economists with diverse demographics discuss their work and lives.[11] In addition, a wide array of videos of different types is available, alongside other useful resources, on the Diversifying

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[10] In another paper in this symposium, Goldin and Avilova discuss the Undergraduate Women in Economics Challenge, which uses role models and other approaches.
[11] The video and other resources are available at https://www.aeaweb.org/resources/students/what-is-economics.
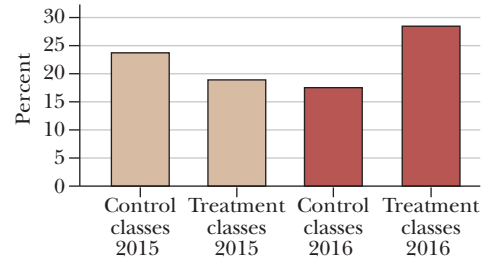
Figure 3
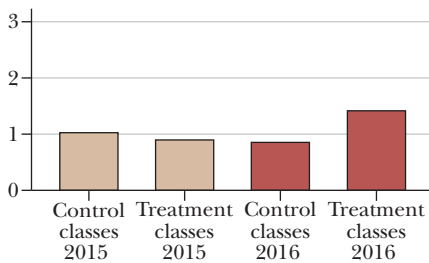**Results of a Gender Role Model Intervention**

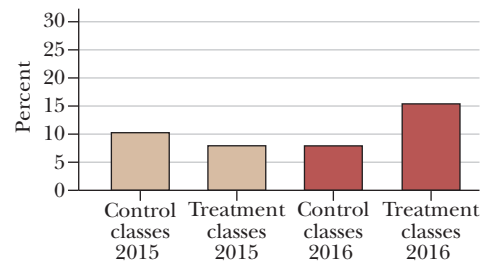Panel A. Enrolled in intermediate micro. within year
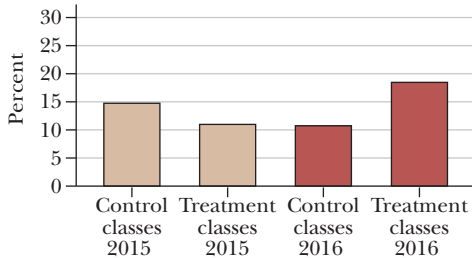
Panel B. Took one or more further econ. classes

Panel C. Average number of econ. classes taken

Panel D. Majored in economics

Source: Porter and Serra (2020).
Note: In this difference-in-difference design, the control classes are never treated, and the treatment classes are treated in 2016 but not 2015.

Economic Quality (or Div.E.Q) website.[12] Instructors can share these videos with their students, perhaps by awarding extra credit to students who watch a video of their choice. Similarly, students can be pointed to the profiles of scholars of color highlighted by the Committee on the Status of Minority Groups in the Economic Profession (CSMGEP) and women who have won prizes from the Committee on the Status of Women in the Economic Profession (CSWEP).[13]

Instructors can also incorporate role models from varied demographic groups in the form of the authors of the readings featured in courses, especially in higher-level electives that revolve around reading journal articles. This can be especially effective if, in class, the instructor shows students an image of the scholar (for example, from their website).

One obvious lesson is that the more diverse the faculty in an economics department are, the more likely students of all demographics will be to be able to find a role model with whom they can identify. The production of economics PhDs bearing

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[12] The website is https://diversifyingecon.org/.
[13] See https://www.aeaweb.org/about-aea/committees/csmgep/profiles and https://www.aeaweb.org/about-aea/committees/cswep.

different minoritized identities might even then become a virtuous cycle, though this does not seem to have occurred in economics (Lundberg and Stearns 2019). However, even instructors who do not share identity traits with their students can bring the faces and voices of diverse role models into the classroom to help all of their students develop their *economics identity*, as research shows the interventions need not be extended or in person.

Assessments and Feedback

How instructors assess students communicates what we believe is important in a course. It also affects student learning and study behaviors, as well as student perceptions of self and identity development. Emerging education research in science, technology, engineering, and mathematics suggests that traditional assessment may do a poor job of reflecting not only the assets of students in the class, but also the work of professionals currently active in the field. For example, traditional assessment and feedback structures in educational settings can unintentionally perpetuate disparities among learners. Depending on how instructors engage in feedback and approach assessment in the classroom, some students may feel more, and some less, empowered to seek feedback. Further, certain kinds of assessments and assignments advantage certain populations.

Inclusive assessment strategies that support a variety of perspectives, knowledge bases, and ways of understanding can help support identity development and promote equity in education. Indeed, identity development hinges on students being acknowledged for their performance, having their interests engaged, and receiving recognition—all of which can be effectively promoted through thoughtful assessment practices.

Theory and Evidence from Other Fields on Assessments and Feedback

Inclusive feedback and assessment practices aim to ensure that every student receives the guidance they need and is able to demonstrate their understanding on a level playing field. Although studies on inclusive feedback and assessment are as yet relatively few, they present promising evidence and practices. For example, aligning course content and activities with formal assessments, incorporating frequent low-stakes formative assessments, using various formative assessment methods, and including supplementary materials in various formats have each been shown to support the success of students with different levels of preparation and students from minoritized groups (such as women and racial minorities). In addition, assessments can be communicated in multiple ways, and students should be given multiple opportunities to demonstrate their learning.

In introductory chemistry courses, for example, traditional assessments often focus on rote math skills and fact recall. This can disadvantage students with limited pre-college math preparation, but also misrepresents the nature of chemistry. Ralph et al. (2022) analyzed 352 assessment tasks in chemistry classes

across two universities and found that tasks emphasizing mechanistic reasoning (explaining phenomena through interactions at a molecular level) yielded higher pass rates as compared to tasks that centered on rote skills, especially for students labeled as "at-risk." Shifting towards assessments that reflect authentic intellectual work in the field could lead to more equitable outcomes and better align course content with the field's true nature, thus better preparing students for work in the field. Assessment tasks of this type could be active learning opportunities, like those discussed in the preceding section, that allow students to be active agents constructing their own understanding of the subject matter.

In a set of evidence-based guidelines for inclusive education for classes in science, technology, engineering, and mathematics, Salehi et al. (2021) urge instructors to ensure that assessments are strongly aligned with the content as it has been taught in the class, because otherwise, the students have to make assumptions or "read the instructors mind," which disadvantages students who have a different background than the instructor.

Feedback is another critical component of the learning process. In the simplest case, feedback can be a matter of informing students, in a timely manner, how they have been performing on assessments. Using data from across departments of a large UK university that had previously had varying patterns of feedback in its one-year master's degree programs (mostly in social science fields), Bandiera, Larcinese, and Rasul (2015) find that providing feedback before the next evaluation can improve student performance significantly, likely by giving the student information about the returns to their efforts at studying.

Feedback does not need to be extensive or even formal to support all students' learning. Micro-affirmations are small indications of kindness, empathy, or support; they can be subtle acts of inclusion and encouragement, such as recognizing students' contributions. In the science, technology, engineering, and mathmatics classroom, micro-affirmations have been shown to improve student achievement as well as students' integration into science communities, as Estrada et al. (2019) show with data from students in low-level chemistry courses at a large urban university in northern California. Similarly, Carrell and Kurlaender (2023), in a study of 30 large undergraduate courses (serving over 120 students) across disciplines at a single university, found communication to be effective. They showed that professor feedback in the form of encouraging personalized emails, which also provided advice about how to succeed in the course, improved exam, homework, and final course grades, and increased persistence of underrepresented racial minority students by 5 percentage points.

What Can Improved Assessments and Feedback Look Like in Economics?

Modifications to render assessments and feedback more culturally responsive and inclusive, and thus to offer invitations to adopt an economics identity, range from the systemic to the light-touch.

As Harter, Chambers, and Asarta (2022) show based on the 2020 national quinquennial survey on teaching and assessment methods in college economics, in

introductory economics courses, multiple-choice examinations continue to dominate as the primary assessment method; indeed, their significance in determining students' grades rose between 2010 and 2020. On the other hand, upper-division economics classes have seen a shift toward incorporating short-answer exams and a variety of mixed assessment strategies. In general, though, the field of economics still has room for considerable progress in improving its assessment methods beyond traditional testing as a central means of evaluation.

Formative assessment can be implemented during class. Boyle and Goffe (2018) report evidence from a principles of macroeconomics course that incorporates several innovations meant to make assessments and assignments not only more active but also more inclusive and aligned with learning goals. These innovations include Just in Time Teaching assignments before class (Simkins and Maier 2009); challenging "clicker questions" sprinkled throughout each class period, with each usually including peer consultation and a re-vote; in-class worksheets; exams broken up into a larger number of lower-stakes assessments; and "exam wrappers" (post-exam reflections to encourage meta-cognition about their learning). They find significant improvements in student learning.

Feedback interventions can be quite easy to undertake. An obvious step based on the evidence above is to ensure that assignments and assessments are returned to students with grades as early as possible with clear guidance about how they can improve. Instructors can also email students to troubleshoot issues or praise performance or, at least as important, growth. These emails can be short; while they should be designed to feel targeted to the individual student, they can be generated largely from templates the instructor keeps at the ready to speed up the process. Outside of the context of a class, professors or departments can send individualized emails to students at crucial times, like class registration and major declaration—this form of extracurricular feedback recognizes the student as an economist, even if the student does not see that in their own identity yet. In a study conducted with Econ 1 students at the University of California at Santa Barbara, Bedard, Dodd, and Lundberg (2021) find that such emails praising a student's performance and encouraging them to major in economics increase the likelihood of majoring in economics, especially for women and underrepresented racial minorities.

Culturally Relevant, Responsive, and Sustaining Pedagogy

Culturally Relevant and Responsive Pedagogy (also sometimes called Culturally Sustaining Pedagogy), as it is called in the education literature, involves instructors taking active steps to understand the cultural backgrounds of their students and then considering aspects of this background in their teaching (Ladson-Billings 1995; Gay 2000). This style of teaching validates various aspects of a students' identity including their backgrounds, skills, interests, and prior knowledge. It also casts these elements of student identities as assets to learning.

Culturally sustaining pedagogy has three elements (as summarized in Byrd 2016). First, the instructor has high expectations for student performance, while still believing on a fundamental level that every student is capable of improvement and success in the course. This combination is referred to as a "growth mindset" (Canning et al. 2019), as opposed to a fixed mindset, which considers student skills, success, and ability as fixed and unchangeable, and which would render instruction less about helping students learn and more about finding "good" students.

Second, instructors view their students' backgrounds, skills, and experiences as assets rather than distractions or deficits (for example, López 2017), an approach known as "asset-based pedagogy." Asset-based pedagogy requires instructors first to appreciate their students' heterogeneity in terms of their interests, learning styles, community life, and lived experiences, and second to seek ways to connect these aspects of their students' identities to instruction, both in terms of content and modes of teaching. Rather than focusing on what students are lacking in terms of knowledge and skills, teachers who practice asset-based pedagogy believe students already have skills, experience, and knowledge that can be leveraged to build more knowledge.

Finally, this form of teaching must have "critical consciousness," which is an engagement with important social problems, including but not limited to inequality and discrimination. Instructors need not have any specific policy or political preferences, but they must be willing to give students the opportunity to engage with "big questions" and develop their own perspectives. Students with underrepresented identities may derive a particular value from studying social problems that affect their communities. Instruction that makes connections to those issues explicit may speak more personally to them. Thus, students may come to see the importance of economics in solving the problems they care about and ultimately view themselves as an economist who studies these important questions—and pursue further studies in economics.

Theory and Evidence on Culturally Sustaining Pedagogy

Culturally sustaining pedagogy comprises a wide array of approaches, which may be why the study of interventions in this area does not yet include meta-analyses or systematic reviews. While additional and more rigorous work is needed, here we present promising evidence from a few studies investigating specific implementations.

A longitudinal study of over 150 professors in science, technology, engineering, and mathematics with over 15,000 students at a large selective public university showed that instructors who believe skills are fixed have racial achievement gaps twice as large as instructors who have a growth mindset (Canning et al. 2019). The study also found that students of fixed mindset instructors are less motivated and have more negative experiences in class.

There is mixed evidence about whether interventions can increase academic performance by way of improving a student's growth mindset. It seems possible to increase a student's growth mindset, but the effects are heterogeneous across students (Yeager and Dweck 2020; Burnette et al. 2023). Some studies do find

significant impacts. For example, in the context of secondary mathematics education, a short online intervention to boost a growth mindset improved grades among lower-achieving students and led to more overall enrollment in advanced math courses (Yeager et al. 2019). A student's growth mindset and its ability to boost their achievement is significantly bolstered by their peers' norms about growth mindset (Yeager et al. 2019) and whether their instructor also shares a growth mindset (Canning et al. 2019).

Indeed, the email intervention in Carrell and Kurlaender (2023) discussed earlier, in which instructors sent encouraging emails to students who were struggling to perform well, likely owed some of its success to the fact that it demonstrated that the professor believed the student could grow and succeed, and perhaps that it encouraged a growth mindset in the student as well. For instance, underrepresented minority students that received the email treatment were more likely to report that they believed their instructor cared about them. This effect was about 20 percent stronger for first- and second-year students from underrepresented racial minority groups.

Some research has shown that incorporating lived experience (an application of asset-based pedagogy) in instruction in science, technology, engineering, and mathematics can improve learning. A graduate course in public health at George Washington University tested whether an idea associated with some students' lived experience helped them learn. Students were asked to test the "Grandma Hypothesis" about the importance of washing certain parts of your body, like behind the ears and between the toes, by examining whether these parts of their bodies were actually less clean than other parts. The students who tested the Grandma Hypothesis, as compared to those who did not, had higher grades, showed greater confidence in presenting results despite little prior knowledge, and were less likely to report that genomics topics were difficult or unclear (Pérez-Losada, Crandall, and Crandall 2020).

Similarly, in a microbiology laboratory class at a Hispanic-serving institution, students were assigned to ask a family member for a home remedy for gastrointestinal pain. The assignment had them assess whether the remedy worked by killing bacteria or soothing symptoms, and then design and perform an experiment to test the efficacy of the home remedies. Students who did the home remedy experiments got more questions right, attempted harder problems, found the lab more interesting, and were more likely to view themselves as scientists (Fuller and Torres Rivera 2021). In these ways, culturally relevant teaching promoted identity formation in the field.[14]

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[14] For an example from a lower-income country, Nourani, Ashraf, and Banerjee (2023) evaluate a randomized control trial in Uganda of an intervention that taught teachers how to pose sharp questions and generate hypotheses from everyday lived experiences with students. The intervention led to a 51–75 percent percentage point increase in the advancement rate to secondary school for students of treated teachers.

Another aspect of a student's lived experience is whether they are communal goal-oriented or individual goal-oriented. Research has also considered whether science, technology, engineering, and mathematics are experienced as incongruous with communal goal orientations of group success. In a review of this literature, Boucher et al. (2017) show students from several underrepresented demographic groups, notably women, racial minorities, and first-generation students, may prioritize communal goal orientation but find these fields to be more individualistic. They recommend interventions that show students that work in these fields includes collaborative activities and that they can achieve broader communal social goals. Thus, collaborative learning interventions of the types discussed in the earlier section of this paper can also promote cultural relevance.

Some instructors may believe that a route to asset-based learning is to try to match students varied preferred learning styles. There is limited evidence that matching students' learning styles is effective at improving student performance, and there is much doubt about whether distinct learning styles are an empirically and conceptually meaningful phenomenon (Kirschner 2017; Pashler et al. 2008). However, students in general seem to benefit from teaching that uses different representations of content and leverages students' backgrounds as assets: research applying cognitive science principles suggests, for example, that the most effective clicker questions ask students to both draw on everyday experience and to make connections between different representations of content, including graphical, mathematical, and anecdotal representations (Boyle and Goffe 2018; Weiman et al. 2017).

What Can Culturally Responsive and Sustaining Pedagogy Look Like in Economics?

The principles underlying culturally relevant and responsive pedagogy have found limited traction in economics to date. For example, Canning et al. (2019) find that economics instructors are more likely than those in most other fields to have a fixed mindset with regard to their students. As additional evidence, in an introductory economics course at a liberal arts school, only 29 percent of students who identify as women and underrepresented racial minorities believed that examples used in class were relevant to their lives (compared to 40 percent of men who are not racial minorites), and 77 percent of women and students from racial minority groups (compared to 65 of percent of men who are not racial minorities) believed that their courses overlooked important aspects of issues studied in class (Bayer et al. 2020). There are, therefore, many opportunities, some quite simple, for economics instructors to incorporate a growth mindset, asset-based pedagogy, and critical consciousness into their classes. Many of these interventions also incorporate elements of active and collaborative learning, role models, and improved forms of assessment and feedback.

Instructors can foster a growth mindset by explicitly encouraging students to adopt such a mindset and by explicitly signaling that they are invested in their students' success. Instructors can provide a brief overview of the importance of a growth mindset at the beginning of the course. This can be done by including a section about growth mindset in a course syllabus, or can be discussed on the first

day of class; past research has shown that even brief interventions can be effective (Yeager et al. 2019). This text or discussion can highlight scientific evidence that a growth mindset is accurate, encourage students to identify ways that improving their performance can help them achieve personal or social goals, and ask them to apply what they learned about growth mindset in a hypothetical letter to future students.[15]

Because of the importance of instructors' growth mindset, instructors should communicate that they believe their students are capable of success. Encouraging emails that provide tips for success, like those in Carrell and Kurlaender (2023), exemplify this approach. Instructors can also send messages to congratulate students not only on achievement but also on improvement. Instructors can also signal belief in students' growth capacity by drawing on a wider range of students, including students who may not have perfect grades but who have shown personal growth in economics, to serve in key roles like teaching and research assistant—and if these students can share their stories with those that follow them, they can also serve as role models for achievable success.

Instructors can implement asset-based pedagogy in a variety of ways. Economics content lends itself well to presentation in a variety of formats: anecdotal, mathematical, and graphical representations. As discussed in the section on active and collaborative learning, many economics instructors have found creative ways to engage students in active and collaborative work; such exercises can promote engagement by students who have communal values. Instructors can also leverage student backgrounds as assets by focusing the examples and applications used in class around topics students find relatable and by asking students to generate examples themselves; for example, when discussing elasticity, students can be asked to do a "think, pair, share" in which they come up with items for which they and their friends likely have highly elastic demand, and items for which they likely have less elastic demand. Additionally, we can signal that traditionally underrepresented students are valued by using in our examples a variety of pronouns as well as names from a wide array of origin countries.

Boyle and Goffe (2018) implement various strategies in line with asset-based pedagogy to improve performance in a principles of macroeconomics course. For instance, they used clicker questions that asked students to draw on prior knowledge and make connections between different topics. The introduction of new topics during lectures always began at the most concrete level and then moved to more abstract levels. Their course also included peer activities, including students engaging in peer instruction to convince each other of correct answers after a first attempt of answering a challenging question.
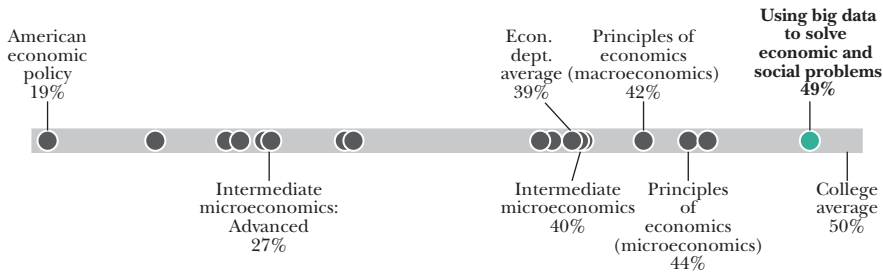
Similarly, the previously discussed intervention in Avery et al. (2024) that closed gender gaps in macroeconomics included both structured group work and "real world" applications. Such applications can be chosen based on a survey of students

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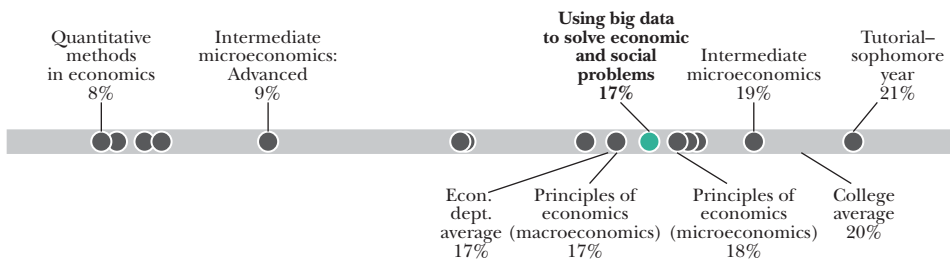[15] More information on implementing growth mindset lessons can be seen at https://diversifyingecon.org/growth-mindset.

Figure 4
How Socially Relevant Topics Improve Gender Representation

Panel A. Women

American
economic
policy
19%

Intermediate
microeconomics:
Advanced
27%

Econ.
dept.
average (macroeconomics)
39%

Principles of
economics
(macroeconomics)
42%

Intermediate
microeconomics
40%

Principles
of
economics
(microeconomics)
44%

**Using big data
to solve
economic and
social problems
49%**

College
average
50%

Panel B. Underrepresented minorities

Quantitative
methods
in economics
8%

Intermediate
microeconomics:
Advanced
9%

**Using big data
to solve economic
and social
problems
17%**

Intermediate
microeconomics
19%

Tutorial–
sophomore
year
21%

Econ.
dept.
average (macroeconomics)
17%

Principles of
economics
(macroeconomics)
17%

Principles of
economics
(microeconomics)
18%

College
average
20%

Source: Bayer et al. (2020b).
Note: These charts show the shares of undergraduate women (panel A) and African American and Hispanic (panel B) students in undergraduate economics courses at Harvard University. The enrollment statistics present means over academic years 2018–2019 and 2019–2020 and exclude summer terms. The sample is restricted to classes taught in both academic years, with an enrollment of at least 20 students in each term. Observations with missing gender or ethnicity are excluded in the respective graphs. We also exclude senior thesis seminars from this analysis. The college averages shown in each panel show the share of women and underrepresented minorities pooling all undergraduate courses.

(Wirth and Perkins 2005) or critical consciousness (for example, topics relating to gender, racial, or socioeconomic inequality). But topics need not be political or charged to be relevant, and instructors should take care not to make assumptions about any particular student's interests or experiences or to put any student in the spotlight as the spokesperson for an issue to which they may seem to have a demographic connection. In addition, applications can be simple and "fun": examples in Avery et al. (2024) included concessions prices at sporting events, impacts of ride-sharing apps, and current events. On applications large and small, it is also important to encourage a variety of views to be expressed.

That said, applications in economics can easily foster critical consciousness, because so much work in economics is focused on policy relevant topics. Bayer et al. (2020b) share their experience with an introductory economics course at Harvard that was overhauled to emphasize social relevance, personal connection,

and real-world topics. The course achieved gender parity, as shown in our Figure 4, reproduced from their paper, and was one of the most highly reviewed courses at Harvard. Examples covered in the course include inequality of opportunity, access to healthcare, criminal justice issues, environmental justice, and even the effects of military strategy on local development.[16]

Economics can also be made to feel more relevant and engaged with critical consciousness if our teaching emphasizes criteria beyond efficiency. For example, Stafford (2021) urges instructors to teach more about distributional impacts when discussing market failures, and Darity (2022) suggests that scarcity be de-emphasized as a central concept in favor of uncertainty and inequality. It is easy to find examples of scholarship that can be highlighted in class to show the relevance of economics to such issues. For instance, we can discuss how well policies close racial wealth gaps (as in Darity, Mullen, and Slaughter 2022), narrow gender inequality (Goldin 2023), improve economic mobility for low-income children (Bergman et al. 2024), and narrow college enrollment gaps by socioeconomic status (Dynarski et al. 2021).

Critical consciousness can be communicated before classes begin to increase interest and enrollment. Bayer, Bhanot, and Lozano (2019) conduct a field experiment that combines role models with social relevance. In the experiment, students are given information about economists from diverse demographic backgrounds with diverse research agendas. Research highlighted includes the effectiveness of charter schools, the relationship between education and Caesarian sections, and the role of peer networks in gender inequality. Students who received the information intervention were 3 percentage points more likely to complete an economics course as compared to students who received a simple message encouraging them to consider taking economics. These effects were even stronger for first-generation college students.

Conclusion

In this paper, we have sought to address twin issues in economics that have largely been considered separately. The first issue is a stubborn lack of diversity in economics on dimensions including but not limited to gender (Chari 2023), race and ethnicity (Hoover and Washington 2023), and socioeconomic status and family background (Stansbury and Schultz 2023). The second issue is that economics instructors have not widely adopted modern evidence-based teaching methods (Asarta, Chambers, and Harter 2021) and, by and large, still use approaches to instruction that are less effective, even though the American Economic Association has encouraged instructors to use techniques that have been shown to be more effective and more inclusive (AEA 2020).

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[16] Course materials are available at https://opportunityinsights.org/course/.

While these challenges are significant, they point to a true opportunity. Education research in science, technology, engineering, and mathematics has identified many strategies that economists can use to help students who are diverse on all dimensions see themselves in economics and see a value in studying it. Many of our suggestions align with best practices promoted by the American Economic Association (AEA 2020) and those identified in the Undergraduate Women in Economics experimental initiative (Avilova 2023; Avilova and Goldin 2023), and many can be implemented or bolstered using resources from the website Diversifying Economic Quality (Bayer 2021). The ideas in this paper include ideas suited for a wide range of courses, with some broadly applicable and some best suited to introductory or advanced classes in particular. There are benefits to using inclusive teaching at all levels: at the introductory level, the widest swath of possible economics students is reached, whereas at higher levels, students may have the skills to engage with and contribute to more complex content on their own and may have an eye toward future work in economics.

Our suggestions in this paper have taken the curricular requirements of an economics major as fixed, but additional opportunities may be unlocked by altering the conventional requirements. For example, the introductory sequence can be made more flexible or can be altered to expose students to relevant research and data early on, as has been done at Harvard University (Bayer et al. 2020b) and Hamilton College (Owen and Hagstrom 2021). As another example, Harvey Mudd College has improved gender equity in computer science by creating separate tracks for students who have previous experience in programming from those with none (as reported in Hafner 2012).

Students with a variety of diverse identities may currently feel, in a standard economics classroom, that economics is not for them, is not about them, and does not value them. All economists who teach send signals to our students that influence their identity journey; as such, every wavering student gives us an opportunity to be the one who helps them see value in economics and see that economics values them. Let us seize those opportunities to build the more vibrant and diverse economics profession we all want to see.

References

Agurto, Marcos, Muchin Bazan, Siddharth Hari, and Sudipta Sarangi. 2022. "To Inspire and to Inform: The Role of Role Models." Unpublished.

Akerlof, George A., and Rachel E. Kranton. 2000. "Economics and Identity." *Quarterly Journal of Economics* 115 (3): 715–53.

Alston, Mackenzie, William A. Darity, Catherine C. Eckel, Lawrence McNeil, and Rhonda Sharpe. 2022. "The Effect of Stereotypes on Black College Test Scores at a Historically Black University." *Journal of Economic Behavior and Organization* 194: 408–24.

American Economic Association (AEA). 2020. "Working with Students.". https://www.aeaweb.org/resources/bestpractices/working-with-students.

Archer, Louise, and Jennifer DeWitt. 2016. *Understanding Young People's Science Aspirations: How Students Form Ideas about 'Becoming a Scientist.'* New York: Routledge.

Aronson, Elliot, N. Blaney, C. Stephin, J. Sikes, and M. Snapp. 1978. *The Jigsaw Classroom.* Thousand Oaks, CA: Sage.

Asarta, Carlos J., Rebecca G. Chambers, and Cynthia Harter. 2021. "Teaching Methods in Undergraduate Introductory Economics Courses: Results from a Sixth National Quinquennial Survey." *American Economist* 66 (1): 18–28.

Avery, Mallory, Jane Caldwell, Christian D. Schunn, and Katherine Wolfe. 2024. "Improving Introductory Economics Course Content and Delivery Improves Outcomes for Women." *Journal of Economic Education*: 1–16. https://doi.org/10.1080/00220485.2024.2334041.

Avilova, Tatyana. 2023. "Summary of UWE Treatment School Progress Reports and Best Practices." https://github.com/tavilova/PersonalWebsite/blob/gh-pages/Appendix_ProgressReports.pdf.

Avilova, Tatyana, and Claudia Goldin. 2023. "What Did UWE Do for Economics?" NBER Working Paper 31432.

Ballen, Cissy J., Carl Wieman, Shima Salehi, Jeremy B. Searle, and Kelly R. Zamudio. 2017. "Enhancing Diversity in Undergraduate Science: Self-Efficacy Drives Performance Gains with Active Learning." *CBE—Life Sciences Education* 16 (4): ar56.

Bandiera, Oriana, Valentino Larcinese, and Imran Rasul. 2015. "Blissful Ignorance? A Natural Experiment on the Effect of Feedback on Students' Performance." *Labour Economics* 34: 13–25.

Barkley, Elizabeth F., K. Patricia Cross, and Claire Howell Major. 2004. *Collaborative Learning Techniques: A Handbook for College Faculty.* San Francisco: John Wiley and Sons.

Barrera, Sergio, Susan Sajadi, Marionette Holmes, and Sarah Jacobson. 2024. "Replication data for: Valuing Identity in the Classroom: What Economics Can Learn from Science, Technology, Engineering, and Mathematics Education." American Economic Association [publisher], Inter-university Consortium for Political and Social Research [distributor]. https://doi.org/10.3886/E202581V1.

Bayer, Amanda. 2021. "Diversifying Economic Quality." American Economic Association Committee on the Status of Minority Groups in the Economics Profession. https://diversifyingecon.org.

Bayer, Amanda, Syon P. Bhanot, and Fernando Lozano. 2019. "Does Simple Information Provision Lead to More Diverse Classrooms? Evidence from a Field Experiment on Undergraduate Economics." *AEA Papers and Proceedings* 109: 110–14.

Bayer, Amanda, Syon P. Bhanot, Erin T. Bronchetti, and Stephen A. O'Connell. 2020a. "Diagnosing the Learning Environment for Diverse Students in Introductory Economics: An Analysis of Relevance, Belonging, and Growth Mindsets." *AEA Papers and Proceedings* 110: 294–98.

Bayer, Amanda, Gregory Bruich, Raj Chetty, and Andrew Housiaux. 2020b. "Expanding and Diversifying the Pool of Undergraduates Who Study Economics: Insights from a New Introductory Course at Harvard." *Journal of Economic Education* 51 (3–4): 364–79.

Bayer, Amanda, Gary A. Hoover, and Ebonya Washington. 2020. "How You Can Work to Increase the Presence and Improve the Experience of Black, Latinx, and Native American People in the Economics Profession." *Journal of Economic Perspectives* 34, (3): 193–219.

Bedard, Kelly, Jacqueline Dodd, and Shelly Lundberg. 2021. "Can Positive Feedback Encourage Female and Minority Undergraduates into Economics?" *AEA Papers and Proceedings* 111: 128–32.

Bergman, Peter, Raj Chetty, Stefanie DeLuca, Nathaniel Hendren, Lawrence F. Katz, and Christopher Palmer. Forthcoming. "Creating Moves to Opportunity: Experimental Evidence on Barriers to Neighborhood Choice." *American Economic Review.*

Bishop, Jacob, and Matthew A. Verleger. 2013. "The Flipped Classroom: A Survey of the Research." Paper presented at ASEE Annual Conference and Exposition, Atlanta, GA, June.

Boucher, Kathryn L., Melissa A. Fuesting, Amanda B. Diekman, and Mary C. Murphy. 2017. "Can I Work with and Help Others in This Field? How Communal Goals Influence Interest and Participation in STEM Fields." *Frontiers in Psychology* 8. https://doi.org/10.3389/fpsyg.2017.00901.

Boyle, Austin, and William L. Goffe. 2018. "Beyond the Flipped Class: The Impact of Research-Based Teaching Methods in a Macroeconomics Principles Class." *AEA Papers and Proceedings* 108: 297–301.

Burnette, Jeni L., Joseph Billingsley, George C. Banks, Laura E. Knouse, Crystal L. Hoyt, Jeffrey M. Pollack, and Stefanie Simon. 2023. "A Systematic Review and Meta-Analysis of Growth Mindset Interventions: For Whom, How, and Why Might Such Interventions Work?" *Psychological Bulletin* 149 (3–4): 174–205.

Button, Patrick, LaPorchia A. Collins, Augustine Denteh, Mónica García-Pérez, Ben Harrell, Elliott Isaac, and Engy Ziedan. 2021. "Teaching Controversial and Contemporary Topics in Economics Using a Jigsaw Literature Review Activity." *Journal of Economic Education* 52 (4): 286–95.

Byrd, Christy M. 2016. "Does Culturally Relevant Teaching Work? An Examination from Student Perspectives." *SAGE Open* 6 (3): 2158244016660744.

Canning, Elizabeth A., Katherine Muenks, Dorainne J. Green, and Mary C. Murphy. 2019. "STEM Faculty Who Believe Ability Is Fixed Have Larger Racial Achievement Gaps and Inspire Less Student Motivation in Their Classes." *Science Advances* 5 (2): eaau4734.

Carlone, Heidi B., and Angela Johnson. 2007. "Understanding the Science Experiences of Successful Women of Color: Science Identity as an Analytic Lens." *Journal of Research in Science Teaching* 44 (8): 1187–1218.

Carrell, Scott E., and Michal Kurlaender. 2023. "My Professor Cares: Experimental Evidence on the Role of Faculty Engagement." *American Economic Journal: Economic Policy* 15 (4): 113–41.

Carrell, Scott E., Marianne E. Page, and James E. West. 2009. "Sex and Science: How Professor Gender Perpetuates the Gender Gap." *Quarterly Journal of Economics* 125 (3): 1101–44.

Caviglia-Harris, Jill. 2016. "Flipping the Undergraduate Economics Classroom: Using Online Videos to Enhance Teaching and Learning." *Southern Economic Journal* 83 (1): 321–31.

Chari, Anusha. 2023. "The 2023 Report of the Committee on the Status of Women in the Economics Profession." *AEA Papers and Proceedings* 113: 815–39.

Collins, LaPorchia. 2020. "The Do Now: A Simple, but Effective Active Learning Strategy." *Applied Economics Teaching Resources* 2 (2).

Darity, William. 2022. "Alternatives to the Scarcity Principle." *Journal of Economic Education* 53 (4): 340–47.

Darity, William, Jr., A. Kirsten Mullen, and Marvin Slaughter. 2022. "The Cumulative Costs of Racism and the Bill for Black Reparations." *Journal of Economic Perspectives* 36 (2): 99–122.

Dee, Thomas S. 2005. "A Teacher Like Me: Does Race, Ethnicity, or Gender Matter?" *American Economic Review* 95 (2): 158–65.

Dissanayake, Sahan T. M., and Sarah A. Jacobson. 2016. "Policies with Varying Costs and Benefits: A Land Conservation Classroom Game." *Journal of Economic Education* 47 (2): 142–60.

Dynarski, Susan, C. J. Libassi, Katherine Michelmore, and Stephanie Owen. 2021. "Closing the Gap: The Effect of Reducing Complexity and Uncertainty in College Pricing on the Choices of Low-Income Students." *American Economic Review* 111 (6): 1721–56.

Eddy, Sarah L., and Kelly A. Hogan. 2014. "Getting under the Hood: How and for Whom Does Increasing Course Structure Work?" *CBE—Life Sciences Education* 13 (3): 453–68.

Estrada, Mica, Gerald R. Young, Jill Nagy, Emily J. Goldstein, Avi Ben-Zeev, Leticia Márquez-Magaña, and Alegra Eroy-Reveles. 2019. "The Influence of Microaffirmations on Undergraduate Persistence in Science Career Pathways." *CBE—Life Sciences Education* 18 (3): ar40.

Evans, Carol. 2013. "Making Sense of Assessment Feedback in Higher Education." *Review of Educational Research* 83 (1): 70–120.

Fairlie, Robert W., Florian Hoffmann, and Philip Oreopoulos. 2014. "A Community College Instructor Like Me: Race and Ethnicity Interactions in the Classroom." *American Economic Review* 104 (8): 2567–91.

Fairweather, James. 2010. "Linking Evidence and Promising Practices in Science, Technology, Engineering, and Mathematics (STEM) Undergraduate Education A Status Report for The National Academies National Research Council Board of Science Education." Status Report for National Academies National Research Council Board of Science Education.

Freeman, Scott, Sarah L. Eddy, Miles McDonough, Michelle K. Smith, Nnadozie Okoroafor, Hannah Jordt, and Mary Pat Wenderoth. 2014. "Active Learning Increases Student Performance in Science, Engineering, and Mathematics." *Proceedings of the National Academy of Sciences of the United States of America* 111 (23): 8410–15.

Fuller, Karla S., and Camila Torres Rivera. 2021. "A Culturally Responsive Curricular Revision to Improve Engagement and Learning in an Undergraduate Microbiology Lab Course." *Frontiers in Microbiology* 11: 577852.

Gay, Geneva. 2000. *Culturally Responsive Teaching: Theory, Research, and Practice.* New York and London: Teachers College, Columbia University.

Gladstone, Jessica R., and Andrei Cimpian. 2021. "Which Role Models Are Effective for Which Students? A Systematic Review and Four Recommendations for Maximizing the Effectiveness of Role Models in STEM." *International Journal of STEM Education* 8 (1): 59.

Godwin, Allison. 2016. "The Development of a Measure of Engineering Identity." Paper presented at ASEE Annual Conference and Exposition, New Orleans, June 26.

Godwin, Allison, Geoff Potvin, Zahra Hazari, and Robynne Lock. 2016. "Identity, Critical Agency, and Engineering: An Affective Model for Predicting Engineering as a Career Choice." *Journal of Engineering Education* 105 (2): 312–40.

Goffe, William L., and David Kauper. 2014. "A Survey of Principles Instructors: Why Lecture Prevails." *Journal of Economic Education* 45 (4): 360–75.

Goldin, Claudia. 2023. "Why Women Won." NBER Working Paper 31762.

Hafner, Katie. 2012. "Giving Women the Access Code." *The New York Times*, April 2. https://www.nytimes.com/2012/04/03/science/giving-women-the-access-code.html.

Harter, Cynthia, Rebecca G. Chambers, and Carlos J. Asarta. 2022. "Assessing Learning in College Economics: A Sixth National Quinquennial Survey." *Eastern Economic Journal* 48 (2): 251–66.

Hazari, Zahra, Gerhard Sonnert, Philip M. Sadler, and Marie-Claire Shanahan. 2010. "Connecting High School Physics Experiences, Outcome Expectations, Physics Identity, and Physics Career Choice: A Gender Study." *Journal of Research in Science Teaching* 47 (8): 978–1003.

Hernandez, Paul R., P. Wesley Schultz, Mica Estrada, Anna Woodcock, and Randie C. Chance. 2013. "Sustaining Optimal Motivation: A Longitudinal Analysis of Interventions to Broaden Participation of Underrepresented Students in STEM." *Journal of Educational Psychology* 105 (1): 89–107.

Herrmann, Sarah D., Robert Mark Adelman, Jessica E. Bodford, Oliver Graudejus, Morris A. Okun, and Virginia S. Y. Kwan. 2016. "The Effects of a Female Role Model on Academic Performance and Persistence of Women in STEM Courses." *Basic and Applied Social Psychology* 38 (5): 258–68.

Holt, Charles A. 1996. "Classroom Games: Trading in a Pit Market." *Journal of Economic Perspectives* 10 (1): 193–203.

Holt, Charles A., and Susan K. Laury. 1997. "Classroom Games: Voluntary Provision of a Public Good." *Journal of Economic Perspectives* 11 (4): 209–15.

Hoover, Gary A., and Ebonya Washington. 2023. "Report of the Committee on the Status of Minority Groups in the Economics Profession." *AEA Papers and Proceedings* 113: 794–814.

Kaddoura, Mahmoud. 2013. "Think Pair Share: A Teaching Learning Strategy to Enhance Students' Critical Thinking." *Educational Research Quarterly* 36 (4): 3–24.

Kagan, Spencer. 1994. *Cooperative Learning.* San Clemente, CA: Kagan Publishing.

Kirschner, Paul A. 2017. "Stop Propagating the Learning Styles Myth." Computers and Education 106: 166–171.

Kofoed, Michael S., and Elizabeth McGovney. 2019. "The Effect of Same-Gender or Same-Race Role Models on Occupation Choice: Evidence from Randomly Assigned Mentors at West Point." *Journal of Human Resources* 54 (2): 430–67.

Ladson-Billings, Gloria. 1995. "Toward a Theory of Culturally Relevant Pedagogy." *American Educational Research Journal* 32 (3): 465–91.

Lawner, Elizabeth K., Diane M. Quinn, Gabriel Camacho, Blair T. Johnson, and Bradley Pan-Weisz. 2019. "Ingroup Role Models and Underrepresented Students' Performance and Interest in STEM: A Meta-Analysis of Lab and Field Studies." *Social Psychology of Education* 22 (5): 1169–95.

Layton, Richard A., Misty L. Loughry, Matthew W. Ohland, and George D. Ricco. 2010. "Design and Validation of a Web-Based System for Assigning Members to Teams Using Instructor-Specified Criteria." *Advances in Engineering Education* 2 (1): n1.

López, Francesca A. 2017. "Altering the Trajectory of the Self-Fulfilling Prophecy: Asset-Based Pedagogy and Classroom Dynamics." *Journal of Teacher Education* 68 (2): 193–212.

Lundberg, Shelly, and Jenna Stearns. 2019. "Women in Economics: Stalled Progress." *Journal of Economic Perspectives* 33 (1): 3–22.

Madaus, George F., and Marguerite Clarke. 2001. "The Adverse Impact of High Stakes Testing on Minority Students: Evidence from 100 Years of Test Data." Unpublished.

McLoughlin, Lisa A. 2005. "Spotlighting: Emergent Gender Bias in Undergraduate Engineering Education." *Journal of Engineering Education* 94 (4): 373–81.

Murphy, M. C., V. J. Taylor, and C. M. Steele. Forthcoming. "Stereotype Threat: A Situated Theory of Social Cognition." In *Oxford Handbook of Social Cognition***, edited by K. Hugenberg, K. Johnson, and D. Carlston. New York: Oxford University Press.**

National Academies of Sciences, Engineering, and Medicine. 2011. *Successful K–12 STEM Education: Identifying Effective Approaches in Science, Technology, Engineering, and Mathematics.* Washington, DC: National Academies Press.

National Academies of Sciences, Engineering, and Medicine. 2018. *How People Learn II: Learners, Contexts, and Cultures.* Washington, DC: National Academies Press.

National Center for Education Statistics. 1996–2022. "Integrated Postsecondary Education Data System Statistical Tables—Fall Enrollment: Race/Ethnicity, Gender, Attendance Status, and Level of Student." United States Department of Education. https://nces.ed.gov/ipeds/datacenter (accessed May 4, 2024).National Research Council. 2000. *How People Learn: Brain, Mind, Experience, and School: Expanded Edition*. Washington, DC: National Academies Press.

Nokes-Malach, Timothy J., J. Elizabeth Richey, and Soniya Gadgil. 2015. "When Is It Better to Learn Together? Insights from Research on Collaborative Learning." *Educational Psychology Review* 27 (4): 645–56.

Nourani, Vesall, Nava Ashraf, and Abhijit Banerjee. 2023. "Learning to Teach by Learning to Learn." Unpublished.

Olsson, Maria, and Sarah E. Martiny. 2018. "Does Exposure to Counterstereotypical Role Models Influence Girls' and Women's Gender Stereotypes and Career Choices? A Review of Social Psychological Research." *Frontiers in Psychology* 9: 392862.

Owen, Ann L., and Paul Hagstrom. 2021. "Broadening Perceptions of Economics in a New Introductory Economics Sequence." *Journal of Economic Education* 52 (3): 175–91.

Pashler, Harold, Mark McDaniel, Doug Rohrer, and Robert Bjork. 2008. "Learning Styles: Concepts and Evidence." *Psychological Science in the Public Interest* 9 (3): 105–19.

Pérez-Losada, Marcos, Kelly M. Crandall, and Keith A. Crandall. 2020. "Testing the 'Grandma Hypothesis': Characterizing Skin Microbiome Diversity as a Project-Based Learning Approach to Genomics." *Journal of Microbiology and Biology Education* 21 (1).

Pittinsky, Todd L., and R. Matthew Montoya. 2016. "Empathic Joy in Positive Intergroup Relations." *Journal of Social Issues* 72 (3): 511–23.

Porter, Catherine, and Danila Serra. 2020. "Gender Differences in the Choice of Major: The Importance of Female Role Models." *American Economic Journal: Applied Economics* 12 (3): 226–54.

Ralph, Vanessa R., Leah J. Scharlott, Adam G. L. Schafer, Megan Y. Deshaye, Nicole M. Becker, and Ryan L. Stowe. 2022. "Advancing Equity in STEM: The Impact Assessment Design Has on Who Succeeds in Undergraduate Introductory Chemistry." *JACS Au* 2 (8): 1869–80.

Sackett, Paul R., Chaitra M. Hardison, and Michael J. Cullen. 2004. "On Interpreting Stereotype Threat as Accounting for African American-White Differences on Cognitive Tests." *American Psychologist* 59 (1): 7–13.

Salehi, Shima, Cissy J. Ballen, Gloriana Trujillo, and Carl Wieman. 2021. "Inclusive Instructional Practices: Course Design, Implementation, and Discourse." *Frontiers in Education* 6.

Schinske, Jeffrey N., Heather Perkins, Amanda Snyder, and Mary Wyer. 2016. "Scientist Spotlight Homework Assignments Shift Students' Stereotypes of Scientists and Enhance Science Identity in a Diverse Introductory Science Class." *CBE—Life Sciences Education* 15 (3): ar47.

Secchi, Silvia, and Simanti Banerjee. 2019. "A Dynamic Semester-Long Social Dilemma Game for Economic and Interdisciplinary Courses." *Journal of Economic Education* 50 (1): 70–85.

Sheridan, Brandon J., and Ben Smith. 2020. "How Often Does Active Learning Actually Occur? Perception versus Reality." *AEA Papers and Proceedings* 110: 304–08.

Simkins, Scott, and Mark Maier, eds. 2009. *Just in Time Teaching: Across the Disciplines, and Across the Academy.* New York: Routledge.

Skagen, Darlene, Brett McCollum, Layne Morsch, and Brandon Shokoples. 2018. "Developing Communication Confidence and Professional Identity in Chemistry through International Online

Collaborative Learning." *Chemistry Education Research and Practice* 19 (2): 567–82.

Sokhanvar, Zahra, Keyvan Salehi, and Fatemeh Sokhanvar. 2021. "Advantages of Authentic Assessment for Improving the Learning Experience and Employability Skills of Higher Education Students: A Systematic Literature Review." *Studies in Educational Evaluation* 70: 101030.

Springer, Leonard, Mary Elizabeth Stanne, and Samuel S. Donovan. 1999. "Effects of Small-Group Learning on Undergraduates in Science, Mathematics, Engineering, and Technology: A Meta-Analysis." *Review of Educational Research* 69 (1): 21–51.

Stafford, Sarah L. 2021. "Emphasizing Distributional Impacts in Teaching Solutions to Market Failures." *International Review of Environmental and Resource Economics* 15 (3): 175–202.

Stansbury, Anna, and Robert Schultz. 2023. "The Economics Profession's Socioeconomic Diversity Problem." *Journal of Economic Perspectives* 37 (4): 207–30.

Starr, Christine R., Lisa Hunter, Robin Dunkin, Susanna Honig, Rafael Palomino, and Campbell Leaper. 2020. "Engaging in Science Practices in Classrooms Predicts Increases in Undergraduates' STEM Motivation, Identity, and Achievement: A Short-Term Longitudinal Study." *Journal of Research in Science Teaching* 57 (7): 1093–1118.

Steele, Claude M. 1997. "A Threat in the Air: How Stereotypes Shape Intellectual Identity and Performance." American Psychologist 52 (6): 613–29.

Steele, Claude M., and Joshua Aronson. 1995. "Stereotype Threat and the Intellectual Test Performance of African Americans." *Journal of Personality and Social Psychology* 69 (5): 797–811.

Steele, Claude M., Steven J. Spencer, and Joshua Aronson. 2002. "Contending with Group Image: The Psychology of Stereotype and Social Identity Threat." In *Advances in Experimental Social Psychology*, Vol. 34, edited by Mark P. Zanna, 379–440. San Diego, CA: Academic Press.

Stommel, Jesse. 2018. "How to Ungrade." Jesse Stommel, March 11. https://www.jessestommel.com/how-to-ungrade.

Stout, Jane G., Nilanjana Dasgupta, Matthew Hunsinger, and Melissa A. McManus. 2011. "STEMing the Tide: Using Ingroup Experts to Inoculate Women's Self-Concept in Science, Technology, Engineering, and Mathematics (STEM)." *Journal of Personality and Social Psychology* 100 (2): 255–70.

Theobald, Elli J., Mariah J. Hill, Elisa Tran, Sweta Agrawal, E. Nicole Arroyo, Shawn Behling, Nyasha Chambwe et al. 2020. "Active Learning Narrows Achievement Gaps for Underrepresented Students in Undergraduate Science, Technology, Engineering, and Math." *Proceedings of the National Academy of Sciences* 117 (12): 6476–83.

Verdín, Dina, Allison Godwin, Adam Kirn, Lisa Benson, and Geoff Potvin. 2018. "Understanding How Engineering Identity and Belongingness Predict Grit for First-Generation College Students." School of Engineering Education Graduate Student Working Paper 4-2018.

Wieman, Carl, Katherine Perkins, Sarah Gilbert, Francoise Benay, Sarah Kennedy, Kate Semsar, Jenny Knight et al. 2017. *Clicker Resource Guide: An Instructors Guide to the Effective Use of Personal Response Systems (Clickers) in Teaching*. Vancouver: University of British Columbia.

Wigfield, Allan. 1994. "Expectancy-Value Theory of Achievement Motivation: A Developmental Perspective." *Educational Psychology Review* 6: 49–78.

Wirth, Karl R., and Dexter Perkins. 2005. "Knowledge Surveys: An Indispensable Course Design and Assessment Tool." *Innovations in the Scholarship of Teaching and Learning*: 1–12.

Yeager, David S., and Carol S. Dweck. 2020. "What Can Be Learned from Growth Mindset Controversies?" *American Psychologist* 75 (9): 1269–84.

Yeager, David S., Paul Hanselman, Gregory M. Walton, Jared S. Murray, Robert Crosnoe, Chandra Muller, Elizabeth Tipton et al. 2019. "A National Experiment Reveals Where a Growth Mindset Improves Achievement." *Nature* 573 (7774): 364–69.

Zhang, Luyao, Sarah A. Jacobson, and Jiasheng Zhu. 2022. "The Right Tool for the Job: Matching Active Learning Techniques to Learning Objectives." Unpublished.

Lessons for Expanding the Share of Disadvantaged Students in Economics from the AEA Summer Program at Michigan State University

Lisa D. Cook and Christine Moser

I n 2022, just over 10 percent of Economics PhDs were awarded to minorities. This underrepresentation of minorities in PhD programs in economics has been recognized as a problem in the profession for decades, yet the current share of minorities in the economics profession remains low. Specifically, of the 1,391 PhD degrees awarded in economics at US universities in 2022, 822 were received by foreign students. Of the remaining 515 who were US citizens or permanent visa-holders, 4.1 percent were Black and 6.0 percent were Hispanic (Survey of Earned Doctorates, 2022, Tables 3.3 and 3.4, https://ncses.nsf.gov/pubs/nsf24300/data-tables).

In 1969, discussions between the Caucus of Black Economists (which later became the National Economic Association) and the Executive Committee of the American Economic Association led to the establishment of the AEA Summer Program (AEASP), which sought to provide underrepresented minorities with the preparation needed for a doctoral program in economics and related disciplines (Alexis 1975). Since the Summer Program was first held at the University

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of California-Berkeley in 1974, more than a dozen institutions have hosted the AEA Summer Program (as listed in online Appendix Table 1). The program is currently based at Howard University.

The AEA Summer Program seeks to create a path to careers in economics for students who may be unaware of the opportunities in the field. These students are unlikely to have the specialized academic preparation or knowledge to navigate the application process to succeed in an economics PhD program, even if they were to overcome the hurdle to be accepted. The program covers full room, board, and tuition and provides a stipend. The AEA awards the program to an institution and provides substantial funding. The AEASP has also received funding from the National Science Foundation, the host institution, the Federal Reserve System, the National Economic Association, and other sources.

In this essay, we describe what we learned from executing the AEA Summer Program at Michigan State University from 2016 to 2020. The original program contained many of the elements that still exist today. The program's constant goals are to make participants aware of opportunities for careers in economics, graduate programs in economics, and related fields; to give participants a vision of the path towards their goals; and to enhance their ability to achieve these goals with course-work in economics, math, and statistics. The program is a residential program with an intensive curriculum of courses, seminar speakers, counseling related to graduate programs, and mentoring and support during and following the program. While the purpose remains constant, the AEA Summer Program is somewhat of a start-up, as each new hosting university is faced with strategic and tactical decisions with every move.

Our follow-up with the MSU alumni shows the promise and possibilities of targeted summer programs. We know of more than 40 program alumni who enrolled in PhD programs in economics, 19 who enrolled in PhD programs in other fields, at least 11 who enrolled in a variety of master's programs, and others who are working as research assistants or enrolled in bridge programs and will likely apply to PhD programs. Our alumni are earning prestigious awards, with at least six successfully competing for National Science Foundation (NSF) Graduate Research Fellowships, and others successfully competing for Ford and Soros Fellowships for graduate study.

We aim this essay at multiple audiences: students who might be interested in attending the AEA Summer Program, faculty who might recommend it to some of their students, all economics faculty interested in gaining insights from our experience, and departments considering hosting the program or starting a similar program. Many of the general lessons we have learned can be applied beyond a summer program, with insights to enhance the curriculum and mentoring of economics majors.

We begin with an overview of curriculum, faculty, and staffing of the AEA Summer Program at Michigan State University. While our priority was delivering high-quality courses, several other aspects of the program were also necessary for success. Therefore, we highlight the following features of the Michigan

State University program: outreach and recruiting, admissions, and an integrated and supportive learning environment. We then discuss our evidence on outcomes after the completion of the program and raise the possibility of expansion of the program. We conclude with some advice to students, faculty, and potential hosts and sponsors based on our experience.

Curriculum, Faculty, and Staff

Each home institution for the AEA Summer Program develops its own curriculum, which is proposed to and approved by the American Economic Association. The basic structure of the program at Michigan State University was similar to previous programs—offering a full load of four courses in an eight-week summer session. Although this basic structure tends to remain intact from host to host, program leadership, program instructors, and institutional capacity shape how the program is implemented.

Given the cumulative nature of undergraduate economics courses, we adopted the structure of some prior host institutions in providing instruction at two levels. The "Foundations" level was designed for students who had taken no previous econometrics and no math beyond calculus, with the aim of encouraging these students to take additional coursework at their home institutions after their summer program experience. At this level, nearly all admitted students had taken calculus, statistics, and principles courses, but needed much additional coursework to be competitive for graduate studies. Courses at the Foundations level were taught at an advanced undergraduate level.

The goal of the "Advanced" level was to prepare and challenge students who already had a strong background in undergraduate economics, math, and statistics. These students typically had taken linear algebra, econometrics, and intermediate microeconomics. These courses were taught at the equivalent of the master's level. At both levels, the courses were designed to challenge students and introduce them to key concepts, but not to replace or replicate full-term courses at their home universities. Instructors often had to make adjustments for each cohort and tutors were available for students who needed to fill a gap in their preparation.

Each level had four courses: Microeconomics, Mathematics for Economists, Econometrics, and Research Methods. In the online Appendix, Table 2 provides examples of texts used in these courses. The Foundations-level math course covered topics including single-variable and multivariate optimization, integration, and linear algebra. The Advanced-level math course included matrix algebra, derivatives, partial derivatives, optimization, linear differential equations, Lagrange multiplier methods, and dynamic programming. The Research Methods courses were designed not only to teach students the key tools of empirical research and writing, but also to empower and motivate them to explore their own research interests. The courses primarily used Stata. In addition, in 2018, we added a workshop introducing students to machine learning using R that was open to all students.

The courses required students to work with complicated data sets and interpret results. Students presented their research projects from these courses at the Pipeline conference hosted by the Committee on the Status of Minority Groups in the Economics Profession (CSMGEP).[1]

Hosting the program required staffing eight courses each summer: econometrics, mathematics, microeconomics, and research methods at the two levels. While course content was largely the purview of instructors, we encouraged innovation, and the content for the program as a whole evolved with new developments in economics research over the course of the five years at Michigan State University. For example, we explicitly introduced concepts in machine learning at both levels of the program starting summer 2018. In 2019 and 2020, soon-to-be Nobel Laureate Guido Imbens of Stanford University gave workshops on machine learning.

In our version of the Summer Program, the Microeconomics and Mathematics courses were split into four-week sessions taught by different instructors, for a total of twelve instructors each summer. In turn, graduate teaching assistants ("fellows") were hired from around the country and Michigan State University to work closely with faculty and students. All fellows participated in an orientation where we discussed and encouraged best practices for teaching economics, including those posted on the AEA website.[2]

We intentionally recruited faculty and graduate students from underrepresented backgrounds (including low-income and first-generation) to serve as instructors and fellows, with the belief that they would also be well positioned to serve as formal and informal mentors. Moreover, we believed the program functions best with continuity in the faculty, to ensure consistency across cohorts and allow faculty to apply their past experience to new cohorts. This required faculty who were willing to commit for multiple summers, and who had both an understanding of what is needed and a willingness to adapt to the needs of students in each cohort.

Early Outreach and Recruiting

A primary justification for a program that provides a clear pathway from undergraduate study to a PhD program in economics is that, without such a program, some students would be unaware that graduate studies in economics is a possible path for them, while others might learn about graduate studies too late in their

[1] The Summer Mentoring Pipeline Conference is a separate program of the Committee on the Status of Minority Groups in the Economics Profession. It brings together PhD students and early-career PhDs, their mentors, and other participants and presenters. Since 2013, the Pipeline Conference has been held during the AEA Summer Program in order to foster connections and continue expanding the pipeline. At Michigan State University, the Pipeline Conference was held the last days of the program.
[2] The program also organized a brown bag seminar for fellows in order for them to continue to make progress on their dissertations and to receive feedback from their peers from a variety of economics programs.

undergraduate careers to be adequately prepared. Therefore, our outreach and recruiting efforts aimed to encourage these types of students to apply to the summer program.

At the most basic level, we aimed to provide uniformity to the AEA Summer Program process over time. We particularly focused on having program information and the application consistently available, as well as the application period itself (available on November 1 each year and due on January 31 of the following year). With the help of the American Economic Association, this information is now hosted on the AEA website.[3]

We also instituted a series of nudges via social media to remind prospective applicants of the availability of the application at regular intervals before the deadline, to increase the number and completeness of applications. When program moved to Michigan State University in 2015, economists had begun to settle on Twitter as their social media outlet of choice, and we used Twitter (#EconTwitter) and other social media platforms extensively for disseminating information about the program. We went as far as hiring a social media expert to plan and execute our strategy. We sought to take full advantage of the democratization of information available on social media, especially with respect to other training opportunities that were often disseminated by word of mouth. As a result, the pool of applicants became more educationally and geographically diverse over the life of the program. A number of students told us that they "found us on Facebook."

Another strategic decision was to recruit continuously year-round and in person on college campuses, especially at institutions previously little known to the AEA Summer Program, and at conferences related to economics. We also hosted social media events while recruiting on campus. For example, a Facebook Live event in 2018 on the campus of Spelman College took questions from students on campus and around the country. In general, recruiting in person afforded us the opportunity to introduce the AEA Summer Program to students and faculty alike. Faculty conversations usually focused on content, structure, and admissions criteria of the program. Prospective students focused typically on content, required preparation, and affordability.

Applications and Admissions

The major considerations for admissions were (1) preparation via coursework, (2) how much the program might benefit the applicant, and (3) how the applicant would benefit the profession and further the goals of the program. In terms of coursework, to be admitted at the Foundations level, students must have completed calculus, statistics, and principles of microeconomics with at least a 3.0 grade point average. Students placed at the Advanced level typically had taken

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[3]For the website of the AEA Summer and Scholarship Programs, see https://www.aeaweb.org/about-aea/committees/aeasp.

linear algebra, econometrics, and intermediate microeconomics.[4] Because we were accepting two distinct classes, applicants with more coursework were not necessarily admitted over those with less.

For the second consideration—evaluating how the program might benefit the applicant—we looked at applicant essays and reference letters, in addition to their transcripts, to identify where we might have the biggest impact. For example, students at more prestigious schools with advanced coursework and good advising might benefit less from the program than other applicants. For the final consideration, we relied primarily on student essays and letters of recommendation to identify applicants whose backgrounds and perspectives aligned with the program's purpose, which, according the AEA Summer Program website, "is to provide a strong basis for the professional success of individuals from diverse backgrounds who will inform the profession and broaden the scope and impact of high-quality research agendas that are pursued in economics and in related fields." We did not interpret this to be strictly based on race, ethnicity, or gender and welcomed any applicant who could bring a unique perspective to the field. For example, this included sexual minorities and first-generation college students. The latter group is in recognition of the lack of socioeconomic diversity in economics relative to other fields, which has become the focal point of recent research and debate.[5]

Applicants who did not have sufficient prior coursework to succeed in the program, but who were otherwise good candidates, were sent a letter advising them of the recommended coursework and encouraging them to apply in a subsequent year. For example, we found that many students from more business-focused economics programs were not being steered toward courses and undergraduate experiences that would prepare them for graduate work in economics.

To ensure balanced class sizes, we tentatively placed admitted students in one of the two levels. To keep class sizes small, we aimed to have roughly 20 students per level, or 40 students per cohort. Applications increased dramatically after the first year and were between 120 and 150 in the last three years. The size of the admitted cohort increased from 27 in the first year to 41 in the final year. The number of qualified applicants was greater than program capacity in most years, with a typical waitlist of 10 to 15 applicants. The most common reasons for not being accepted or placed on the waitlist were missing coursework, a low-grade point average, or poor grades in key courses. In addition, some applicants, such as those who already had or were pursuing a master's degree, were not admitted, because they were overqualified and we felt the marginal benefit of the program would be limited for these applicants.

Ideally, students in the AEA Summer Program would be early in their undergraduate careers—sophomores and juniors. However, many of our admitted students were rising seniors or recent graduates who were not adequately prepared

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[4] See https://www.aeaweb.org/about-aea/committees/aeasp/program-background.
[5] See survey results related to elitism in economics in the American Economic Association Climate Survey Results Final Report 2019 and, in this journal, Stansbury and Schultz (2023).

to apply to PhD programs. In the aftermath of the program, we encouraged these students to apply for research assistantship and post-baccalaureate programs and to take additional courses to strengthen their applications.

The 177 total students who attended the AEA Summer Program at Michigan State University over the five years came from 115 different institutions in 33 states, plus the District of Columbia and Puerto Rico. Around 58 percent of these institutions were public, six were historically Black colleges and universities, and at least eight were Hispanic-serving Institutions. The gender balance was close to 50:50. About half of the students were Black, a little more than one-third were Hispanic, and the rest were a mixture of American Indian, Asian, Native Hawaiian or Pacific Islander, or white. By academic year, 19 percent were college graduates, 28 percent were rising seniors, 45 percent were rising juniors, and the remainder were sophomores.[6] The vast majority were economics majors, but several had completed degrees in other fields and were interested in switching to economics for graduate school.

A Fully Integrated Program: Mentoring and the Learning Environment

One of the main lessons we learned was that the success of the program largely derived from it being a fully integrated program that went well beyond coursework, with concern over the learning environment, mentor and cohort relations, and a developed support system. In turn, these issues required significant investments of human and financial resources. In the wake of the pandemic, we learned quickly that the online program in 2020 required more work to foster relationships, but it was possible. In parallel with the American Economic Association developing and disseminating best practices to make the profession and classrooms more inclusive, the AEA Summer Program adopted these practices in 2020 and actively encouraged faculty, fellows, and tutors to adopt them, as well. Several faculty members suggested that the classroom practices made them better overall teachers. However, the overarching principle of an integrated program was the foundation of what we considered best practice for executing this program.

Mentoring was woven into every part of the program, because many students need more than coursework to be prepared for graduate school. Many participants were first-generation college students or from programs that did not emphasize graduate school as an option. Thus, students often needed basic information on graduate programs, admissions, and the profession. They also needed to see a wide range of economists in a variety of fields and doing different jobs, through outside speakers and connections with research assistant opportunities, so that they could see the possibilities in economics. Instructors were selected both for their ability

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[6] For a year-by-year breakdown of these demographic characteristics, see Table 3 in the online Appendix.

to teach and their commitment to working with students beyond the classroom. Faculty were encouraged and graduate fellows were expected to join students on planned excursions. Several faculty members opened their homes for events, like the July 4th picnic, and others helped to organize extracurricular events, like soccer games.

Similarly, the graduate students in economics from around the country who served as teaching assistant fellows were encouraged to share their experiences and to serve as mentors, rather than only helping with homework. Teaching fellows not from Michigan State University, and thus in the area only for the summer, lived in the same dormitory as the students and often held impromptu study sessions with groups of students. Finally, we created a brown bag dissertation seminar series for fellows, who were often in various stages of writing their dissertations and could benefit from presenting drafts of their work. We began to see that the fellows were a crucial part of the program and gained from their interactions with other fellows, as well.

We found the broader learning environment was important. Initially, we over-scheduled the students. The course material and pace alone were very challenging for them. Although we scaled back and adjusted some of the programming, this environment could be very stressful for some participants. Thus, the program deliberately incorporated extracurricular group activities allowing students to understand diminishing returns to studying and the importance of work-life balance early in their academic training. Among these scheduled breaks were a midterm weekend trip to Chicago that included a visit to the Federal Reserve Bank of Chicago and a tour of the University of Chicago with research presentations by faculty and an alumna of the AEA Summer Program who was a graduate student in the economics department; weekend trips to Lake Michigan, Detroit, and Ann Arbor; yoga and exercise classes; group mental health workshops; a book club; and occasional therapy dogs. Managing stress and competitiveness became even more important when the program became virtual in 2020.

Peer pressure was ubiquitous in the program, as it is across many aspects of academia, and it was incumbent upon the faculty, fellows, and program administrators to minimize it where possible. For example, the existence of two levels in the program set up a situation in which many students wanted to be placed in the Advanced level, regardless of their prior coursework, grades, and placement test scores.[7] To reduce feelings of inferiority among those placed in the Foundations level, the faculty and program administrators had to ensure that each cohort understood why they were selected for each level and that how they were ultimately part of the same Summer Program cohort.

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[7]A placement test covering microeconomic theory and econometrics was administered shortly after students arrived. This was done because students with the same courses on their transcripts could have been exposed to different material at their home institutions. For most students, the results of the test were consistent with the level into which students had been placed, but a few were reassigned based on the test.

Students were getting enough incremental information and advice from many sources over the course of the program that we originally did not plan for individual advising at the end of the program. However, some students were overwhelmed with information and did not know what their next steps should be. Sometimes students were hearing conflicting opinions on the types of doctoral programs to consider or whether they needed to do a research assistantship.

In order to ensure that students came away with an individualized plan, we decided to create an end-of-program exit survey and interview. The survey asked students to map out plans for additional coursework and applying for pre-doctoral and research opportunities or graduate school for the next three years. The students completed the survey prior to the last day of the program. We required that they discuss the completed surveys with faculty administrators the last day of the program.[8] The backgrounds of students varied widely and standard advice for or the most common paths to a PhD did not always apply. Even for students whose plans did not involve a PhD in economics, it was important to sit with them individually and help them synthesize what they were taking away from the program. While we did not initially plan such an exit interview in advance of the program, it became a critical means by which faculty advised and mentored students and by which the program could follow up with alumni at regular intervals.

For the 2017 to 2019 cohorts, we examined responses to two questions from the exit survey: What are your current plans for post-graduate studies? How has the AEA Summer Program helped you change or refine your plans? Students at the Foundations level largely articulated plans to return to their home institutions (or to enroll in other institutions or programs) and obtain further preparation in economics before applying for a PhD in economics. A nontrivial share said they were better informed about the preparation required to do a PhD in economics, but were not sure if they would pursue a PhD. Students at the Advanced level largely articulated plans to address small gaps, if needed, before applying to PhD programs in economics. Most expressed an interest in doing a research assistantship or post-baccalaureate program to better understand what economists do, gain greater exposure to research in economics, and to enroll in classes. For the most part, ambiguity in response to these two questions focused on the timing of doing an economics PhD, not whether they should.

Broader Exposure to the Economics Profession

External speakers and workshop leaders were a critical part of the program. Seminar speakers were invited at least weekly to represent a wide range of subfields in economics to give students the broadest exposure possible to research in

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[8]The exit survey can be found in the online Appendix.

economics. Speakers hailed from a wide variety of economics departments and other academic units with economists. For the program at Michigan State University, we sought a range of speakers from prominent economists, including Ben Bernanke and Janet Yellen, to nonacademic economists, such as Hal Varian of Google and Roger Ferguson of TIAA-CREF, to program alumni, including Carlos Vargas-Silva from Oxford. We also sought out junior economists, such as Mackenzie Alston, Renee Bowen, Kalena Cortes, Jamein Cunningham, Rob Gillezeau, Dania Francis, and Maggie E. C. Jones to expose students to economists along various stages of the tenure process and also closer to their age.

One innovation of the speaker series involved learning-by-doing and reflected much larger issues in the economics profession. In our first two years of the program, we found that women were turning us down at rates higher than the general population. Roughly 40 to 60 percent of female economists turned down our invitations, compared to approximately 25 to 30 percent of men. In addition to paid travel expenses, an honorarium of $500 was introduced for speakers in summer 2018 and beyond. While the original motive was to cover childcare costs incurred during the trip to East Lansing, the honorarium was extended to all speakers to use as needed. Upon examining the data on seminar speakers from 2016 to 2017 and from 2018 to 2019, it appears that the stipend was a factor in changing both the size and composition of the pool of women speakers and lowering the rejection rate for women and men.

When Michigan State University was applying to host the program, the American Economic Association encouraged partnerships with other schools to provide greater exposure to other types of institutions and programs. Ultimately, Western Michigan University became the cohost of the program. Two faculty members taught in the program, and the school hosted students for a day trip to campus and Lake Michigan. As part of the visit to Western Michigan, economists from the W. E. Upjohn Institute for Employment Research (also based in Kalamazoo, Michigan) spoke to students about nonacademic research positions.

We considered discussion of research assistantship opportunities to be an important pathway to understanding what economists do, what economic research entails, and what skills required to be a successful economist. Prior to coming to the AEA Summer Program, most students were unaware of research opportunities at their home institutions and elsewhere and were not familiar with what the job of research assistant entailed. Therefore, one seminar slot was set aside for presentations by program alumni who were currently research assistants from the Federal Reserve system and other institutions.

The summer program worked hard to make connections to programs that provided more than the experience of a research assistantship, but that also had mentoring and advising components. The Federal Reserve system has a track record of mentoring its research assistants along with historical ties to the AEA Summer Program. We worked closely with the Federal Reserve System, especially the Federal Reserve Board of Governors and the Federal Reserve Banks of Boston and Chicago

to organize research presentations from a wide variety of research economists and research assistants, including from the subfields of economic history, labor, and finance.

The AEA Summer Program also collaborated extensively with several other pre-doctoral programs: the PhD Excellence Initiative at New York University (currently housed at Stanford University) and the Research Scholar Initiative at Harvard University. These programs offered mentoring in economics, as well as the opportunity to take additional courses to prepare for graduate study. Also, these programs were small enough to provide substantial attention to individual students and provided the opportunity to serve as a research assistant and/or coauthor, if this matched the student's interest. An informal collaboration arose with Susan Athey, Guido Imbens, and the pre-doctoral initiative they started at the Graduate School of Business at Stanford. In addition to a presentation on machine learning in 2019 and 2020, Guido returned with an alumnus of the AEA Summer Program who was also participating in the Stanford program to introduce students to this new pre-doctoral opportunity.

When the AEA Summer Program was virtual in 2020, we hosted a video-conference session and invited a number of organizations representing new or ongoing post-baccalaureate opportunities, including the Becker Friedman Institute (which organizes research assistantships in economics throughout the University of Chicago), the Congressional Budget Office, Duke economics, the Abdul Latif Jameel Poverty Action Lab (J-PAL) at MIT, Ross School of Business (Michigan), the San Francisco Fed, Stanford economics and the Stanford Graduate School of Business, the *Economist*, and the *Wall Street Journal*. While we were able to organize a videoconference with these organizations, these relationships require development and maintenance, and staff resources for such an activity were scarce. Ideally, there would be an administrator with oversight of advising and engagement who would develop and manage these partnerships. The partnerships worked best when they had someone with the time to work with us and our students to understand how best to help students succeed in a new role.

Outcomes and Follow-Up

For students at the Foundations level, we encouraged them to continue in economics with courses at their home institution. In some cases, we gave them a path to participating in the Advanced level in a subsequent year, if this coursework were completed and if they reapplied. Three such students were ultimately admitted to the Advanced level and thus participated twice in the program at Michigan State University. For students at the Advanced level, many were either not prepared to go directly from undergraduate to graduate studies in economics or preferred to gain additional experience before applying in order to strengthen their applications. Thus, most alumni of the Summer Program applied for a variety of research assistantships or post-baccalaureate programs.

We sought to follow alumni formally and informally. Formally, like other universities hosting the AEA Summer Program, the original Michigan State University plan envisioned following up with alumni on a yearly basis with a phone call and emailed survey. However, despite these efforts, precise data on alumni activities and outcomes have proven difficult to obtain consistently. The original plan underestimated the resources required to follow our alumni. Similar to some of the other previous host institutions, we received a low response rate to our annual alumni survey. This is a key way to measure the program's success, and future programs should allocate more resources to evaluation from the outset.

On the informal side, faculty were in touch with alumni because many required letters of recommendation as they applied for internships, research assistantships, and PhD programs. We also invited alumni from any cohort to contact us through social media, and a number of alumni responded each year. In the second year of the program, we asked the AEA Committee on the Status of Minority Groups in the Economics Profession to incorporate the Summer Program alumni into its reception at the AEA annual meeting. These reunions were well attended and offered alumni the opportunity to reconnect with alumni from their or any cohort, as well as with faculty, fellows, and administrators in the program. In addition to obtaining informal information about alumni as we reconnected with them, we collected additional information when alumni registered at the door.

What do we know about what alumni have done since their time in the program? In terms of research assistantship and pre-doctoral programs, we estimate that approximately half of the summer program alumni did a research assistantship, pre-doctoral, or similar program following the AEA Summer Program. As a result of our close collaboration, most of the research assistantships were in the Federal Reserve System. Eighteen (roughly 10 percent) summer program participants were later hired by the Board, and 24 were hired by regional Federal Reserve banks in their two-year research assistant programs. In 2019, the Boston Fed sponsored a weeklong program that followed the AEA Summer Program for five to seven participants.

Furthermore, we obtained some data on outcomes from the Federal Reserve System with respect to its Research Assistant program. According to the Federal Reserve, the AEA Summer Program at Michigan State University resulted in the Board and the Reserve Banks having the most diverse composition in its history. Specifically, in 2020 AEASP alumni numbered 9 out of the 16 research assistants at the Board who identified as underrepresented minorities, and others were scattered throughout the system (as reported by Jones and Opoku-Agyeman 2020). To give a bit of context, in the past decade the Federal Reserve System attempted to diversify its staff of economists. In 2021, only two of the Federal Reserve Board's economists (out of the total of 417) were Black. More broadly, the Federal Reserve System had 1.3 percent of economists and 3.7 percent of research assistants who were Black (as reported by Smialek 2021). One could credibly infer that the AEA Summer Program was a significant contributor to diversifying the economics pipeline at the Fed during this period.

In terms of graduate program enrollment, we know (as noted at the start of the paper) of at least 40 alumni from the AEA Summer Program who enrolled in PhD programs in economics and 19 who enrolled in economics-adjacent PhD programs, including computer science, mathematics, public policy, and agricultural economics. We know of at least eleven who enrolled in a variety of master's programs—although this number is certainly an undercount, because these students would have been less likely to need a recommendation or reach out to us for advice. Some alumni are still working as research assistants or are enrolled in bridge programs and will likely enroll in a PhD program. We know of six AEASP alumni who received National Science Foundation Graduate Research Fellowships, two who received a Ford graduate fellowship, and two received a Soros graduate fellowship.

A Second Summer Program?

The AEA Summer Program at Michigan State University was running at capacity in the last two years, with the highest average number of students per year of any previous program. Given the 35 to 40 faculty, staff, fellows, and tutors required, this massive undertaking was effectively year-round, not just during the summer. The period during the regular school year, for example, included recruiting trips to various types of universities around the country. This period also required communicating with students from past summers who might be struggling in their graduate or post-baccalaureate programs, who are unsure about next steps in their career, and who require letters of recommendation for research assistantships, jobs, scholarship applications, and graduate-school applications.

Early in the program, we tried using part-time staff, believing that this was sufficient for a summer program. As a result, we were chronically understaffed in the first year. In fact, we needed three types of full-time administrators besides the faculty-administrators: an accounting and fiscal officer, a research administrator, and an advising and engagement administrator. One lesson from our experience is to ensure adequate staff from the start to ensure continuity within and across cohorts and for the duration of the summer program.

In terms of the numbers of students we could serve, the faculty felt that 40 total, or 20 per level, was probably the maximum we could accommodate while maintaining the intensive mentoring and close relationships. There are economies of scale in administrative costs when one institution hosts more students, but we feel the overall quality of what we could provide students would decline.

One suggestion that arose from talking to faculty in the program and others throughout the profession is that it may be desirable to have two sites for the AEA Summer Program running simultaneously: such a change would serve more students, while keeping the class sizes small, and limiting the burden on a single institution. Originally, this idea was suggested to address the time mismatch with respect to the semester versus quarter system. Historically, the program has generally

been timed to be consistent with the semester system. The programs would have two host institutions and would require staffing and institution-specific resources. The drawbacks of such a model include higher administrative and coordination costs. In addition, only one institution would be able to host the Pipeline conference. If the programs overlapped, there could be a common virtual seminar series and other shared public presentations, as well as outings.

Conclusion and Advice for Others

Many underrepresented minority students and first-generation college students need both awareness of the opportunities for graduate studies in economics and additional coursework in economics to prepare them for graduate work. The AEA Summer Program does this, but it is only one part of the pipeline. Freshman and sophomores may never learn enough about economics to become interested in the major or may assume it is not for them. The AEASP typically works for economics majors who need additional training and support to make it to graduate school or to a research assistantship or bridge program from which they can apply to graduate school. Those who make it to graduate school and those who complete a PhD may need further support and mentoring to navigate unfamiliar spaces.

Below we provide some guidance for students, departments and faculty, and potential host institutions interested in the AEA Summer Program.

For Prospective Students

No one should be discouraged from applying to the AEA Summer Program because they are not from a top-ranked college or university or because they are not sure graduate school is for them. Applicants should have some economics training and an interest in learning more about graduate school. Not everyone follows the same path to economics and those who majored in something else should look into what courses they need to get into a particular program. Every host institution of the AEASP will have its own criteria for admission and prospective students should look at the current application portal.

In general, students need to be aware that having an undergraduate degree in economics may not be sufficient preparation for graduate school in economics! Most Bachelor of Arts degrees in economics, for example, do not require the math courses needed for most PhD programs. The AEA website has some good resources on this topic.[9] In addition to the AEA Summer Program, students should look into the range of mentoring, research-assistantship, and bridge programs that are currently available. Some of these pay for additional coursework that may be needed for graduate school, and some offer opportunities to be mentored in research in economics, which would give prospective graduate students further exposure to

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[9] See the AEA "Preparing for grad school" page at https://www.aeaweb.org/resources/students/grad-prep.

what economists actually do and a better understanding of the skills necessary to undertake graduate study and research in economics.

For Departments, Faculty, and Advisors

In undergraduate economics programs where few or no students have traditionally attended graduate school, it can be difficult to identify and advise those that should consider this option. Some of the students in the summer program (and many applicants) were not getting adequate advising from their home institutions. For some this was a lack of advising and encouragement, while for others it was a mismatch of undergraduate coursework and career goals. This meant that for those students who previously were not counseled on, did not understand, or did not plan for the coursework required for admission to a PhD program, the program likely came too late for them in their undergraduate program. In this case, we could encourage them to explore post-baccalaureate and research assistantship programs. However, such students would benefit from being made aware of the gap between the minimum requirements for an undergraduate degree in economics and what is needed for admission to a PhD (or even master's) program early in their undergraduate program. The AEA Summer Program is one way to help students fill in the gaps in their education, but they need to be aware of the program and preferably apply as sophomores or juniors. This gives them time to go back to their home institution, take additional coursework, and better plan their next steps.

For Potential Host Institutions

Each institution hosts the AEA Summer Program for three to five years. A range of schools have hosted the program and, based on our experience, we can provide some advice for hosting the AEASP or running a similar program. First, the department and university need to be fully committed and aware of the time and financial resources such a program requires. Second, do not underestimate the administrative needs of the program. It may be a summer program, but the planning, budgeting, and recruiting are year-round. Third, it is helpful, particularly for smaller schools, to have other schools or institutions nearby that can either partner with the host school or at least widen the pool of potential instructors. Host programs may want to consider coordinating with other summer pre-doctoral programs on campus to potentially increase students' peer network. For example, the AEASP coordinated with a social science pre-doctoral program at Michigan State University for several Welcome Weekend events, such as a slam poetry event and a soccer game.

For Potential Sponsors and Partners

The AEA Summer Program provides full room, board, and a stipend for students and requires staffing courses and administrative positions. As such there are many opportunities for sponsors to contribute. Institutions can provide faculty or mentors to students as program needs arise. For example, cosponsor Western Michigan University provided summer support for faculty teaching in the Michigan State University program, and the Federal Reserve System made research assistants

throughout the system available for presentations in East Lansing (and remotely in 2020). The Federal Reserve Bank of Chicago hosted students for a half-day event. Other sponsors, including the Stata Corporation, have provided research support and others have provided direct financial support. Sponsors of the current program at Howard University can be found at https://economics.howard.edu/aeasp/sponsors/2023.

References

Alexis, Marcus. 1975. "Summer Program in Economics for Minority Students." *American Economic Review* 65 (2): 502–05.

Becker, Charles M., Cecilia Elena Rouse, and Mingyu Chen. 2016. "Can a Summer Make a Difference? The Impact of the American Economic Association Summer Program on Minority Student Outcomes." *Economics of Education Review* 53: 46–71.

Collins, Susan M. 2000. "Minority Groups in the Economics Profession." *Journal of Economic Perspectives* 14 (2): 133–48.

Jones, Kayla, and Anna Gifty Opoku-Agyeman. 2020. "The Future of Economics Depends on the AEA Summer Program." *Medium*, April 17. Unpublished.

Smialek, Jeanna. 2021. "Why Are There So Few Black Economists at the Fed?" *New York Times*, February 2. https://www.nytimes.com/2021/02/02/business/economy/federal-reserve-diversity.html.

Stansbury, Anna, and Robert Schultz. 2023. "The Economics Profession's Socioeconomic Diversity Problem." *Journal of Economic Perspectives* 37 (4): 207–30.

What Went Wrong with Federal Student Loans?

Adam Looney and Constantine Yannelis

Between 2000 and 2020, the total number of Americans owing federal student loans more than doubled from 21 million to 45 million, and the total amount they owed more than quadrupled from $387 billion to $1.8 trillion, growing much faster than any other form of household debt. Figure 1 shows the growth in student loan borrowers and balances. Prior to 2020, when payments were temporarily frozen, a million students defaulted each year, and millions more struggled with their loans and failed to make payments. As recently as 2018, the Congressional Budget Office expected taxpayers to earn a profit on federal student lending programs (CBO 2024). It now expects new loans issued over the next decade to cost $302 billion—more than will be spent on Pell grants for low-income undergraduates. Moreover, that prospective cost estimate excludes hundreds of billions of write-downs on existing loans expected because of new policies that will reduce borrowers' payments and provide debt forgiveness. Compounding these financial costs, many students left college without a degree or with a degree of dubious value, having missed out on the opportunity to rise up the economic ladder. What went wrong?

Since federal student lending programs started in the 1950s, such programs have exhibited boom-and-bust credit cycles. Legislation expanding financial aid to increase educational opportunities led to increased enrollment, but also to

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Figure 1
Total Borrowers and Total Debt
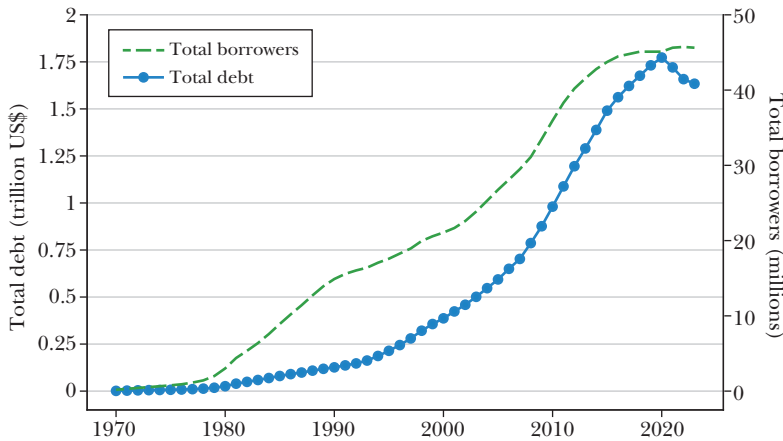
Source: Looney and Yannelis (2015) and Federal Student Aid Data Center (2023).
Note: This figure plots the total number of borrowers and total student loan debt in the United States.
Debt is reported in trillions of 2022 dollars and the number of borrowers is reported in millions.

the proliferation and expansion of institutions providing low-quality education to riskier students. The subsequent deterioration of student outcomes—and reports of scandals—causes Congress to limit lending using so-called "accountability rules" regulating how postsecondary institutions participate in federal lending programs. When these new rules constrain opportunities for some would-be students, Congress then whittles away at the rules, allowing student loans to expand again, until a new range of concerns appears.

After a previous student loan crisis in the 1980s was arrested by new accountability rules passed by Congress, those rules were gradually loosened in the late 1990s. Almost immediately, college enrollment and student borrowing accelerated, particularly among groups that had historically been underrepresented at traditional institutions—students who were lower-income; first-generation students; Black and Hispanic students; older students; students enrolled less than full time; students pursuing degrees other than a BA; and students who were much more likely to rely on federal aid not just for tuition but also for other costs of attendance, like living expenses. Expanding educational opportunities for these groups is clearly desirable and a key purpose of financial aid programs. From the perspective of student lending, however, these new borrowers were much riskier, partly because of their socioeconomic backgrounds and also because of the institutions they attended.

The institutions that enrolled this new wave of borrowers were disproportionately not traditional four-year institutions with strong educational and economic outcomes. Starting around 2000, for-profit institutions tripled their enrollment and community college students tripled their rate of borrowing. In 2000, only one of the top ten schools in terms of aggregate student loan volume was for-profit.

By 2014, for-profit schools accounted for eight of the ten schools whose students owed the most (Looney and Yannelis 2015). In general, the schools that enrolled the surge of new students were those with high default rates and low student loan repayment rates, where few students complete their intended degrees, or where graduates' earnings are the lowest. This influx of disadvantaged borrowers to lower-quality schools was catastrophic for those students' finances, aggregate student loan outcomes, and the federal student loan budget. Between 2000 and 2014, the student loan default rate rose by 75 percent (Looney and Yannelis 2015).

Today's student loan crisis—and the fact that it is one of a series—high-lights the challenges of using a student loan financial aid system to promote access to educational opportunities that vary enormously (but in opaque ways) in their quality, value, and student outcomes. Today, the student loan program is the most costly federal program for subsidizing higher education. In contrast to other federal aid to students, however, loan eligibility is not means tested, and few guardrails exist to prevent using loans to pursue low-quality or excessively costly programs. As a result, the program's budget cost and its distributional effects are delegated to the program's beneficiaries themselves—the institutions that enroll students and set the cost of attendance, and the students who decide where to enroll and how much to borrow. Schools' payments are only very weakly linked to students' outcomes. As a result of these misaligned incentives, students—particularly disadvantaged students and those historically underrepresented at universities—face high costs, variable quality, and inequity in who goes to college and graduate school.

Overview of the US Student Loan System

The legislative history of federal student lending has been driven by efforts to achieve two opposing goals: to expand access to higher education by increasing grant aid and loan eligibility and take-up, and to contain the associated and sometimes unanticipated budget costs of those programs. Today's student lending "crisis" is only the latest iteration in a repeated pattern in which Congress expands aid eligibility to accommodate access to higher education for specific groups (like military veterans, "nontraditional" postsecondary students, online students, or students facing rising costs), the availability of aid causes an influx or expansion of lower-quality, "predatory," high-cost programs, student loan outcomes deteriorate and budgetary costs rise, and policymakers implement new rules to curtail abuses and reduce the cost—but also constraining aid availability.

Early Steps

The first major federal effort at supporting students in the pursuit of a college degree was the passage of the Servicemen's Readjustment Act of 1944. The "GI Bill," as it was commonly known, was not a loan program, but instead covered the costs of higher education for veterans. The GI Bill set a precedent for the benefits and concerns about the student loan programs that followed: it caused a surge in postsecondary

attainment (Stanley 2003), but also led to a wave of for-profit schools established to cash in on federal aid, without providing much or any education (Whitman 2017).

While the for-profit sector represents only a small share of enrollment, its expansion and contraction provides a barometer of the incentives facing marginal postsecondary institutions to enroll aid-dependent students. Unlike institutions in the nonprofit or public sector, for-profit colleges exhibit high rates of entry and exit. Despite the misperception that for-profit schools rely on the free market, the vast majority of their revenue comes from government loans and grants (Deming, Goldin and Katz 2012). In general, for-profits spend little on instructional expenses, while their students are reliant on federal aid and have poor educational and employment outcomes. Hence, their expansion or contraction—and associated student outcomes— is a visible indicator of the risk-taking stance of federal credit policy. Indeed, the vast majority of the time series variation in student loan defaults is driven by the expansion and contraction of for-profit colleges (Looney and Yannelis 2022).

Soon after the passage of the GI Bill in 1944, rules were enacted to limit eligibility to certain schools and to create accountability standards. When the first federal loans were enacted to support students pursuing technical fields in response to fears of technological dominance by the Soviet Union, following the launching of the Sputnik satellite in 1957, these funds were limited to state-run and nonprofit schools. The landmark 1965 Higher Education Act (HEA) then expanded the student loan program to other fields, creating modern federal student loan programs through the Federal Family Education Loan program.[1] Title IV of the Higher Education Act established general rules governing the eligibility of postsecondary educational institutions to participate in federal student aid programs; that is, institutions must be accredited by a recognized accrediting agency, be authorized to operate in their respective state, and offer eligible programs leading to a degree or providing training for gainful employment in a recognized field. Institutions are required to adhere to regulations regarding their financial responsibility, administrative capability, and accountability rules intended to reduce abuse of federal aid programs and promote quality student outcomes, particularly in the for-profit sector.

In 1965, when tuition levels were lower, policymakers viewed grant aid as sufficient for lower-income families. Students from high-income families were expected to pay their own way. Federal student loans were for students in the middle—those whose incomes were too high for grant aid, but below a means-tested limit.

Under the Federal Family Education Loan program, private banks provided the loans, but their role as credit intermediaries was purely superficial. Loan eligibility and terms were set by federal law. The banks did not underwrite the loans, they were not authorized to assess the creditworthiness or ability-to-pay of the borrower, and thanks to a federal guarantee, the private banks were not on the hook for any subsequent losses in the event of default. In 1992, the Direct Loan program was introduced, in which student loans were issued directly by the Department of Education,

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[1] In 1988, Congress renamed the federal loan program the Robert T. Stafford Student Loan program, in honor of a US Congressman (from 1961 to 1971) and Senator (from 1971 to 1989) from Vermont who championed the program. Federal student loans are sometimes referred to as Stafford loans.

using funds from the US Treasury. The eligibility and credit terms were identical to those offered by banks under the Federal Family Education Loan program. The introduction of the Direct Loan program had no effect on credit outcomes, but saved taxpayers billions of dollars in fees paid to banks. Starting in 2010, all federal loans are now issued under the Direct Loan Program.

A disadvantage of the original lending system was that access to federal loans was a patchwork, because it depended on whether a student's local bank elected to participate in the federal program. To encourage more banks to offer loans, Congress passed legislation in 1972 to establish the Student Loan Marketing Association to service and securitize federal loans, relieving banks of these costs and responsibilities. Sallie Mae, as it was widely known, was among the original "government-sponsored enterprises" established to increase credit to a specific sector. Later amendments to the Higher Education Act provided states with incentives to create their own institutions to guarantee student loans, and also increased guaranteed returns for banks, liberalized access for students, created parent loans, and increased loan limits. Sallie Mae was allowed to make loans directly to students. The cumulative effect of these amendments was to allow any qualified student at any accredited institution to take federal student loans. By the late 1980s, the vast majority of students had access to federal student loans (Looney and Yannelis 2022).

In the late 1980s, the student lending system plunged into its most severe crisis, consisting of a series of scandals involving for-profit schools, correspondence programs, and skyrocketing default rates on federal loans. Congress again legislated changes tightening institutional oversight. The most significant change was the Cohort Default Rate rule enacted in 1989, which prohibited schools from accessing federal aid if their borrowers had systematically high default rates. Congress passed the so-called 85/15 financing rule, which limited the share of revenue that for-profit schools could obtain from federal aid to 85 percent. Congress also banned institutions that enrolled more than 50 percent of students in distance learning programs (which later prohibited online programs), prohibited aggressive recruiting methods, allowed the Department of Education to garnish the wages of students with delinquent student loan debt, and prohibited loans from being discharged in bankruptcy. Those rules barred most of the worst-performing schools from participating in the program. When the rules went into effect in the early 1990s, it caused more than 1,000 institutions to close or otherwise exit the program (Cellini, Darolia, and Turner 2020) and a dramatic decline in the student loan default rate (Looney and Yannelis 2022).

Lead-In to the Current Student Loan Predicament

Less than a decade later, starting in 1998, Congress defanged the key accountability provisions that it had just enacted. The 85/15 rule was changed to 90/10, so that proprietary schools could obtain a higher share of their revenue from Title IV federal student aid programs (including Pell grants as well as student loans). The distance learning rules, which had otherwise prohibited the expansion of mostly or exclusively online institutions, were eliminated. Political support for these changes came from a broad coalition spanning advocates seeking more

opportunities for underserved students to for-profit institutions bristling under existing rules. These changes allowed for the advent of very large online institutions or programs, which subsequently enrolled millions of Pell grant recipients, GI Bill recipients, and student loan borrowers.

Other legislation undermined accountability provisions, whether indirectly or unintentionally. To protect student loan borrowers against certain risks, Congress allowed borrowers to defer or reduce their payments during periods of military service, graduate enrollment, or during unemployment or financial hardship. Loan payments were suspended with interest, which was added to the loan at the end of the forbearance. One result of these changes was that student loan borrowers attending institutions with poor outcomes chose (or were steered into) forbearances or deferments rather than default, which allowed their institution to escape accountability under the Cohort Default Rate Rules. Another result was that the interest balances of those borrowers snowballed over time.

Likewise, the Post 9/11 GI Bill, which expanded benefits for veterans who served on active duty after September 10, 2001, inadvertently increased borrowing in the for-profit sector. Because of a loophole, GI Bill benefits were treated the same as private out-of-pocket payments under the 90/10 rule, which meant, for example, that a for-profit institution that received $1 in GI Bill benefits could then receive $9 in Title IV funds (and 36 percent of GI Bill benefits flowed to for-profit institutions). GI Bill benefits are, furthermore, not considered grant or scholarship aid under rules that limit federal loan amounts, which allowed students to take out federal loans (in cash) for expenses already paid for by the GI Bill.

Federal Loans from the Student Perspective

While the rules governing whether and how institutions can participate in federal lending programs have changed significantly, and while students now receive loans through their institution's financial aid office rather than from a bank, when considered from the perspective of a student, the fundamental system of federal student loans is surprisingly constant over time.

All borrowers must complete the Free Application for Federal Student Aid (FAFSA). However, information collected on this form is not used for means testing or underwriting of student loans. Undergraduate loans are available to essentially all undergraduate students enrolled at least half-time at an accredited institution, regardless of their financial need. While low-income students are eligible for "subsidized" loans, in which interest accrual is suspended while students remain enrolled, all students whose cost of attendance exceeds grant aid are eligible for unsubsidized loans. For undergraduates, the loan amount is limited to the lesser of (1) the cost of attendance (including tuition and fees and the institution's estimate of living expenses) less grant aid or (2) statutory loan limits, which are determined by whether a student is dependent or independent (typically age 24 or older) and their academic level of study.[2] In 2022, statutory limits allowed first-year

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[2] Because grant aid is typically means tested, an implication of these rules is that higher-income students may qualify to borrow more than lower-income students.

dependent undergraduates to borrow $5,500 per year, second-year students $6,500, and third- and fourth-year borrowers $7,500. Independent borrowers face higher limits. Graduate borrowers face similar eligibility rules, but their loan limits were historically set at higher levels. Since 2007, graduate students face no statutory limit for annual and lifetime borrowing, which is limited only by the program's cost of attendance.

Today's nominal loan limits were implemented in 2007. Previously, nominal limits for certain undergraduate loans had not been increased since 1987 and graduate loans not since 1993, which means they eroded significantly in real terms. In fact, even with the 2007 limit increase, annual loan limits for most undergraduate borrowers—adjusted for inflation—are *below* those that applied in the 1980s and 1990s.

Federal loans can be used not only for required tuition and fees, but also living expenses and other nontuition costs of attendance. To the extent that the loan amount exceeds net-of-grant tuition or payments to the university, proceeds are furnished to the student directly.

Interest rates are set by law, and for the 2021–2022 academic year were 2.75 percent for undergraduates and 4.3 percent for graduate students. Between 2006 and 2021, interest rates varied from a low of 2.75 percent to a high of 6.8 percent for undergraduate borrowers, and 4.3 percent to 6.8 percent for graduate borrowers.

Students are required to begin repaying their loans after a six-month grace period following separation from school. The standard repayment plan is a 10-year amortizing loan where students make 120 equal monthly payments. If students fail to make a required payment for 270 days they are in default (Yannelis and Tracey 2022).

The recent history of student lending rules neither substantially affects the incentives for students to borrow nor directly explains the recent increase in borrowing. Perhaps the biggest recent change was the introduction of a series of income-driven repayment plans starting in 2009. These plans link the payments of student loan borrowers to their incomes, and borrowers with low earnings can make lower or even zero payments. After a period of repayment, remaining balances are forgiven. For example, under the first plan introduced, borrowers paid nothing if their income was below 150 percent of the poverty line or, if their income exceeded that poverty threshold, 15 percent of their income was in excess of that threshold; remaining balances would be forgiven after 25 years. Over time, the Department of Education used its regulatory authority to expand the number of these income-driven repayment plans and the generosity of their terms. For example, in 2023, the Saving on a Valuable Education plan (SAVE) was introduced, which raised the income threshold before which payments are required to 225 percent of the poverty line (about $33,885 for a single individual in 2024) and to 5 percent of income over that threshold for undergraduate loans, and 10 percent for graduate loans. For borrowers who borrowed small amounts, the remaining loan balance can be forgiven as quickly as ten years. Based on the typical earnings trajectories of students, the SAVE plan is expected to reduce the net present value of payments

below the face value of the loan for many students—making paying for college with loans more favorable than paying out of pocket.

Aggregate Trends in Undergraduate Enrollment and Borrowing

Looking back over a half-century of student lending policy, our view is that the majority of the time series variation in student loan default rates—a salient and consistently measured summary measure of loan outcomes—was driven by the changes in federal policies regarding which institutions participated in lending programs and how many borrowers they enrolled (Looney and Yannelis 2022). These rules affected the entry, exit, and expansion of for-profit institutions, for whom accountability rules determined their ability to operate. Among community colleges and certain other nonselective institutions, these rules influenced whether the institutions chose to participate in lending programs, and thus the share of students in these sectors who borrowed. Many community colleges, for example, elected not to participate, either so as not to jeopardize their eligibility for federal grant programs or out of paternalistic concern for their students' finances. However, we see only a modest role for rising costs or other aggregate economic factors, primarily because undergraduate loan limits are set so low that most of the variation in outcomes across borrowers is related to characteristics of borrowers and their institutions.[3]

Overview of Aggregate Trends in Undergraduate Enrollment and Student Borrowing

To illustrate these trends, Figure 2, panel A, describes aggregate enrollment of undergraduate students, the number of borrowers, and the propensity of those students to borrow. The recent increase in college and graduate enrollment reflects both population growth and a jump in enrollment rates. Between 1990 and 2010, the number of high school graduates increased by 34 percent, the number of undergraduate students increased by 47 percent, and the number enrolled in graduate school increased by 56 percent (US Department of Education 2022). The share of recent high school students enrolling in college went from 60.1 percent in 1990 to 63.3 percent in 2000 to 68.1 percent in 2010 (US Census Bureau 2023).[4] The total

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[3]An exception is the situation of graduate students, for whom the net cost of attendance matters a great deal, and for whom the recent the expansion in graduate credit, through the elimination of graduate loan limits, has caused a deterioration in loan outcomes. Parents of dependent undergraduate students may also borrow through the federal loan program up to the cost of attendance less any grants or loans their children receive. Parent loans compose about 7 percent of federal loans. Parents are eligible as long as they do not have an adverse credit history (and regardless of ability to pay). We exclude a discussion of parent loans from this because they are more akin to unsecured loans than to loans to students whose acquired human capital "backs" the loan. For a discussion of problems facing parent borrowers see Baum, Blagg, and Fishman (2019).

[4]Enrollment figures include foreign students, and Current Population Survey data include foreign-born students who are resident in the United States. Only US citizens and permanent residents are eligible for financial aid, hence number of borrowers excludes foreign students. According to the Department

Figure 2
Undergraduate Enrollment and Borrowing

Panel A. Enrollment and borrowers

Panel B. Annual borrowing and net tuition
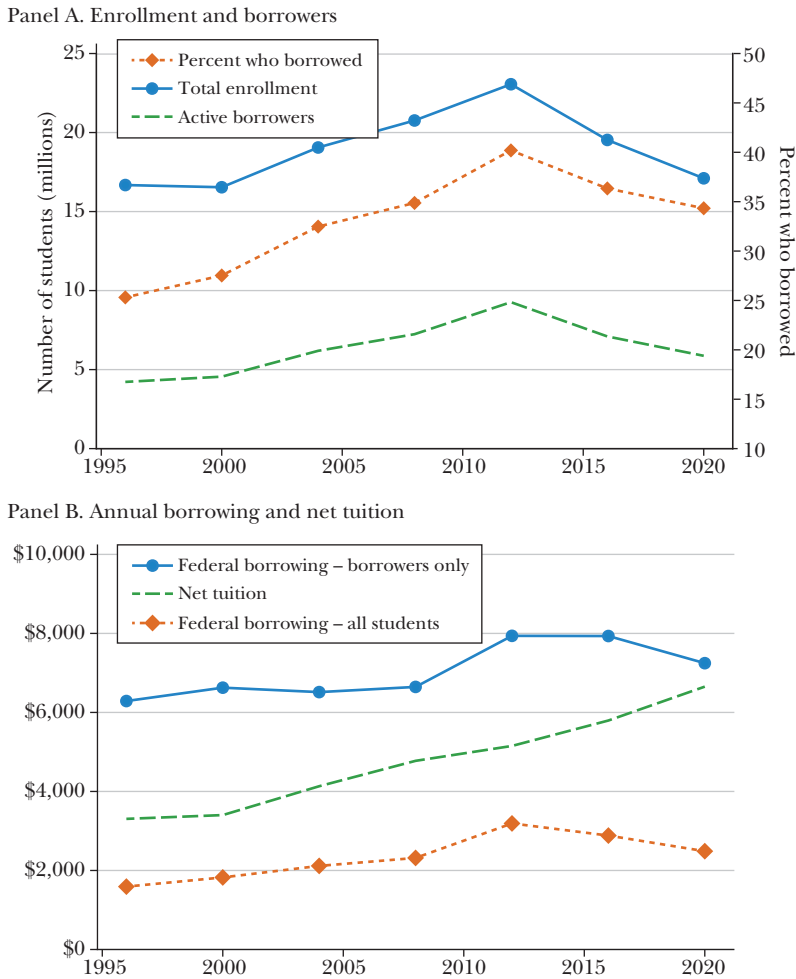
Source: National Center for Education Statistics (1986–2020b).
Note: Panel A plots total enrollment, total active borrowers, and the share of students enrollment that are active borrowers. Panel B plots the average annual federal borrowing and average net-of-grant and scholarship tuition paid. Annual federal borrowing is reported both annual average amount borrowed across all undergraduate students and the average conditional on borrowing at least $1. Dollar amounts in 2022 dollars.

number of college and university students (including undergraduate and graduate students) increased from 16.5 million in 2000 to a peak of 23 million in 2012, before declining back to 17 million in 2020.

of Education Digest of Education Statistics Table 310.20, foreign enrollment increased from 407,272 in 1990, to 547,873 in 2000, 723,249 in 2010, and 948,519 in 2021.

Why did enrollment rates increase? One likely reason is the persistently high return to college and graduate school over the last several decades, which increased demand for education. During the aftermath of the 2001 recession and during the Great Recession starting in 2007, the opportunity cost of enrollment was low, because of the weak labor market. Because of policy changes and the advent of online education, the supply of programs surged, particularly open access institutions, online programs, master's programs, and graduate programs not related to (or constrained by) professional organizations. Many of these new programs were targeted and particularly appealing to nontraditional student populations struggling in the job market and with other responsibilities because they offered more scheduling flexibility, were easy to sign up for, and federal aid and loans not only covered tuition but also helped pay for rent and other expenses.

In 1996 and 2000, fewer than 30 percent of enrolled undergraduates borrowed, but the share borrowing increased rapidly over the subsequent twelve years to peak at 40 percent in 2012. Between rising enrollment and a rising share of students who borrowed, the number of undergraduate students taking out federal loans doubled from 4.5 million to 9.3 million borrowers. Since then, although total enrollment has declined to its level in 2000, the fraction of students who borrow has remained high.

Note that Figure 2, panel A, describes active borrowers, or the flow of borrowers, not the total number of Americans with loans (presented in Figure 1). Because student loans have a long duration between when they are originated and when they are eventually paid off (or forgiven), the recent rise in the number of active borrowers caused the stock of borrowers to surge. Consider an undergraduate student who begins borrowing as a first-year student, completes a degree after five years (roughly the average length of enrollment for BA degree earners from four-year institutions), enters repayment after the standard six-month grace period, and subsequently pays off loans exactly on the standard repayment plan's ten-year schedule—that borrower will remain in the stock of student loan borrowers for almost 16 years from the moment they start borrowing. Borrowers who go to graduate school, enter the military, defer payments for other reasons, or repay under an income-driven repayment plan are likely to owe their loans even longer. In this sense, the large increase in the stock of student loan borrowers follows from the rise in enrollment and rate of borrowing of recent postsecondary students.

Annual and Cumulative Amounts Borrowed and the Relation to Tuition

While the number of borrowers has increased, the amount of undergraduate students who borrow on an annual basis has been relatively constant because of loan limits. Figure 2, panel B, illustrates the annual average amounts borrowed by undergraduate students, the amount borrowed conditional on having borrowed at all, and the average annual net-of-grant and scholarship tuition paid each year. On average, the annual amount borrowed per undergraduate student through federal student loans in 2020 was about $2,000. Among those who borrow, the average amount was about $6,500. Most undergraduate students who borrow take loans up to the applicable limit (Black et al. 2023). The average amount borrowed falls very close

to the $6,500 limit applied to second-year students. The average amount borrowed by undergraduates (conditional on borrowing at all) is little changed over time (in nominal terms), because it is largely fixed by the applicable loan limits.

While undergraduates also face cumulative lifetime limits of $31,000 for dependent students ($57,400 for independent undergraduates), in practice, relatively few undergraduates hit these lifetime limits simply because they either graduate or drop out before the limit applies. Indeed, a student's educational persistence—the number of years they enroll—tends to be a more important determinant of their cumulative debt burden than their tuition costs or even financial need simply because of the binding annual limits. This relationship helps explain the otherwise counterintuitive fact that more indebted borrowers have lower default rates than borrowers with small balances; having a small undergraduate balance likely meant that you dropped out before completing a degree.

Despite widespread news articles featuring student loan borrowers with enormous, six-figure balances, it is not possible to borrow such amounts in federal loans as an undergraduate, and, prior to 2006, it was rare as a graduate student outside of medical school. While loan balances were low in the 1990s, by 2015, over 5 percent of borrowers had balances over $100,000. (For a descriptive discussion of borrowers with large balances, their outcomes, and the increase in these borrowers during the 2010s, see Looney and Yannelis 2019.) Historically, borrowers with high balances tended to be professional degree students attending selective programs—doctors and lawyers—and thus tended to have strong labor market outcomes.

Over time, unpaid undergraduate loans could rise as interest accumulated. However, at a 5 percent interest rate (the rate in the 2023 school year), if a borrower made no payments and the interest compounded, it would take more than 14 years for the balance to double. This process of balances growing, rather than shrinking, has increased in recent years due to the uptick in the use of forbearances and income-driven repayment plans. However, in the Saving on a Valuable Education income-driven repayment program, unpaid interest will no longer accumulate, ending negative amortization for enrolled borrowers.

One common explanation for rising student debt is that rising tuition is driving borrowing costs. We are skeptical that rising tuition is a primary driver of borrowing amounts or worsening financial outcomes for undergraduates. Annual undergraduate loan limits are low, and most undergraduate borrowers are capped at the limit. At the margin, increases in tuition cannot increase borrowing for most students. That said, higher tuition costs do place greater demands on family finances, which may cause some students to switch from not borrowing to borrowing. Indeed, tuition increases may lead more students to borrow (Chakrabarti, Nober, and Van der Klaauw 2020; Chakrabarti et al. 2023). However, rising cost appears to explain little of the total change in borrowing. Hershbein and Hollenbeck (2015) decompose changes in student loan borrowing over the period from 1996 to 2008 into changes in the observable characteristics of students, such as demographic characteristics, institution of study, family income, and tuition. Their conclusion is that changing student characteristics and rising tuition combined explained only

30 to 40 percent of the increases in borrowing in that period, of which college costs were only a part.

Another reason to be skeptical of the role of cost in driving borrowing is that net tuition is rising more slowly than conventionally believed after taking into the effect of tuition discounts, scholarships, tax credits, and grant aid. According to the College Board (2022), net tuition at two-year public schools (community colleges) has declined, on average, since the 1990s, and in-state tuition at four-year public schools is about the same, on average over that period.

Of course, not all students pay the average. At private nonprofits and selective public institutions, the "sticker price" has increased substantially, and for families that do not qualify for means-tested aid, that price increase is significant. Also, a rising share of students appear to be choosing higher-cost programs. For instance, between 2002 and 2018, at flagship public universities, out-of-state enrollment—where tuition is typically more than twice that of in-state tuition—increased by 55 percent and in-state enrollment decreased by 15 percent (Klein 2022).

More generally, the direction of causality between financial aid and college costs is a matter of considerable debate. While one view is that increased borrowing is required by excessive costs, another view is that broadly available loans and grants causes some families and students to choose more expensive educational options and institutions to raise their prices—a theory referred to as the "Bennett Hypothesis" after it was posited by Secretary of Education William J. Bennett in 1987. Some studies do suggest that increases in tuition are at least partially driven by increases in loan limits (Lucca, Nadauld, and Shen 2019; Cellini and Goldin 2014; Kargar and Mann 2023; Black, Turner, and Denning 2023).

Shifts in Undergraduate Enrollment and Borrowing Patterns by Type of Student

Changes in Enrollment across Sectors and the Characteristics of Newly-Enrolled Students

Increases in the number of undergraduate borrowers and deteriorating outcomes are primarily the result of increases in enrollment of relatively aid-dependent students at riskier, lower-quality institutions.

Table 1 describes undergraduate enrollment, the share of students who borrow, and the resulting change in the number of borrowers between 2000, 2012, and 2020—roughly the periods before the run-up in student debt, the peak of undergraduate borrowing, and the most recent available data—and the share of students who borrow. To illustrate changes in the characteristics of students and borrowers, we summarize these data by demographic characteristics; the institutional sector of their school; dependency status (which is important because independent borrowers are typically older, may have more employment and family responsibilities, and face higher loan limits than dependent students and tend to borrow more); and parents' highest level of educational attainment (a consistently and universally-available measure of family socioeconomic background).

Table 1

Undergraduate Federal Student Loans

	Undergraduate enrollment			Fraction of students that borrowed			Change in number of borrowers	
	2000	*2012*	*2020*	*2000*	*2012*	*2020*	*2000–2012*	*2000–2020*
Total	16.5	23.1	17.1	28%	40%	34%	104%	29%
Race/Gender								
Asian/White female	6.6	8.1	5.3	28%	41%	38%	79%	9%
Asian/White male	5.3	6.6	4.2	26%	36%	30%	70%	–9%
Black female	1.3	2.3	1.5	36%	53%	50%	167%	56%
Black male	0.7	1.4	0.8	34%	46%	43%	165%	35%
Hispanic or Latino female	1.1	2.1	2.2	26%	36%	27%	172%	109%
Hispanic or Latino male	0.9	1.6	1.4	21%	32%	24%	159%	76%
Dependency status								
Dependent	8.4	11.2	9.7	33%	41%	36%	66%	24%
Independent	8.1	11.8	7.4	21%	39%	32%	165%	37%
Parents' highest education level								
Less than BA	9.3	13.7	9.3	29%	42%	36%	113%	22%
Bachelor's degree	3.5	4.6	4.1	29%	38%	34%	74%	40%
Graduate degree	2.7	4.0	3.7	27%	35%	31%	99%	61%
Sector								
Public 4-year	5.2	6.5	6.4	39%	48%	38%	55%	20%
Not-for-profit 4-year	2.3	2.7	2.6	50%	60%	51%	39%	16%
Public 2-year	7.0	8.8	5.0	5%	17%	11%	290%	51%
Private for-profit	0.8	3.0	1.1	74%	71%	62%	250%	9%

Source: National Center for Education Statistics (1986–2020b).
Note: The first three columns (2000, 2012, and 2020) present undergraduate enrollment (in millions). The next three columns present the fraction of undergraduate students that borrowed, and the last two columns show the change in borrowers between 2000–2012 and 2000–2020.

The table highlights several facts about changes in enrollment and borrowing. First, over the period from 2000 to 2012, enrollment and, particularly, borrowing surged among groups that had historically been underrepresented in postsecondary education: Black and Hispanic students, first-generation students, independent students, and those at for-profit institutions and community colleges.

The fraction of enrolled students who borrowed increased from 28 percent to 40 percent between 2000 to 2012. Part of the reason is the economic context; many new entrants enrolled because of the weak economic conditions during the Great Recession, and were more financially insecure and reliant on federal aid to fund their education. Borrowing among independent students—older students returning to school after age 24—surged from 21 percent to 39 percent. However, by itself, the changing demographic characteristics of borrowers explains relatively little of the increase in borrowing. Black students are roughly 25 percent more likely to borrow than non-Hispanic white and Asian students, while Hispanic students are

slightly less likely to borrow. While a large share of new entrants were first-generation students, they are only slightly more likely to borrow than children of more educated parents.

A second observation from Table 1 is that the increase in borrowing (conditional on enrollment) was widespread across demographic groups and across students from different socioeconomic status (as measured by their parent's education).

Finally, from 2012 to 2020, many of these changes had reversed, including the surge in aggregate enrollment. By 2020, Black undergraduate enrollment remains only modestly higher than in 2000—about 10 percent greater. White undergraduate enrollment in 2020 was below its level in 2000. Hispanic enrollment almost doubled. While 60 percent of postsecondary students and 61 percent of borrowers were first-generation students in 2000, in 2020, enrollment of first-generation students reverted to its 2000 level and their share of enrollment declined to 56 percent in 2020.

Notably, a surprising fact is that in 2020, while the overall share of students who borrowed remained somewhat higher (34 percent) than in 2000 (28 percent)—and higher within each demographic group—the borrowing rates at four-year public and private nonprofit institutions was roughly unchanged. Hence, the increase in overall borrowing is closely tied to where students enrolled.

The Shift in Higher Education Institutions and Borrowing Rates

Why did the share of students who borrowed increase? A major factor was the types of higher education institutions in which they enrolled. Enrollment at for-profits increased by 267 percent (2.2 million students) between 2000 and 2012. About three-quarters of students at for-profits borrow. The number of students at for-profit institutions who took out student loans rose from 602,000 in 2000 to 2.1 million in 2012.

In the community college sector, the biggest change was not the increase in enrollment (which rose 25 percent), but instead the surge in the share of students who borrow from 5 percent to 17 percent. Some of this increase in borrowing was associated with state appropriations cuts (Chakrabarti et al. 2020). But the increase in borrowing is also related to changes in accountability rules that had previously deterred community colleges from participating in the federal loan program. The number of active community college borrowers increased by 1.1 million between 2000 and 2012. Of the total increase of 4.7 million borrowers from 2000 to 2012, 32 percent of the increase was accounted for by more for-profit borrowers and 23 percent more community college borrowers.

Between 2001 and 2011, total twelve-month enrollment increased by 5.9 million students, including 1.5 million additional Black students, 1.6 million additional Hispanic students, and 1.5 million additional white students. Among these groups, 47 percent of the additional Black students, 24 percent of additional Hispanic students, and 65 percent of the additional white students enrolled at a for-profit. In 2011, almost one-fourth of Black students were enrolled at a for-profit. In addition, 23 percent of new Black students and 29 percent of Hispanic students enrolled at a community college, while community college enrollment fell among white students.

According to Table 1, in 2020 total enrollment was about the same as in 2000, but the number of borrowers was nevertheless 29 percent higher. Three trends help explain why borrowing remains higher. First, enrollment at for-profit schools increased. Second, the fraction of students who borrow at community colleges is more than twice as great as in 2000. And finally, a larger share of students are enrolled at four-year public and private institutions. While the fraction of students who borrowed to attend these programs is no different than in 2000, enrollment increased by 22 percent and 12 percent, respectively. These trends help explain the borrowing patterns described above. Part of the reason that borrowing rates among nonwhite, first-generation, and independent borrowers increased is because these newly-enrolled students flowed into for-profit and community colleges where borrowing was or became widespread. But borrowing rates also increased because a larger share of students (particularly white students) enrolled at four-year programs instead of community colleges. As we describe below, the expanded enrollment at four-year institutions tended to occur among less-selective or open enrollment institutions, whose student outcomes were often more similar to those in the for-profit and community college sectors.

Higher Education Institutions and Student Loan Outcomes

In our view, the concentration of borrowing at for-profit schools, community colleges, and other less-selective institutions—and among the relatively disadvantaged students they enroll—is the principal cause of the deterioration in student loan outcomes. At any given institution, of course, some portion of the average outcomes of students reflects selection, like the admissions process at highly-selective institutions or enrollment choices of less-advantaged students based on considerations like proximity, cost, or flexibility at nearby open enrollment institutions.

However, institutions also seem to have causal effects on student outcomes. The challenge to identifying a causal effect is to find a way of adjusting for unobservable variables. One approach in the literature has been to adjust for the schools to which students apply: using this method, Chetty et al. (2020) estimate that 80 percent of the difference in earnings premia across colleges conditional on parental income, race, and test scores is due to the causal effect or "value added" of colleges. Given the causal linkage from institutions to outcomes, the average outcomes of existing or prior enrollees provides a strong estimate of the likely outcomes of subsequent students who attend the college.

Another approach to looking at causal effects of types of institutions on outcomes relies on those just above or just below a certain test-score cutoff. Examining the discontinuity at the minimum SAT score to be admitted to Georgia's four-year public system, Goodman, Hurwitz, and Smith (2017) find large effects on educational outcomes (degree completion rates) of students who are marginally admitted and thus diverted from the alternative (which is typically community college). Likewise, Zimmerman (2014) examines a similar test-score cutoff at a large Florida public institution and finds that marginally admitted students earn 22 percent more than their peers who were not admitted—a return

of 8.7 percent per year of college attended, on average, which is about the same as the cross-sectional ordinary least squares difference in earnings between individuals with different years of college.

The evidence of large discontinuities in outcomes for marginal students at public four-year institutions is particularly relevant to interpreting the outcomes of new students who enrolled during the period from 2000 to 2012. Many of these students were presumably on the margin of enrolling or not enrolling, and when they did enroll, many of them ended up at the type of institution with lower payoffs.

For-profit higher education institutions appear to result in particularly poor outcomes. Students from for-profit colleges accumulate higher levels of debt, their labor market earnings after enrollment are lower, and the rates of default on their loans are higher than students in other sectors (Deming, Goldin, and Katz 2012; Lang and Weinstein 2013; Armona, Chakrabarti, and Lovenheim 2022). Attending a four-year private for-profit college is the strongest predictor of loan default—more predictive than dropping out!—according to researchers at the Federal Reserve Bank of New York (Chakrabarti et al. 2017). Examining pre- and post-enrollment earnings of students who attended for-profit programs using administrative data on the population of federally-aided students, Cellini and Turner (2019) find that for-profit students earned less five or six years post-attendance than they did prior to enrollment—lower than student outcomes in identical programs offered by public institutions, even after accounting for differences in student characteristics. Looney and Yannelis (2015) also document that the rise in for-profits is associated with many of the adverse outcomes for student loan borrowers.

While one might be concerned that the poor outcomes of students at low-quality colleges reflects the disadvantage of their students, this appears not to be the case. The poor outcomes of students at for-profit colleges are not attributable to differences in family income, age, race, academic preparation, or other factors (Scott-Clayton 2018).

Enrollment Changes across Institutions by Measures of Institutional Quality and Student Outcomes

To emphasize that the quality of the institutions attended by new borrowers is a key cause of worsening loan outcomes, Figure 3 describes recent enrollment changes among institutions categorized directly by student loan outcomes. Up to this point, our discussion has differentiated types of higher education institutions by their academic level and control: four-year public, two-year public, private nonprofit, and private for-profit. Another informative way of categorizing the quality of educational institutions is based on the educational, labor market, or student loan outcomes of their students. If average outcomes at institutions largely reflect differences in value added, those averages provide useful predictions of the outcomes of individual students who enroll at those institutions.

To illustrate the relationship between institutional characteristics and worsening student loan outcomes, Figure 3, panel A, shows the change in fall enrollment

at educational institutions ranked by the average student loan repayment rate at each institution. The sample includes all institutions that enroll undergraduate students. Institutions are grouped into enrollment-weighted quintiles based on their fall enrollment in 2000 and their average enrollment-weighted repayment rate of their student loan borrowers over the period when this metric was available in the US Department of Education College Scorecard (for the 2006 to 2013 graduating cohorts, the repayment rate is defined as the fraction of the nonenrolled borrowing cohort whose loan balances have declined in the three years since graduation). Thus, each line represents an equal share of enrollment in the year 2000 and is indexed to one in that year.

The figure makes clear that the surge in enrollment that started in the late 1990s to early 2000s and continued through the Great Recession was tilted toward institutions with low repayment rates. While enrollment at institutions where students were most successful in repaying their loans increased only by about 13 percent between 2000 and 2010, enrollment at institutions where students struggled the most to repay their loans expanded by close to 70 percent.[5] In other words, the surge in enrollment predominantly occurred at institutions where students tended to struggle the most with their loans.

We emphasize the student loan repayment rate because it is directly related to the financial strain and deterioration of loan outcomes of borrowers. However, the pattern of enrollment changes would be qualitatively the same had we instead categorized institutions by measures of educational outcomes (like the graduation rate), admissions selectivity, labor market outcomes (like the mean or median earnings of program completers, as measured by the College Scorecard), or alternative student loan outcomes (like the default rate or fraction of borrowers not paying down their loan).

Indeed, in 2011, the average enrollment-weighted degree completion rate at institutions in the lowest-repayment rate quintile illustrated in Figure 3 was 23 percent, the average post-enrollment earnings were $27,760, and the average student loan default rate was 20 percent. In contrast, at institutions in the highest repayment rate quintile, 73 percent graduated, their average earnings was $48,375, and the default rate was 3 percent. What kinds of schools are these? In the lowest repayment quintile, the largest institutions are the University of Phoenix (at the time, the largest online for-profit institution); Kaplan University and Ashford University (which previously were large online for-profit institutions, but have since been acquired by Purdue University and University of Arizona, respectively, and are now operated as the online offerings of those public universities), and two large community college systems operating around Houston, Texas—the Houston Community College System and Lone Star College. The largest institutions in the highest repayment rate quintile are large public institutions: Texas A&M, Pennsylvania State University, University of Texas at Austin, Michigan State University, and University

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[5]Were data on twelve-month enrollment available prior to 2001, it is likely that this total headcount data would illustrate an even larger surge in enrollment at low-repayment-rate institutions because they have more short-term programs and more nontraditional enrollment patterns.

Figure 3
Enrollment Changes by Institutional Characteristics

Panel A. Enrollment change by institution's student loan repayment rate
(indexed to enrollment in 2000)
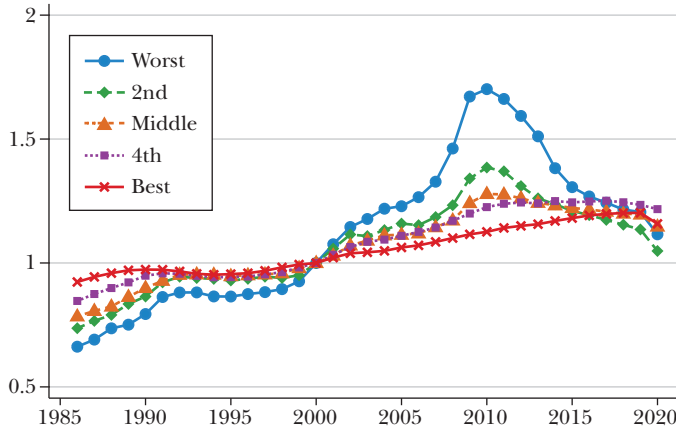
Panel B. Change in enrollment of first-generation students by their
institution's loan repayment rate quintile (change since 2000 in millions
of students)
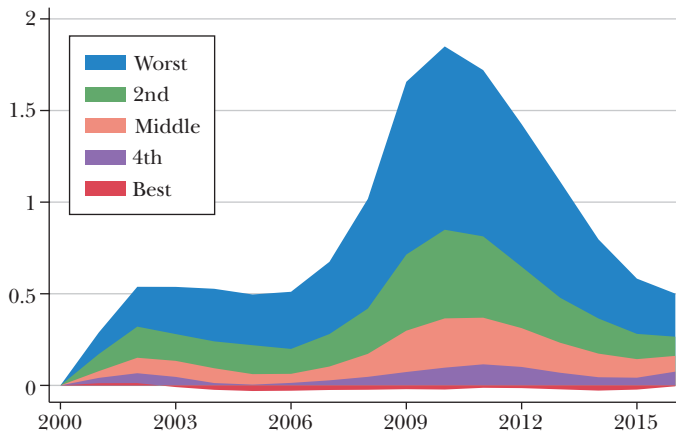
Source: National Center for Education Statistics (1986–2020a) and College Scorecard (2024).
Note: The top panel of Figure 3 shows that enrollment increased the most among institutions with the worst student loan outcomes. The bottom panel shows that first-generation students disproportionately enrolled at these worst-performing institutions.

of Minnesota Twin Cities. Note that while these institutions are prestigious, they are also not highly selective, with acceptance rates between 31 percent and 75 percent.

Across a range of student loan, educational, and labor-market outcomes, the pattern is the same—institutions offering the highest-quality educations and with the best outcomes expanded enrollment the least, whereas the lowest-performing institutions expanded the most.

Who were the students enrolling at these lower-quality institutions? Predominantly, they were the most at-risk and disadvantaged students. Given

the changes in the characteristics of those who enrolled during this period, the students filling these seats at low-performing institutions were disproportionately Black or Hispanic, independent students, and first-generation students. To illustrate, panel B of Figure 3 focuses on first-generation students, the best-available measure of the socioeconomic background of students (family income is only available for dependent students; financial aid applications of independent students and graduate students only require income information from the students themselves). Panel B shows that the increase in first-generation enrollment is highly concentrated among the lowest-quality institutions. Among the institutions with the worst repayment outcomes, an additional 1.8 million first-generation undergraduate students were enrolled in 2010 compared to 2000. First-generation enrollment at the highest-quality institutions was essentially unchanged over this period.

The divergence in enrollment closely coincides with the timing of changes to institutional accountability. In earlier work, Looney and Yannelis (2022) provide evidence that the implementation and subsequent unwinding of these accountability measures caused the changes in enrollment and, subsequently, the number of students who default on their loans.

Graduate Students: Similar Enrollment Changes but Soaring Dollar Amounts

The deterioration of undergraduate student loan outcomes is primarily about changes in the risk characteristics of the institutions that students attend and the vulnerabilities of those students, rather than rising costs or borrowing amounts. In contrast, the story of the deterioration of graduate loan outcomes is both about changes in enrollment patterns *and* surging loan volumes accommodated by the fact that, since 2007, there are no annual or lifetime limits on how much graduate students can borrow in federal loans. At present, almost half of all federal student loans are issued to graduate students even though graduate students represent a small share of total enrollment.

Figure 4, panel A, illustrates graduate enrollment, the number of active borrowers, and the fraction of graduate students who borrow. Similar to the pattern of undergraduate enrollment, graduate enrollment began rising starting in 2000 and more quickly after 2004. However, two notable differences emerge. First, the enrollment of graduate students remains at historic highs (unlike undergraduate enrollment, which peaked in 2012). Second, the fraction of graduate students who borrow remains at about 40 percent, about the same level as in 2004 and somewhat higher than among undergraduates (35 percent in 2020).

Figure 4, panel B, describes the average tuition and borrowing amounts of graduate students. In 2020, the average graduate student paid about $13,000 in net tuition (roughly double the average net tuition of undergraduates). The average amount borrowed per graduate student was about $10,000 (compared to $2,000 per undergraduate), and among those graduate students who borrowed, they borrowed

Figure 4
Graduate Enrollment and Borrowing

Panel A. Enrollment and borrowers

Panel B. Annual borrowing and net tuition
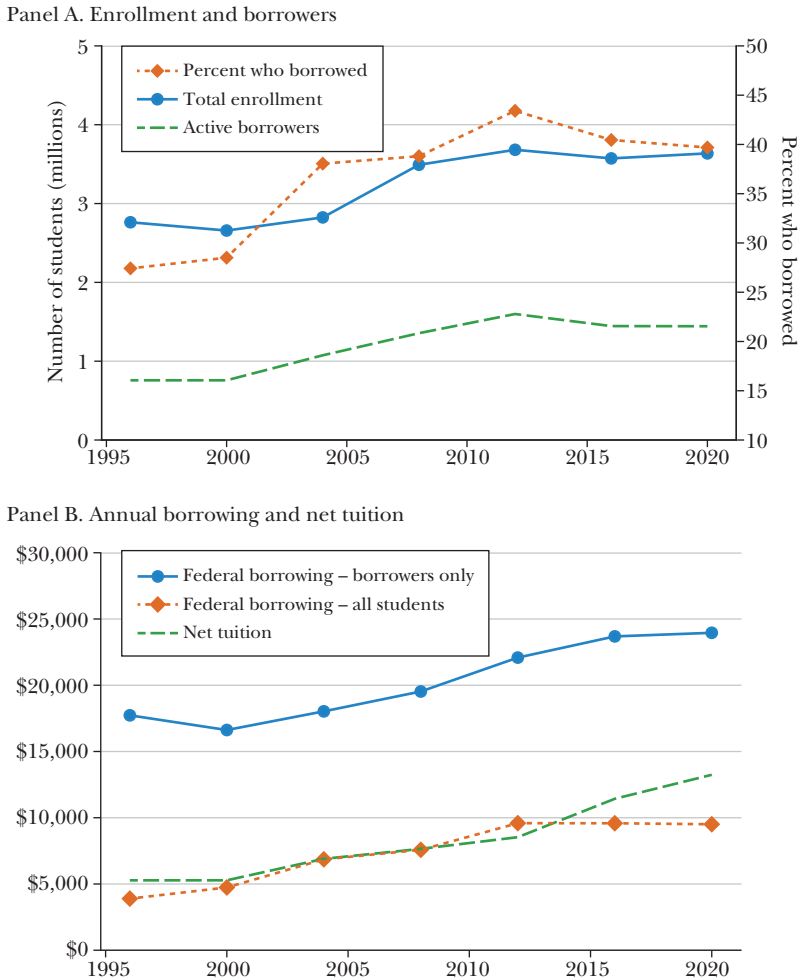
Source: National Center for Education Statistics (1986–2020b).
Notes: Panel A plots total graduate enrollment, total active borrowers, and the share of graduate students enrollment that are active borrowers. Panel B plots the average annual federal borrowing and average net-of-grant and scholarship tuition paid. Annual federal borrowing is reported both annual average amount borrowed across all graduate students and the average conditional on borrowing at least $1. Dollar amounts in 2022 dollars.

almost $25,000 each year. Looking over time, average tuition and other costs are correlated with the amounts borrowed, and increases in costs are closely related to increases in borrowing.

For graduate students, the most salient change in policy in the last two decades has been the elimination of limits on student loan amounts in 2007. While most

graduate students were not bound by the prior limit ($20,500), the elimination of the limit increased borrowing among those at the limit, caused some borrowers who previously took private loans for excess costs to switch to federal loans, and caused institutions to raise graduate tuition (Black, Denning, and Turner 2023).

In part because of these enrollment trends and the removal of limits on the size of graduate loans in 2007, graduate students today borrow almost the same aggregate amount each year as undergraduate students, even though there are almost five times as many undergraduate students (Monarrez and Matsudaira 2023).

Table 2 shows that the number of graduate student borrowers more than doubled between 2000 and 2012 (from 0.8 million to 1.6 million) and remained close to that higher level in 2020. This change was driven in part by enrollments, which increased by 39 percent between 2000 to 2012 and remained higher (in contrast to undergraduate enrollment, which reverted to 2000 levels by 2020). In particular, the number of borrowers in master's degree programs increased 163 percent, which represents most of the increase in the total number of borrowers.

Beyond enrollment, the share of students who borrowed increased from 29 to 43 percent between 2000 and 2012, and remained at 40 percent in 2020. Again, these changes are concentrated among master's students. The fraction of professional-degree students who borrowed in 2020 was the same as in 2000, and the share of doctoral students who borrowed fell. In contrast, the share of master's students who borrowed increased from 25 to 44 percent in 2012 and remained above 40 percent in 2020. In sum, almost all of the increase in the number of graduate borrowers is tied to students pursuing master's degrees.

Who was enrolling and borrowing in these programs? Table 2 shows that among graduate students, the demographic shifts are even more pronounced than among undergraduates. Women surged into graduate study over this period, and their enrollment remained high through 2020. Roughly twice as many Black, Hispanic, or Asian students enrolled in graduate school in 2012 and 2020 as in 2000. In contrast, by 2020, enrollment of white women was almost unchanged and enrollment of white men fell 9 percent.

Above and beyond enrollment, these new students borrowed at much higher rates than previous graduate students. The number of Black graduate borrowers tripled and the number of Hispanic borrowers almost quadrupled.

The growth in master's degree enrollment and borrowing has drawn scrutiny because of the rising costs and amounts borrowed for these programs, and because of large differences in outcomes across programs and institutions. For example, over half of the increase in Black graduate enrollment was accounted for by enrollment in for-profit institutions, while the share of Black graduate students enrolled at public institutions declined (Monarrez and Matsudaira 2023). This change in enrollment matters for student loan outcomes because about 25 percent of for-profit graduate borrowers leave with high debt burdens relative to their earnings using the Department of Education's proposed measure of debt affordability, compared to 2 percent of students in the public sector (US Department of Education 2023). As Table 2 shows, the number of graduate borrowers at for-profit institutions was ten times larger in 2012 than in 2000 and almost eight times larger in 2020.

Table 2
Graduate Student Federal Student Loans

	Graduate enrollment			Fraction of students that borrowed			Change in number of borrowers	
	2000	2012	2020	2000	2012	2020	2000–2012	2000–2020
Total	2.7	3.7	3.6	29%	43%	40%	111%	90%
Race/Gender								
Asian/white female	1.2	1.6	1.4	26%	42%	40%	112%	79%
Asian/white male	1.0	1.2	1.0	29%	36%	27%	52%	0%
Black female	0.2	0.3	0.3	41%	66%	61%	241%	201%
Black male	0.1	0.1	0.1	35%	62%	53%	184%	194%
Hispanic or Latino female	0.1	0.2	0.2	29%	51%	53%	227%	300%
Hispanic or Latino male	0.1	0.1	0.2	29%	42%	44%	129%	230%
Parents' highest education level								
Less than BA	1.2	1.5	1.5	30%	48%	47%	113%	98%
Bachelor's degree	0.6	0.9	1.0	26%	39%	37%	134%	140%
Graduate degree	0.8	1.2	1.2	31%	40%	34%	106%	67%
Sector								
Public 4-year	1.5	1.7	1.6	24%	37%	34%	73%	54%
Not-for-profit 4-year	1.1	1.4	1.5	35%	46%	41%	76%	66%
Private for-profit	0.1	0.4	0.3	44%	58%	55%	926%	656%
Graduate degree program type								
Masters	1.6	2.5	2.1	25%	44%	42%	163%	108%
Doctorate	0.4	0.4	0.7	20%	24%	18%	36%	74%
First-professional	0.3	0.4	0.5	70%	79%	70%	33%	46%

Source: National Center for Education Statistics (1986–2020b).
Notes: The first three columns (2000, 2012, and 2020) present graduate student enrollment (in millions). The next three columns present the fraction of students that borrowed, and the last two columns show the change in borrowers between 2000–2012 and 2000–2020.

Graduate borrowers therefore have very different employment and financial outcomes than in the past. In 2000, 30 percent of graduate student borrowers were borrowing to attend a professional degree program, like law or medical school, which tended to lead to high-paying, secure professions. In 2020, those borrowers represented only 13 percent of graduate borrowers. However, because today's professional degree borrowers borrow so much more in 2020, they still owe about 40 percent of graduate debt—about the same as in 2000.

Within master's programs and doctoral programs, student outcomes are very heterogeneous, both because of the career paths of students and differences in costs across programs. Consider students pursuing a master's in social work in Los Angeles: according to the Department of Education's College Scorecard, University of Southern California graduates earn $64,000 a year and owe $126,000 in federal debt. At University of California, Los Angeles, students earn $77,000 and owe $54,000. And at California State University, Los Angeles, students earn $64,000

and owe $30,000. While the debt-service-to-income level of University of Southern California's graduates is the highest (too high, per the Department of Education's proposed measure of affordability), its program is also the country's largest, with 1,200 graduates per year. Such programs that lead to excessive indebtedness impose financial burdens on their students and eventually large costs on taxpayers.

One result of these enrollment and borrowing changes is that many of the newly-enrolled graduate students at low-quality institutions feel they got a bad deal, and they did. For-profit borrowers are less likely to complete degrees and find jobs, and those who do find work earn less than peers at selective institutions. These outcomes translate into substantially higher loan default rates that have persisted through the past two decades.

Another result is that Americans owe much more in aggregate student debt, raising concerns about reduced access to credit and financial hardship. However, the evidence on the economic impacts of student debt is mixed. While loans provide liquidity and a path to upward mobility for some (Goodman, Isen and Yannelis 2021), difficulty repaying may depress consumption, investment, and saving for others (Dinerstein, Yannelis, and Chen 2023).

Because of persistent inequities in who goes to college and graduate school, student debt remains highly concentrated among children of higher-income households who attained significant education and had lucrative careers (Baum and Looney 2020; Looney 2021; Catherine and Yannelis 2023). However, debt has increased across the income and educational spectrum. The top 40 percent of households owe well over half of outstanding debt, while the bottom 40 percent owe a smaller share (of a rising amount). Moreover, these figures understate the concentration of debt among the affluent, because lower-income groups benefit more from income-driven repayment and related forgiveness (Catherine and Yannelis 2023).

The concentration of debt among affluent households alongside the concentration of default and distress among borrowers with smaller balances and poorer outcomes has created political challenges in solving the student debt crisis, with debates over the targeting of relief and the design of income-driven repayment plans.

Finally, recent decades point to significant unmet demand for education among disadvantaged groups, but a lack of opportunities to attend good schools. While for-profit colleges are obvious contributors to the student lending crisis, the lack of expansion of high-quality public and nonprofit institutions is also a major factor. A range of supply constraints related to government approval processes, finances, and prestige help explain this lack of high-quality expansion (Cellini 2009; Blair and Smetters 2021). Promoting access specifically to high-quality, good-value programs remains a key challenge.

Conclusion: Challenges of Student Lending Policy

The labor market returns to college and graduate school are at historic highs. The typical college graduate earned 75 percent more than a high school graduate

in 2019, and average returns to an additional year of education are in the range of 10.5 percent (Psacharopoulos and Patrinos 2018). For decades, student loans have offered students without means or access to credit a way to finance these investments. The expansion in access to and use of student loans over the last 20 years has boosted enrollment and educational attainment among groups who would not otherwise have had the financial resources to attend college or graduate school. Moreover, the labor market outcomes of groups who increased bachelor's and graduate degree attainment the most over the last 20 years are strong. Alongside broader evidence of the high returns to college for marginal students, too few Americans are pursuing postsecondary education, not too many.

However, the last 20 years also illustrates some significant tradeoffs of relying on the historical student lending system as a primary vehicle to boost access. On the plus side, from a fiscal perspective, lending programs are less expensive than grant programs, and, some argue, more politically and fiscally sustainable because they are self-funded by their beneficiaries rather than from general revenues—the interest paid by previous generations of borrowers funded the costs of new loans to current students. This approach had distributional advantages, as higher-earning graduates tended to pay more without subsidies, offsetting reduced payments of lower-income borrowers (Catherine and Yannelis 2023).

The advent of income-driven repayment plans and improvements in their administration have increased the insurance value and redistribution in the loan system by tying payments to earnings. Previously, borrowers faced an inflexible ten-year repayment plan, which tended to burden borrowers with high payments early in their careers or when their incomes were temporarily low (Mueller and Yannelis 2022; Dynarski and Kreisman 2013). Extending repayment or making payment graduated helps borrowers smooth consumption given that incomes tend to rise over time (Boutros, Clara, and Gomes 2022).

However, significant problems of quality and cost remain largely unaddressed by federal policymakers. Institutions face few federal incentives to offer high-quality, high-value educational programs and to enroll federal-aid-dependent students into those programs, and bear little consequence for poor outcomes. A significant cause of the worsening outcomes of student borrowers is the type of institutions and programs they attend. At many for-profit colleges, the returns to a degree may even be zero, suggesting a negative return when costs are factored in. Even at high-quality, elite programs, the costs can be extremely high and, under the current income-driven plans, those costs are likely to fall on federal taxpayers.

The advent of income-driven repayment plans and their rising take-up have exacerbated these disadvantages: they can erode the incentives of students to seek higher-return, lower-cost programs; they insulate institutions from market pressure to improve value; and they impose marginal tax rates on students. Under today's income-driven repayment plans, most students are expected to repay less than $1 for each $1 they borrow, and thus such plans seem especially vulnerable to adverse selection and moral hazard for both individuals and institutions (Karamcheva et al. 2020; Britton and Gruber 2019; de Silva 2023). These incentives can make borrowers insensitive to price, quality, or outcomes, and encourage institutions to raise tuition

or cut costs. Some schools and types of specialized investors have proven over the decades to be particularly adept at capturing government aid while providing poor returns to students (Eaton, Howell, and Yannelis 2020). While income-driven repayment plans provide payment relief to existing borrowers, on their own, they potentially worsen the problem of institutional quality and value.

Policymakers have proposed legislative and regulatory changes to federal aid programs intended to better align the incentives of schools, borrowers and taxpayers. These proposals impose fines or sanctions on schools for the adverse outcomes of students, putting schools on the hook for adverse outcomes. (Brazil instituted a similar policy in 2017.) While such policies can help fix school incentives, a concern is that they will unintentionally deter institutions from admitting students from challenging backgrounds. The central difficulty is that we only observe a program's dropout rate, default rate, or post-enrollment labor market outcomes that are correlated with students' family income, race, and socioeconomic status, rather than the program's value added (Barahona et al. 2021).

Perhaps the loudest debate about the student loan crisis surrounds the issue of loan forgiveness for past borrowers, and whether to increase loan subsidies for future students attending college and graduate school. This debate involves the intertwined issues of cost and equity. Recent and proposed policies to forgive loans and provide more generous income-based repayment plans for future borrowers have made student loans the costliest federal program for supporting education (CBO 2024). Most of these incremental subsidies will benefit students who would have attended college and graduate school anyway. Because of inequity in access to college and graduate school, those students tend to be affluent, well educated, and successful after graduation. Thus, increases in loan subsidies are more expensive because they benefit inframarginal students, and regressive because they benefit higher-income groups more than the struggling borrowers they intend to serve (Catherine and Yannelis 2023). While more targeted aid policies can seem complicated or administratively daunting, we believe that increased targeting of aid—to prospective students based on need, to institutions based on the outcomes of their students, and to borrowers based on their post-college earnings—is the best way to promote access to high-quality schools, to protect students and taxpayers from excessive costs, and to ensure the long-term sustainability of federal aid programs.

References

Armona, Luis, Rajashri Chakrabarti, and Michael F. Lovenheim. 2022. "Student Debt and Default: The Role of For-Profit Colleges." *Journal of Financial Economics* 144 (1): 67–92. https://doi.org/10.1016/j.jfineco.2021.05.022.

Autor, David H. 2014. "Skills, Education, and the Rise of Earnings Inequality among the 'Other 99 Percent.'" *Science* 344 (6186): 843–51.

Bailey, Martha J., and Susan M. Dynarski. 2011a. "Inequality in Postsecondary Education." In *Whither Opportunity: Rising Inequality, Schools, and Children's Life Chances*, edited by Greg J. Duncan and Richard J. Murnane, 117–32. New York: Russel Sage Foundation.

Bailey, Martha J., and Susan Dynarski. 2011b. "Gains and Gaps: Changing Inequality in US College Entry and Completion." NBER Working Paper 17633.

Barahona, Nano, Cauê Dobbin, Hanson Ho, Sebastián Otero, and Constantine Yannelis. 2021. "Skin in the Game: Colleges' Financial Incentives and Student Outcomes." Unpublished.

Barr, Andrew, and Sarah E. Turner. 2013. "Expanding Enrollments and Contracting State Budgets: The Effect of the Great Recession on Higher Education." *ANNALS of the American Academy of Political and Social Science* 650 (1): 168–93.

Baum, Sandy, Kristin Blagg, and Rachel Fishman. 2019. *Reshaping Parent PLUS Loans: Recommendations for Reforming the Parent PLUS Program.* Washington, DC: Urban Institute.

Baum, Sandy, and Adam Looney. 2020. "Who Owes the Most in Student Loans: New Data from the Fed." Brookings Institution, October 9. https://www.brookings.edu/articles/who-owes-the-most-in-student-loans-new-data-from-the-fed.

Black, Sandra E., Jeffrey T. Denning, Lisa J. Dettling, Sarena Goodman, and Lesley J. Turner. 2023. "Taking It to the Limit: Effects of Increased Student Loan Availability on Attainment, Earnings, and Financial Well-Being." American Economic Review 113 (12): 3357–3400.

Black, Sandra E., Lesley J. Turner, and Jeffrey T. Denning. 2023. "PLUS or Minus? The Effect of Graduate School Loans on Access, Attainment, and Prices." NBER Working Paper 31291. https://doi.org/10.3386/w31291.

Blair, Peter Q., and Kent Smetters. 2021. "Why Don't Elite Colleges Expand Supply?" NBER Working Paper 29309.

Boutros, Michael, Nuno Clara, and Francisco Gomes. 2022. "Borrow Now, Pay Even Later: A Quantitative Analysis of Student Debt Payment Plans." Unpublished.

Britton, Jack W., and Jonathan Gruber. 2019. "Do Income Contingent Student Loan Programs Distort Earnings? Evidence from the UK." NBER Working Paper 25822.

Catherine, Sylvain, and Constantine Yannelis. 2023. "The Distributional Effects of Student Loan Forgiveness." *Journal of Financial Economics* 147 (2): 297–316.

Cellini, Stephanie Riegg. 2009. "Crowded Colleges and College Crowd-Out: The Impact of Public Subsidies on the Two-Year College Market." *American Economic Journal: Economic Policy* 1 (2): 1–30.

Cellini, Stephanie Riegg. 2010. "Financial Aid and for-Profit Colleges: Does Aid Encourage Entry?" *Journal of Policy Analysis and Management* 29 (3): 526–52.

Cellini, Stephanie Riegg, and Latika Chaudhary. 2014. "The Labor Market Returns to a For-Profit College Education." *Economics of Education Review* 43: 125–40.

Cellini, Stephanie Riegg, Rajeev Darolia, and Lesley J. Turner. 2020. "Where Do Students Go When For-Profit Colleges Lose Federal Aid?" *American Economic Journal: Economic Policy* 12 (2): 46–83.

Cellini, Stephanie Riegg, and Claudia Goldin. 2014. "Does Federal Student Aid Raise Tuition? New Evidence on For-Profit Colleges." *American Economic Journal: Economic Policy* 6 (4): 174–206.

Cellini, Stephanie Riegg and Nicholas Turner. 2019. "Gainfully Employed? Assessing the Employment and Earnings of For-Profit College Students Using Administrative Data." *Journal of Human Resources* 54 (2): 342–370.

Chakrabarti, Rajashri, Vyacheslav Fos, Andres Liberman, and Constantine Yannelis. 2023. "Tuition, Debt, and Human Capital." *Review of Financial Studies* 36 (4): 1667–1702.

Chakrabarti, Rajashri, Nicole Gorton, Michelle Jiang, and Wilbert van der Klaauw. 2017. "Who Is More Likely to Default on Student Loans?" *Liberty Street Economics* (blog), Federal Reserve Bank of New York. https://libertystreeteconomics.newyorkfed.org/2017/11/who-is-more-likely-to-default-on-student-loans/.

Chakrabarti, Rajashri, William Nober, and Wilbert Van der Klaauw. 2020. "Do College Tuition Subsidies Boost Spending and Reduce Debt? Impacts by Income and Race." Federal Reserve Bank of New York Staff Report 949.

Chava, Sudheer, Heather Tookes, and Yafei Zhang. 2023. "Leaving Them Hanging: Student Loan Forbearance, Distressed Borrowers, and Their Lenders." Georgia Tech Scheller College of Business Research Paper 4451747.

Chetty, Raj, John N. Friedman, Emmanuel Saez, Nicholas Turner, and Danny Yagan. 2020. "Income Segregation and Intergenerational Mobility across Colleges in the United States." *Quarterly Journal of Economics* 135 (3): 1567–1633.

Chou, Tiffany, Adam Looney, and Tara Watson. 2017. "Measuring Loan Outcomes at Postsecondary

Institutions: Cohort Repayment Rates as an Indicator of Student Success and Institutional Account-ability." NBER Working Paper 23118.

Christensen, Cody, and Lesley J. Turner. 2021. *Student Outcomes at Community Colleges: What Factors Explain Variation in Loan Repayment and Earnings?* Washington, DC: Brookings Institution.

College Board. 2022. "Trends in College Pricing and Student Aid 2022." The College Board. https://research.collegeboard.org/media/pdf/trends-in-college-pricing-student-aid-2022.pdf.

College Scorecard. 2024. "College Scorecard Data." Washington, DC: US Department of Education. https://collegescorecard.ed.gov/data (accessed October 2023).

Congressional Budget Office (CBO). 2024. "Student Loan Programs." https://www.cbo.gov/data/baseline-projections-selected-programs.

Darolia, Rajeev, Cory Koedel, Paco Martorell, Katie Wilson, and Francisco Perez-Arce. 2015. "Do Employers Prefer Workers Who Attend For-Profit Colleges? Evidence from a Field Experiment." *Journal of Policy Analysis and Management* 34 (4): 881–903.

Deming, David J., Claudia Goldin, and Lawrence F. Katz. 2012. "The For-Profit Postsecondary School Sector: Nimble Critters or Agile Predators?" *Journal of Economic Perspectives* 26 (1): 139–64.

Deming, David J., Noam Yuchtman, Amira Abulafi, Claudia Goldin, and Lawrence F. Katz. 2016. "The Value of Postsecondary Credentials in the Labor Market: An Experimental Study." *American Economic Review* 106 (3): 778–806.

de Silva, Tim. 2023. "Insurance versus Moral Hazard in Income-Contingent Student Loan Repayment." Unpublished.

Di Maggio, Marco, Ankit Kalda, and Vincent Yao. 2019. "Second Chance: Life without Student Debt." NBER Working Paper 25810.

Dinerstein, Michael, Constantine Yannelis, and Ching-Tse Chen. 2023. "Debt Moratoria: Evidence from Student Loan Forbearance." NBER Working Paper 31247.

Dynarski, Susan, and Daniel Kreisman. 2013. "Loans for Educational Opportunity: Making Borrowing Work for Today's Students." Hamilton Project Discussion Paper 2013-05.

Eaton, Charlie, Sabrina T. Howell, and Constantine Yannelis. 2020. "When Investor Incentives and Consumer Interests Diverge: Private Equity in Higher Education." *Review of Financial Studies* 33 (9): 4024–60.

Federal Student Aid Data Center. 2023. "Federal Student Loan Portfolio." Washington, DC: US Department of Education. https://studentaid.gov/data-center/student (accessed October 2023).

Goodman, Joshua, Michael Hurwitz, and Jonathan Smith. 2017. "Access to 4-Year Public Colleges and Degree Completion." *Journal of Labor Economics* 35 (3): 829–67.

Goodman, Sarena, Adam Isen, and Constantine Yannelis. 2021. "A Day Late and a Dollar Short: Liquidity and Household Formation among Student Borrowers." *Journal of Financial Economics* 142 (3): 1301–23.

Hampole, Menaka V. 2022. "Financial Frictions and Human Capital Investments." Unpublished.

Herbst, Daniel. 2023. "The Impact of Income-Driven Repayment on Student Borrower Outcomes." *American Economic Journal: Applied Economics* 15 (1): 1–25.

Hershbein, Brad, and Kevin M. Hollenbeck, eds. 2015. *Student Loans and the Dynamics of Debt.* Kalamazoo, MI: WE Upjohn Institute for Employment Research.

Hoxby, Caroline M. 2009. "The Changing Selectivity of American Colleges." *Journal of Economic Perspectives* 23 (4): 95–118.

Hoxby, Caroline, and Sarah Turner. 2013. "Expanding College Opportunities for High-Achieving, Low Income Students." Stanford Institute for Economic Policy Research Discussion Paper 12-014.

Hoxby, Caroline M., and Sarah Turner. 2015. "What High-Achieving Low-Income Students Know about College." *American Economic Review* 105 (5): 514–17.

Karamcheva, Nadia, Jeffrey Perry, and Constantine Yannelis. 2020. "Income-Driven Repayment Plans for Student Loans: Budgetary Costs and Policy Options." Congressional Budget Office Working Paper 2020-02.

Kargar, Mahyar, and William Mann. 2023. "The Incidence of Student Loan Subsidies: Evidence from the PLUS Program." *Review of Financial Studies* 36 (4): 1621–66.

Katz, Lawrence F., and Kevin M. Murphy. 1992. "Changes in Relative Wages, 1963–1987: Supply and Demand Factors." *Quarterly Journal of Economics* 107 (1): 35–78.

Kelchen, Robert. 2018. "A Look at College Students' Living Arrangements." https://robertkelchen.com/2018/05/28/a-look-at-college-students-living-arrangements.

Klein, Aaron. 2022. *The Great Student Swap.* Washington, DC: Brookings Institution.

Lang, Kevin, and Russell Weinstein. 2013. "The Wage Effects of Not-for-Profit and For-Profit Certifications:

Better Data, Somewhat Different Results." *Labour Economics* 24: 230–43.

Looney, Adam. 2021. "The Student Debt Burden and Its Impact on Racial Justice, Borrowers, and the Economy." Brookings Institution, April 13. https://www.brookings.edu/articles/the-student-debt-burden-and-its-impact-on-racial-justice-borrowers-and-the-economy.

Looney, Adam, and Constantine Yannelis. 2015. "A Crisis in Student Loans? How Changes in the Characteristics of Borrowers and in the Institutions They Attended Contributed to Rising Loan Defaults." *Brookings Papers on Economic Activity* 46 (2): 1–89.

Looney, Adam, and Constantine Yannelis. 2019. "How Useful Are Default Rates? Borrowers with Large Balances and Student Loan Repayment." *Economics of Education Review* 71: 135–45.

Looney, Adam, and Constantine Yannelis. 2022. "The Consequences of Student Loan Credit Expansions: Evidence from Three Decades of Default Cycles." *Journal of Financial Economics* 143 (2): 771–93.

Looney, Adam, and Constantine Yanellis. 2024. "Replication data for: What Went Wrong with Federal Student Loans." American Economic Association [publisher], Inter-university Consortium for Political and Social Research [distributor]. https://doi.org/10.3886/E205102V1.

Lucca, David O., Taylor Nadauld, and Karen Shen. 2019. "Credit Supply and the Rise in College Tuition: Evidence from the Expansion in Federal Student Aid Programs." *Review of Financial Studies* 32 (2): 423–66.

Matsudaira, Jordan D., and Lesley J. Turner. 2020. *Towards a Framework for Accountability for Federal Financial Assistance Programs in Postsecondary Education.* Washington, DC: Brookings Institution.

Mezza, Alvaro, Daniel Ringo, Shane Sherlund, and Kamila Sommer. 2020. "Student Loans and Homeownership." *Journal of Labor Economics* 38 (1): 215–60.

Monarrez, Tomás, and Jordan Matsudaira. 2023. *Trends in Federal Student Loans for Graduate School.* Washington, DC: US Department of Education.

Mueller, Holger, and Constantine Yannelis. 2022. "Increasing Enrollment in Income-Driven Student Loan Repayment Plans: Evidence from the Navient Field Experiment." *Journal of Finance* 77 (1): 367–402.

National Center for Education Statistics. 1986–2020a. "Integrated Postsecondary Education Data System." US Department of Education, National Center for Education Statistics, Washington, DC. https://nces.ed.gov/ipeds (accessed October 2023).

National Center for Education Statistics. 1986–2020b. "National Postsecondary Student Aid Study." US Department of Education, National Center for Education Statistics, Washington, DC. https://nces.ed.gov/surveys/npsas (Accessed October 2023).

Psacharopoulos, George, and Harry Anthony Patrinos. 2018. "Returns to Investment in Education: A Decennial Review of the Global Literature." *Education Economics* 26 (5): 445–58.

Scott-Clayton, Judith. 2018. "The Looming Student Loan Default Crisis Is Worse than We Thought." *Brookings Institution Economic Studies Evidence Speaks Report* 2 (34).

Stanley, Marcus. 2003. "College Education and the Midcentury GI Bills." *Quarterly Journal of Economics* 118 (2): 671–708.

Urban Institute Education Data Portal. 2023. "Integrated Postsecondary Education Data System (IPEDS)." (Version 0.21.0). https://educationdata.urban.org/documentation/, made available under the ODC Attribution License (accessed October 2023).

US Census Bureau. 2023. "Total Enrollment and by Age: October Table A-7." https://www.census.gov/data/tables/time-series/demo/school-enrollment/cps-historical-time-series.html (accessed October 2023).

US Department of Education. 2022. "Digest of Education Statistics Table 302.20." https://nces.ed.gov/programs/digest/d22/tables/dt22_302.20.asp.

US Department of Education. 2023. "Financial Value, Transparency, and Gainful Employment." *Federal Register* 88 (194): 70004–193.

Whitman, David. 2017. "Truman, Eisenhower, and the First GI Bill Scandal." The Century Foundation. https://tcf.org/content/report/truman-eisenhower-first-gi-bill-scandal/.

Yannelis, Constantine, and Greg Tracey. 2022. "Student Loans and Borrower Outcomes." *Annual Review of Financial Economics* 14: 167–86.

Zimmerman, Seth D. 2014. "The Returns to College Admission for Academically Marginal Students." *Journal of Labor Economics* 32 (4): 711–54.

On the Economics of Extinction and Possible Mass Extinctions

M. Scott Taylor and Rolf Weder

The expansion of Homo Sapiens has radically altered the environment inhabited by the other species living on planet Earth. We spread ourselves across the globe by exploring new areas and exploiting their resources. Today, humans touch and transform every part of the earth. What does this domination mean for millions of other species inhabiting the globe? While the number of extinctions in the last one hundred years is but a small fraction of the over ten million species in existence today, an increasing number of scientists are pointing to alarming signals that we may be entering the Earth's "Sixth Mass Extinction" (for example, see Kolbert 2014; Ceballos and Ehrlich 2018; Ceballos, Ehrlich, and Raven 2020; Cowie, Bouchet, and Fontaine 2022). Given the current rate of species extinction and near-extinctions we observe, could we be ushering in the first human-caused mass extinction?

A mass extinction is a very rare event. It occurs when a significant fraction of the world's species (a benchmark of 75 percent is widely used) goes extinct in a relatively short period of time (on the order of one to two million years). The Earth has experienced five such extinctions in its history, as shown in Figure 1. Two were caused by asteroid strikes and their aftermath, one by the violent geological activity of our young planet Earth, and the remaining two from relatively slow

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Figure 1
The Five Mass Extinctions
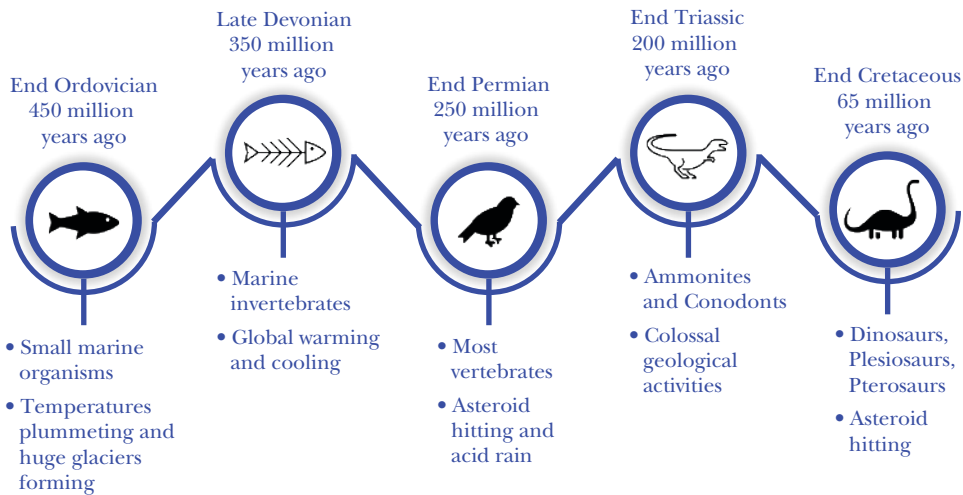
Source: Based on Barnosky et al. (2011).

climate change. Their victims range from microscopic marine organisms to dinosaurs. The prime suspects for contemporary extinctions are habitat loss caused by ongoing climate change; industrial pollution discharges into the air, land, and sea; the introduction of invasive species to new environments; and human harvesting plus deforestation.

The signals to which scientists are pointing come from detailed analyses of recent trends and their extrapolation into the future. Some of these trends are indeed alarming. The most recent report by the World Wildlife Fund shows their global index of biodiversity, the Living Planet Index (LPI), has fallen by no less than 69 percent since its inception in 1970 (Almond et al. 2022). And the IUCN Red List of Threatened Species, established by the International Union for Conservation of Nature in 1964, tells us that 28 percent of the thousands of species they currently assess are threatened by extinction.

With these facts as a backdrop, we focus on two research questions: Why do extinctions occur? And is the rate of human-caused extinction likely to increase over time?

To help us organize our thoughts and data, we develop a simple model highlighting several economy-environment interactions. It allows us to show how extinction is a natural process and all species are in some sense vulnerable. This vulnerability can however be magnified by human intervention leading to an increase in extinction outcomes. The model is simple enough to identify the causal forces at work and just complicated enough to capture some unexpected general equilibrium and long-run impacts.

We start by using variants of the model to discuss two well-documented case studies of near extinction: the historic slaughter of the plains buffalo in the late-nineteenth-century United States and the ongoing slaughter of sharks worldwide. These case studies provide clear evidence on the why of human-caused extinctions. The driving force behind these extinctions is technological progress. It increases humans' ability to harvest from nature, raises human income and consumption, and reduces the costs of moving goods and people worldwide.

To answer our second question, we need to move beyond singular cases to study multiple species whose future health may be linked by common human causes. This allows us to ask how the *rate* of extinction could rise over time, and whether this event is likely or unlikely. One possible link across species comes from the demand side. When the demand for a good is tied to the harvest of a rapidly declining species, but then shifted to the remaining faster growing species, it creates a pattern of sequential depletion. Earlier extinctions create the necessary conditions for later ones. Another possible link comes from the supply side. When climate change alters natural habitats, it makes species vulnerable to extinction. Climate change can bring about multiple extinctions, but these events are only linked through their common and slowly changing cause. When both demand and supply side links are present, they work as complements to generate an accelerating process of sequential extinction; or what we might call a mass extinction.

To assess our likely future in the light of these possibilities, we assess past trends. We first exploit data from the Living Planet Index and the IUCN Red List and find, at least for the class of aquatic vertebrates Chondrichthyes, strong evidence of an ongoing and accelerating sequential depletion of what are more widely known as shark species. This finding is consistent with habitat destruction and human harvesting working as complements to raise extinction risks. With this information in hand, we then ask how these several decade-long processes affecting sharks have gone on despite the potential protections afforded by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). We argue that policymakers have been slow to respond to these dangers and that current protections are far too narrow. With evidence of slow-moving and incomplete policy responses, coupled with ongoing climate change and habitat loss, we conclude that extinction risks are rising for many species. This future is not inevitable, and we offer two suggestions to improve on these outcomes in our final section.[1]

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[1]An earlier and longer version of this paper is available as an NBER Working Paper (No. 31952). It contains a complete version of the model with all derivations and simulations, and a broader account of the literature. Taylor and Weder (2024) contains information on data sources, subsidiary calculations, and additional material.

The Simple Economics of Extinction

To understand what might be driving extinctions, we extend the model by Brander and Taylor (1997), which relates human activities to the health of natural populations. Suppose an economy uses a composite factor (labor L) to produce two types of goods, a (aggregate) manufactured good and a (aggregate) harvest good tied to nature. Manufacturing requires only labor. The production of the harvest good depends on the health of a resource S and labor L, where S is proportional to the biomass (or population) of the species under consideration. The level of harvesting by any agent today affects the resource stock and thus harvesting productivity for everyone tomorrow. For the basic version of the model, we assume this underlying intertemporal externality is not addressed (for alternative assumptions, see Copeland and Taylor 2009) and there is open access to the resource. Consumers are identical and spend a fixed fraction of their income on each good. Over time, the path for S is determined by the scale of equilibrium harvesting $H(S)$ relative to natural population growth $G(S)$, both of which are plotted in Figure 2 for varying levels of S.

Natural Population Growth and Harvesting

To start, ignore all human influences and focus on $G(S)$ in Figure 2. Natural growth is negative, $G(S) < 0$, for any stock below the minimum viable population M, which might be thought of as the population's point of no return. If natural disasters, predators, or invasive species lowered the population—even temporarily—below M, the resulting dynamics of the system drive the population to extinction at $S = 0$. Alternatively, any population above M would, in the absence of harvesting, grow until it reached the biological maximum at K. A population just equal to M cannot remain there since any small perturbation drives the system to either extinction or its carrying capacity. A population's vulnerability rises if M is close to K or, in other words, if $v = M/K$ increases. By construction, v represents the fraction of all initial population levels below K that generate extinction as the outcome absent human harvesting.[2]

Now add the impact of human consumption given by the equilibrium harvest function $H(S)$. The quantity of harvesting $H(S)$ rises with S because a larger stock raises the productivity of harvesting, lowers the unit cost of production and, via competition, lowers the price of the harvest good which raises the quantity demanded. The harvesting function $H(S)$ in Figure 2 becomes steeper if the technology for harvesting improves, society's preference for the harvest good in consumption increases, the human population (which equals the labor force L) rises, and if the economy as a whole becomes more productive.

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[2] $G(S)$ captures the idea that natural populations expand to fill their environment (up to the carrying capacity K) but are also inherently vulnerable to extinction (if their stock falls below the minimum viable population M). Mathematically: $G(S) = rS(1 - S/K)(S/M - 1)$ with r equaling the intrinsic growth rate of a population and $0 < M < K$.

Figure 2
Harvesting, Steady States, and Extinction
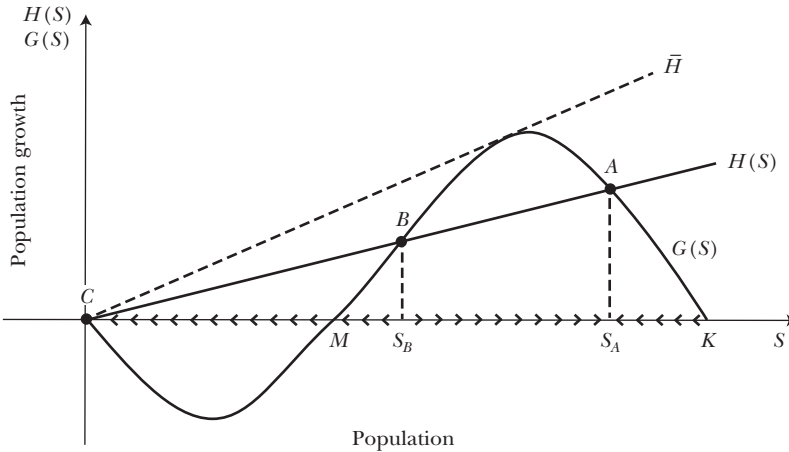
Note: Population size S, growth G(S), and harvests H(S).

When humans are involved, the dynamics become slightly more complicated, and the likelihood of extinction rises. The resting points (steady states) of the economy are given by the intersections of the harvesting $H(S)$ and the growth function $G(S)$. At point *C*, the population is zero with, therefore, zero harvesting and zero growth; once at *C*, we remain forever. At point *B*, harvesting just equals natural growth, but any small positive or negative shock generates further changes, either to the right or to the left of S_B—and cumulatively to *A* or *C*, respectively. Finally, point *A* represents the only interior steady state that is stable to small perturbations.

Figure 2 shows that if the harvesting function is steeper than $\bar{H}$, the only steady state is extinction at point *C*. Therefore, extinction is more likely the larger the human population, the stronger society's preference for the harvest good in consumption, the better the harvesting technology, and the more productive the state of the economy's technology. Biology, however, also matters: a higher vulnerability of the natural population v and a lower reproduction rate r both reduce the maximum of the growth function increasing the likelihood of extinction in the model.[3]

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[3]The equilibrium harvest function is given by $H(S) = \alpha\beta LS\varphi$, where α is a productivity shifter in harvesting, β is the share of income consumers spend on the harvesting good, and φ determines overall labor productivity. Combining $H(S)$ with $G(S)$ we find that extinction will occur if the demand side determinants dominate those determining supply: specifically, when $\beta L\varphi > (r/\alpha)\left[(1-v)^2/(4v)\right]$. See our NBER Working Paper (No. 31952) for a complete derivation.

Paths to Extinction

We can now imagine the possible paths to extinction. First, even without human intervention, natural variation in predators, extreme weather, volcanic eruptions, or disease could push the population, even temporarily, below M. Since M is the point of no return for the population, these shocks create what we might call *natural selection extinctions* (what biologists measure as the "background extinction rate"). Second, with active human harvesting and an economy at S_A in Figure 2, this same natural variation is now more likely to drive a population to extinction. This is true because any shock only needs to reduce the size of a population slightly below S_B from S_A (instead of below M from K). Absent immediate and compensating changes, the population falls toward extinction.

A third path to extinction comes directly from human over-harvesting. This is shown in Figure 2 by a harvest function steeper than $\bar{H}$. In this case, harvesting outstrips natural growth at all populations. Harvesting could well cease before the population gets anywhere near zero, because once we push the population below M, extinction is inevitable and the species in question is a dead man walking. Biologists use the less colorful term "extinction debt" to describe the set of future extinctions predetermined by past actions. Finally, the last path to extinction comes from habitat loss. Habitat loss lowers K (for example, through changes in the climate) or comes about when we fragment an existing habitat into isolated segments (for example, by clearing forests for commercial farming or building roads for exploration). In both cases, the vulnerability v of a population rises, which makes extinction more likely.

Therefore, even though extinction is a natural process driven by environmental variability and the pressures of natural selection, it also has human causes. Humans can be the primary drivers through over-harvesting, or we can be a secondary driver when harvesting lowers populations, making them more susceptible to extinction via natural fluctuations. Humans are also responsible for habitat loss, raising populations' vulnerability. Given these many possibilities, it is often difficult to identify the underlying cause for any extinction. Fortunately, there are several clear-cut cases we can learn from, and we study two of them using theory as our guide.

The North American Buffalo (Bison)

Prior to European contact, what later became the continental United States was home to some 25–30 million plains buffalo. They were found in all the lower 48 states except New England, with especially dense concentrations in the productive grassland of the Great Plains, ranging from what is now Texas up to Montana and North Dakota. The steady movement of peoples westward removed all buffalo east of Wisconsin and most of Minnesota by the 1830s. By the end of the US Civil War in 1865, only 10–15 million buffalo remained wild on the Great Plains. Even here, their habitat was divided in two by the furious work efforts to complete the Union Pacific Railroad, and by wagon trains carrying hundreds of thousands of pioneers

travelling west. The remaining herds of buffalo in Montana, Wyoming, and the Dakotas became known as the Northern herd; buffalo in Kansas, Nebraska, Texas, Colorado, Oklahoma, and New Mexico constituted the much larger Southern herd.

None of this history should be surprising: westward expansion meant farms and cattle ranches reduced buffalo habitat; towns, forts, railroads, and wagon trains fragmented it; and subsistence hunting to feed railroad crews, farmers, and towns people meant the killing of buffalo for meat. Observers of the 1860s thought buffalo west of the Mississippi would decline at a pace much like the slow and steady destruction experienced by herds east of the Mississippi. No one foresaw that history would be far less kind to the buffalo.

Slaughter on the Plains

Starting in 1871 and continuing over a span of a little more than ten years, the remaining 10–15 million plains buffalo were killed in a punctuated slaughter. The Great Plains were littered with rotting carcasses, stripped of their hides, but otherwise untouched. Although most Americans are taught that this "slaughter on the plains" was facilitated by the new railroads and perhaps perpetrated by the US Army, recent work in international trade has come to a different conclusion. We draw throughout this section from Taylor (2011), in which one of us presented evidence that a combination of technological progress in tanning and free international trade in buffalo hides drove them very close to extinction. Extinction was so close that by 1888, the (soon-to-be) famous naturalist William Temple Hornaday was sent by the Smithsonian in Washington to collect the last remaining buffalo from the scattered northern herd. From the tens of millions that once roamed the Great Plains, Hornaday found only perhaps 100 remained. Fortunately, indigenous groups, and others, such as Charles Goodnight in Texas, preserved the last remnants.

Two independent accounts tell almost exactly the same story about the innovation behind the slaughter. The first comes from a *London Times* dispatch from New York, reporting that in early 1871, a few enterprising New Yorkers arranged for a bale of buffalo hides to be sent east to tanners in Pennsylvania and New York to see if they could be rendered into useful products (Buffalo Hides 1872). Until that time, the market for buffalo products (meat and buffalo robes) was constrained by both geography (robes could only be taken from herds in cold climates in cold weather months), and technology (railroad cars were not refrigerated). While the initial US experiment at tanning failed, several bales made their way to England, where tanners succeeded in turning buffalo hides into useful, thick, strong leather.

A second account comes from a direct participant in the slaughter. In an interview with former buffalo hunter George Hodoo Brown (as reported in Gilbert, Remiger, and Cunningham 2003, p. 55), he recounts his return to a meat hunting camp in May 1871: "As I came back in camp, I told the other fellers it was getting too warm to get the meat to market without spoiling. They says 'Why don't you just skin them and let the meat lay', I says, 'What the devil would I do with the hide', and

they said ship it to W. C. Lobenstein in Leavenworth and he will send me a check. So next day, Burdett and I went a skinning."

Therefore, in spring of 1871, a new market was born. Before the innovation, the market for buffalo kills was determined by domestic demand for meat or fur. Given the limits imposed on the meat market by transportation and the requirements of the fur market, the demand for buffalo kills was relatively small with S_A near K. In 1871, however, this all changed: once the easily transported buffalo hides could be sold at high prices, hunters flooded the plains. A much greater labor force was employed in hunting and the harvest function in Figure 2 shifted dramatically upward, well beyond $\bar{H}$. As the slaughter proceeds, the herd naturally falls, and we move towards the extinction outcome in C.

The incentives were large. A typical four-man buffalo hunting crew had one hunter killing 60 buffalo per day; two skinners each skinning 30 per day; and one camp cook keeping the accumulating hides and camp safe. In a 25-day month, this crew produced 1,500 hides with a market value of perhaps $3 each. Therefore, $4,500 of total revenue is available to defray minimal costs before splitting it four ways. Alternative employment at that time was earning about $50 per month on a ranch or railroad crew. Anyone with a gun, a knife, and a wagon for transport could enter the new buffalo gold rush. By the year 1879, the buffalo are nearly extinct on the southern ranges and hunters moved north. From 1881 to 1883 the northern hunt plays out in a similar manner. By the time Hornaday arrives in Montana in the late 1880s, only perhaps 100 buffalo remained.

Evidence on Prices and Exports

While the story of the buffalo extinction brims with foreign interlopers and colorful characters, the economic logic rests on two underlying claims. The first claim is that buffalo hide prices during the 1870s were essentially unaffected by the slaughter, which maintained the incentive to continue hunting despite falling numbers. Taylor (2011) presents data on the prices of hides in the New York market and an estimate of the price obtained by hunters over the 1866–1885 period that indeed imply little or no movement. The reason: while the number of buffalo hides exported by the United States were significant by US standards, they were very small relative to the world market for all hides.

The second claim is that that significant numbers of buffalo hides were exported. Taylor (2011) presents data concerning US exports of buffalo hides drawn from various years of the US Department of Treasury, Bureau of Statistics, Foreign Commerce and Navigation of the United States, deflated by the mentioned price series per hide. Since hides include both cattle and buffalo hides, a well-known model of the US cattle industry to remove possible cattle hides from the export numbers is employed. The result is the constructed buffalo hide export series shown in Figure 3, which matches the historical record of buffalo hunting exceedingly well.

Figure 3
Buffalo Hide Exports during the Slaughter
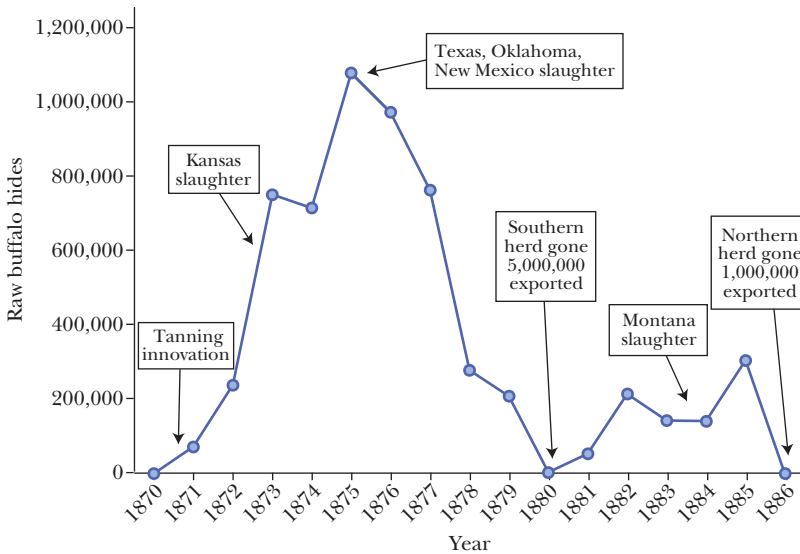
Source: Based on Taylor (2011).
Note: US Raw Buffalo hides exported to all countries.

Process towards Virtual Extinction

The buffalo slaughter began in early 1871 in Kansas and Nebraska, but by the end of 1874 buffalo hunters needed to move south into Texas, Oklahoma, and New Mexico. An estimate by Colonel Richard Irving Dodge (then resident in Kansas) put the 1872–1874 hide shipments by rail at 1.4 million hides; the number from the export figures puts it slightly higher at 1.7 million. When buffalo were gone from Kansas and Nebraska, the slaughter moved south. The peak years for buffalo hunting were 1875 and 1876, with the last buffalo hunts in Texas in 1879 destroying remnants of the Southern herd. In 1881, the hide hunters turned northward and soon the Northern herd was also destroyed.

In total, the export data show over six million buffalo hides exported, but these figures ignore losses to wastage. Dodge, for example, reports that every buffalo hide shipped in 1872 represented three buffalo killed, with this ratio falling to 2:1 in 1873, and then 1.25:1 in later years. Applying these estimates, the export of 6 million represents a kill of closer to 9 million buffalo. Even a total kill of 9 million does not exhaust the 10–15 million buffalo thought to reside on the Great Plains, which means that there was still ample room for hunting by settlers and wanton killing by the US army. Nevertheless, it seems clear that the driving force behind the buffalo slaughter was a foreign-made innovation and a healthy foreign demand for industrial leather.

In the end, the buffalo did not quite go extinct, and some might even argue that their domination of the Great Plains had to end anyway. Of course, we will never know what could have been. Buffalo are raised today in many US states and Canadian provinces, and so careful management of the herds may have led to a booming domestic industry generating meat, hides, and robes for years to come. While elements of US society were shocked and horrified by the slaughter on the plains, no legislation regulating their hunt was passed in time. Political differences, bureaucratic delay, and a belief that fewer buffalo remaining would mean a more docile indigenous population won the day, while the power of international markets ensured their rapid and almost complete destruction.

Sharks

Most of us are terrified of sharks. On television and in movies they appear suddenly from dark water and with deadly effect—making sharks perhaps the least charismatic of the world's megafauna. In reality, sharks are mostly shy and peaceful around humans. They have an astounding capability to use electromagnetic fields for hunting and have survived glaciations, climate events, and even an asteroid strike or two. However, within the last few decades, sharks have increasingly fallen victim to the human predators. Many shark populations have collapsed over the last 30 years, and in Erhardt and Weder (2020), which we draw from in this section, one of us argued that the indiscriminate harvesting of sharks for international trade has put many slow-reproducing shark populations in tremendous peril.

International Trade of Shark Fins

Most shark hunting is driven by the demand for shark fins, which are mainly consumed in Asian countries, to a large extent, in the form of shark-fin soup. There is a long tradition, particularly in China, of consuming shark-fin soup at special occasions like weddings, banquets and New Year celebrations. Although shark-fin consumption was discouraged during the Mao era (1949–1976), it regained popularity under Deng Xiaoping (1979–1997) (Rose 1996, p. 49). By the turn of the twenty-first century, shark-fin soup had become a "day-to-day, integral component of Chinese culinary identity" consumed by much of the general public (Cheung and Chang 2011, p. 355). As emphasized by Dent and Clarke (2015, p. 11), the market for shark meat recently expanded due to, for example, anti-finning regulations that encouraged the full utilization of shark bodies. International trade of liver oil used, for example, in cosmetics and vaccines also provides an increasing threat, particularly to deepwater sharks and rays as shown by Finucci et al. (2024).

The final consumers of the shark-fin soup are largely indifferent to the species of shark ending up in their soup. The processing of a shark fin (for example, how the fibers or needles inside the fin are removed in the cooking process and prepared), and the combination with other ingredients, make it unimportant and

Figure 4
World Capture of Shark Populations
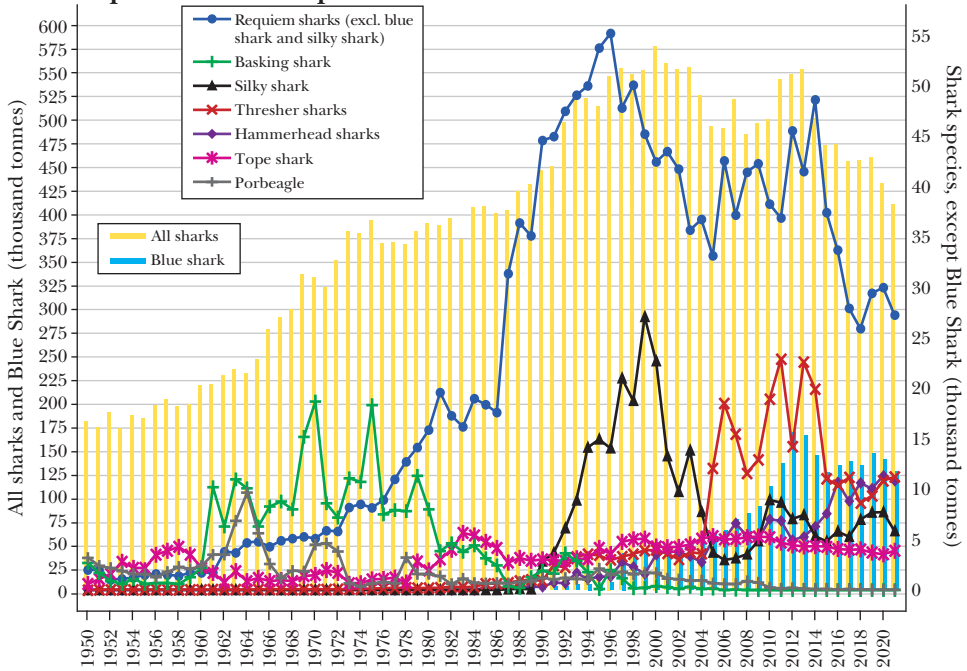
Source: Authors' calculations based on data from FAO (2023b).
Note: The left-hand axis measures capture of all sharks (yellow bars) and blue sharks (blue bars). The right-hand axis measures specific species of sharks, often showing a pattern of rising and then falling capture.

also difficult for the consumer to differentiate across species. Consequently, sharks from many species have their fins collected by fishery industries all over the world and sent to mainly Asian countries. Data from FAO (2023a) on imports of shark fins reveals that worldwide imports (by weight) more than quadrupled from 1976 (the earliest year we have data for) to the peak in 2011, followed by some reduction thereafter. Approximately 90 percent of worldwide imports of shark fins (by weight) from 1976 to 2016 went to four countries that are the major consuming, processing, and trading hubs of shark fins: China (including Hong Kong), Singapore, Malaysia, and Taiwan. The rest of the world imports a small fraction of world supply, although it has recently increased.[4]

Global Capture Statistics versus Individual Heterogeneity

Figure 4 presents worldwide capture statistics from FAO (2023b), which are available since 1950 (expressed in tonnes of the live weight of sharks). The worldwide capture of all sharks, in yellow, is measured on the left-hand axis. It is relatively

[4] See Taylor and Weder (2024) for a detailed account of our calculations for these numbers and those shown in Figure 4.

low in the 1950s, increases thereafter to reach a plateau in the 1970s and 1980s, and starts a steady climb in the early 1990s to reach a peak in 2000. Also shown in Figure 4 are the capture of individual shark species and two groups of species (Requiem and Hammerhead). Except for the Blue Shark, they are graphed on the right-hand axis. In contrast to the relatively smooth moving aggregate, the figure reveals a largely similar pattern of increased harvest, peak harvest, and then decline for both groups and individual shark species.

For example, reading from left to right, the Porbeagle showed an early peak capture in 1964 (9,674 tonnes), quickly falling to 1,000 tonnes thereafter and further diminishing to a capture of approximately 100 tonnes or less since 2015. Similarly, the Basking Shark reached its peak capture in 1970 (18,700 tonnes) and then steadily declines to 389 tonnes in 2000 and fell further in the following years. Next, the Tope and Silky Shark enter the capture statistics only to peak, and then be replaced by the Thresher shark. The Blue Shark, which is hunted in large numbers, became a hunting target relatively late before reaching its peak capture in 2012 (167,639 tonnes) and then declines. Similarly, Requiem Sharks start with very high harvests early only to fall off very late in the sample. Finally, the capture of Hammerhead Sharks may still be rising, although we suspect individual species within this and the Requiem groups are likely to show the same pattern of rising and then falling captures as revealed by all other species.

A Demand Shock Created by Growth and Technology

We can understand these patterns with the help of our model. From the 1980s up to the present, demand for shark fins in Asia rises substantially, driven by a cultural shift in its acceptability and a steadily rising and increasingly affluent population. More aggressive fishing technologies like "long-lining" (a long central line with hooks attached to many branch lines) or dragging a trawl net behind a fishing boat come into widespread use. Because these technologies are not targeted to any one shark species, they increase the hunting pressure on every shark species. The harvest function facing any individual shark species becomes steeper. Using Figure 2, captures rise and stocks fall.

But the effect of this increased pressure is not felt equally across species. Sharks have large differences in size (from less than a meter to more than ten meters) and large differences in their rate of reproduction (Worm et al. 2013). If one species reproduces more quickly than another, its growth function will rise faster and peak at a higher maximum. As a result, the harvest function lies above its natural growth $G(S)$ everywhere for slower-growing species; whereas for a faster-growing species, it does not. Because the demand for shark fins does not discriminate across sources, and the technology for capture is indiscriminate, the slower-reproducing species may go extinct while their faster growing brethren survive. In fact, the early-peaking Porbeagle Shark as well as the Basking Shark, for example, are characterized by relatively low reproduction rates, while the later-peaking Blue Shark has a higher rate. While the aggregate capture will eventually decline, it may at first rise with harvests

from the newly recruited—but not yet depleted—faster-growing species mimicking the pattern in Figure 4.

Extinction in a Many Species World

Our case studies focus on either one population (buffalo in the United States) or a handful of shark species. Perhaps they are not representative cases. Perhaps the extinction of one species makes extinction by others less likely because of a strong policy response to the first. Perhaps many species have common stressors—like climate change—which makes multiple, roughly simultaneous, extinctions more likely. Perhaps there are other less obvious links. To study these possibilities and to understand the fate of sharks, we extend our model to allow for many species, examine a broader selection of data on populations, and evaluate ongoing policy actions in light of our findings.

Many Species with Different Rates of Regeneration

As a first change to the earlier model, we now assume there are very many species (indeed, a continuum) that differ only in their rate of regeneration r. Second, we develop an alternative assumption about demand. Thus far, we have implicitly assumed the demand that would have fallen on an extinct species is shifted to other goods in the rest of the economy (in the model, to the manufactured good), leaving the demand for the remaining harvestable species unaffected. We contrast this "diffuse demand" assumption with its natural alternative: demand from the extinct species is instead shifted on to the remaining species. We call this our "concentrated demand" assumption. It is similar to that adopted in the "fishing down the food chain" literature where the depletion of some species by overfishing leads to increased pressures on fish not previously targeted (Cressey 2010). Third, we suppose that any shock that degrades the carrying capacity K or increases the minimum viable population M, does so for all species. These changes could occur from land conversion to agriculture, from the introduction of invasive species, or from climate change.[5]

Despite these complications, each species has a harvest and growth function as shown in Figure 2, but now growth functions differ across species. As a result, some species may survive while others go extinct. The exact chain of events is naturally quite complex, and to understand the model's mechanics, we rely on simulations as detailed in Taylor and Weder (2023). In some cases, the many species model provides only limited new information. For example, if demand is diffuse, the extinction of any one species is independent of all others. Thus, as explained earlier, a demand shock can generate extinction outcomes via overharvesting, as would a

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[5] For a discussion of invasive species and their damage to ecosystems, see McAusland and Costello (2004), Costello et al. (2007), and Egan (2017).

common supply shock that raises vulnerability and lowers natural growth.[6] In each case, a set of species goes extinct but the extinction of any one species is unrelated to all others. One new finding in the multi-species case is that slow-growing species go extinct first and, less obviously, the time between the extinctions lengthens. This is true because it is generally harder, and therefore takes longer, to drive a faster-growing species to extinction. Therefore, simple demand and supply shocks—like those highlighted in the buffalo and shark cases—can generate multiple extinctions but they do not necessarily increase the rate of extinctions over time.

Concentrated Demand and Mass Extinctions

These results change dramatically if we assume previous extinctions concentrate demand on the surviving species. Now, earlier extinctions cause later ones. Slower-growing species go extinct first, but demand concentration may not eliminate all species. We may instead be left with a much smaller set of very rapidly growing species. The key to generating a mass extinction of all species is to combine our concentrated demand assumption with ongoing habitat loss. When habitat loss occurs, each species becomes more vulnerable to extinction: its maximum rate of growth declines and its species-specific $G(S)$ is compressed towards the horizontal axis in Figure 2. The advantage of being a rapidly growing species is reduced by habitat loss at the same time that demand concentration places an increasingly large burden on those species remaining. With these two forces in play, not only can all species go extinct, but the rate of extinction also rises over time, generating a mass extinction.[7]

We illustrate this result with the simplified case of twelve species shown in the two panels of Figure 5. At time zero, demand is spread evenly across the species and all populations are at their carrying capacity. Panel A tracks the harvesting for each of the twelve species over time, $h(t)$, and by choice of units the top line represents the harvest from the slowest growing species, the second-to-top line the second slowest growing, and so on. Initially, harvests decline as populations shrink, with the slowest growing species showing the greatest rate of decline. Once this first species is eliminated, all others receive a relatively small positive demand shock, and they decline a bit faster. With further extinctions, demand is increasingly concentrated on a smaller and smaller set of species and the harvests of those remaining rises—despite their falling population levels. It is easy to see that the harvest of individual species exhibits a boom-and-bust pattern reminiscent of Figure 4. Although those species remaining are the fastest growing, ongoing habitat loss lessens this advantage and the process accelerates. As shown, multiple extinction events are now compressed in time and all twelve species go extinct.

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[6]With diffuse demand, the extinction condition in footnote 3 extends to the continuum case, with $r(z)$ being the intrinsic growth rate of species z. By ordering species, $r(z)$ is increasing in z over $[0,1]$. Slow-growing species go extinct if demand-side determinants dominate those of supply: $\beta L \varphi > \left[r(z)/\alpha \right] \left[(1-v)^2/(4v) \right]$; faster growing species survive if the inequality is reversed for some z close to 1.
[7]With concentrated demand, the demand side determinants rise with a decreasing number of surviving species, $1 - \bar{z}$. The condition for extinction of individual species in the model changes to: $(\beta L \varphi)/(1 - \bar{z}) > \left[r(z)/\alpha \right] \left[(1-v)^2/(4v) \right]$.

Figure 5
Concentrated Demand, Habitat Loss, and Mass Extinction

Panel A. $h(t)$ for different r values

Panel B. Extinction rate (extinctions per million species year)

Source: Authors' simulation.
Note: Details available in Taylor and Weder (2024).
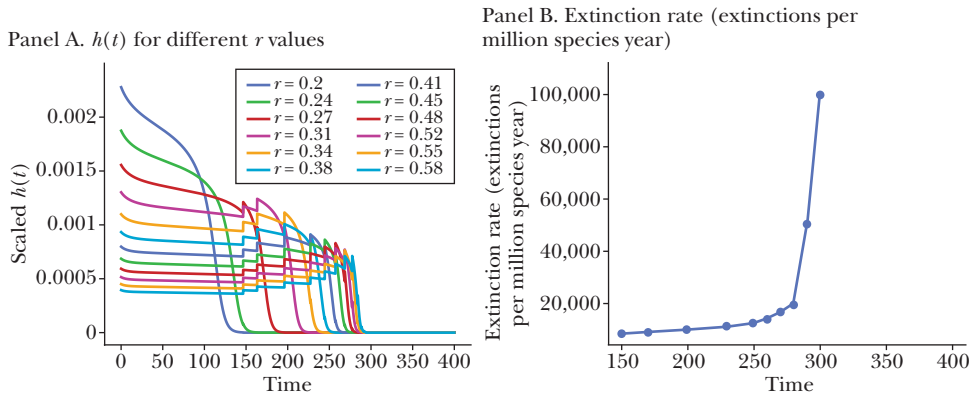
To see this compression in time more clearly, in panel B we calculate the extinction rate over the sample period in terms of biologists' measure of "extinctions per million species year." The figure shows the rate of extinction starts quite low, as it should. The number of existing species is initially large which implies a small rate of extinction, and the speed with which extinction occurs is slow because demand has yet to concentrate. As time goes on, the set of species shrinks with a rising rate of extinction, just as demand concentration becomes much more powerful, given the smaller set of remaining populations. As a result, the extinction rate spikes, which produces what we might refer to as a mass extinction.

Assessing Extinction Risks

The buffalo and shark cases offer two very clear examples where supply or demand shocks usher in rapid species decline. The theory, when extended to multiple species, adds to this the possibility that demand concentration and gradual habitat loss can combine to produce a sequential mass extinction. But how common are these two cases, and how serious is the situation? Shouldn't policymakers be expected to intervene to preserve species? To address these questions, we exploit three data sources about extinction risk: the Living Planet Index from the World Wildlife Fund, the IUCN Red List from the International Union for Conservation of Nature, both mentioned in the introduction, and the listing of species in the annexes of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, known as CITES. The Living Planet Index measures the change in populations' abundance. The IUCN Red List provides an assessment of individual species' extinction risk. The listing of species by CITES can be interpreted as the

international community's policy response to these developments. Our investigation here focuses on sharks, because comparing the data sources across all taxa is just too broad an exercise to be useful. Moreover, data is available for many species of sharks and sharks are hunted in every ocean worldwide, with possibly devastating ecological effects.

The Living Planet Index

The Living Planet Index is produced in a global form, in addition to various sub-indices specific to either a given geography (say, North America, Asia, and others) or the primary habitat of the species included (marine, terrestrial, or freshwater). The Convention of Biological Diversity has adopted this index as an indicator of progress towards its targets and it is likely to play a significant role in policy discussions in coming years.[8] This data source is a valuable one, and it has drawn the attention of researchers looking for measures of biodiversity. However, it has four well-known limitations. As a result of these challenges and critiques, it is unclear how much we should be alarmed by the dramatic decrease in this index since 1970.

First, the data used are far from representative. The species, time periods, populations, and geography are all collected opportunistically from primary sources, which range from scientific studies to community reports and volunteer counts. Second, the primary studies measure populations in different units. This leads to an index based on the arithmetic averages of growth rates. As a result, the Living Planet Index does not measure changes in the population for any species, it measures instead the (unweighted, arithmetic) average rate of change for the species across many samples—and this may well be negative even though the aggregate population is growing. Third, most data series for individual species have large gaps (some as large as 20 years) that are filled by a smoothing procedure. Finally, randomness in the population estimates themselves are sufficient to produce a declining index, even if populations are stable (Buschke et al. 2021).

To gain insight into the mechanics and limitations of this measure, we collected from the Living Planet Index (2023) its publicly available data on shark species. The data span the period from 1950 to 2018 and include 284 total time series of abundance measures spread across 63 shark species. Of these series, 231 are uninterrupted (no missing values within the time series), while 53 time series had missing values. The data are far from a balanced panel: of the almost 20,000 data cells (69 years x 284 series), only 18 percent of the cells have data, improving to 23 percent if we take the post-1970 period forward. The data are also measured in a dizzying array of units: from indirect measures of abundance, such as catch per unit effort, to the average number of sharks per tour recorded by cage divers, on through to numbers of aerial

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[8]The Convention on Biodiversity is a multilateral treaty and was the brainchild of a UN Environment Program working group. For more information on the Convention see https://www.un.org/en/observances/biological-diversity-day/convention. For more information on the 2010 Biodiversity Target, see https://www.cbd.int/2010-target/.

Figure 6
Two Living Planet Indices for Sharks

Panel A. The raw data Living Planet Index for
sharks: 1970 to 2016
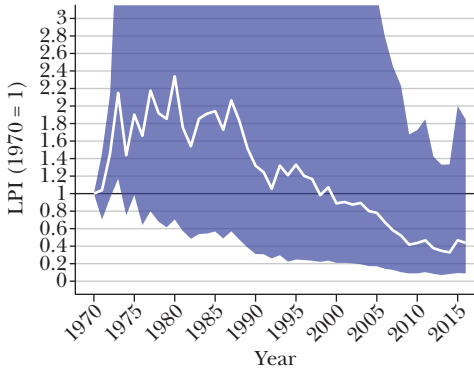
Panel B. A smoothed Living Planet Index for
sharks: 1970 to 2016
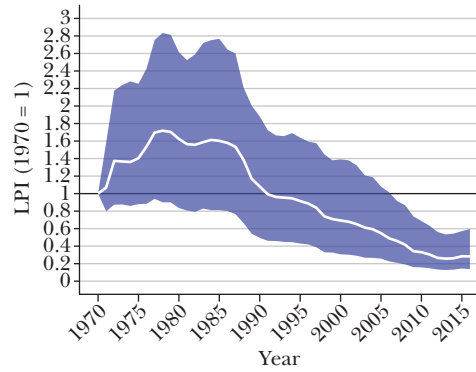
Source: Authors' calculations based on data from the Living Planet Index (2023).
Note: For details, see Taylor and Weder (2024).

sightings per 100 square kilometer. In fact, there are 107 different units of measurement and 126 different measuring methods across the 284 time-series.

We replicated their methods and constructed two of our own indices for sharks: one based on raw population data, and one replicating the Living Planet Index smoothing procedure. We show these two panels, with their standard errors, in Figure 6 (the smoothing procedure uses bootstrapping as a resampling method to estimate a population's distribution). First, it is apparent from either panel, using either the raw data or the smoothed version, that the average growth rates for sharks—the change in the thin line in the panels—has been negative for many years driving the index values downward. The fall has been especially rapid since 1985 or 1990, with no evidence of the trend reversing itself. Second, the exact timing of when the index falls below its 1971 benchmark of one differs considerably: in the raw data, this occurs near 2000, while in the smoothed data, it begins in 1991. Despite these differences, the two indices do agree that average growth rates for sharks have been negative for many years—so negative as to drive their respective indices down by 40–80 percent since 1970. The only caveat we have is that the bootstrapped standard errors surrounding the smoothed estimates admit the possibility of a far less dramatic decline.[9]

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[9] Details of these calculations are available in Taylor and Weder (2024). Given the limitations and noisiness of data, the confidence intervals are immense, arising in particular from the very large variance in growth rates at any point in time and showing quite clearly the role that outliers can play in determining the index values.

These findings, together with those previously reported on worldwide shark capture in Figure 4 strongly suggest that there have been large negative changes in shark populations worldwide and these declines have been ongoing for over 40 years. However, because the exact timing and magnitude of the declines remain uncertain, we now turn to examine another authoritative data source—the IUCN Red List.

The IUCN Red List

The International Union for the Conservation of Nature (IUCN) Red List provides an assessment of the risk of global extinction for animals, fungi, and plants (IUCN 2024). In the IUCN Red List, species are categorized according to various levels of endangerment, ranging from "Least Concern" (LC), which means widespread and abundant, to "Extinct" (EX), which are species that without any reasonable doubt have lost the last member. In-between these two extremes, species are divided into "Near Threatened" (NT), "Vulnerable" (VU), "Endangered" (EN), "Critically Endangered" (CR), and "Extinct in the Wild" (EW), as well as two residual categories of "Not Evaluated" and "Data Deficient" (IUCN 2022). Like the Living Planet Index, the Red List is clearly not representative: it depends on the willingness, capability, and feasibility of experts and sponsors to perform and provide assessments. The IUCN notes that of the approximately two million categorized (described) species on earth, less than 10 percent (approximately 150,000 species) have been assessed for the Red List, and these assessments are biased towards terrestrial domains and in particular forest ecosystems with a better coverage of animals.

We focus on the three categories Vulnerable (VU), Endangered (EN), and Critically Endangered (CR) of threatened species in the IUCN Red List. The criteria determining their classification are the speed of population size reduction (past, present, or projected); the geographic range, size, and fragmentation of its habitat; the size, fluctuation, and distribution of its populations, and a quantitative analysis of its risk of extinction (IUCN 2022, Table 2.1). In terms of Figure 2, these assessments would reflect recent changes in S and take into account the current position of S. For example, if S/K was close to v, the extinction risk would be very high.

Again, we focus on sharks, which are part of the aquatic class of vertebrates known as Chondrichthyes. The IUCN data contain an impressive sample of 427 shark species. Of these, the 2023 IUCN Red List places 153 shark species in the three high extinction-risk categories (VU, EN, CR), and 274 shark species in either Near Threatened (NT) or Least Concern (LC). For 78 percent of these 427 shark species, we have information on their current population trend: *all* of the shark species in any one of the high extinction-risk categories exhibit negative population growth rates, but perhaps surprisingly, so too do 97 percent of the sharks in the NT category. Overall, only nine (all of which are in the LC category) exhibit positive population growth rates.

Since the IUCN Red List data often contain updates of assessments of the same species, it is possible to examine changes in category listing over time. For

Figure 7
Increase in the Extinction Risk Category of Sharks: 2000–2020
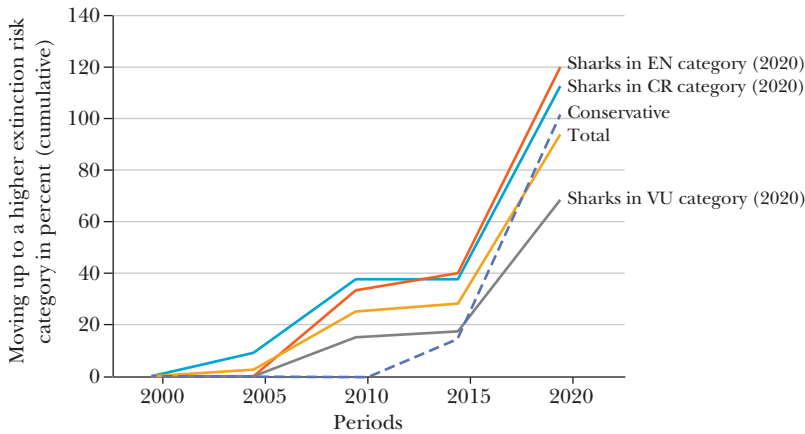
Note: VU stands for Vulnerable, EN for Endangered, and CR for Critically Endangered. Total shows all shark species in the database, and Conservative is based on the conservative IUCN methodology, as described in the text.

example, by our count, 75 percent of the shark species in the Critically Endangered category (CR) moved there from a lower risk category in the previous population assessment, whereas 0 percent transitioned to a lower risk category. Similarly, 80 percent of the shark species in the Endangered (EN) category, and 51 percent of the species in the Vulnerable (VU) category, moved from a lower-risk category. We can take some solace in the fact that 88 percent of the shark species in the Least Concern (LC) category have remained so. Nevertheless, the overall trend is for shark species to *graduate* to higher risk categories over time.

We show this result in Figure 7 by reporting the cumulative fractions of shark species, in each group (VU, EN, CR), with an increase in the extinction risk category per five-year increment. Also shown is the same fraction for the aggregate or total across these groups. The overall pattern is one where the fraction of shark species moving to a higher extinction risk category rises for each group, with a sharp increase in the last period. For the aggregate labelled Total, we find a fraction of 3 percent from 2000 to 2005, 23 percent from 2005 to 2010, 3 percent from 2010 to 2015, and 66 percent from 2015 to 2020. This finding is in line with Dulvy et al. (2021) who, for the class Chondrichthyes as a whole, report a large increase in the number and share of species threatened with extinction since their own first global assessment in 2014.

In the periodical updates of its listings, the IUCN also uses a more conservative method to determine a change in the extinction risk category of a species. These data provide us with a much smaller sample of shark species, which we also present in the figure and label Conservative (see the dotted line). These sharks show a time series of status changes much like those of the large group.[10]

While our analysis of shark populations is not exhaustive, the evidence gleaned from our test case using the Living Planet Index (based on average changes in populations), the IUCN Red List (based on population assessments and accounting for habitat loss), and the capture statistics in Figure 4 all point in the same direction. There has been a rapid, dramatic increase in the harvesting of shark species since the mid to late 1980s and many shark species are headed towards extinction. Our theory provides a direct link between these findings—human overharvesting which leads to sequential exploitation and a rising risk of eventual extinction. While it appears no shark species has recently gone extinct, it is natural to ask how policymakers have responded to what is plainly obvious in the data. Since international trade plays a key role in the sharks' depletion, the relevant policy forum to examine is CITES.

Protection through CITES?

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established in 1973 and includes 183 country members as signatories. Protected species are listed on one of three appendices (CITES 2024). Species listed on Appendix I (currently 1,099 species) are the most endangered and their commercial trade is prohibited. Appendix II includes 5,466 species of fauna and 33,764 species of flora which may become threatened with extinction if international trade is not monitored. These species require an export or re-export permit from their country of origin when imported to another country. Lastly, for the 506 species in Appendix III, importing countries monitor the import of these species from a requesting member. In all cases, enforcement is carried out by the law enforcement authorities of the individual members with little or no oversight from CITES. At meetings (every three years), the Conference of the Parties amends Appendix I and II by adding or removing species based on two-thirds majority voting, whereas individual countries can change Appendix III simply by notifying the secretariat.

Given the data we presented, the reader might think a great number of shark species are in either Appendix I or II. Instead, we find an alarming gap between what the Living Planet Index and the IUCN Red List reveal about the health of

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[10]According to IUCN (2022), most updates over time lead to changes in status because of new information, criteria or taxonomic revisions, errors, or incorrect data in the previous assessment. Dulvy et al. (2021), however, reports that 94.2 percent of revised status changes of chondrichthyan species are due to the arrival of new information (p. 4775). Because new information should, everything else equal, on average lead to a neutral effect on an extinction risk status, both the complete data and the conservatively determined set are relevant. See Taylor and Weder (2024) for further details and the data underlying our counts.

shark populations, and their CITES listings. For example, although there are 153 shark species in the three high-risk of extinction categories of the IUCN Red List, only 15 of these shark species were covered by a CITES listing until very recently (December 31, 2022), all of which are in Appendix II. In May 2023, CITES did add an additional 59 shark species to Appendix II, raising the number of listed sharks to 74. It is important to recall that an Appendix II listing does not ban or limit trade in any real way. Instead, it creates a reporting requirement, but unfortunately there are concerns with compliance and record keeping (Cardenosa, Merten, and Hyde 2019; Okes and Sant 2022). Even with these new CITES listings, their coverage is very incomplete (as detailed in Taylor and Weder 2024). Using the IUCN Red List for comparison, we find 63 percent of the critically endangered sharks are still not listed by CITES, 62 percent of endangered sharks are still not listed, and 65 percent of those sharks vulnerable to extinction are not listed—even though our reading of the IUCN's assessment reports leaves little doubt that international trade is a driving force behind the population declines for many of these species.

The Path Forward

Every undergraduate in economics should know that in a poorly regulated economy, environmental destruction and species loss can follow from economic expansion. This is particularly the case with commonly held resources. Our model illustrates this basic fact by showing how the primitives of biology, the strength of underlying market demands, and humans' impact on natural habitats interact to determine the likelihood of extinction outcomes. Our multi-species model goes further to show how multiple and even mass extinctions can arise. Free markets are powerful, fast, and deliberate, which is why international trade is such a tremendous wealth-generating force, but governments are less powerful, often slow to react and anything but deliberate. Assuming we can tweak current policymaking to solve our common property problems is naïve. Monitoring problems, political constraints, and species mobility can hamstring, or at least delay, effective policy responses. These are the lessons we draw from our analysis.

As a move toward evening the odds, a first step should be addressing data deficiency. We cannot save what we do not count, and we have only very limited data on the health of over ten million species worldwide. One step forward would be for countries and the international community to establish a biodiversity census, using methods and procedures employed for the population or for a census of manufactures. While tremendous expenditures are sometimes allocated to saving endangered species, the more mundane task of cataloguing and counting the less charismatic species on regular five-year intervals is probably more important. This biodiversity census would include information about the size and fragmentation of habitats, which seems crucial given their interaction with population sizes and growth. If we continue to rely on aggregate measures of biodiversity constructed by opportunistic sampling (the Living Planet Index), or periodic study of a very limited

set of select species (the IUCN Red List), it will remain impossible for researchers to produce a comprehensive view of species health worldwide. Without data from stratified and repeated sampling, any study of extinction risks, including our own, has a weak claim to external validity. On this front we are optimistic, because ongoing efforts to measure ecosystem health and services offer some steps in the right direction (for example, the UN Millennial Assessment and Canada's new Census of the Environment), but much more needs to be done.

A second major threat comes from the political process, where trade-offs across economic issues and short political lifetimes make species preservation a hard sell. The costs of species preservation are often immediate and obvious, while the benefits less clear and longer term. This calculus should be familiar to economists, because we faced similar challenges with monetary policy long ago. Our remedy was to create independent central banks. Institutions guiding species preservation also need an element of independence. The US Endangered Species Act for example, ensures that the listing decision for a species cannot consider the potential economic ramifications. In the European Union, the Court of Justice of the European Union ensures the uniform application of the Habitats Directive to protect biodiversity in all EU member countries. Similarly, in Canada, the critical habitat designation for an endangered species must be determined solely on the viability of the endangered population.

In our globalized world where the harvesting and consumption of many species are continents apart, CITES is the relevant actor that now needs independence from the political fray. One possibility would be to adopt a system of *automatic listing* of species in CITES appendices. For example, if a species reached an agreed to level of extinction risk as determined by the IUCN Red List, its listing on Appendix I or II would be automatic. This would alter the status quo by requiring that CITES members debate and vote on deletions or special exceptions from the appendices, rather than inclusions. Because exceptions to the appendix requirements are available to members even today, they would be forfeiting very little, if any, sovereignty. The key differences would be that every at-risk species would be given rapid protection, while demands for special exemptions and exclusions would be visible to the public, to nongovernmental organizations, and to other member countries.

If the world's wealth of biological diversity is truly an inheritance we hold for future generations, then shouldn't actions which put this wealth at risk be visible to us all? However, agreeing to this change in the status quo may require a change in our thinking. For some of us, the value of other species arises from their role in satisfying human wishes and desires. Species have value because they provide us with food, clothing, and medicine; or they provide us with wonder and awe. Under this view, a country with a resident population of any species "owns" that population, and any reduction in the country's property rights, via an automatic listing for example, is a loss in the value of this right. An alternative view, often associated with indigenous populations and animal rights groups, is one where all forms of life on earth have an intrinsic value and a right to existence. Under this view, no party truly owns the African elephant, great white sharks, or even the many species of fire ants, and

the primary responsibility of humans as the dominant species is one of stewardship. These two views and their implied preferences spring from deep-seated philosophical and cultural differences that cannot be bridged easily. Social change may shift these perceptions over time, but delay is of course the enemy of endangered species.

There is an urgent need for humans to create mechanisms to limit the process of extinction worldwide, and if we succeed, we will deserve our genus and species title—Homo Sapiens.

References

Almond, Rosamunde, Monique Grooten, Diego Juffe Bignoli, and Tanya Petersen, eds. 2022. *Living Planet Report 2022—Building a Nature-Positive Society*. Gland, Switzerland: WWF.

Barnosky, Anthony D., Nicholas Matzke, Susumu Tomiya, Guinevere O. U. Wogan, Brian Swartz, Tiago B. Quental, Charles Marshall et al. 2011. "Has the Earth's Sixth Mass Extinction Already Arrived?" *Nature* 471 (7336): 51–57.

Brander, James A., and M. Scott Taylor. 1997. "International Trade and Open Access Renewable Resources: The Small Open Economy Case." *Canadian Journal of Economics* 30 (3): 526–52.

Buffalo Hides. 1872. "Some Eight or Ten Months Ago." *The Times*. August 17, 4. https://www.mstaylor1.org/work#/buffalo-hunt/.

Buschke, Falko T., James G. Hagan, Luca Santini, and Bernard W. T. Coetzee. 2021. "Random Population Fluctuations Bias the Living Planet Index." *Nature Ecology and Evolution* 5 (8): 1145–52.

Cardeñosa, Diego, Wessley Merten, and John Hyde. 2019. "Prioritizing Global Genetic Capacity Building Assistance to Implement Cites Shark and Ray Listings." *Marine Policy* 106: 103544.

Ceballos, Gerardo, and Paul R. Ehrlich. 2018. "The Misunderstood Sixth Mass Extinction." *Science* 360 (6393): 1080–81.

Ceballos, Gerardo, Paul R. Ehrlich, and Peter H. Raven. 2020. "Vertebrates on the Brink as Indicators of Biological Annihilation and the Sixth Mass Extinction." *Proceedings of the National Academy of Sciences* 117 (24): 13596–602.

Cheung, Gordon C. K., and Chak Yan Chang. 2011. "Cultural Identities of Chinese Business: Networks of the Shark-Fin Business in Hong Kong." *Asia Pacific Business Review* 17 (3): 343–59.

CITES. 2024. "Convention on International Trade in Endangered Species of Wild Fauna and Flora." https://cites.org/eng (accessed January 2024).

Copeland, Brian R., and M. Scott Taylor. 2009. "Trade, Tragedy, and the Commons." *American Economic Review* 99 (3): 725–49.

Costello, Christopher, Michael Springborn, Carol McAusland, and Andrew Solow. 2007. "Unintended Biological Invasions: Does Risk Vary by Trading Partner?" *Journal of Environmental Economics and Management* 54 (3): 262–76.

Cowie, Robert H., Philippe Bouchet, and Benoît Fontaine. 2022. "The Sixth Mass Extinction: Fact, Fiction or Speculation?" *Biological Reviews* 97 (2): 640–63.

Cressey, Daniel. 2010. "'Fishing Down Food Chain' Fails Global Test." *Nature*, November 17. https://doi.org/10.1038/news.2010.619.

Dent, Felix, and Shelley Clarke. 2015. "State of the Global Market for Shark Products." FAO Fisheries and Aquaculture Technical Paper 590.

Dulvy, Nicholas K., Nathan Pacourea, Cassandra L. Rigby, Riley A. Pollom, Rima W. Jabado, David A. Ebert, Brittany Finucci. 2021. "Overfishing Drives over One-Third of All Sharks and Rays Towards a Global Extinction Crisis." *Current Biology* 31: 4773–87.

Egan, Dan. 2017. *The Death and Life of the Great Lakes.* New York: W. W. Norton and Company.

Erhardt, Tobias, and Rolf Weder. 2020. "Shark Hunting: On the Vulnerability of Resources with Heterogeneous Species." *Resource and Energy Economics* 61 (4): 101181.

FAO. 2023a. *Global Aquatic Trade Statistics. Global Aquatic Trade—All Partners Aggregated—Quantity (1976–2021) (FishStatJ).* https://www.fao.org/fishery/en/statistics/software/fishstatj (accessed October 2023).

FAO. 2023b. *Global Fishery and Aquaculture Production Statistics. Global Capture Production (1950–2021) (FishStatJ).* https://www.fao.org/fishery/en/statistics/software/fishstatj (accessed October 2023).

Finucci, Brittany, Nathan Pacoureau, Cassandra L. Rigby, Jay H. Matsushiba, Nina Faure-Beaulieu, C. Samantha Sherman, Wade J. VanderWright, et al. 2024. "Fishing for Oil and Meat Drives Irreversible Devaunation of Deepwater Sharks and Rays." *Science* 383 (6687): 1135–41.

Gilbert, Miles, Leo Remiger, and Sharon A. Cunningham. 2003. *Encyclopedia of Buffalo Hunters and Skinners.* Union City, TN: Pioneer Press.

IUCN. 2024. "The IUCN Red List of Threatened Species." https://www.iucnredlist.org/ (accessed January 2024).

IUCN Standards and Petitions Committee. 2022. *Guidelines for Using the IUCN Red List Categories and Criteria.* Version 15.1 (July 2022).

Kolbert, Elizabeth. 2014. *The Sixth Extinction: An Unnatural History.* London: Bloomsbury Publishing.

Living Planet Index (LPI). 2023. "The Living Planet Index." https://www.livingplanetindex.org/data_portal (accessed October 2023).

McAusland, Carol, and Christopher Costello. 2004. "Avoiding Invasives: Trade-Related Policies for Controlling Unintentional Exotic Species Introductions." *Journal of Environmental Economics and Management* 48 (2): 954–77.

Okes, Nicola, and Glenn Sant. 2022. *Missing Sharks: A Country Review of Catch, Trade and Management Recommendations for Cites-Listed Shark Species.* Cambridge, UK: TRAFFIC International.

Rose, Debra A. 1996. *An Overview of World Trade in Sharks and Other Cartilaginous Fishes.* Cambridge, UK: TRAFFIC International.

Taylor, M. Scott. 2011. "Buffalo Hunt: International Trade and the Virtual Extinction of the North American Bison." *American Economic Review* 101 (7): 3162–95.

Taylor, M. Scott, and Rolf Weder. 2023. "On the Economics of Extinction and Mass Extinctions." NBER Working Paper 31952.

Taylor, M. Scott, and Rolf Weder. 2024. "Replication data for: On the Economics of Extinction and Possible Mass Extinctions." American Economic Association [publisher], Inter-university Consortium for Political and Social Research [distributor]. https://doi.org/10.3886/E198224V1.

Worm, Boris, Brendal Davis, Lisa Kettemer, Christine A. Ward-Paige, Demian Chapman, Michael R. Heithaus, Steven T. Kessel, and Samuel H. Gruber. 2013. "Global Catches, Exploitation Rates, and Rebuilding Options for Sharks." *Marine Policy* 40: 194–204.

Recommendations for Further Reading

Timothy Taylor

This section will list readings that may be especially useful to teachers of undergraduate economics, as well as other articles that are of broader cultural interest. In general, with occasional exceptions, the articles chosen will be expository or integrative and not focus on original research. If you write or read an appropriate article, please send a copy of the article (and possibly a few sentences describing it) to Timothy Taylor, preferably by e-mail at <taylort@ macalester.edu>, or c/o Journal of Economic Perspectives, Macalester College, 1600 Grand Ave., Saint Paul, MN 55105.

Potpourri

Shafik Hebous, Alexander Klemm, Geerten Michielse, and Carolina Osorio-Buitron from the IMF have written "How to Tax Wealth" (IMF How to Note 2024/001, March 2024, https://www.elibrary.imf.org/view/journals/061/2024/001/061.2024.issue-001-en. xml). "This note discusses three approaches of wealth taxation, based on (1) returns with a capital income tax, (2) stocks with a wealth tax, and (3) transfers of wealth through an inheritance (or estate) tax. Taxing actual returns is generally less distortive and more equitable than a wealth tax. Hence, rather than introducing wealth taxes, reform priorities

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should focus on strengthening the design of capital income taxes (notably capital gains) and closing existing loopholes, while harnessing technological advances in tax administration—including cross-border information sharing—to foster tax compliance. The inheritance tax is important to address the buildup of dynastic wealth."

Elroy Dimson, Paul Marsh, Mike Staunton offer a long-run view in "Corporate bonds and the credit premium." It appears in the publicly available part of the *UBS Global Investment Returns Yearbook 2024*, which is subtitled: "Leveraging deep history to navigate the future" (https://www.ubs.com/global/en/investment-bank/in-focus/2024/global-investment-returns-yearbook.html). "Traditionally, bonds have been seen as boring, relative to stocks. In choosing the name James Bond, Ian Fleming said, 'I wanted the simplest, dullest, plainest-sounding name I could find.' . . . [D]ebt securities worldwide have a value of some USD 136 trillion compared with around USD 100 trillion for global equities. The debt total comprises some USD 70 trillion in government debt and USD 66 trillion of debt securities issued by corporations. Of this amount, corporate bonds account for around USD 45 trillion, the remainder being other corporate issues. . . . Corporate bonds are a major asset class . . . The return to a higher interest rate environment has led many investors to re-consider their merits. This new chapter is thus timely in presenting long run evidence on corporate bonds since the 1860s from both the US and UK. Even very high-quality corporate bonds have offered a significant credit risk premium. The premium from high-yield (or junk) bonds is appreciably higher. Yield spreads of corporate over government bonds incorporate this premium but are not a measure of the expected premium because they also encapsulate expected default losses. This chapter reports on default and recovery rates over the long haul and reviews the determinants of yield spreads and default rates."

The McKinsey Global Institute has published "Investing in productivity growth," by Jan Mischke, Chris Bradley, Marc Canal, Olivia White, Sven Smit, and Denitsa Georgieva (March 27, 2024, https://www.mckinsey.com/mgi/our-research/investing-in-productivity-growth). "Advanced-economy productivity growth has slowed by about one percentage point since the global financial crisis (GFC). . . . The slump in capital investment slowed productivity growth beyond manufacturing by 0.5 percentage point in the United States, 0.3 point in our Western European sample economies, and 0.2 point in Japan . . . This decline spanned almost all sectors: in the United States, the only exceptions were mining and agriculture; in Europe, only mining, construction, and finance and insurance generally remained stable, while real estate accelerated. More specifically, slowing growth in tangible capital (for example, machines, equipment, and buildings) explains almost 90 percent of the drop in the United States and 100 percent in Europe. From 1997 to 2019, gross fixed capital formation in tangibles fell from 22 to 14 percent of gross value added in the United States and from 25 to 17 percent in Europe. Intangible capital growth (for example, R&D and software) was more resilient but could not make up for falling investment in the material world. Gross fixed capital formation in intangibles

increased from 12 to 16 percent in the United States and from 10 to 12 percent in Europe. Investment in intangibles is needed to boost corporate performance and labor productivity, but it may face barriers (skills needed to scale up, limited collateralization and recovery value), and the productivity benefits can take longer to materialize."

The Congressional Budget Office provides a primer on "The Role of Federal Home Loan Banks in the Financial System (March 2024, https://www.cbo.gov/system/files/2024-03/59712-FHLB.pdf). "In 1932, lawmakers created a system of Federal Home Loan Banks (FHLBs) as a government-sponsored enterprise (GSE) to support mortgage lending by the banks' member institutions. The 11 regional FHLBs raise funds by issuing debt and then lend those funds in the form of advances (collateralized loans) to their members—commercial banks, credit unions, insurance companies, and community development financial institutions. . . . The FHLB system is organized as a cooperative; the individual banks are owned by their members, and FHLBs do not issue publicly traded stock . . . As of December 31, 2022, the FHLBs reported assets of $1,247 billion, liabilities of $1,179 billion, and capital (the difference between assets and liabilities) of $68 billion. . . . During financial crises and other periods of market stress, FHLBs also provide liquidity to member institutions, including those in financial distress. . . . FHLBs are a 'lender of next-to-last resort.' (Banks turn to them before accessing the Federal Reserve's discount window because borrowing from the window signals that a bank is under stress.)"

Roman Kräussl and Alessandro Tugnetti discuss "Non-Fungible Tokens (NFTs): A Review of Pricing Determinants, Applications and Opportunities" (*Journal of Economic Surveys*, April 2024, pp. 555–74, https://onlinelibrary.wiley.com/doi/full/10.1111/joes.12597). They describe NFT markets in five areas: Gaming, Collectibles, Metaverse, Utility, Art, and Metaverse. "In the realm of gaming, NFTs represent assets that can be utilized within video games, with their elements stored on the blockchain. This offers a significant departure from traditional video games, as players gain real ownership of in-game assets through the purchase and sale of NFTs. . . . NFT collectibles are released in collections, or series, which represent variations of the same image, video, or other media. The characters in the Cryptopunks project, for instance, differ from each other in certain attributes that also make the price vary: man/woman, human/alien/monkey, and presence or absence of accessories. . . . NFT utilities, the third main group, are assets that provide utility in the real or digital world through the blockchain . . . The most popular NFT utility projects are VeeFriends (which grant access to the VeeCon, a multi-day event exclusively for VeeFriends NFT holders), Ethereum Name Service (ENS, where users can purchase and manage domain names for their digital assets), and Nouns. . . . Art NFTs are assets with an artistic function that have not been released in series (as could happen for collectibles) and that cannot be used within any type of video game hosted on the blockchain. . . . Everyone can create and sell their works on

different platforms in a much shorter time than on the traditional art market, with an average time between purchase and resale in art NFTs of just 33 days versus the average resale period on the traditional art market of 25–30 years . . . The fifth main group, Web3 or Metaverse, can be defined as an extension and grouping of the previous ones. The Metaverse is a virtual universe accessible through a computer screen, laptop, virtual reality (VR), or any other digital system. Users who access this world can create their virtual avatar and interact with the surrounding reality, including other users. They can purchase virtual plots of land within the Metaverse to create their own organizations and host events. In many cases, firms have established virtual businesses and created a space where they can offer goods and services, promote their products and organizations, and hold virtual events . . .”

Symposia

A special issue of the *Journal of Benefit-Cost Analysis* includes papers on twelve policies with the highest benefit-cost ratios in pursuit of development goals (Spring 2023 14: S1, https://www.cambridge.org/core/journals/journal-of-benefit-cost-analysis). The overview essay by Bjorn Lomborg is titled: “Save 4.2 Million Lives and Generate $1.1 Trillion in Economic Benefits for Only $41 Billion: Introduction to the Special Issue on the Most Efficient Policies for the Sustainable Development Goals.” He writes: “The approaches cover tuberculosis, education, maternal and newborn health, agricultural R&D, malaria, e-procurement, nutrition, land tenure security, chronic diseases, trade, child immunization, and skilled migration. Spanning 2023–2030, these policy approaches are estimated to cost an annual average of $41 billion (of which $6 billion is non-financial). They will realistically deliver $2.1 trillion in annual benefits, consisting of $1.1 trillion in economic benefits and 4.2 million lives saved. The pooled benefit–cost ratio of all 12 investments is 52.”

The southern portion of Manhattan was scheduled to start a congestion pricing plan for road traffic as of June 30, but Governor Kathy Hochul decided to put the plans on an indefinite pause. *Vital City* has published a special issue with ten short explainer articles that provide an overview of the plan, the goals, and some likely sticking points (May 2024, https://www.vitalcitynyc.org/issues/congestion-pricing). In the opening essay, Josh Greenman writes: “The congestion pricing plan has twin, closely related objectives: to reduce stubbornly high automobile traffic in Manhattan, and to raise at least $1 billion, and ideally more, in capital funding annually to support public transit. MTA [Metropolitan Transporttation Authority] officials expect the plan to reduce the number of vehicles entering the central business district by 17 percent. The program’s final details go like this: Cars will pay $15 to enter Manhattan at 61st Street and below during daytime hours (5 AM to 9 PM), and $3.75 during off-peak hours (9 PM–5 AM on weekdays, and 9 PM to 9 AM on weekends). At peak times, motorcycles will pay $7.50; small trucks and charter

buses, $24; and large trucks and tour buses, $36. Ubers, Lyfts and for-hire vehicles will charge $2.50 per ride, and yellow taxis, $1.25 per ride. There will be no toll-booths: Automated license-plate-reading cameras at 110 locations will photograph vehicles' license plates."

The *Journal of Economic Education* has published a six-paper symposium on "What should go into the only economics course students will ever take?" edited by Avi J. Cohen, Wendy Stock, and Scott Wolla (2024, 55:2, https://www.tandfonline.com/toc/vece20/55/2). In an introductory essay, Wendy Stock writes: "Among students who began college in 2012, 74 percent never took economics, up from 62 percent in 2004. Fifteen percent of beginning college students in 2012 took some economics, and 12 percent were one-and-done students. About half of introductory economics students never took another economics class, and only about 2 percent majored in economics. The characteristics of one-and-done and some economics students are generally similar and closer to one another than to students with no economics." In another essay, Avi Cohen quotes a comment from George Stigler in 1963 about the intro econ course: "The watered-down encyclopedia which constitutes the present course in beginning college economics does not teach the student how to think on economic questions. The brief exposure to each of a vast array of techniques and problems leaves with the student no basic economic logic with which to analyze the economic questions he will face as a citizen. The student will memorize a few facts, diagrams, and policy recommendations, and ten years later will be as untutored in economics as the day he entered the class. An introductory-terminal course in economics makes its greatest contribution to the education of students if it concentrates upon a few subjects which are developed in sufficient detail and applied to a sufficient variety of actual economic problems to cause the student to absorb the basic logic of the approach . . ."

Interviews

Jon Hartley has a wonderful interview with Steven Levitt at the "Capitalism and Freedom in the 21st Century" podcast ("Steven D. Levitt [Freakonomics co-author and University of Chicago Economics Professor] on His Career And Decision To Retire From Academic Economics," March 7, 2024, https://capitalismandfreedom.substack.com/p/episode-28-steven-d-levitt-freakonomics). Hartley asks: "Why retire and become an emeritus professor at age 57?" Levitt answers: "I think two different forces at work here. The first one is that maybe between five and 10 years ago, I worked on three or four projects that I was just incredibly excited about that I felt were some of the best research that I'd ever done . . . [T]hese were four papers that I was really excited about and collectively they had zero impact. They didn't publish well by and large, nobody cared about them and I remember looking at one point at the citations and seeing that collectively they had six citations. I thought, my god,

what am I doing? I just spent the last two years of my life and nobody cares about it. . . . And you combine that with the idea, with the fact that along with Stephen Dubner, we've got this media franchise where Dubner's podcast Freakonomics Radio gets a couple million downloads a month. And if I want to get a message out, I can get millions of people through a different medium. It just didn't make sense to me to keep on puttering around, doing all this work, spending years to write papers that no one cared about when I had other ways of getting my ideas out. And really my interests were elsewhere. I didn't get any thrill. . . . The question I should ask myself is why didn't I retire a long time ago? It made no sense. I've just been, I've thought, I've known for years, it's the wrong place for me to be. And it just took me a long time to figure out how to extricate myself from academics. And I'm so glad I'm doing it. It's good for everyone. It doesn't make any sense to, it feels to me awful to be in a place where I'm not excited and where I'm not contributing materially. So, for me, it feels like a breath of fresh air to be saying, 'Hey, I'm not going to be an academic anymore. I'm going to be doing what I really love to do.'"

Corey S. Powell interviews David Dunning on how the idea of the Dunning-Krueger effect has developed since the original paper published in 2000 ("David Dunning: Overcoming Overconfidence," *Open Mind*, April 5, 2024. https://www.openmindmag.org/articles/david-dunning-on-expertise). "The Dunning-Kruger result is a little complicated because it's actually many results. The one that is a meme is this idea: On any particular topic, people who are not experts lack the very expertise they need in order to know just how much expertise they lack. The Dunning-Kruger effect visits all of us sooner or later in our pockets of incompetence. They're invisible to us because to know that you don't know something, you need to know something. It's not about general stupidity. It's about each and every one of us, sooner or later. You can be incredibly intelligent in one area and completely not have expertise in another area. We all know very smart people who don't recognize deficits in their sense of humor or their social skills, or people who know a lot about art but may not know much about medicine. We each have an array of expertise, and we each have an array of places we shouldn't be stepping into, thinking we know just as much as the experts. My philosopher friend and I call that 'epistemic trespassing,' because you're trespassing into the area of an expert. We saw this a lot during the pandemic. . . . I think it was Vernon Law, the baseball pitcher, who said that life is the cruelest teacher because it gives you the test before it provides the lesson."

Janet Bush interviews Edward Glaeser on the topic, "What's the future for cities in the postpandemic world?" (McKinsey Global Institute, April 17, 2024, https://www.mckinsey.com/mgi/forward-thinking/whats-the-future-for-cities-in-the-postpandemic-world). On his views of the "15-minute city," Glaeser says: "I certainly applaud the idea that we're going to have land-use regulations that are such that it's easy to put residences, and workplaces, and cafés, and stores all in the same neighborhood. There are wonderful things about the 15-minute city, a vision of neighborhoods being full of lots of different amenities. It's great. The ability for us to have access to

lots of things without driving a car, that's fantastic. But the view that we should basically see ourselves as being citizens of a sort of small neighborhood, rather than citizens of an entire metropolis, that feels deeply dangerous to me, especially in America, with its history of profound racial and income segregation. Together with Carlo Ratti and a series of other coauthors, we put together a paper looking at, essentially, mobility using cellphones and the 15-minute city. And what we find in the US is actually the more that rich people, elites, live within their 15-minute area, they actually integrate more. So in an elite setting, it's not a terrible thing. If you're coming from a poorer area, if you're an African American, the 15-minute-city experience is one that involves just much more experience segregation for them. And so if you want a city that's integrated, you want to eschew the 15-minute city. You want to embrace a metropolis-wide vision of the city, not one that focuses on small little neighborhoods. . . . In most American cities, you get up in the morning, you leave your segregated neighborhood. You go to an integrated firm. You interact with lots of different people. And so the neighborhood doesn't matter. But it does matter for kids. Because the kids actually don't go to work in an integrated company. They go to a segregated school. They play on a segregated street corner. Understanding this feels important to me. I have new work with Cody Cook and Lindsey Currier that tries to differentially look at them, the cellphone mobility patterns of poor kids and rich kids, and just documents how much more of a life that is disconnected from the marvels of urban areas that the kids of poverty experience, even in wealthy cities."

Discussion Starters

Tim Sablik discusses "Tipping: From Scourge of Democracy to American Ritual," subtitled "Over the course of the 20th century, tipping went from rare and reviled to an almost uniquely American custom. We still like to complain about it" (*Econ Focus*: Federal Reserve Bank of Richmond, First/Second Quarter 2024, pp. 18–21, https://www.richmondfed.org/publications/research/econ_focus/2024/q1_q2_economic_history). "If you feel like you're being asked to tip in more places lately, you aren't alone. According to a Pew Research Center survey released in November 2023, 72 percent of Americans agreed that tipping is now expected in more places than it was five years ago. Social media is filled with stories of customers being asked to tip for all sorts of transactions where that custom previously wasn't the norm: buying office furniture, going through the drive-thru, or even paying for lunch at a self-checkout. . . . [T]he rest of the world has tended to view Americans as somewhat tip obsessed. One travel guide by Australian airline Qantas advises travelers to the United States that 'in America, tipping is optional in name only.' In many countries in Europe and Asia, tipping is either not the norm or the size of tips is much smaller. But it wasn't always this way. In America's early years, tipping was rare and faced intense opposition from many who called the practice un-American."

Steven M. Rosenthal and Livia Mucciolo ask "Who's Left to Tax? Grappling With a Dwindling Shareholder Tax Base" (*Tax Notes*, April 1, 2024, https://www.taxnotes.com/featured-analysis/whos-left-tax-grappling-dwindling-shareholder-tax-base/2024/03/29/7j9cr). "From 1965 to 2022, the share of outstanding U.S. stock held in taxable brokerage and mutual fund accounts declined from 79 percent to 27 percent . . . Foreign investors, retirement accounts, and other tax-exempt entities now dominate US stock ownership. The transformation over the past 60 years in the nature of US stock ownership from overwhelmingly domestic taxable accounts to overwhelmingly foreign and tax-exempt investors has many important policy implications, including how we can most effectively tax corporate profits; who is affected by changes in corporate taxation; and the form of corporate payouts to shareholders. Policymakers must continue the process, only now beginning, of grappling with the dwindling shareholder tax base."
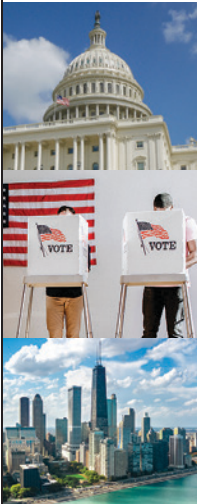
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Symposia

The Tax Cuts and Jobs Act of 2017

William G. Gale, Jeffrey L. Hoopes, and Kyle Pomerleau,
"Sweeping Changes and an Uncertain Legacy: The Tax Cuts and Jobs Act of 2017"

Jon Bakija, "The US Individual Income Tax: Recent Evolution and Evidence"

Gabriel Chodorow-Reich, Owen Zidar, and Eric Zwick,
"Lessons from the Biggest Business Tax Cut in US History"

Kimberly A. Clausing,
"US International Corporate Taxation after the Tax Cuts and Jobs Act"

Kevin Corinth and Naomi Feldman,
"Are Opportunity Zones an Effective Place-Based Policy?"

Expanding the Appeal of Economics

Tatyana Avilova and Claudia Goldin, "Seeking the 'Missing Women' of Economics with the Undergraduate Women in Economics Challenge"

Sergio Barrera, Susan Sajadi, Marionette Holmes, and Sarah Jacobson,
"Valuing Identity in the Classroom: What Economics Can Learn from Science, Technology, Engineering, and Mathematics Education"

Lisa D. Cook and Christine Moser,
"Lessons for Expanding the Share of Disadvantaged Students in Economics from the AEA Summer Program at Michigan State University"

Articles

Adam Looney and Constantine Yannelis,
"What Went Wrong with Federal Student Loans?"

M. Scott Taylor and Rolf Weder,
"On the Economics of Extinction and Possible Mass Extinctions"

Features

Timothy Taylor, "Recommendations for Further Reading"

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