Tax Policy and Investment in a Global Economy*

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Abstract

We evaluate the 2017 Tax Cuts and Jobs Act by combining reduced-form estimates from tax data with a global investment model. Firms exposed to larger domestic tax changes increased domestic investment relatively more. U.S. multinationals subject to novel foreign tax changes increased foreign capital and further boosted domestic investment, indicating complementarity between domestic and foreign capital. In our general equilibrium model calibrated to match the reduced-form evidence, short-run domestic corporate investment increases 10% and long-run capital rises 6%. The tax revenue feedback from growth offsets 5% of pre-TCJA corporate revenue.

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1 Introduction

The Tax Cuts and Jobs Act (TCJA) of 2017 was the largest corporate tax reduction in the history of the United States.[1] It lowered the top statutory corporate tax rate from 35% to 21%, changed a host of investment incentives, and fundamentally altered the treatment of international income. Collectively, these corporate tax changes were scored to reduce corporate tax revenue by $100 to $150 billion per year (Joint Committee on Taxation, 2017; Congressional Budget Office, 2018). Yet, both at the time of passage and in its aftermath, economists have not reached consensus on ballpark estimates of its effects on corporate investment or tax revenue.[2]

This paper uses administrative tax data and a new model of global investment behavior to evaluate the TCJA corporate tax provisions and to illuminate the nature of global production. We have four main findings. First, the main domestic provisions—the reduction in the corporate rate and full expensing of investment—stimulated domestic investment substantially: firms with the mean tax change increased investment by 18% relative to firms experiencing no change. Second, novel international tax provisions that encouraged U.S. multinationals to increase their foreign tangible capital also stimulated *domestic* investment, indicating within-firm complementarity between foreign and domestic capital. Third, using our general equilibrium model that incorporates crowd-out due to rising wages, total C-corporation investment is 10% higher two years after the TCJA and the capital stock is 6% higher in the long run. Total non-residential domestic investment, which includes the non-corporate sector, increases by 6% in the two years after the TCJA. Finally, higher depreciation deductions largely offset additional labor and corporate tax revenue from capital accumulation. The resulting ten year revnue effect of the dynamic feedback from higher capital is 5% of pre-TCJA corporate tax revenue.

We begin by extending the workhorse tax-adjusted, user-cost theory of investment (Hall and Jorgenson, 1967) to a multinational firm facing domestic and foreign taxes. In our model, a firm operates domestic and foreign production lines using domestic and foreign capital, which may be complements or substitutes in production, along with flexible inputs such as local labor and materials. The firm pays a rate τ on domestic source income and $\bar{\tau}$ on foreign source income and receives an investment subsidy Γ on domestic investment and $\bar{\Gamma}$ on foreign in-

[1] The official name of the act is given in Public Law 115-97, "An Act to Provide for Reconciliation Pursuant to Titles II and V of the Concurrent Resolution on the Budget for Fiscal Year 2018." It was originally called the "Tax Cuts and Jobs Act," but this title was changed for procedural reasons.

[2] Auerbach (2018) reviews the range of estimates at the time of passage. Among respondents to a November 2023 poll of leading U.S. academic economists (Clark Center for Global Markets, 2023), 30% agreed with the statement that the corporate capital stock is substantially higher as a result of the TCJA, 33% disagreed, and 36% were uncertain. A larger share agreed that federal tax revenues are substantially lower as a result of the TCJA, a statement forcefully disputed by Goodspeed and Hassett (2022).

vestment. The domestic terms τ and Γ incorporate TCJA changes to the corporate tax rate and expensing of investment. For domestic-only firms, the model collapses to the canonical framework. The foreign tax terms accommodate the novel, more opaque changes to the international tax regime. We linearize the model across steady-states to characterize the investment response to $\tau, \Gamma, \bar{\tau}$, and $\bar{\Gamma}$ as a function of the ratio of pre-TCJA foreign-to-domestic capital and four key structural parameters: the returns-to-scale in capital (α), the elasticity of substitution between domestic and foreign capital (σ), and the relative importance of each source of capital in local profits (a and $\bar{a}$).

Our data set consists of a panel of mid-size and large C-corporation tax returns from the U.S. Treasury. We measure firm-level counterparts to each tax term. The domestic rate τ falls mainly because of the reduction in the statutory corporate rate from 35% to 21%. However, this change affects firms heterogeneously depending on their likelihood of having positive taxable income and their use of deductions and credits. In addition, the TCJA directly changed several deductions and credits. Building on Auerbach (1983), Shevlin (1990), and Graham (1996), we use pre-TCJA firm-specific income dynamics to simulate taxable income trajectories for each firm. We extend this work by incorporating firm-specific use of deductions and credits. We construct new firm-level marginal effective tax rates (METRs) with and without the TCJA as the additional present value of taxes paid when domestic revenue rises by 1%, taking account of the change in the statutory rate, new rules on net operating loss deductions, and the repeal of the Domestic Production Activities Deduction (DPAD) and Alternative Minimum Tax (AMT).

The domestic investment subsidy Γ changes directly because of the more generous expensing of equipment. The effect of this change also varies across firms, depending on the normal tax depreciation schedule of its investment mix as well as on whether the firm's pre-TCJA investment fell below the Section 179 limit. In addition to modeling these provisions and accounting for the firm-specific METRs, we incorporate the TCJA's Foreign-Derived Intangible Income (FDII) deduction, which reduces a firm's domestic tax on the export share of income exceeding 10% of its domestic tangible assets. For firms claiming this deduction, the lower FDII rate reduces τ, while the 10% exemption reduces the effective Γ.

We incorporate two main foreign provisions in TCJA. First, TCJA moved the U.S. from a global system, in which a U.S. corporation would pay U.S. taxes when repatriating foreign source income, to a territorial system, in which the U.S. corporate rate only applies to domestic source income. Second, to discourage the location of intangible capital abroad, the TCJA introduced a minimum tax of 10.5% on Global Intangible Low-Taxed Income (GILTI). The GILTI tax applies to foreign income exceeding 10% of foreign tangible capital, if that income would otherwise face a sufficiently low tax rate. The 10% deduction in GILTI increases the effective $\bar{\Gamma}$ for firms subject to it. Under the plausible assumption that firms expected a transition regime or tax holiday (as in 2004) with a marginal tax rate equal to the GILTI rate, our preferred measure of $\bar{\tau}$ is unchanged for all firms. We demonstrate the robustness of our results to alternative assumptions.

Motivated by the model structure, we estimate regressions in the cross-section of firms of the log change in domestic investment around the reform on the tax policy changes. Among firms that operate only domestically, we find elasticities to the domestic tax terms in line with earlier literature (see Zwick and Mahon (2017)), but at the lower end of the range. Firms with international operations likewise respond to the domestic tax terms. In addition, the domestic investment of firms with substantial international operations responds positively to the effective foreign subsidy $\bar{\Gamma}$. Our theory interprets this response as evidence of complementarity between domestic and foreign capital; the GILTI deduction encourages firms to increase foreign capital, which in turn causes domestic capital to increase when domestic and foreign capital are complements in production. We report robustness exercises that address concerns with the specification, such as testing for pre-trends; including detailed industry fixed effects; or controlling for the "trade war," firm size, lagged investment, profit shifting, and toll taxes.

The estimated regression coefficients, together with the pre-TCJA ratios of foreign-to-domestic capital and profits, provide moments to identify the model's structural parameters. If the regression dependent variable had measured the long-run change in investment, the mapping from these moments to parameters would follow directly from the model's steady state elasticity formulas. In our setting where the coefficients correspond to short-run elasticities, identification requires also determining the ratios of short-run to long-run elasticities, which in turn depend on adjustment costs. We show that under the empirically relevant case for our setting of minimal foreign adjustment costs that all tax elasticities scale by approximately the same ratio (χ_{SR}), which we externally calibrate. This method is exact for domestic-only firms and applies across a range of types of domestic adjustment costs (e.g., convex or fixed).

We then choose parameters to minimize the distance between the data and model-implied moments separately for domestic-only firms and firms with large and small foreign presence. A key advantage of externally calibrating χ_{SR} is the transparency of this procedure. For domestic-only firms, the theory dictates that the regression coefficients on τ and Γ have opposite signs of equal magnitude, each of which equals the inverse of $1-\alpha$ scaled by χ_{SR}. We obtain the scale parameter α for these firms using the coefficient from this restricted regression. For the multinational firms, we provide analytical mappings between the remaining parameters and the model moments. The estimated parameters have reasonable values: α implies returns-to-scale in the revenue function of roughly 0.9, σ ensures complementarity between local and foreign capital for the firms with large overseas operations, and a implies that domestic earnings depend largely on domestic rather than foreign capital.

We use the estimated model to quantify the response of corporate capital in partial versus general equilibrium, to disentangle which parts of the reform mattered most to investment, and to assess the revenue consequences. Applying the regression coefficients directly to the tax rate changes and scaling by χ_{SR} would imply a long-run increase in domestic corporate capital due to TCJA of 14.7%. Performing the analogous exercise with model-estimated parameters in partial equilibrium yields an increase in capital of 11.7%. However, because this exercise excludes the regression intercept, it omits any changes, such as in wages, that affect all firms.

The first main quantitative result from the model is a general equilibrium long-run increase in domestic corporate capital of 6.4%. To compute the general equilibrium increase, we solve jointly for the change in capital in each portfolio of firms and a representative non-C-corporate sector, holding aggregate labor fixed. The difference between the partial and general equilibrium responses stems from the offsetting effect of a higher wage, which rises by roughly 0.9% due to the higher capital stock. We show in a stripped-down version of our model that the cross-firm investment response along with the labor share together discipline the magnitude of general equilibrium dampening. In the short-run, domestic corporate investment is higher by 10.2% and total non-residential domestic investment by 5.7%. Actual non-residential investment in 2019:Q4 exceeded both professional and time-series pre-TCJA forecasts by about 6%, suggesting our model contains a plausible no-TCJA counterfactual path (see Appendix A).

The second quantitative result of the model concerns how the mechanical tax change and the dynamic capital response contribute to tax revenues. Applying the change in tax policy to the pre-TCJA steady state yields a mechanical reduction in corporate tax revenue of 42 percentage points. The dynamic response of corporate investment initially reduces corporate tax revenue due to increased adjustment costs and depreciation deductions. Over time, the profits from capital accumulation offset these forces. Labor income and taxes on that income increase as the capital stock grows, as do income taxes on corporate payouts. Together these forces add additional revenue by year 10 of 6 percentage points of pre-TCJA corporate tax revenue (14% of the mechanical reduction). Averaged over ten years, the personal income tax gains and higher profits from growth modestly outweigh increased deductions, raising revenue by 5 percentage points of pre-TCJA revenue (12% of the mechanical reduction). Looking across provisions, expensing has a smaller "cost-per-additional-capital" than changes to the marginal rate because it applies only to new investment, while the marginal rate also reduces revenue from existing capital.

This exercise is not intended to serve as a comprehensive dynamic score of the corporate provisions of the TCJA, as we focus only on the feedback to revenue from higher investment and growth. We exclude several response margins that would offset some of the mechanical revenue loss.[3] We also leave unmodeled several components of the reform, including the individual tax provisions and pass-through tax cuts.

We consider several extensions of our baseline model, including the interest rate response, alternative assumptions around the phase-out of the expensing provisions or pre-TCJA expectations of tax rates on future repatriated dividends, and varying the value of χ_{SR}. While some of these changes imply a larger investment response than our baseline and some a smaller response, none materially changes the results just described.

Related literature. We provide new estimates of the effects of the largest corporate tax cut in U.S. history. Due to its size and prominence, an early literature reported expected effects using calibrated models (Barro and Furman, 2018; Slemrod, 2018; Gale et al., 2019; Clausing, 2020) or filings with the U.S. Securities and Exchange Commission by public firms (Hanlon, Hoopes and Slemrod, 2019). Gale and Haldeman (2021); Kopp et al. (2019); Gravelle and Marples (2019) show that aggregate business investment immediately after TCJA exceeded pre-TCJA expectations while corporate revenue fell sharply, but conclude that the aggregate data alone do not provide sufficient basis to attribute the higher investment to the TCJA's changes to the tax-adjusted user cost of capital.[4] Garcia-Bernardo, Janský and Zucman (2022) use aggregate data and public filings to study the effect on profit shifting.[5] Like us, Kennedy et al. (2022) use firm-level tax return data. They exploit the variation in the domestic corporate rate cut across C-corporations and S-corporations of similar size. Though they focus on wage outcomes along the income distribution, they also report positive investment effects.

[3]For example, we do not model the reshoring of reported corporate profits in response to the reduction in the statutory rate and the GILTI and FDII incentives (Dharmapala, 2014; Goodspeed and Hassett, 2022), capital structure responses and their effects on tax collections (De Mooij, 2011), or corporate capital gains realization behavior (Desai and Gentry, 2004).

[4]Appendix A provides additional detail on aggregate trends. It also reconciles our findings with earlier work arguing for a limited short-run response to the reform based on aggregate data. For example, the BEA's upward revision of investment data closes a substantial share of the gap between our estimates and preliminary assessments.

[5]Our paper is not centrally concerned with profit shifting or the impact of the reform on this behavior. Nevertheless, we use theoretical extensions to clarify when profit shifting motives might interact with the firm's real investment decisions. We also confirm our main results are not driven by the small number of firms who are likely active profit shifters. Our findings complement recent work more focused on the real implications of profit shifting (Altshuler, Boller and Suárez Serrato, 2023).

Our paper broadens and sharpens the analysis of TCJA in three ways. First, we focus on a sample of mid-size and large firms, including the multinational corporations exposed to the novel tax policy provisions targeting foreign and intangible income. Second, we measure for each firm the impact of the key provisions of the TCJA on foreign and domestic marginal tax rates and the cost of capital.[6] Third, we deploy a structural model to analyze long-run aggregate effects in general equilibrium and explore policy counterfactuals.

We also contribute to the broader theoretical and empirical literature on tax policy and investment behavior.[7] We develop a structural model with multinational production and estimate the model's parameters. The overall profits elasticity of capital appears in the canonical Hall and Jorgenson (1967) framework and links our results to evaluations of past corporate tax policy changes. Our estimates are within the range of past work in terms of responsiveness to tax term changes.[8] The parameters governing the relationship between domestic and foreign capital within a firm have less antecedent, although this parameter matters centrally to international tax policy (Costinot and Werning, 2019). Desai, Foley and Hines Jr (2009) and Becker and Riedel (2012) are important exceptions and like us find evidence consistent with complementarity. Relative to their research designs, our direct measurement of a change to the foreign cost-of-capital offers a sharper test of production function complementarity.

Our quantitative model enables an analysis of policy counterfactuals. Indeed, many of the provisions of TCJA remain contested in the political arena. We decompose the effect of the reform into its constituent parts, such as expensing, lower rates, and international provisions. Future research can use our estimates to consider alternative policy proposals.

[6] Specifically, on the domestic side we advance the literature by calculating marginal tax rates that account for both income and loss dynamics as well as firm-specific use of credits and deductions and by calculating firm-specific exposure to bonus depreciation. On the international side, our measurement of actual FDII and GILTI claims overcomes the difficulty of inferring exposure from public accounting data that may explain the mixed results of these provisions found elsewhere in the literature (Beyer et al., 2023*a*; Krull and Wu, 2022; Samuel, 2023; Huang, Osswald and Wilson, 2023).

[7] See Hall and Jorgenson (1967); Summers (1981); Feldstein (1982); Poterba and Summers (1983); Auerbach and Hassett (1992); Cummins, Hassett and Hubbard (1994, 1996); Hines (1996); Chirinko, Fazzari and Meyer (1999); Devereux and Griffith (2003); Desai and Goolsbee (2004); House and Shapiro (2008); Edgerton (2010); Dharmapala, Foley and Forbes (2011); Yagan (2015); Zwick and Mahon (2017); Ohrn (2018); Giroud and Rauh (2019); Suárez Serrato (2018); Bilicka (2019); Curtis et al. (2021); Akcigit et al. (2021); Moon (2022).

[8] Hassett and Hubbard (2002) propose a consensus range of 0.5 to 1 for regressions of investment relative to capital on the tax term. In analogous specifications, we estimate coefficients of 0.52 (s.e.=0.07), 0.44 (s.e.=0.08), and 0.76 (s.e.=0.16) for all firms, domestic firms, and multinational firms, respectively. In Appendix B.12, we show how this specification relates to our model parameters.

2 Policy Background

2.1 Motivation for the TCJA

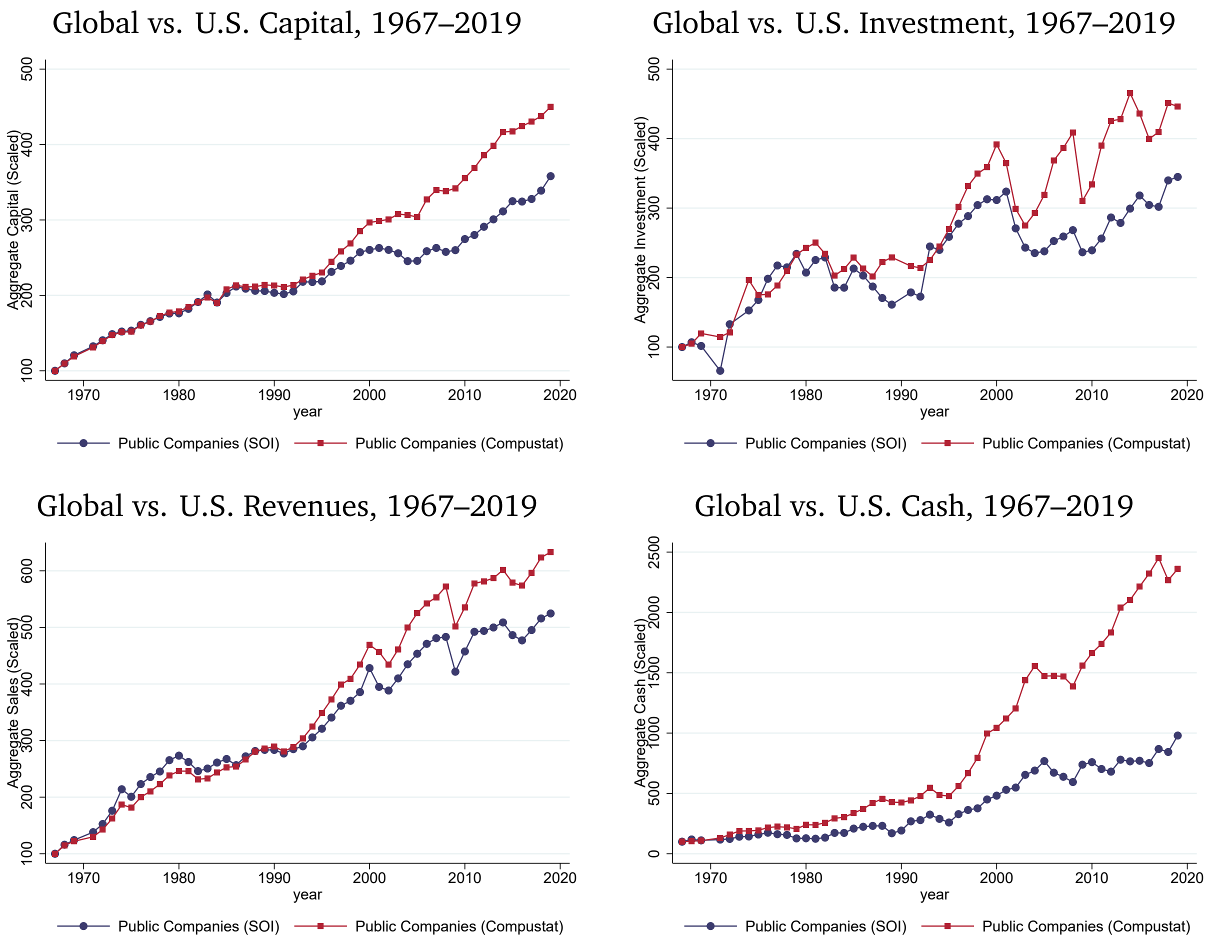
After several decades of frequent, large changes to the U.S. corporate tax system, the basic elements of the top corporate rate, the expensing regime, and international taxation remained relatively stable for 30 years following the Tax Reform Act of 1986.[9] During this time corporate tax rates fell in many other countries (Auerbach, 2018), and deepening globalization made international considerations increasingly relevant for domestic investment.

The main goal of the TCJA's corporate provisions was to increase U.S. competitiveness and investment by bringing rates in line with international levels. Policymakers argued that the U.S. corporate tax system was not competitive in terms of statutory tax rates and its world-wide rather than territorial structure (Council of Economic Advisers, 2018). These concerns came against the backdrop of sluggish domestic investment (Gutiérrez and Philippon, 2017; Alexander and Eberly, 2018) and deepening cross-border investment.

Figure 1 uses aggregates from our tax return data (described in detail in Section 4) and Compustat to contextualize the reform. The figure shows consistent series of domestic and global capital accumulation, investment, revenue, and cash holdings by U.S. publicly-traded firms from 1967-2019. Until the early 1990s, U.S. firms had very little foreign investment or capital. Since that time, most of the growth in global capital by U.S. public firms has occurred abroad. This pattern along with high foreign profits and cash holdings also led to concerns about profit-shifting. The international focus of TCJA differs from earlier corporate tax changes in the U.S. that occurred before the period of deep globalization and that have shaped much of our understanding of the investment effects of tax policy.

[9] Notable changes to corporate tax policy in the 25 years prior to the 1986 reform include the switch to the reserve ratio test for asset depreciation allowances and the introduction of the investment tax credit (ITC) in 1962; the 1964 corporate rate cut; suspension, restatement, repeal, and reimposition of the ITC between 1966 and 1971; the Vietnam War surcharge in 1968; the switch to the Asset Depreciation Range for depreciation allowances in 1971; the switch to the Accelerated Cost Recovery System (ACRS) for depreciation allowances in 1981; further changes to ACRS in 1982; and the switch to the Modified ACRS (MACRS), reduction in the corporate rate, and repeal of the ITC in 1986. After 1986, the top corporate rate changed from 40 to 34 in 1988 and to 35 in 1993 where it remained until 2017, while depreciation allowances moved with accelerated depreciation policies beginning in 2001. On the international side, the 1997 "check the box" regime allowed multinationals to avoid immediate taxation under Subpart F of passive income in disregarded entities; and the 2004 "repatriation holiday" temporarily reduced taxes on dividends paid to U.S. parents by their foreign subsidiaries.

Figure 1: Activity by U.S. Firms is Increasingly Global



Notes: These figures use merged Compustat and Statistics of Income (SOI) datasets to plot aggregates, for domestic variables versus global variables for firms we are able to merge each year. We scale each variable to 100 in 1967 after converting totals to 2019 dollars (Appendix Figure F.1 presents figures with unscaled totals). We use the following Compustat variables for global measures: PPENT for capital, CAPX for investment, SALE for revenues, and CHE+IVAO for cash. Pre-1993 SOI investment only includes investment-tax credit-(ITC)-eligible basis, understating the divergence in the figure. The last year of Compustat PPENT excludes capitalized operating leases per a change in accounting rules using data from Compustat Snapshot. We thank Yueran Ma for guidance on this correction.

2.2 Main Corporate Provisions of the TCJA

Tax policy affects firm investment through changing the marginal effective tax rate (METR) on corporate profits and the tax term in the cost of capital. Table 1 lists the major provisions affecting these components for either domestic or foreign activity, along with the 10-year tax revenue estimate from Joint Committee on Taxation (2017). These "static" estimates include some behavioral responses, such as income shifting between tax bases or changes in tax credit takeup, but they assume no effect of the TCJA on the aggregate capital stock.

Table 1: Main Provisions of the TCJA Affecting Investment

Provision	Pre-TCJA	Post-TCJA	Cost ($)
Domestic Provisions			
1. Top corporate rate	35%	21%	−1.35T
2. Accelerated depreciation	50% bonus	Full expensing for 5 years, then phase-out	−86B
3. Domestic Production Activities Deduction (DPAD)	9% of qualified production activity income	None	+98B
4. Alternative Minimum Tax	Applicable if mean revenues >$7.5M	None	−40B
5. Foreign-Derived Intangible Income (FDII)	None	37.5% deduction on export share of deemed intangible income	−64B
6. Net operating losses	2 year carryback + carryforward	No carryback and limited to 80% of income	+201B
Foreign Provisions			
1. Foreign subsidiary income	Taxable when repatriated	Not taxed	−224B
2. Global Intangible Low Tax Income (GILTI)	None	Minimum tax of 10.5% on foreign deemed intangible income	+112B
Total			−1.35T

Notes: The table describes the main provisions of the TCJA affecting corporate investment. The last column shows the estimated revenue impact over 2018-2027 from Joint Committee on Taxation (2017).

The most important provision for the domestic METR was the reduction in the statutory top corporate tax rate for C-corporations from 35% to 21%. Of course, for many firms the METR differs from the statutory rate because of credits or deductions that make taxable income negative or otherwise modify the effective rate. The TCJA also changed some of these provisions, including limiting the deduction from carrying forward previous net operating losses (NOLs) to 80% of taxable income; repealing the Domestic Production Activity Deduction (DPAD), which had reduced METRs for qualifying firms, especially in the manufacturing sector; and repealing the corporate Alternative Minimum Tax (AMT). Furthermore, the relevance of the statutory rate reduction for the METR depends on pre-TCJA behavior, because firms without taxable income (perhaps due to high use of deductions and credits) or those facing binding limits on credit usage do not face the statutory rate and hence do not experience the full rate reduction.[10]

[10] A firm without taxable income can still have a positive METR if the firm expects to pay taxes in the future, because of loss carryforwards. The leading example of binding credit usage concerns General Business Credits

Our measurement of METRs in Section 4 accounts for all of these features.

The TCJA made two changes that implicate the domestic effective cost of capital. The first directly targets the cost of capital by allowing firms to immediately expense equipment investment. The second occurs through a new deduction for Foreign Derived Intangible Income (FDII). This provision allows firms to deduct from domestic income 37.5% of the component deemed due to domestic intangible capital and sold abroad. The deduction is implemented as the export share of domestic income in excess of 10% of domestic tangible capital. While intended to encourage firms to report profits in the U.S., we show in Appendix B.8 that the FDII deduction has the same effect on investment incentives as a reduction in the domestic METR and an increase in the cost of capital for tangible assets. The latter effect owes to the exclusion of income up to 10% of domestic tangible capital; thus, a marginal increase in domestic tangible capital mechanically reduces the FDII deduction and increases taxes owed.

The reform also changed international taxation. Prior to the TCJA, U.S. firms paid domestic taxes on any foreign profits repatriated as dividends to the U.S. parent but could defer repatriation indefinitely. The new system replaced this worldwide approach with a territorial tax wherein firms deduct the full amount of repatriated dividends from their taxable income, thereby exempting foreign profits from domestic income tax. The TCJA supplements this territorial system with a provision analogous to the FDII deduction, known as the Global Intangible Low-Taxed Income (GILTI) tax. GILTI is foreign income in excess of 10% of foreign tangible capital. A corporation can deduct 50% of this income and further claim credits for 80% of foreign taxes paid. The GILTI provision often is described as a minimum tax, because a corporation with foreign income and no foreign taxes paid will pay 10.5% ($= 0.5 \times 21\%$) on its GILTI. We show in Appendix B.8 that GILTI may affect foreign investment incentives through both the foreign METR and the foreign cost of capital for tangible assets. The latter effect owes to the exclusion of income up to 10% of foreign tangible capital; thus, a marginal increase in the foreign tangible capital stock mechanically reduces GILTI tax.

The TCJA made several other changes that affect businesses but that we do not include in our baseline analysis. Most important, the provisions for bonus depreciation are scheduled to phase out over time and the rates in FDII and GILTI change as well. We assume that firms in 2018 and 2019 expected these provisions to be permanent, following Desai and Goolsbee (2004) and consistent with limited evidence of intertemporal substitution in House and Shapiro (2008) and Zwick and Mahon (2017). We explore sensitivity to this assumption through our

(GBCs), which are limited to 75% of taxable income. A firm for which this limit always binds has an effective marginal tax rate equal to 25% of the statutory marginal rate.

quantitative model.[11] Other domestic provisions do not directly change the marginal incentives for C-corporation investment in tangible capital, including those reducing the limit for interest deductions from 50% to 30% of income and the generosity of the Research and Experimentation tax credit. We consider theoretical extensions that show how our user cost equations change when incorporating these factors.

On the foreign side, the TCJA mandated a transition tax for firms with outstanding stocks of unrepatriated foreign earnings of 15.5% for cash and 8% for illiquid assets and gave firms eight years to pay this tax. The TCJA also implemented a base erosion and anti-abuse tax (BEAT), which imposed a tax on payments from U.S. firms to foreign affiliates in excess of 3% of total deductions. While important for tax revenues and profit shifting by multinationals, these provisions are less relevant for the investment behavior of these firms. We consider them in theoretical extensions and empirical robustness exercises.

The TCJA also reduced top individual income tax rates and created a deduction for qualifying business income under Section 199A, which reduced the effective tax rates for pass-through businesses and changed labor supply incentives. Estimating the impact of these provisions on aggregate investment is beyond the scope of our study.

3 Model

In this section we extend the canonical Hall and Jorgenson (1967) tax-adjusted user cost framework to a multinational setting. The model relates the response of investment to four tax terms: the METRs τ on domestic source income and $\bar{\tau}$ on foreign source income and the cost-of-capital subsidies Γ on domestic investment and $\bar{\Gamma}$ on foreign investment. This result guides our measurement and reduced-form empirical specification. Furthermore, the investment elasticities depend on a small set of parameters governing the scale of production, the elasticity of substitution between domestic and foreign capital, the relative importance of foreign capital in the domestic earnings function and vice versa, and the relative size of the foreign operation. Using regression coefficients from Section 5 and other moments, we estimate these parameters in Section 6 and then use them in quantitative exercises in Section 7.

[11]The TCJA allowed full expensing of equipment investment through 2022, after which the bonus amount declines by 20 p.p. per year until it reaches zero in 2027. The FDII deduction falls from 37.5% to 21.875% and the GILTI deduction from 50% to 37.5% beginning in 2026. If firms expected the expensing provisions to expire, our estimated investment elasticities likely overstate the investment response to a permanent change to full expensing because standard values for discount and depreciation rates imply that the intertemporal substitution toward investment in periods with higher expensing outweighs the lower steady-state capital value. In this sense, the paper's conclusions about the overall investment effects of the TCJA's corporate provisions provide an upper bound if firms expected the expensing provisions to expire.

3.1 Setup

Time is continuous and runs forever. Atomistic firms operate up to two locations, one domestic and the other international. Each location produces output using local and foreign capital and local labor and materials. We denote by X and $\bar{X}$ the domestic and international values of a variable X and describe the optimization problem of the domestic operation, with the international operation mirror-symmetric. We describe the decision problem of a single firm and omit firm-specific subscripts except when we discuss general equilibrium.

The domestic operation produces output Q_t by combining local and foreign capital K_t and $\bar{K}_t$ with local labor L_t and materials M_t:

$$Q_t = \left(A_t \mathscr{K}_t^{\alpha_{\mathscr{K}}} L_t^{\alpha_L} M_t^{\alpha_M}\right)^{\mathscr{M}}, \tag{1}$$

$$\text{where: } \mathscr{K} = \left(aK^{\frac{\sigma-1}{\sigma}} + (1-a)\bar{K}^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}. \tag{2}$$

Here A_t denotes (scaled) total factor productivity, $\mathscr{K}$ is a composite of domestic and international capital with elasticity of substitution $\sigma > 0$, a governs the relative importance of foreign capital in determining domestic revenue, $\mathscr{M} \geq 1$ is the firm's equilibrium markup and arises from the demand constraint $Q_t \propto P_t^{-\frac{\mathscr{M}}{\mathscr{M}-1}}$, and $\mathscr{M}(\alpha_{\mathscr{K}} + \alpha_L + \alpha_M) \leq 1$. At each date t, the firm takes the capital stocks as pre-determined and factor prices P_t^L and P_t^M as exogenous and chooses L and M to maximize operating earnings $P_t Q_t - P_t^L L_t - P_t^M M_t$.

Appendix B.1 shows that this optimization problem results in a concentrated earnings function that depends only on capital:

$$F\left(K_t, \bar{K}_t; Z_t\right) \equiv P_t Q_t - P_t^L L_t - P_t^M M_t = Z_t \mathscr{K}_t^{\alpha} = Z_t \left(aK_t^{\frac{\sigma-1}{\sigma}} + (1-a)\bar{K}_t^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma\alpha}{\sigma-1}}, \tag{3}$$

where $\alpha \equiv \frac{\alpha_{\mathscr{K}}}{1-(\alpha_L+\alpha_M)} \subseteq [0,1]$ and $Z_t \propto A_t^{\alpha/\alpha_{\mathscr{K}}}$. Z is lower if Total Factor Productivity (TFP) A is lower or the factor cost of labor or materials is higher. Curvature in the profit function arises whenever the revenue function features diminishing returns to scale, $\alpha_{\mathscr{K}} + \alpha_L + \alpha_M < 1$, whether the diminishing returns result from market power ($\mathscr{M} > 1$) or diminishing returns to scale in production. The earnings function in the international location takes a similar form:

$$\bar{F}\left(\bar{K}_t, K_t; \bar{Z}_t\right) = \bar{Z}_t \left(\bar{a}\bar{K}_t^{\frac{\sigma-1}{\sigma}} + (1-\bar{a})K_t^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma\alpha}{\sigma-1}}. \tag{4}$$

The scale parameter α, elasticity of substitution σ, a and $\bar{a}$ which determine the importance of non-local capital in generating earnings, and the relative productivity $\bar{Z}/Z$ collectively characterize a firm. Immediately, a domestic-only firm has $a = 1$ and $\bar{Z} = 0$.[12]

The functions F and $\bar{F}$ embody any (gross) complementarity or substitution in production across locations, with the elasticity of substitution σ and the curvature α determining these forces: $\text{sign}(F_{K\bar{K}}) = \text{sign}(\alpha + 1/\sigma - 1)$. The literature on multinational location choice has given reasons for either complementarity or substitution to dominate. In Helpman (1984), more foreign tangible capital increases the productivity of domestic capital, because larger foreign scale increases brand recognition and hence demand for domestic output, and because it requires more managerial capacity that also benefits domestic production. Appendix B.4 incorporates such forces as part of a general accumulation of intangible capital that is non-rival within the firm and shows that they give rise to complementarity in the same sense as $F_{K\bar{K}} > 0$. Integrated production, or "global value chains", within the firm also generates complementarity between K and $\bar{K}$, because more foreign capital increases the upstream supply of imported inputs or downstream demand for domestic output, both of which raise the marginal product of domestic capital (Antrás and Chor, 2022). Alternatively, substitution may arise if local and foreign plants of the same firm compete to serve the same destinations, as greater foreign scale then crowds out domestic production. Brainard (1993) provides a model of this proximity-concentration trade-off. The functional form in equation (2) allows for all of these possibilities as well as the case of independence while being tractable enough to guide empirical work. Estimating the degree of complementarity or substitution is an outcome of the analysis.

Domestic capital evolves dynamically as $\dot{K}_t = I_t - \delta K_t$, where I_t is gross investment and δ is the rate of depreciation. The cost of a unit of domestic investment is $(1 - \Gamma_t) P_t^K$, where Γ_t contains the present value of depreciation allowances as well as any other tax provisions such as the FDII deduction that link taxes paid to tangible capital.[13] In addition, changing the capital stock incurs an adjustment cost $\Phi(I_t, K_t) = (\phi/(1+\gamma))(I_t/K_t - \delta)^{1+\gamma} K_t$ paid in tax-deductible units (e.g., labor). Total domestic taxable profits consist of operating earnings net of these adjustment costs, $F\left(K_t, \bar{K}_t; Z_t\right) - \Phi(I_t, K_t)$, and are taxed at rate τ_t. An analogous set of equations hold for international capital and profits.

[12] A slight generalization would require a firm to pay a fixed cost to operate foreign capital, in which case the parameters for a domestic-only firm might not lie in the corner. This model has the same implications as our baseline environment except that we preclude domestic-only firms from becoming multinationals in response to the TCJA.

[13] For example, if a firm faces a constant tax rate τ_t and can immediately deduct depreciation of θ_t ("bonus" depreciation) for an investment made at date t and subsequently deduct $(1 - \theta_t) d_{h|t}$ at horizon h (not to be confused with economic depreciation of δ), then $\Gamma_t = \theta_t \tau_t + (1 - \theta_t) \tau_t \zeta_t$ where $\zeta_t = \int_0^\infty e^{-rh} d_{h|t} dh$.

The cash flow returned to equity or debt holders each period is:

$$D_t = (1-\tau_t)\left(F\left(K_t,\bar{K}_t;Z_t\right)-\Phi(I_t,K_t)\right)+(1-\bar{\tau}_t)\left(\bar{F}\left(\bar{K}_t,K_t,\bar{Z}_t\right)-\bar{\Phi}\left(\bar{I}_t,\bar{K}_t\right)\right) \qquad (5)$$
$$-(1-\Gamma_t)P^K_t I_t-\left(1-\bar{\Gamma}_t\right)P^{\bar{K}}_t\bar{I}_t.$$

The firm maximizes the present value of cash flows with a discount rate ρ, subject to initial conditions K_0 and $\bar{K}_0$ and the dynamic evolution equations.

We make three remarks on this setup. First, for now we do not need to keep track of which government collects the tax revenue generated by τ or $\bar{\tau}$ or the details of the subsidies Γ and $\bar{\Gamma}$; for the firm's choice of capital, all that matters is the marginal incentives it faces. We revisit this issue in Section 7.3 when assessing the revenue effects of TCJA. Second, we do not directly model the full system of tax credits and loss provisions, but will take account of these in the measurement of the marginal incentives $\tau, \Gamma, \bar{\tau}, \bar{\Gamma}$. Third, equation (5) makes clear that the functions $F(K,\bar{K};Z)$ and $\bar{F}(\bar{K},K,\bar{Z})$ provide mappings between local and foreign tangible capital and local and foreign taxable earnings. In the presence of profit-shifting, these mappings may differ from the physical production functions relating local and foreign capital to true local and foreign earnings. Nonetheless, because the firm maximizes after-tax profits, the functions $F(K,\bar{K};Z)$ and $\bar{F}(\bar{K},K,\bar{Z})$ determine the choice of capital. Section 3.3 discusses an extension that explicitly incorporates profit-shifting motives.

3.2 Dynamic System and Linearization Across Steady States

Denoting by λ_t and $\bar{\lambda}_t$ the costate variables associated with domestic and international capital accumulation, the necessary First Order Conditions (FOC) for domestic investment and capital can be written (see Appendix B.2):

$$\text{FOC } (I_t): \qquad \dot{K}_t/K_t = \left[\frac{1}{\phi}\left(\frac{\lambda_t - P^K_t(1-\Gamma_t)}{(1-\tau_t)}\right)\right]^{\frac{1}{\gamma}}, \qquad (6)$$

$$\text{FOC } (K_t): \qquad \dot{\lambda}_t = (\rho+\delta)\lambda_t-(1-\tau_t)(F_1-\Phi_2)-(1-\bar{\tau}_t)\bar{F}_2, \qquad (7)$$

where F_n denotes the derivative of $F\left(K,\bar{K};Z\right)$ and Φ_n denotes the derivative of $\Phi(I_t,K_t)$ with respect to argument n. In addition, the transversality condition requires $\lim_{T\to\infty} e^{\rho T}\lambda_T K_T = \lim_{T\to\infty} e^{\rho T}\bar{\lambda}_T\bar{K}_T = 0$. The analogous equations hold for foreign capital. The terminal values of λ and $\bar{\lambda}$ complete the system and are given by their values in steady state:

$$\lambda^* = (1-\Gamma^*)P^K,\ \bar{\lambda}^* = \left(1-\bar{\Gamma}^*\right)P^{\bar{K}}. \tag{8}$$

This framework admits a tractable and intuitive expression for the change in capital across the pre and post-reform steady states. Let $R^* = (\rho+\delta)(1-\Gamma^*)P^K$ denote the steady state user cost of capital.[14] Rearranging equation (7) and its foreign counterpart in the steady state with $\dot{\lambda}_t = \dot{\bar{\lambda}}_t = 0$ and substituting using equation (8) gives the steady state system:

$$(1-\tau^*)F_1^* + (1-\bar{\tau}^*)\bar{F}_2^* = R^*, \tag{9}$$

$$(1-\bar{\tau}^*)\bar{F}_1^* + (1-\tau^*)F_2^* = \bar{R}^*. \tag{10}$$

Since $F_1^* = F_1\left(K^*,\bar{K}^*;Z^*\right), F_2^* = F_2\left(K^*,\bar{K}^*;Z^*\right), \bar{F}_1^* = \bar{F}_1\left(\bar{K}^*,K^*;Z^*\right), \bar{F}_2^* = \bar{F}_2\left(\bar{K}^*,K^*;Z^*\right)$, equations (9) and (10) give a system of two non-linear equations in two unknowns K^* and $\bar{K}^*$. Totally differentiating this system gives an estimating equation relating capital to taxes.

As a preliminary step, let $\chi_K \equiv \bar{K}^*/K^*$ denote the steady state ratio of international to domestic capital, $\chi_R = \bar{R}^*/R^*$ the ratio of international to domestic steady state user cost, and:

$$s_1 \equiv \frac{a(K^*)^{\frac{\sigma-1}{\sigma}}}{a(K^*)^{\frac{\sigma-1}{\sigma}} + (1-a)\left(\bar{K}^*\right)^{\frac{\sigma-1}{\sigma}}} = \frac{a}{a+(1-a)\chi_K^{\frac{\sigma-1}{\sigma}}} \subseteq [0,1], \tag{11}$$

$$\bar{s}_1 \equiv \frac{\bar{a}\left(\bar{K}^*\right)^{\frac{\sigma-1}{\sigma}}}{\bar{a}\left(\bar{K}^*\right)^{\frac{\sigma-1}{\sigma}} + (1-\bar{a})(K^*)^{\frac{\sigma-1}{\sigma}}} = \frac{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}}}{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}} + (1-\bar{a})} \subseteq [0,1], \tag{12}$$

$$s_{F_1} \equiv \frac{(1-\tau^*)F_1^*}{R^*} = \frac{a\left((1-\bar{a})\chi_R - \bar{a}\chi_K^{-\frac{1}{\sigma}}\right)}{(1-\bar{a}-a)\chi_K^{-\frac{1}{\sigma}}}, \subseteq [0,1], \tag{13}$$

$$s_{\bar{F}_1} \equiv \frac{(1-\bar{\tau}^*)\bar{F}_1^*}{\bar{R}^*} = 1 - \frac{(1-a)\left((1-\bar{a})\chi_R - \bar{a}\chi_K^{-\frac{1}{\sigma}}\right)}{(1-\bar{a}-a)\chi_R} \subseteq [0,1]. \tag{14}$$

denote shares of the capital inputs and marginal product terms, respectively. The second equalities show that these share terms depend on $\sigma, a, \bar{a}$ and the observable ratios χ_K and χ_R.[15] Let

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[14] Dating back to Hall and Jorgenson (1967), most studies define the user cost as the implicit rental rate of capital after applying all taxes, that is, dividing the expression defining R^* by $(1-\tau)$. Equations (9) and (10) show that this convention does not easily extend to the multinational setting where a firm faces potentially many corporate tax rates.

[15] While the second equalities in equations (11) and (12) follow immediately by dividing the numerator and denominator by $(K^*)^{\frac{\sigma-1}{\sigma}}$, proving the second equalities in equations (13) and (14) requires using equations (9) and (10) and a substantial amount of algebra, which we detail in Appendix B.2.4. The ratio χ_R is directly a

$\tilde{\alpha} = \sigma(\alpha + 1/\sigma - 1) \subseteq (-\infty, 1]$.

The four tax terms central to our analysis are $\hat{\Gamma} = d\Gamma/(1-\Gamma)$, $\hat{\bar{\Gamma}} = d\bar{\Gamma}/\left(1-\bar{\Gamma}\right)$, $\hat{\tau} = d\tau/(1-\tau)$, $\hat{\bar{\tau}} = d\bar{\tau}/(1-\bar{\tau})$. Letting lower case $k, \bar{k}, i, \bar{i}, p^K, p^{\bar{K}}, r, \bar{r}, z, \bar{z}$ denote log deviations of their uppercase variables, Appendix B.2 proves the main result of this section:

$$k = \frac{\omega_{k,r}\hat{\Gamma} + \left(1-\omega_{k,r}\right)\hat{\bar{\Gamma}} - \omega_{k,\tau}\hat{\tau} - \left(1-\omega_{k,\tau}\right)\hat{\bar{\tau}} + \epsilon}{1-\alpha}, \tag{15}$$

$$\text{where: } \omega_{k,r} \equiv \frac{1-\left((1-s_1) - s_{\bar{F}_1}(1-s_1-\bar{s}_1)\right)\tilde{\alpha}}{1-\left(1-s_{F_1}-s_{\bar{F}_1}\right)(1-s_1-\bar{s}_1)\tilde{\alpha}}, \tag{16}$$

$$\omega_{k,\tau} \equiv \frac{s_{F_1} + \left(1-s_{F_1}-s_{\bar{F}_1}\right)\bar{s}_1\tilde{\alpha}}{1-\left(1-s_{F_1}-s_{\bar{F}_1}\right)(1-s_1-\bar{s}_1)\tilde{\alpha}}, \tag{17}$$

$$\epsilon \equiv \omega_{k,\tau}z + \left(1-\omega_{k,\tau}\right)\bar{z} - \omega_{k,r}\left(\frac{d\rho + d\delta}{\rho+\delta} + p^K\right) - \left(1-\omega_{k,r}\right)\left(\frac{d\bar{\rho} + d\bar{\delta}}{\bar{\rho}+\bar{\delta}} + p^{\bar{K}}\right). \tag{18}$$

Thus, long-run capital responds according to the elasticity $1/(1-\alpha)$ to a weighted average of the deviations of domestic and foreign tax rates and costs of capital. The appearance of the returns to scale $1-\alpha$ in the denominator of the long-run elasticity is standard; in the case of a domestic-only firm, $\omega_{k,r} = \omega_{k,\tau} = 1$ and the long-run elasticity collapses to $k = (\hat{\Gamma} - \hat{\tau})/(1-\alpha)$.[16] Our contribution is to show that it carries over into the multinational setting with appropriately-defined weights $\omega_{k,r}$ and $\omega_{k,\tau}$ multiplying the domestic and foreign tax changes.[17] These weights are functions of the parameters $\alpha, \sigma, a, \bar{a}$ and the steady-state ratios of foreign-to-domestic capital and user cost.

Importantly, while the weights on domestic and international taxes sum to one, negative weights and hence elasticities on the foreign terms are possible. In the case of Γ and $\bar{\Gamma}$, the foreign weight is positive if and only if $F_{K\bar{K}} > 0$, i.e., if $\alpha + 1/\sigma > 1$. Intuitively, cheaper foreign capital ($\bar{\Gamma}\uparrow$) results in higher $\bar{K}$; whether this increase crowds out or in K depends on whether $F_{K\bar{K}}$ is positive or negative. The sign of the coefficient multiplying $\bar{\Gamma}$ therefore reveals whether domestic and foreign capital are (gross) complements or substitutes. In the special case where

function of parameters; the ratio χ_K is an equilibrium object that depends on $\alpha, \sigma, a, \bar{a}$ and the ratios of $\bar{Z}^*/Z^*$ and $(1-\bar{\tau}^*)/(1-\tau^*)$. The advantage of writing the shares in terms of χ_R and χ_K is that the unobserved firm-specific ratio of productivities $\bar{Z}^*/Z^*$ is replaced by observable factor quantities and prices.

[16] Equation (15) nests important special cases beyond the standard closed economy one factor model: (i) the closed economy two factor model when $\bar{Z}^* = s_{\bar{F}_1} = 0$ and $s_{F_1} = 1$, in which case $\omega_{k,\tau} = 1$ and $\omega_{k,r} = 1-(1-s_1)\tilde{\alpha}$; and (ii) *ex ante* symmetry with $\tau^* = \bar{\tau}^*, R^* = \bar{R}^*$, and $Z^* = \bar{Z}^*$, in which case $K^* = \bar{K}^*$ and hence $s_1 = \bar{s}_1 = s_{F_1} = s_{\bar{F}_1} = a$. Appendix B.2 gives the expressions for $\bar{K}$ and total corporate capital.

[17] In fact, the property that the coefficients multiplying $\hat{\Gamma}$ and $\hat{\bar{\Gamma}}$ sum to the same total as the coefficients multiplying $\hat{\tau}$ and $\hat{\bar{\tau}}$ holds for any twice-differential production function defined over K and $\bar{K}$ (see Appendix B.2.3).

$F_{K\bar{K}} = 0$, the domestic capital decision does not depend on foreign capital and $\omega_{k,r}$ equals one just as in the domestic-only case. The determination of whether $\omega_{k,\tau}$ exceeds one is more complicated because foreign taxes directly affect both K and $\bar{K}$; in the special case of $F_{K\bar{K}} = 0$ and *ex ante* symmetry ($\tau^* = \bar{\tau}^*, R^* = \bar{R}^*, Z^* = \bar{Z}^* \Rightarrow K^* = \bar{K}^*$), the term $\omega_{k,\tau}$ simply equals the domestic capital share in the production function a.[18]

The dependence of the share weights $\omega_{k,r}$ and $\omega_{k,\tau}$ on underlying parameters introduces heterogeneity in the response of domestic capital to the tax terms. Of particular importance, as the share of the firm's capital located abroad approaches zero, the term $\omega_{k,r}$ converges to one irrespective of the value of σ. Intuitively, such firms are "almost domestic" and hence changes to the foreign cost of capital minimally affect domestic investment. We return to this prediction in our empirical results.

Equations (15) to (18) frame our empirical exercise. We use corporate tax returns to measure domestic investment and the policy shocks $\hat{\Gamma}, \hat{\tau}, \hat{\bar{\Gamma}}$, and $\hat{\bar{\tau}}$. The possibility that the firm-specific drivers of investment contained in the residual ϵ may be correlated with changes in taxes motivates the measurement of ex ante tax shocks and robustness analysis. Section 6 and Appendix B.10 describe how we connect the response of short-run investment to the cross-steady state formula in equation (15).

3.3 Extensions

Appendix B.2 extends the baseline model to allow for separate investment in equipment and structures, each with its own depreciation rate and cost-of-capital. Assuming a constant elasticity of substitution in the production function across different types of capital, equation (15) continues to hold for total capital, with the user cost terms replaced by appropriately-weighted changes in the user costs of each type.

Appendices B.4 to B.7 extend the baseline environment. Appendix B.4 explicitly models the dynamic accumulation of intangible capital. Intangible capital is fully non-rival within the firm; it increases the productivity of both the domestic and foreign operation. As in Helpman (1984), it therefore induces complementarity between domestic and foreign tangible capital, since cheaper foreign tangible capital results in more intangible capital accumulation which in turn makes domestic tangible capital more profitable. Equation (15) has two changes as a result: $\omega_{k,r}$ now reflects the complementarity arising from intangible capital as well as from σ

[18] As noted by Desai, Foley and Hines Jr (2009), the direct effect on K of $\bar{\tau}$, or isomorphically foreign productivity, complicates the interpretation of the evidence in their work and in Becker and Riedel (2012), which examine the response of K to variation in $\bar{K}$ induced by foreign GDP growth and foreign marginal tax rates, respectively. In our framework, these papers provide evidence on the sign of $\omega_{k,\tau}$ rather than $\omega_{k,r}$.

and a, and a new term arises if the user cost of intangible capital changes.

Appendix B.5 explicitly incorporates the location choice of intangible capital, as key provisions of TCJA such as FDII and GILTI targeted this margin. Unlike equipment and structures, by definition intangible capital does not have a physical location nor does its movement across borders leave a verifiable record in shipping or customs data, making the location of intangible capital and the associated profits in low-tax jurisdictions an attractive tax strategy. In our framework, if firms allocate intangible capital across jurisdictions to minimize taxes without any regard to the location of physical capital, then nothing changes in the firm's physical investment decision and equation (15) remains unaltered. In the case where the relative location of physical capital constrains the firm's location decision of intangible capital, two changes arise. First, in the realistic case of $\tau > \bar{\tau}$, the pre-TCJA domestic user cost rises and the foreign user cost falls, as the accumulation of domestic capital reduces the firm's ability to shift profits abroad using intangibles. Second, the reduction in the difference $\tau - \bar{\tau}$ under TCJA has the additional effect of reducing the wedge between the user costs.

Appendix B.6 incorporates the tax deduction of interest payments. Once again, if firms make their financial capital structure decision independently of their choice of physical capital, then nothing changes in the firm's physical investment decision. In the case where these decisions interact, perhaps because of a leverage constraint tying the optimal amount of debt to the quantity of physical capital, again two changes arise. First, the pre-TCJA domestic user cost falls, as the accumulation of domestic capital increases the firms' ability to issue tax-shielded debt. Second, the reduction in τ has a smaller effect on investment because it simultaneously reduces the value of the tax shield. Empirically, Richmond et al. (2024) find no investment effect of the TCJA's change in the interest limitation.

Finally, Appendix B.7 relates equation (3) to the problem of a firm operating a global value chain (GVC) with domestic and foreign inputs. This setup introduces the complication of how to assign revenues across tax jurisdictions; under the reasonable benchmark that revenue assignment mirrors costs, a GVC gives rise to equation (3) except with time-varying a and $\bar{a}$.

3.4 General Equilibrium

While equation (15) holds firm-by-firm, the residual ϵ contains changes to factor prices common to all firms. In the cross-section regressions in Section 5, these common changes appear in the constant term and do not affect the identification of the parameters governing the tax elasticities. For general equilibrium questions such as the effect of the TCJA on aggregate investment or revenue, however, higher factor demand will cause factor prices to increase if supply curves slope up. To model this feedback, subscript individual firms with i and let $X_t^D = \sum_i X_{i,t}$ denote aggregate demand for factor $X \in \{K, L, M\}$. Factor supply obeys $X_t^S / X_t^* = \left(P_t^X / \left(P_t^X\right)^*\right)^{\nu_X}$ and in equilibrium $X_t^D = X_t^S = X_t$. We impose an extreme but realistic calibration: (1) $\nu_M = \nu_K = \infty$ since raw materials tend to trade on international markets and recent literature does not find an effect of investment demand on the price of capital goods (House, Mocanu and Shapiro, 2022); and (2) $\nu_L = 0$ in accordance with balanced growth path preferences.[19] We consider alternative calibrations and additional general equilibrium forces in Section 7.4.

4 Data and Measurement of Tax Rates and Investment

4.1 U.S. Corporate Tax Files

We measure firm-level tax rates and investment for a representative sample of C-corporations using information reported on corporate tax returns. Our data set starts from the size-stratified samples of roughly 100,000 C-corporation and S-corporation returns per year that are produced and cleaned by the Statistics of Income (SOI) division at the Internal Revenue Service (IRS). Firms selected into the SOI sample remain in the sample unless they change tax identifier or fall into a size stratum with a lower sampling probability, giving us a panel (see Zwick and Mahon (2017) for details). We drop S corporations (∼50% of the sample), financial firms (NAICS 52), firms with less than \$1 million in domestic tangible assets (∼25%), and firms with insufficient history to permit measurement of each policy shock variable. These refinements leave a sample of approximately 12,000 firms. We augment the SOI Corporate Sample with variables and tax years drawn from the population of corporate returns. Our main analysis sample of 9,231 firms uses tax returns from 2011 through 2019, although we use data going back to 1993 when measuring some of the policy shocks.[20]

For each firm-year, we combine data from Forms 1120, 4562, 5471, and 1118. Form 1120 is the corporate income tax return required of all domestic corporations and contains income

[19] House, Mocanu and Shapiro (2022) show that the early and influential evidence of capital prices responding to investment incentives in Goolsbee (1998) disappears when using more recent vintages of data on the Goolsbee sample or extending the sample period. The factor supply function for labor can be microfounded from workers with utility $C^{1-\gamma}/(1-\gamma) - \nu L^{1+\chi}/(1+\chi)$ and no saving technology, $C = wL$. Setting the wage proportional to the marginal rate of substitution and solving gives $L_t \propto \left(P_t^L\right)^{\nu_L}$, with $\nu_L \equiv \frac{1-\gamma}{\chi+\gamma}$. Keeping L constant on a balanced growth path requires $\gamma = 1$ and hence $\nu_L = 0$; intuitively, with balanced growth preferences the equilibrium quantity of labor does not respond to shifts in the labor demand curve. Appendix B.9 provides further details.

[20] The analysis sample is approximately 10% the size of the sample in Zwick and Mahon (2017), which included more small firms, S-corporations, and a longer panel.

statement and balance sheet items, taxes, deductions, and credits, as well as firm characteristics such as industry. Form 4562 is required to claim depreciation and amortization and contains investment expenditure by tax duration bin. Form 5471 is required of corporations with ownership stakes in foreign corporations and includes the foreign subsidiary income statement and balance sheet items as well as foreign taxes paid (see Dowd, Landefeld and Moore (2017) for details). We define multinational firms as having positive 5471 tangible capital.[21] Form 1118 covers foreign tax credits and in particular contains information related to GILTI obligations. Using information on these forms, we develop measures of the impact of the reform on the tax terms $(\Gamma, \tau, \bar{\Gamma}, \bar{\tau})$ and firm-level outcomes (see Appendix C for additional details).

Domestic Cost of Capital (Γ). The effective discount to the cost of capital for firm i, $\Gamma_{i,t}$, starts with the time-varying present value of depreciation allowances in each of $j \in J$ asset types. Denoting the no-bonus present value of depreciation allowances as $\zeta_{j,0} = \int_0^\infty e^{-rh} d_{j,h|t} dh$, the level of bonus depreciation as θ_t, and bonus eligibility as $\mathbb{I}\{\text{eligible}\}$, the total present value of allowances of asset type j is $\zeta_t^j = \mathbb{I}\{\text{eligible}\}\left(\theta_t + (1-\theta_t)\zeta_{j,0}\right) + (1-\mathbb{I}\{\text{eligible}\})\zeta_{j,0}$. We calculate this present value for each depreciable life category on Form 4562 under both pre-TCJA bonus depreciation of $\theta = 0.5$ and post-TCJA bonus depreciation of $\theta = 1$.

We aggregate the asset-level depreciation allowances ζ_t^j to the firm level using firm-specific investment shares, defined following Zwick and Mahon (2017) as the firm's pre-2011 average share of depreciable investment in each Form 4562 depreciable life category.[22] Denoting by $\zeta_{i,t}$ the firm-level weighted-average present value of allowances, the present value of tax savings is $\tau_{i,t}\zeta_{i,t}$, where $\tau_{i,t}$ is the firm's marginal tax rate defined below.

Exposure to FDII affects Γ because the FDII deduction applies to the export share of income in excess of 10% of domestic tangible capital. As a result, increasing domestic tangible capital mechanically increases income taxes by reducing the amount of the FDII deduction. Appendix B.8 incorporates FDII into the firm's optimization problem in Section 3 and shows that the implications for investment are isomorphic to a lower marginal tax rate and smaller Γ. Putting all of these elements together, using the FDII deduction of 0.375 of eligible income, the deemed intangible income threshold of 0.1, and denoting ξ the share of domestic income from exports and τ^s the ex-FDII marginal tax rate, we define $\Gamma_{i,t} = \tau_{i,t}\zeta_{i,t} - \tau_{i,t}^s \times \xi_i \times 0.375 \times$

[21] A handful (roughly 100) of firms in our sample have positive but *de minimus* foreign presence, which we define as having 5471 capital and earnings both less than 1% of their domestic counterpart. We put these firms in the domestic group as well.

[22] We expand on Zwick and Mahon (2017) by (1) incorporating investment shares and depreciation rules for investment ineligible for bonus depreciation and (2) relying on firm-level rather than industry-level measures of ζ, allowing us to consider the impact of the reform on longer-lived investment and to identify causal effects using within-industry variation in exposure to the depreciation rules.

$0.1/(\rho+\delta)$. To implement this formula, we apply a common $\rho = 0.06$ and $\delta = 0.1$ and obtain ξ_i by inverting the FDII deduction reported after TCJA on Form 1120.

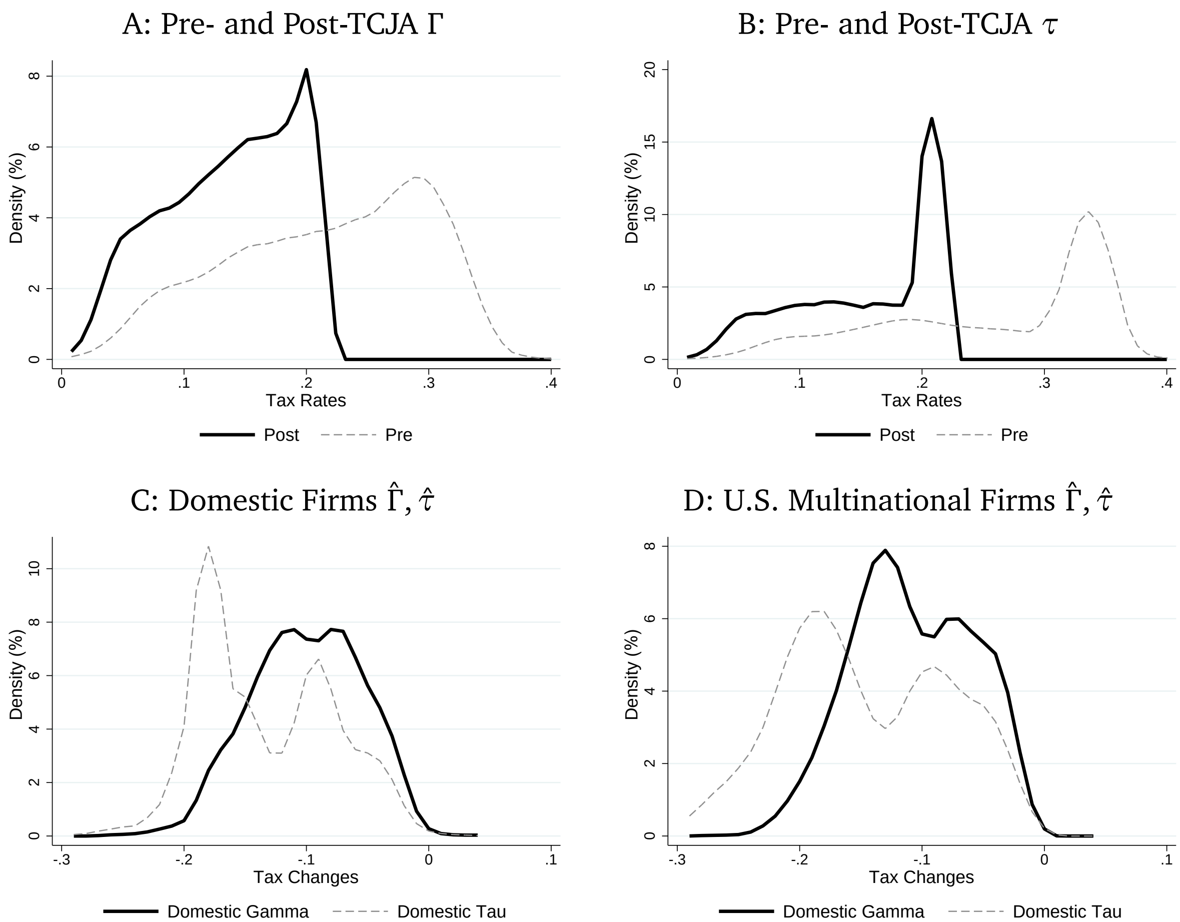
Panel A of Figure 2 plots the pre- and post-TCJA distributions of Γ. Both exhibit substantial variation. Variation across asset types arises because equipment but not structures are bonus eligible and because of variation in depreciation lives within each category. Variation in Γ then reflects the firm-level investment shares in each asset type, as well as the firm-specific METR and FDII-eligibility.[23] Panels C and D show substantial variation in $\hat{\Gamma} = d\Gamma/(1-\Gamma)$, the variable that enters into the regression, across both domestic and U.S. multinational firms.

Domestic Marginal Tax Rate (τ). Changes to the effective marginal tax rate, $\tau_{i,t}$, reflect the reduced statutory rate, repeal of the Domestic Production Activities Deduction (DPAD) and corporate Alternative Minimum Tax (AMT), reform to the net operating loss (NOL) regime, and the introduction of FDII. We translate these components into changes in each firm's METR building on Auerbach (1983), Shevlin (1990), and Graham (1996). As in this work, we simulate firm-level taxable income trajectories starting in year t using a firm-specific standard deviation for income changes estimated using historical data. These trajectories determine the impact of the NOL regime, which makes the present value of taxes depend on past and future income in addition to current income. We go beyond past work by also simulating the future use (if available) of the general business credits, DPAD, and AMT using the historical firm-specific propensity to use each credit or deduction (conditional on having positive taxable income) and the amount of the credit or deduction conditional on use. Appendix C.4 provides more detail on the simulation and validation exercises.

Using these simulated paths of taxable income, credits, and deductions, we define the marginal rate $\tau^s_{i,t}$ as the change in the present value of taxes from increasing income by one percent of revenue in year t, divided by one percent of revenue in year t. We compute $\tau^s_{i,t}$ under both pre- and post-TCJA rates, credits, deductions, and NOL rules for income in $t = 2015$ and $t = 2016$ and average the rates for these two years to arrive at our pre- and post-TCJA $\tau^s_{i,t}$. Changes in $\tau^s_{i,t}$ thus incorporate both the changes to the statutory rate, credits, and deductions as well as the heterogeneous impact of these components depending on a firm's pre-TCJA taxes. For firms subject to FDII, the effective marginal rate also accounts for the FDII deduction and

[23] Curtis et al. (2021) argue that tax depreciation lives substantially reflect historical accident and do not necessarily correspond to economic depreciation. Consistent with this idea, the correlation at the 3-digit level between economic depreciation based on BEA data and tax depreciation from Zwick and Mahon (2017) is 0.38. The analogous correlation between economic depreciation and $\hat{\Gamma}$ is 0.05. We conduct a robustness exercise that uses 3-digit fixed effects to isolate the residual variation in Γ holding economic depreciation fixed at that level and find the results unchanged.

Figure 2: Kernel Density Distribution of Tax Changes



Notes: Panels A and B depict kernel density estimates for the domestic tax terms of interest. Panel C provides kernel density estimates for $\hat{\Gamma}$ and $\hat{\tau}$ for domestic firms. Panel D provides kernel density estimates for $\hat{\Gamma}$ and $\hat{\tau}$ for U.S. multinationals.

is $\tau_{i,t} = (1 - 0.375 \times \xi_i) \times \tau^s_{i,t}$. For other firms and prior to the TCJA we set $\tau_{i,t} = \tau^s_{i,t}$.

Panel B of Figure 2 plots the pre- and post-TCJA distributions of τ. Both have modes around their respective statutory rates of 35% and 21%. However, both also exhibit substantial mass below the modes, reflecting firm-specific use of deductions and credits as well as NOLs. As a result, Panels C and D show substantial variation in how much different firms' METRs changed, with larger percent reductions for firms with higher pre-TCJA METRs and smaller reductions for firms directly affected by the repeal of DPAD or AMT.

To decompose the sources of variation in τ, we develop several tax rate measures that isolate variation from different sources: base year income differences, net operating losses, tax credits (e.g., general business credits), and base provisions (e.g., DPAD and the AMT). We find that each of these sources generate firm-level variation, but that base year income is the most important source of heterogeneity across firms. Net operating losses and the AMT also account for material amounts of variation, whereas DPAD and business credits contribute a positive but smaller amount. See Appendix C.5 for more detail.

Foreign Cost of Capital ($\bar{\Gamma}$). We measure the pre-TCJA foreign effective discount to the cost of capital, $\bar{\Gamma}_{i,t}$, using the OECD average present value of depreciation allowances from Foertsch (2022). TCJA affects this variable through the GILTI provision because the GILTI tax applies to foreign income in excess of 10% of foreign tangible capital. As a result, increasing foreign tangible capital by \$1 mechanically reduces GILTI by \$0.10 and hence reduces U.S. income tax. Appendix B.8 incorporates GILTI into the firm's problem in Section 3 and shows the implications for investment. Using this framework, we implement the cost of capital incentive for firms with GILTI tax liability in 2018 or 2019 by lowering post-TCJA $\bar{\Gamma}_{i,t}$ by $0.21 \times 0.5 \times 0.1/(\rho + \delta)$, where 0.21 is the U.S. post-TCJA statutory rate, 0.5 is the GILTI deduction, 0.1 is the deemed intangible income threshold, and the denominator $\rho + \delta$ converts the flow tax savings into a present value. We assign GILTI liability if 0.21×GILTI income net of deductions exceeds deemed foreign taxes paid, where each of these variables is obtained from Form 1118.[24]

Foreign Marginal Tax Rate ($\bar{\tau}$). Measurement of the pre-TCJA tax rate on foreign subsidiary income faces the difficulty of determining firms' expectations of what rate they would eventually pay when repatriating that income (Dharmapala, 2018). In fact, the literature presents mixed conclusions about the effect of the reform on foreign marginal effective rates. Appendix D.3 gives a partial review.

If firms believed they would have to pay the pre-TCJA U.S. statutory rate of 35%, then the change to a territorial system with GILTI would imply a reduction in the foreign METR for almost all firms. However, the widespread use of deferral of foreign dividends suggests firms instead believed there would be another one-time "repatriation holiday" akin to the lower rate in

[24] Several technical details merit mention. First, a non-trivial minority of firms have GILTI liability only because of expense reallocation making the foreign tax credit (FTC) limit bind (Dharmapala, 2018); for these firms their GILTI liability depends only on their expense reallocation and in particular does not depend on their foreign tangible capital (see Appendix B.8). We code these firms as having no change in their foreign cost of capital. Second, our baseline GILTI formula omits the reduction in FTCs in proportion to the GILTI share of foreign income. We find it plausible that firms did not recognize this interaction (it requires a multi-step calculation across schedules of multiple tax forms and an "explainer" of GILTI from the Tax Foundation omitted it entirely (Bunn, 2021)), and this assumption circumvents having to rely on imprecise measures of firm-level foreign tax rates. We include the FTC offsets below when assessing implications for U.S. tax revenue. Third, firms increasing their foreign capital to avoid GILTI tax have a strong incentive to acquire capital with low economic depreciation so as to avoid recurring investment outlays. We therefore set $\delta = 0.05$ for the purpose of determining the impact of GILTI on $\bar{\Gamma}$.

2004 under the American Jobs Creation Act (AJCA). In this case, firms with foreign tax credits (FTCs) in excess of the anticipated transition rate and the 10.5% GILTI level would experience no change with the TCJA, as these firms expected to pay no taxes to the U.S. government on foreign source income either before or after TCJA. Depending on the holiday tax rate, some firms with smaller FTCs might have expected to experience a tax increase, and others might have expected a tax decrease.

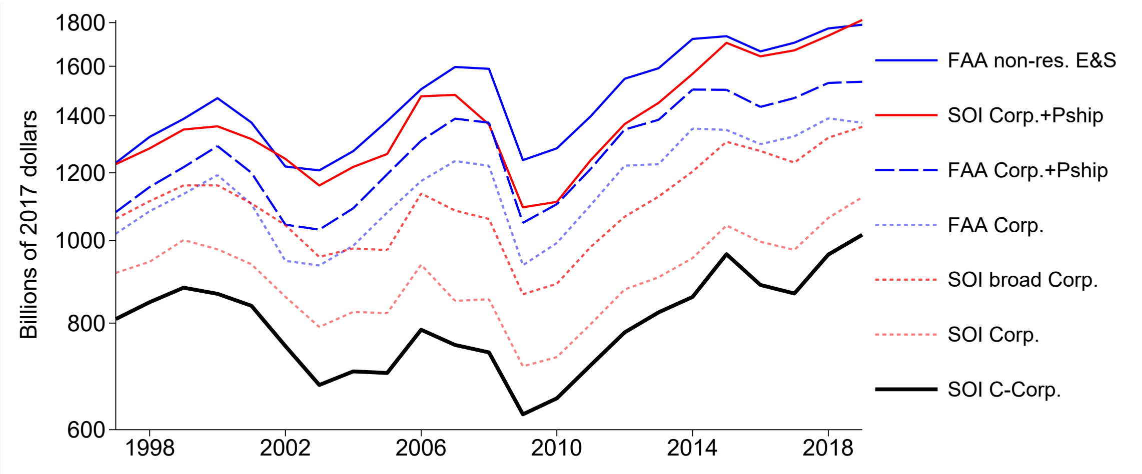
If firms anticipated a transition rate at the GILTI level of 10.5% with 80% of FTCs allowed, then no firm experienced a change in their METR on foreign source income under TCJA. We make this case our baseline assumption, both because we find it reasonable as the actual transition rate was in the neighborhood of 10.5% (depending on the firm's illiquid asset share) and because it amounts to setting $\hat{\hat{\tau}} = 0$ for all firms. Accordingly, this assumption elides the difficult task of computing foreign tax rates.

If in fact firms anticipated a higher transition rate or simply increased foreign investment in response to the statutory certainty that TCJA provided for the taxation of foreign income, our baseline empirical estimates will misattribute some of the investment response of multinational firms to the GILTI tangible capital deduction rather than to the other changes to taxation of foreign income. This change would not however affect our qualitative conclusions concerning complementarity of foreign and domestic capital. We consider alternative assumptions about the change in the foreign marginal rate in theoretical extensions in Section 7.4 and empirical extensions in Appendix D.3.

Key Outcomes. Our main outcome is *investment*. This variable includes expenditures for all equipment and structures investment put in place in the U.S. during the current year, obtained from Form 4562. In some specifications, we restrict attention to the expenditures for which bonus depreciation and Section 179 incentives apply, which we refer to as *equipment*. *Capital* includes the book value of tangible, depreciable assets net of accumulated depreciation per books. This measure includes the capital from consolidated domestic subsidiaries but typically excludes that from foreign subsidiaries. *Foreign capital* includes the total book value of tangible, depreciable assets reported for controlled foreign corporations on all Form 5471 filings attached to the firm's Form 1120 corporate filing, net of accumulated depreciation.

Figure 3 shows that investment as reported on tax forms closely tracks national accounts aggregates. The figure plots several measures of investment in non-residential equipment and structures, all deflated using the GDP price index. In 2016, our tax-based measure of investment by C-corporations accounted for 54% of total national accounts investment. Moreover,

Figure 3: Investment Benchmark



Notes: Fixed Asset Accounts (FAA) non-res. E&S is investment in non-residential equipment and structures (FAA table 2.7 lines 3 and 36). FAA Corp. and Pship is private investment in non-residential equipment and structures by C or S corporations (FAA table 4.7 lines 18 and 19) or partnerships (FAA table 4.7 lines 62 and 63). SOI Corp.+Pship is total non-residential investment by SOI corporations or partnerships. SOI Corp. includes only investment by corporations and SOI C-Corp. investment by C corporations. SOI broad Corp. includes the part of partnership investment that can be allocated to direct corporate owners of the partnership.

despite the series coming from completely separate source data, the correlation of annual changes in the logs of both series exceeds 0.7. The figure also shows that most of the gap between SOI C-Corporate and national accounts investment occurs because of investment in other sectors identifiable in SOI, including S-corporations and partnerships. Including investment by partnerships directly owned by corporations (the line labeled "SOI broad Corp." in the figure) increases the 2016 corporate share in the SOI data to 78%. Fully allocating partnership investment to corporate owners introduces substantial logistical hurdles due to multiple tiers of ownership and entities not in the SOI corporate sample, however, so our firm-level analysis focuses on investment directly attributable to C-corporations.[25]

Table 2 reports summary statistics. Panel A reports statistics for the full sample and the domestic sample, which includes firms with less than one percent of their income and capital from foreign operations. Panel B provides statistics for the multinationals with high and low levels of foreign activity. Specifically, the "multinational high" and "multinational low" samples include U.S. multinationals not in the domestic sample with respectively more than or less than 15% of their pre-TCJA capital abroad (i.e., pre-TCJA $\chi_K \geq 0.15$ or $\chi_K < 0.15$, which is roughly the median in the multinational sample).

[25] Such arrangements concentrate in a few industries, as defined by the North American Industry Classification System (NAICS), which include utilities (NAICS 22), pipeline transportation (NAICS 486), and real estate (NAICS 531).

The average value of $\hat{\Gamma} - \hat{\tau}$ is 4%. Appendix Tables G.15, G.16, and G.17 report tax change statistics by industry in the full sample, the domestic sample, and the foreign sample, respectively. This number is smaller than the analogous prediction in Barro and Furman (2018). They report a change in the user cost of capital due to the TCJA being made permanent of 10% for equipment and 11% for structures. The difference between our estimate and theirs can be explained by their use of the statutory corporate tax rate and by our inclusion of 50% bonus depreciation in the pre-period.[26]

5 Regression Estimates

In this section, we present our main empirical results of the effects of TCJA on investment of U.S. C-corporations. The regression specification mirrors model equation (15):

$$Y_{i,t} = b_0 + b_1 \times \hat{\Gamma}_{i,t} + b_2 \times \hat{\bar{\Gamma}}_{i,t} + b_3 \times \hat{\tau}_{i,t} + b_4 \times \hat{\bar{\tau}}_{i,t} + \mathbf{b}_5' \times \mathbf{x}_{i,t} + e_{i,t}, \tag{19}$$

where $Y_{i,t}$ is an outcome, $\Gamma, \bar{\Gamma}, \tau, \bar{\tau}$ are defined as in Section 4, $\hat{q} = dq/(1-q)$ for a tax term q, and $\mathbf{x}$ contains any controls. The main outcome is investment growth, $Y_{i,t} = d \log I_{i,t}$, measured as the log difference between pre-TCJA average investment over 2015-2016 and post-TCJA average investment over 2018-2019.[27] We winsorize $Y_{i,t}$ at the 5% level.

5.1 Identification

In the next section we use the regression coefficients from specification (19) to recover the structural coefficients given in equation (15). Five issues merit mention now because they affect the empirical implementation.

First, across pre- and post-TCJA steady states where $I_i^* = \delta K_i^*$, investment growth and capital growth coincide. We prefer investment as an outcome because of superior measurement in the tax data. Second, our preferred measure of $\hat{\bar{\tau}}_{i,t} = 0$ for all firms removes this variable from the regression. Effectively, we estimate a dummy variable for GILTI binding and inter-

[26] Barro and Furman (2018) also include state corporate taxes in their user cost model and adjust for debt finance. However, accounting for these factors is not necessary to explain the difference between our estimates.

[27] This specification differs from the common approach of regressing the investment-capital ratio on the level of the tax terms and a proxy for λ (see, e.g., Desai and Goolsbee, 2004; Edgerton, 2010). Besides the obvious fact that we cannot compute λ using the stock market capitalization for the privately held firms in our sample, the benchmark result of Hayashi (1982) does not apply to our model with decreasing returns to scale. Moreover, we show in Appendix B.12 that the common regression does not recover structural parameters unless λ is properly measured, because λ changes endogenously in response to a tax reform.

Table 2: Summary Statistics

Panel A: Pooled and Domestic Samples

	All Firms						Domestic Firms					
	Mean	Std. Dev.	Median	P10	P90	N	Mean	Std. Dev.	Median	P10	P90	N
Pre-TCJA Γ	0.22	0.08	0.23	0.10	0.32	9231	0.22	0.08	0.23	0.10	0.32	6973
Pre-TCJA $\bar{\Gamma}$	0.18	0.00	0.18	0.18	0.18	9231						
Pre-TCJA τ	0.26	0.09	0.30	0.12	0.35	9231	0.26	0.09	0.31	0.13	0.35	6973
$\hat{\Gamma} - \hat{\tau}$	0.04	0.03	0.03	0.00	0.07	9231	0.03	0.03	0.03	0.00	0.07	6973
$\hat{\Gamma}$	-0.10	0.05	-0.10	-0.16	-0.04	9231	-0.10	0.05	-0.10	-0.16	-0.04	6973
$\hat{\bar{\Gamma}}$	0.02	0.05	0.00	0.00	0.14	9231						
$\hat{\tau}$	-0.14	0.06	-0.15	-0.20	-0.05	9231	-0.13	0.06	-0.15	-0.19	-0.05	6973
$d\log$(Investment)	-0.05	1.04	0.04	-1.42	1.28	9231	-0.06	1.08	0.02	-1.52	1.35	6973
Pre-TCJA χ_K	0.09	0.31	0.00	0.00	0.25	9231	0.00	0.00	0.00	0.00	0.00	6973
Export Share	0.07	0.20	0.00	0.00	0.28	9231	0.02	0.10	0.00	0.00	0.01	6973
Relative Profit	0.13	0.42	0.00	0.00	0.32	9231	0.00	0.00	0.00	0.00	0.00	6973
Average Tax Rate	0.05	0.06	0.02	0.00	0.13	9214	0.05	0.06	0.02	0.00	0.14	6958
Lagged Capital ($M)	383.6	3011.4	15.7	2.1	352.7	9231	253.0	2204.6	11.0	1.9	165.6	6973

Panel B: Multinational Samples

	Multinational-High						Multinational-Low					
	Mean	Std. Dev.	Median	P10	P90	N	Mean	Std. Dev.	Median	P10	P90	N
Pre-TCJA Γ	0.21	0.08	0.23	0.09	0.31	1112	0.22	0.08	0.23	0.10	0.31	1146
Pre-TCJA $\bar{\Gamma}$	0.18	0.00	0.18	0.18	0.18	1112	0.18	0.00	0.18	0.18	0.18	1146
Pre-TCJA τ	0.25	0.09	0.28	0.11	0.35	1112	0.25	0.09	0.29	0.11	0.35	1146
$\hat{\Gamma} - \hat{\tau}$	0.04	0.03	0.04	0.01	0.08	1112	0.04	0.03	0.03	0.01	0.07	1146
$\hat{\Gamma}$	-0.11	0.05	-0.11	-0.18	-0.04	1112	-0.11	0.05	-0.11	-0.16	-0.04	1146
$\hat{\bar{\Gamma}}$	0.07	0.07	0.10	0.00	0.14	1112	0.05	0.07	0.00	0.00	0.14	1146
$\hat{\tau}$	-0.15	0.07	-0.16	-0.24	-0.05	1112	-0.14	0.06	-0.15	-0.21	-0.05	1146
$d\log$(Investment)	0.02	0.87	0.08	-1.04	1.08	1112	-0.02	0.92	0.09	-1.17	1.11	1146
Pre-TCJA χ_K	0.72	0.58	0.48	0.19	1.95	1112	0.05	0.04	0.04	0.00	0.12	1146
Export Share	0.29	0.35	0.10	0.00	0.99	1112	0.14	0.24	0.00	0.00	0.50	1146
Relative Profit	0.67	0.74	0.36	0.00	1.96	1112	0.24	0.46	0.06	0.00	0.67	1146
Average Tax Rate	0.04	0.05	0.01	0.00	0.12	1112	0.04	0.05	0.02	0.00	0.12	1144
Lagged Capital ($M)	646.6	3003.9	72.8	4.4	1149.2	1112	923.0	5855.8	46.8	4.9	1065.5	1146

Notes: This table provides summary statistics for four samples. Panel A includes summary statistics for all firms (Columns 1-6), and domestic firms (Columns 7-12). Panel B includes summary statistics for U.S. multinationals with high foreign-to-domestic capital (Columns 1-6), and U.S. multinationals with low foreign-to-domestic capital (Columns 7-12). Capital is in millions of USD. We define $d\log$(Investment) as the change in mean investment over 2015–16 versus 2018–2019, and we winsorize it from above and below at the 5% level. We winsorize Relative Profit and Pre-TCJA χ_K from above at the 10% level. For disclosure reasons, we do not report true medians (or other percentiles). Instead, we report the average of observations in neighboring percentile bins. Table G.14 provides a few additional summary statistics for the tax term changes.

pret the coefficient by scaling it by $\hat{\hat{\Gamma}}$ for GILTI payers. In Section 7.4 we consider alternative interpretations where the effect of GILTI includes both $\hat{\hat{\Gamma}}$ and a non-zero change in $\hat{\hat{\tau}}$.

Third, our baseline specification estimates short-run elasticities of investment to tax changes, while equation (15) characterizes long-run elasticities. Section 6 provides conditions under which the short-run elasticities all scale to the long-run elasticities by the same factor, preserving equation (19) as a valid representation of the structural data generating process.

Fourth, the elasticities in equation (15) depend on firm-specific factors. Most important, domestic firms have $\omega_{k,r} = \omega_{k,\tau} = 1$, implying $b_2 = b_4 = 0$ and $b_1 = -b_3$. We therefore report regressions separately for domestic and multinational firms. Furthermore, within multinational firms the relative values of b_1 and b_2 depend on the degree of foreign presence. Intuitively, holding fixed the production function parameters, firms with very little foreign capital have a smaller domestic investment response to the foreign cost-of-capital. We therefore also report regressions splitting multinational firms by high and low foreign presence. These splits also allow the other structural coefficients to vary across these sets of firms.

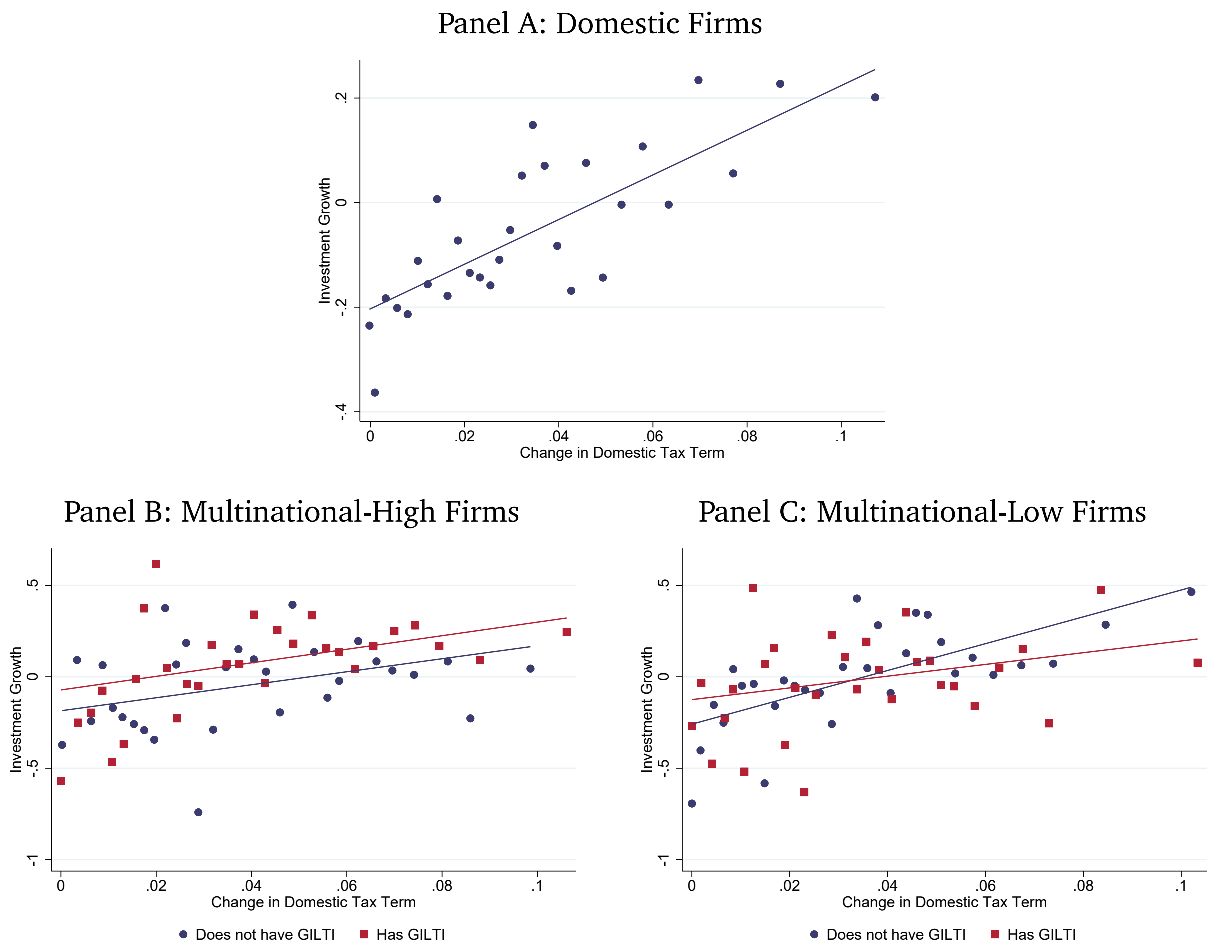
Fifth, the residual $e_{i,t}$ contains non-tax determinants of investment growth such as changes in productivity or the price of the firm's capital goods. Since equation (19) estimates changes in investment on changes in taxes, causal interpretation of the estimated coefficients requires the usual difference-in-differences assumption that firms more exposed to TCJA were otherwise on parallel investment paths with firms less exposed. We present evidence of absence of pre-trends and several robustness exercises that control for potential confounds to bolster the plausibility of this assumption. Furthermore, since equation (19) contains multiple, non-binary right hand side variables, in the presence of treatment effect heterogeneity the estimated coefficients are not necessarily convex averages of the individual treatment effects. The sample splits help along this dimension as well.

5.2 Non-Parametric Evidence

Figure 4 shows means of the log change in investment for different quantiles of the composite domestic tax term change $\hat{\Gamma} - \hat{\tau}$ ("binned" scatter plots).[28] For domestic firms plotted in Panel A, this composite tax term exactly comports with economic theory. The tight upward slope reveals

[28]The negative intercepts in Figure 4 reflect our use of the log change in investment as the dependent variable and the large cross-sectional variance in investment growth rates. By Jensen's inequality, the mean of the log change in each bin is substantially below the mean percent change in investment in each bin. Specifically, using the percent change in investment yields a positive intercept and a slope that is positive and statistically indistinguishable from the slope in Figure 4. In other words, the figure does not imply that total investment fell for firms that received the smallest tax change.

Figure 4: Investment Growth versus Tax Shocks for Domestic and Multinational Firms



Notes: This figure presents binscatter plots for domestic firms and U.S. multinationals with high or low foreign-to-domestic-capital. The x-axis is $\hat{\Gamma} - \hat{\tau}$ (the change in the domestic tax term) and the y-axis is $d\log(\text{Investment})$. We winsorize $d\log(\text{Investment})$ at the 5% level. We further categorize U.S. multinationals by whether or not they are GILTI payers in 2018 or 2019.

a positive investment elasticity to taxation around TCJA. For the multinational firms plotted in Panels B and C, our theory no longer dictates a single elasticity to $\hat{\Gamma}$ and $\hat{\tau}$. Nonetheless, the upward slopes indicate a positive investment elasticity in these samples. Furthermore, these panels show the investment responses separately for firms with and without GILTI liability. For the multinational firms with high foreign presence in Panel B, firms with GILTI liability have higher investment growth at any given value of the composite domestic tax term. This shift up in the schedule of GILTI versus non-GILTI firms manifests as a positive value of b_2 in the regression. Our calibrated model accounts for it by imposing complementarity between foreign and domestic capital in production.

Table 3: The Effect of Tax Term Shocks on Investment Growth

Dep. Var.:	$d\log$(Investment)					
Sample:	Pooled	Domestic Firms		Multinational Firms		
		Unrestricted	Restricted	All	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
$\hat{\Gamma}$	3.28***	3.12***	4.27***	4.38***	4.76*	4.10*
	(0.57)	(0.63)	(0.51)	(1.30)	(1.88)	(1.79)
$\hat{\bar{\Gamma}}$	0.50**			0.28	0.90*	−0.26
	(0.19)			(0.27)	(0.40)	(0.38)
$\hat{\tau}$	−4.04***	−4.08***	−4.27***	−4.57***	−4.23**	−4.95***
	(0.45)	(0.52)	(0.51)	(0.94)	(1.35)	(1.32)
Observations	9,231	6,973	6,973	2,258	1,112	1,146

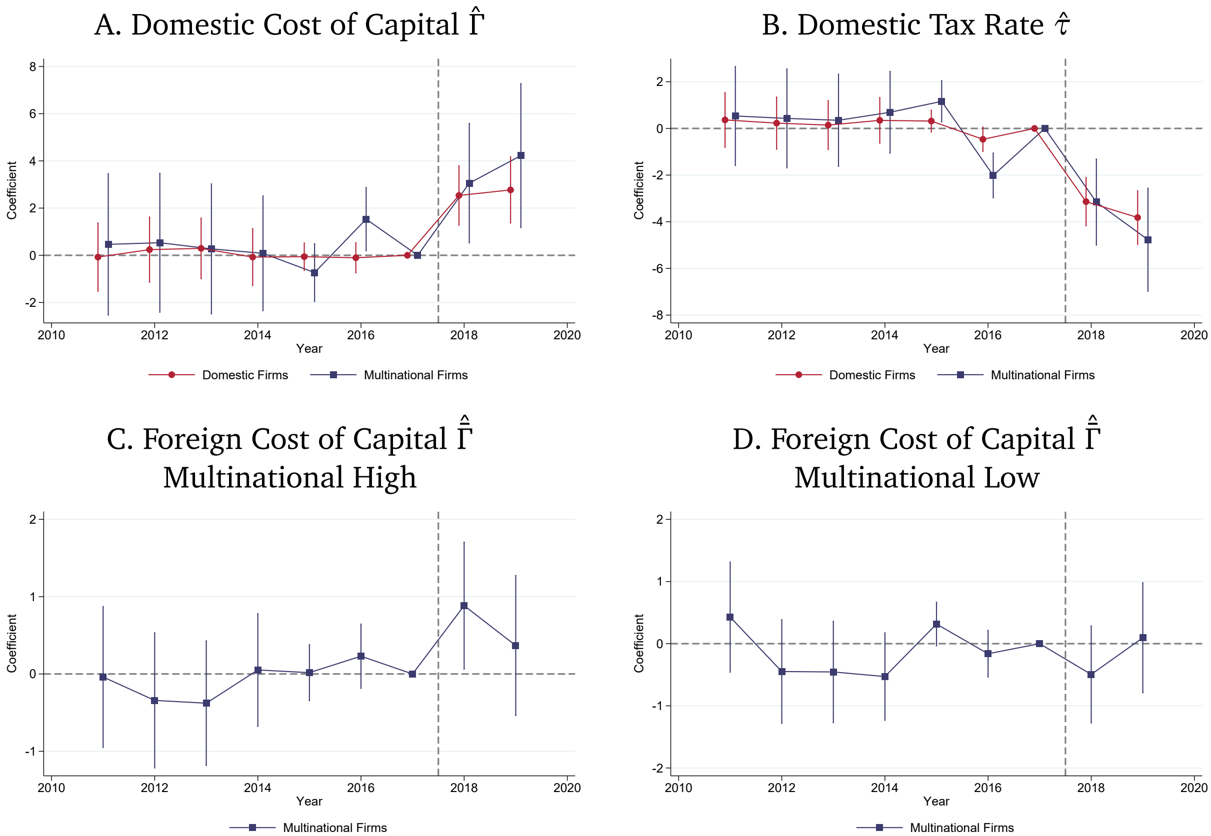
Notes: This table presents the results for regressions of $d\log$(Investment) on our tax terms across different samples. We winsorize $d\log$(Investment) at the 5% level. Column 1 presents the results for our pooled sample of both domestic firms and U.S. multinational firms, while columns 2 and 3 report the results for domestic firms. Column 4 provides the results for all U.S. multinational firms, while columns 4 and 5 partition U.S. multinational firms into those with high and low foreign capital, where high foreign capital firms have a ratio of foreign to domestic capital above 15%. * $p < .05$, ** $p < .01$, *** $p < .001$

5.3 Baseline Regressions

Table 3 reports the main regression results for the elasticities of domestic investment. Column (1) pools the entire sample and shows positive and highly statistically significant investment elasticities to the domestic and foreign costs-of-capital Γ and $\bar{\Gamma}$ and a statistically significant negative elasticity to the domestic tax rate τ. Motivated by our theory, the remaining columns report results for various sub-samples. Columns (2) and (3) focus on domestic firms, which comprise about three-quarters of the sample. Column (2) presents an unrestricted specification, and column (3) restricts the coefficients on the domestic cost-of-capital and tax rate to be equal and opposite by including only the composite tax term $\hat{\Gamma} - \hat{\tau}$. The elasticities of investment with respect to the domestic tax terms remain of similar magnitude and highly statistically significant in this group.

Column (4) reports results for multinational firms and columns (5) and (6) for sub-samples of multinational firms split by their degree of multinational activity. Multinational firms exhibit positive elasticities to Γ and negative elasticities to τ. Consistent with Panel B of Figure 4, multinational-high firms also have a large, statistically significant positive elasticity to $\bar{\Gamma}$. In contrast, and consistent with our model, the domestic investment of multinational-low firms responds little to the foreign cost-of-capital.

Figure 5: Year-by-Year Investment Effects by Tax Term Component and Group



Notes: These figures plot the tax-term coefficients between 2011-2019 from the regression specified in equation (19) using our firm-level corporate tax data. The coefficients in each year come from separate regressions with the dependent variable the log change in investment between 2017 and the year shown and the right hand side variables fixed at their pre-to-post TCJA change. Panels A and B report separate coefficients for the domestic-only and pooled multinational firm samples. Panels C and D report the $\hat{\hat{\Gamma}}$ coefficients from regressions in the samples of U.S. multinationals with high and low foreign capital, respectively, where high foreign capital is defined as having a ratio of foreign to domestic capital above 15%. The solid vertical lines depict 95% confidence intervals.

To summarize the investment response in the reduced-form regressions, we apply the mean policy changes to the coefficients from columns (3) and (4) and weight predicted effects by pre-TCJA capital. This calculation gives an 18% increase in domestic investment relative to firms experiencing no change.

Figure 5 displays the evolution of the regression coefficients as the horizon for investment growth changes, holding the right hand side variables fixed at their pre-to-post TCJA change. For each plot, we report separately the paths of coefficients in the domestic and multinational samples. Firms with larger and smaller changes in Γ or τ from TCJA have very similar investment trajectories over the pre-TCJA period, supporting a causal interpretation of the post-TCJA responses. The coefficients for $\bar{\Gamma}$ bounce around a little more in the pre-TCJA period but display no evidence of pre-trends in the years immediately before passage.

Responses of foreign capital offer further validation of these results (Appendix D.1). We use tax data for foreign subsidiaries of U.S. multinationals from Form 5471 to examine the change in net foreign tangible capital, which is a key transmission mechanism in our model. We also decompose the growth in foreign capital into contributions from large economies versus tax havens. We find growth in foreign tangible capital, evidenced by a statistically significant and economically sizable coefficient on $\hat{\bar{\Gamma}}$. The growth in foreign capital occurred in all regions, with relatively stronger growth outside of tax havens.[29]

We conduct robustness exercises designed to support a causal interpretation of the baseline regressions and assess the sensitivity of our quantitative estimates (Appendix D.2). We report regressions including detailed industry fixed effects; weighted regressions by firm size; and a set of regressions with controls for the "trade war," firm size, lagged investment, intangible intensity, and toll tax payments. We also report regressions that exclude likely profit shifters, and regressions that use a simulated IV strategy with alternative sources of tax rate variation in the instrument. To assess whether industries with heterogeneous depreciation rates exhibit different responsiveness to taxes, we report a regression that interacts 3-digit depreciation rates with our tax shocks. Finally, we consider augmented regressions that implement different assumptions about expectations for $\bar{\tau}$ in the absence of the reform (Appendix D.3).

Appendix D.4 presents results for other firm outcomes: the investment to capital ratio, log domestic capital accumulation, log investment by subcomponent, log tax payments, log labor compensation, log salaries and wages, log officer compensation, and log R&D. These estimates generally support the result that firms expanded their domestic operations in response to the reduced tax burdens. In a companion paper, we study the impact of the reform on financial outcomes, including stock market valuations, and find these tax changes are materially incorporated into asset prices during the 2017 reform debate (Chodorow-Reich et al., 2025).

[29] One potential limitation of this evidence is the possibility that after the TCJA, multinationals have an incentive to account for foreign assets more carefully (or perhaps even to overstate them). If this is the case, there is a potential concern that some of the results may be driven by differential reporting incentives and not by real changes in investment. For this reason, we do not incorporate these responses into our model estimation.

6 Structural Parameters

6.1 Estimated Parameters

We use the method of moments to recover the parameters $\alpha, \sigma, a, \bar{a}$, and χ_K. We obtain separate sets of parameters for domestic-only, multinational with high foreign presence, and multinational with low foreign presence firms. We start from five empirical moments in our data: the regression coefficients b_1, b_2, b_3, the ratio of capital at foreign subsidiaries to the domestic parent, χ_K, and the ratio of after-tax profits, denoted $\chi_\tau \chi_F$. We measure χ_K as the ratio of foreign tangible capital from Form 5471 to domestic tangible capital from Form 1120, Schedule L. We measure χ_F by summing all foreign non-dividend income reported on Form 5471.[30]

If the regression coefficients had come from specifications with long-run changes in capital or investment as the dependent variable, these moments would suffice to identify the parameters, as we show shortly. In our setting where the coefficients correspond to short-run elasticities, identification requires also determining the ratios of short-run to long-run elasticities, which in turn depend on the capital adjustment costs. We proceed in two steps, first describing our procedure for handling adjustment costs and then the identification of the parameters of interest conditional on the short-to-long-run ratios.

In the first step, we externally calibrate the foreign adjustment costs $\bar{\phi} = 0$. With this parameterization, the tax term elasticities b_1, b_2, b_3 all scale by approximately the same ratio of short-run to long-run investment, denoted χ_{SR}. The large relative magnitude of the $\bar{\Gamma}$ elasticity in column (5) of Table 3 *requires* negligible foreign adjustment costs, because domestic investment responds to $\bar{\Gamma}$ only through its impact on foreign capital.[31] Appendix B.10 derives the linearized solution for the transition path from the old to new steady state, provides formulas for the short-run and long-run elasticities, and proves the implication of common scaling.[32]

[30] The exclusion of dividend income avoids double-counting of income generated by tiered ownership structures, partly addressing the concerns of Blouin and Robinson (2020). Per conversations with experts, double-counting of tangible capital in these data is less of a concern due to fixed asset consolidation practices. For both χ_K and χ_F, we minimize the influence of outliers by computing weighted means after winsorizing the top and bottom quartile of observations.

[31] More precisely, the magnitude of the $\bar{\Gamma}$ coefficient relative to the Γ coefficient requires much larger domestic than foreign adjustment costs, because domestic investment responds directly to changes in Γ but only indirectly to changes in $\bar{\Gamma}$ through the accumulation of foreign capital and production complementarity. The prevalence of mergers and acquisitions (M&A) rather than acquisition of newly built capital may explain low foreign adjustment costs. Since our main model outcomes concern domestic rather than foreign capital, whether U.S. firms increase their foreign capital stock through new investment or M&A does not matter to aggregation. For computational reasons we calibrate $\bar{\phi} = 0.05$.

[32] Technically, the general dynamic system has two non-explosive roots that determine the speed of convergence and the short-run elasticities depend heterogeneously on each root. With no foreign adjustment costs, the dynamic system has only one root, in which case the elasticities all scale by the same amount up to terms involving third

The ratio χ_{SR} then serves as a sufficient and portable summary of the effect of domestic adjustment costs on the empirical moments.[33] We apply our preferred value of $\chi_{SR} = 1.4$ (Winberry, 2021) to adjust each short-run elasticity.[34] Section 7.4 shows that the main outcomes of our model vary relatively little across values of this ratio between 1.0 and 1.8 as far out as 10 years; intuitively, our empirical estimates directly discipline the response of investment in the first several years.

In the second step, we choose parameters to minimize the distance between the data and model-implied moments. Let $\theta = (\alpha, \sigma, a, \bar{a}, \chi_K)'$ denote the parameter set. An advantage of externally calibrating χ_{SR} is the transparency it provides for estimation of the remaining parameters. Using equation (15) and Appendix B.3, equations (20) to (24) illustrate identification by giving closed-form formulas for the set of model moments in terms of θ, χ_{SR}, and χ_R:

$$b_1(\theta) = \chi_{SR}\omega_{k,r}/(1-\alpha), \tag{20}$$

$$b_2(\theta) = \chi_{SR}\left(1-\omega_{k,r}\right)/(1-\alpha), \tag{21}$$

$$b_3(\theta) = -\chi_{SR}\omega_{k,\tau}/(1-\alpha), \tag{22}$$

$$\chi_K(\theta) = \chi_K, \tag{23}$$

$$\chi_\tau \chi_F(\theta) = \left(\frac{(1-a)\chi_K^{-\frac{1}{\sigma}} - a\chi_R}{(1-\bar{a})\chi_R - \bar{a}\chi_K^{-\frac{1}{\sigma}}}\right)\left(\frac{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}} + (1-\bar{a})}{a + (1-a)\chi_K^{\frac{\sigma-1}{\sigma}}}\right), \tag{24}$$

where, as shown in equations (11) to (14), (16) and (17), $\omega_{k,r}$ and $\omega_{k,\tau}$ are functions of $\alpha, \sigma, a, \bar{a}, \chi_K$, and χ_R (which we set to 1).

Equations (20) to (24) contain the following intuition for parameter identification. For domestic firms, $\omega_{k,r} = \omega_{k,\tau} = 1$ and hence the coefficients on τ and Γ have opposite signs of

derivatives of the production function, which are small. Intuitively, the difference between the ratio of short-run to long-run elasticities to e.g., Γ and $\bar{\Gamma}$ arises primarily because both ratios depend on the magnitude of domestic adjustment costs but the short-run elasticity to $\bar{\Gamma}$ also depends on the foreign adjustment cost. When $\bar{\phi} \to 0$, the only remaining difference occurs because foreign capital does not quite jump immediately to its long-run value due to the feedback from growing domestic capital to foreign capital. For the same reason, the common scaling is exact for the domestic-only firms.

[33] By portable, we mean that the same value can apply across across different models. For example, non-instantaneous adjustment of capital could arise because of (convex or fixed) costs of installing the capital or because firms face financial frictions that prevent them from immediately raising funds to cover the cost of the additional investment. While the value of ϕ (the coefficient multiplying the convex adjustment cost term) implied by χ_{SR} would vary with the presence of these other features, χ_{SR} is in principle a moment of the data.

[34] Winberry (2021) estimates a model with fixed and convex adjustment costs using moments of the investment distribution from Zwick and Mahon (2017) that come from the same SOI sample as our data set. We use his replication code to obtain impulse responses of investment to permanent domestic tax changes and compute the ratio of the response at 10 years to the average response over the first two years. We perform an analogous exercise using the model in Chen et al. (2023), which is estimated from Chinese manufacturing data, and find a value of $\chi_{SR} = 1.2$. See Appendix B.11 for details.

equal magnitude, each of which equals the inverse of $1-\alpha$ multiplied by χ_{SR}. We impose this condition already in the regression in column (3) of Table 3. For multinational firms, instead the sums of the coefficients on Γ and $\bar{\Gamma}$ and on τ and $\bar{\tau}$ equate, with each sum equaling the rescaled inverse of $1-\alpha$. Furthermore, given the profit elasticity α, the response of domestic capital to a subsidy to foreign capital (the coefficients on $\bar{\Gamma}$ in Table 3) bounds the admissible elasticity of substitution between foreign and domestic capital σ. The magnitudes of the regression coefficients and the profit ratio inform the relative magnitudes of σ, a, and $\bar{a}$.

We operationalize the estimation as follows. For domestic firms we have the set of data moments $\hat{m}^D = (b_1, b_3)'$ and for each group of multinational firms the set of data moments $\hat{m}^M = (b_1, b_2, b_3, \chi_K, \chi_\tau \chi_F)'$. Let $m^D(\theta) = (b_1(\theta), b_3(\theta))'$ and $m^M(\theta) = (b_1(\theta), b_2(\theta), b_3(\theta), \chi_K(\theta), \chi_\tau\chi_F(\theta))'$ denote the corresponding model-implied moments. Let V denote the covariance matrix of the data, where the variances of χ_K and $\chi_\tau\chi_F$ come from the cross-sectional distribution in the appropriate sample of firms. For each group of firms, we obtain $\hat{\theta}$ to minimize $(m(\theta)-\hat{m})' W (m(\theta)-\hat{m})$ for a weight matrix $W = (\text{diag}(V))^{-1}$.

Panels A and B of Table 4 list the moments and resulting parameters. For domestic firms, the value of α follows directly from the value of $b_1 = -b_3$ and χ_{SR}. The fitted moments for the multinational-high firms match their data counterparts almost exactly, indicating that the point estimates of the data coefficients satisfy the cross-equation restrictions imposed by the model. For the multinational firms with low foreign presence, the model regression coefficients b_1 and b_3 do not exactly match the data. The model requires $b_1 + b_2 = -(b_3 + b_4)$, and even though we do not have a value of b_4 to target in the data, the small values of χ_K and $\chi_\tau\chi_F$ for these "almost-domestic" firms limit the scope for $b_1 + b_2$ to exceed $-b_3$.

Turning to parameters, the values of α range from 0.67 to 0.75. Combined with a labor share of revenue of 0.65, these values imply total returns to scale in the revenue function of 0.88 to 0.91 ($= 0.65+\alpha\times(1-0.65)$). As a point of comparison, our estimates exhibit modestly higher returns to scale than the corresponding calibrated figure of 0.85 from Winberry (2021).

The value of σ for the multinational-high firms implies gross complementarity between domestic and foreign capital given the value of α. The value of σ for multinational-low firms is much larger but not well-identified given the theoretical restriction that b_2 for these firms cannot differ too much from zero. To interpret the values of a and $\bar{a}$, note that $\chi_K = 1 \Rightarrow a/(1-a) = F_1(K,\bar{K})/F_2(K,\bar{K})$, that is, for a firm with equal foreign and domestic capital, $a/(1-a)$ equals the ratio of the marginal product of domestic earnings with respect to domestic and foreign capital. A value of $a = 0.85$ thus implies that domestic capital increases domestic earnings by roughly 6 times as much as does foreign capital.

Table 4: Moments and Parameters

Panel A: Moments

	b_1/χ_{SR}		b_2/χ_{SR}		b_3/χ_{SR}		χ_K		$\chi_\tau \chi_F$	
	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model
Group:										
Domestic	3.05	3.05			−3.05	−3.05				
Multinat. high	3.40	3.40	0.64	0.64	−3.02	−3.02	0.57	0.57	0.63	0.63
Multinat. low	2.92	3.43	−0.19	−0.19	−3.54	−3.24	0.05	0.05	0.12	0.11

Panel B: Parameters Chosen to Match Moments

	χ_K	α	σ	a	$\bar{a}$
Group:					
Domestic		0.67			
Multinat. high	0.57	0.75	1.75	0.85	0.79
Multinat. low	0.05	0.69	1608	1.00	0.95

Panel C: Other Parameters

Symbol	Name	Value
ρ	Discount rate	0.06
δ	Depreciation rate	0.1
α_L	Labor Share of Revenue rate	0.65
$\{\phi^D, \phi^H, \phi^L\}$	Adjustment cost	{1.7,1.3,1.6}

6.2 Tax Changes and Other Parameters

We set several other parameters using external information, shown in Panel C of Table 4. We set the discount rate ρ to 0.06 and the depreciation rate δ to 0.1, consistent with our measurement of the tax shocks. We set the labor share of revenue α_L to 0.65. We ignore materials inputs and markups for simplicity, $\alpha_M = 0, \mathscr{M} = 1$. We internally set the adjustment cost parameters ϕ^D, ϕ^H, ϕ^L for domestic-only, multinational-high, and multinational-low, respectively, to match the value of χ_{SR} (see Appendix B.10).

We group firms into "portfolios" based on their domestic/multinational-high/low status and their tax changes. Appendix Table G.11 shows these portfolios, the share of capital in each, average capital per firm, and the pre- and post-TCJA tax rates. The "low-tax" firms had pre-TCJA domestic marginal rates as low as 16% while the "high-tax" firms essentially face the statutory rate. Accordingly, the low-tax firms had smaller tax changes. For multinational firms, we further divide by whether GILTI was binding or not. We also add a domestic non-C-corporate sector calibrated using Figure 3 to be 29% of private sector capital.[35] Since we study the effects of the provisions of TCJA affecting C-corporations, we assign no tax changes to this sector and including it matters only for general equilibrium market clearing.[36]

Finally, we need to assign productivities A and $\bar{A}$ to each firm. Given $\alpha, \sigma, a, \chi_K$, and α_L, the ratio $\chi_A = \bar{A}/A$ follows immediately from equation (A.30). We choose A to match the capital-per-firm shown in Appendix Table G.11. This procedure assigns higher productivity to the larger multinational firms than the domestic firms.

7 Model Quantification

7.1 Capital and Investment

We start with a (nearly) "model-free" quantification. Column (1) of Table 5 reports the steady state change in domestic capital (or equivalently investment) using the fitted values of the tax elasticities in Table 3, adjusted by χ_{SR}. This exercise is partial equilibrium because we compute the fitted values without the constant term and hence omit any general equilibrium effects, such as changes in wages, that affect all firms. Applying the regression coefficients directly would imply capital rises by 12% for domestic-only firms, 16-20% for multinational firms, and 15% for the corporate sector as a whole.

Imposing the model structure allows us to move from partial to general equilibrium, decompose the role of different tax changes, and explore policy counterfactuals. Column (2) of Table 5 reports the partial equilibrium effects in the model for comparison with the model-free estimates. We use the estimated parameters from Table 4 and the tax changes by group from Appendix Table G.11 to compute the steady-state change for each group if wages remain fixed. For domestic firms, the model imposes no additional restrictions beyond those already imposed on the data by combining the $\hat{\Gamma}$ and $\hat{\tau}$ into a single regressor $\hat{\Gamma} - \hat{\tau}$. The partial equilibrium responses from the data and the model therefore nearly agree by construction. For multinational-high firms, the data and model partial equilibrium effects also nearly agree, but in this case because the multinational-high regression coefficients obey the additional cross-

[35] Since the top line in Figure 3 is private investment, this calibration segments the private sector from government. We assume the non-corporate sector has the same capital-per-firm as the domestic C-corporation sector.

[36] The expensing provisions applied to non-C-corporations as well. However, these entities also were affected by several other changes in the TCJA such as reductions in personal income tax rates, making it conceptually cleaner to consider exercises affecting taxation of C-corporations only.

Table 5: Long-Run Steady State K and I by Group

	PE Data	PE Model	GE Model
Group:			
Domestic	11.50	10.87	5.58
	(1.38)	(1.38)	(2.45)
Multinat. high	16.30	16.32	10.89
	(4.42)	(5.25)	(6.05)
Multinat. low	19.70	8.75	3.24
	(4.92)	(7.10)	(7.51)
Total	14.70	11.74	6.36
	(1.78)	(2.28)	(3.28)

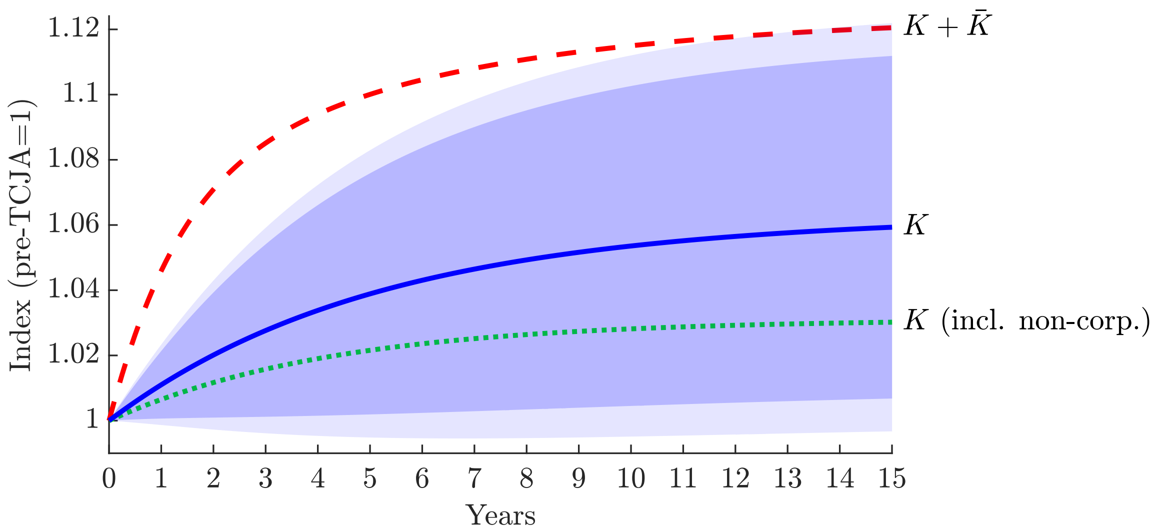
Notes: The table shows long-run changes in domestic corporate capital (or equivalently investment) for domestic-only firms, multinational firms with high foreign presence, multinational firms with low foreign presence, and in total. Column (1) directly applies the regression coefficients in Table 3, adjusted by χ_{SR}, to the tax changes by group in Appendix Table G.11. Column (2) uses the parameters estimated in Table 4 to compute the model-implied change when the aggregate economy faces perfectly elastic labor supply and the wage remains fixed. Column (3) repeats the exercise from column (2) but when the aggregate economy faces inelastic labor supply. Standard errors in parentheses are computed via the Delta method.

equation restrictions in the model. For the multinational-low group, the data response exceeds the model response, because the model's cross-equation restrictions yield parameters that imply a larger response to $\hat{\Gamma}$ and smaller response to $\hat{\tau}$ than the regression coefficients (see Table 4). The total corporate sector model-implied partial equilibrium increase in capital is 11.7%.[37]

Column (3) of Table 5 shows the general equilibrium change in domestic capital in the model, meaning when wages rise and the total supply of labor to the domestic corporate and non-corporate sector remains fixed. In general equilibrium, total corporate capital increases by 6.4% in the long-run. The general equilibrium dampening of 5.4p.p. relative to partial equilibrium stems from an increase in the domestic wage of about 0.9% in the long run. At the 2019 level of compensation per full-time equivalent of \$81,900, a 0.9% increase corresponds to roughly \$750.

[37]We compute standard errors for the model partial and general equilibrium values in Table 5 and Figure 6 using the parameter covariance matrix and the Delta method. These standard errors therefore account for sampling variation in the target moments of the parameter estimation. Specifically, let the superscripts D, H, L refer to parameters estimated for the domestic, multionational-high, and multinational-low firms, respectively, and define the full parameter vector as $\theta \equiv \{\alpha^D, \alpha^H, \sigma^H, a^H, \bar{a}^H, \chi_K^H, \alpha^L, \sigma^L, a^L, \bar{a}^L, \chi_K^L\}$. For each parameter $\theta_p \in \theta$, we recompute K/K_0 replacing θ_p with $\theta_p^+ = \theta_p + \epsilon$ and with $\theta_p^- = \theta_p - \epsilon$ and define the Jacobian $J(p) = \left(K^*\left(\theta_p^+\right)/K_0\left(\theta_p^+\right) - K^*\left(\theta_p^-\right)/K_0\left(\theta_p^-\right)\right)/(2\epsilon)$. The variance is $J(p)'V(\theta)J(p)$, where $V(\theta)$ is the covariance matrix of the parameters computed as in Chamberlain (1982). In practice, uncertainty over σ^H accounts for about half of the confidence interval width.

Figure 6: TCJA and Model-Implied Capital



Notes: The figure shows the model-implied paths of total domestic corporate capital (solid blue line), total domestic and foreign capital of domestic corporations (dashed red line), total non-residential domestic capital including the non C-corporate sector (dotted green line), and the 90 and 95% confidence intervals for domestic corporate capital (blue regions).

The solid blue line and regions in Figure 6 plot the model-implied general equilibrium transition path of domestic corporate capital and the 90 and 95% confidence intervals. Domestic corporate capital increases by 5.9% after 15 years. The transition path implies C-corporation investment higher by 10.2% two years after TCJA. Total non-residential investment in the model (dotted green line), which includes the non C-corporate sector, increases by 3.0% after 15 years, with investment higher by 5.7% two years after TCJA. Appendix A shows that actual non-residential investment in 2019:Q4 exceeded both time series and professional forecasts by roughly 6p.p., suggesting that our model contains a reasonable no-TCJA counterfactual.

The dashed red line in Figure 6 shows the path of total domestic and foreign capital owned by the domestic corporate sector. This measure corresponds to total capital in a data set such as Compustat that does not separate domestic from foreign capital. Total capital owned by domestic firms rises by proportionately more than domestic capital, primarily due to the strong incentive in the GILTI rule for firms to accumulate foreign capital.

7.2 General Equilibrium Intuition

We illustrate what disciplines the degree of general equilibrium dampening using a simplified version of our model with domestic-only firms. In steady state, each firm solves:

$$\max_{K,L} (1-\tau)\left(AK^{\alpha_K}L^{\alpha_L} - P^L L\right) - (1-\Gamma)(\rho+\delta)K.$$

Optimizing the choice of labor as in equation (3) yields the concentrated objective of $\max_K (1-\tau)ZK^{\alpha} - (1-\Gamma)(\rho+\delta)K$, where $\alpha = \frac{\alpha_K}{1-\alpha_L}$ and $Z \propto \left(A/\left(P^L\right)^{\alpha_L}\right)^{\frac{1}{1-\alpha_L}}$. Taking the first order condition, the long-run change in capital is:

$$k = \frac{(\hat{\Gamma}-\hat{\tau})+z}{1-\alpha} = \frac{(\hat{\Gamma}-\hat{\tau}) - \left(\frac{\alpha_L}{1-\alpha_L}\right)p^L + \left(\frac{1}{1-\alpha_L}\right)a}{1-\alpha}. \tag{25}$$

In partial equilibrium, firms take the wage P^L as fixed; the common component of k of $\left(\frac{\alpha_L}{1-\alpha_L}\right)p^L$ is absorbed by the constant term in the cross-firm regression.

In general equilibrium with fixed aggregate labor supply, the wage rises. Rather than solve directly for wage growth p^L, we re-characterize the firm's problem when all firms face the same change in taxes. In the symmetric equilibrium, each firm also effectively faces a fixed supply of labor. The optimization problem then becomes $\max_K (1-\tau)AK^{\alpha_K} - (1-\Gamma)(\rho+\delta)K$. Taking the first order condition, the long-run general equilibrium change in capital is:

$$k = \frac{(\hat{\Gamma}-\hat{\tau})+a}{1-\alpha_K}. \tag{26}$$

The difference between the partial and general equilibrium elasticity of capital to $(\hat{\Gamma}-\hat{\tau})$ is therefore whether α or α_K appears in the denominator of equations (25) and (26).[38]

The cross-firm partial equilibrium investment response (along with χ_{SR}) identifies $\alpha \approx 0.7$ (Table 4), which governs the overall returns to scale in the earnings function. Using $\alpha_K = (1-\alpha_L)\alpha$ and the calibrated labor share of revenue $\alpha_L = 0.65$ then yields $\alpha_K \approx 0.25$, giving a general equilibrium elasticity of roughly 1.33. Applying this elasticity to the average user cost change of 4.1% implies an increase in the capital stock of roughly 5.4%. Our quantitative model differs from this simpler version by incorporating multinational firms, foreign tax changes, and heterogeneous changes in taxes across firms. Nonetheless, the simpler version illustrates how

[38] Allowing for part of the diminishing returns to scale in the earnings function to come from a gross markup $\mathscr{M}$ does not change equation (25). In equation (26), the production function elasticity of capital $\mathscr{M}\alpha_K$ replaces the revenue share of capital α_K in the denominator, since in the symmetric equilibrium all firms keep the same market share.

the cross-firm evidence disciplines the general equilibrium calculation by pinning down the total returns to scale in the production function.

7.3 Tax Revenue

Determining the implications for domestic tax revenue requires an accounting beyond simply the marginal tax rates that govern the investment decision. With obvious notation shorthand (e.g., $F_t = F\left(K_t, \bar{K}_t; Z_t\right)$), we define domestic corporate tax revenue as:

$$T_t = \tau_t \left(F_t - \Phi_t - B_0\right) - \Gamma_t^s I_t + 0.375\tau_t^s \times \xi \times 0.1K + \mathbb{I}\left\{\text{GILTI}\right\}\left(0.105 - 0.8\bar{\tau}^s\right)\left(\bar{F}_t - 0.1\bar{K}_t\right). \tag{27}$$

The first term is the product of the domestic marginal tax rate and the tax base gross of depreciation allowances, where B_0 denotes a lump-sum deduction that incorporates credits and deductions inframarginal for determining investment and is calibrated to match the pre-TCJA average tax rate in each portfolio of firms (see Appendix C). The second term subtracts depreciation allowances, which requires distinguishing the present value of allowances Γ_t^s from the FDII component $0.375\tau_t^s \times \xi \times 0.1/(\rho + \delta)$, where $\tau_t^s = \tau_t/(1 - 0.375\xi)$ denotes the ex-FDII domestic marginal tax rate. The third term corrects for the FDII deduction not applying to income below 10% of tangible capital. The fourth term adds domestic revenue from GILTI, with $\bar{\tau}^s$ denoting the average ex-GILTI foreign tax rate among GILTI payers of 7%.

The total effect of the TCJA's corporate provisions on corporate tax revenue combines two forces: (i) the mechanical revenue effect of the tax changes holding the capital stock fixed, and (ii) the revenue consequences of the dynamic changes in capital induced by the law:

$$\begin{aligned} T_t - T_0 = &\Big[\left(\tau_t - \tau_0\right)\left(F_0 - B_0\right) - \left(\Gamma_t^s - \Gamma_0\right) I_0 + 0.375\tau_t^s \times \xi \times 0.1K_0 \\ &+ \mathbb{I}\left\{\text{GILTI}\right\}\left(0.105 - 0.8\bar{\tau}_t^s\right)\left(\bar{F}_0 - 0.1\bar{K}_0\right) \Big] \text{ (Mechanical)} \\ &+ \Big[\tau_t \left(F_t - \Phi_t - F_0\right) - \Gamma_t^s \left(I_t - I_0\right) + 0.375\tau_t^s \times \xi \times 0.1\left(K_t - K_0\right) \\ &+ \mathbb{I}\left\{\text{GILTI}\right\}\left(0.105 - 0.8\bar{\tau}_t^s\right)\left(\bar{F}_t - \bar{F}_0 - 0.1\left(\bar{K}_t - \bar{K}_0\right)\right) \Big] \text{ (Dynamic).} \end{aligned}$$

Panel A of Figure 7 reports the mechanical, dynamic, and total revenue changes in years 1, 5, and 10 post-reform as well as the 10 year average, expressed as a share of no-law-change corporate revenue T_0. The mechanical decline in corporate income tax equals 41.6% of no-reform revenue and by construction does not depend on the horizon (purple bars). For comparison with the revenue estimates in Table 1, Congressional Budget Office (2017) forecast \$3.9 trillion of corporate income taxes over the 10-year 2018-2027 window in the absence of TCJA, implying a mechanical reduction of \$1.62 trillion.[39]

The dynamic response of corporate taxable income further reduces corporate tax revenues by 6.9% of T_0 in year 1 and switches to a small offset of less than 1% by year 10 (red bars). Panel B separates the dynamic corporate response into the two largest components, the part due to the change in the base gross of deductions, $\tau_t (F_t - \Phi_t - F_0)$, and the part due to the change in investment, $\Gamma_t^s (I_t - I_0)$. The impact reduction in dynamic corporate tax revenue occurs because capital does not jump at the time of the law change, leaving F_t unchanged initially, but the immediate increase in investment incurs adjustment costs that depress taxable income (left bars) and also increases depreciation deductions (right bars). Higher capital quickly overcomes the adjustment costs and the effect on taxable income gross of depreciation deductions turns positive and by itself would result in higher tax revenue of 3.2% in year 5 and 4.7% in year 10. However, the negative revenue impact of higher depreciation persists and offsets the revenue increase from higher gross income even in the medium run.[40]

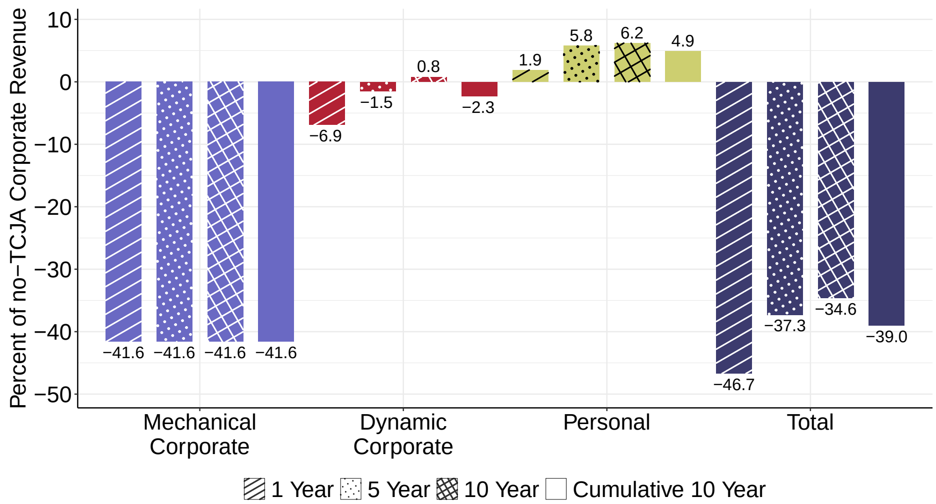
In addition to corporate tax revenue, personal income taxes also change, as shown in the yellow bars in Panel A of Figure 7. The change in personal income taxes occurs for two reasons. First, the general equilibrium change in the wage increases labor tax revenue by $\tau^L \left(p_t^L - p_0^L\right) L_0$, which we evaluate at the pre-TCJA 2007-16 average marginal labor tax rate of $\tau^L = 0.28$ (Congressional Budget Office, 2019). Since the wage depends on the capital stock, it does not jump at the time of the law change but instead rises over time. Second, the lower corporate rate and higher capital stock increase payouts to shareholders, generating additional tax revenue of $\tau^D (D_t - D_0)$. We set $\tau^D = 0.04$, which reflects the fact that only about one half

[39] Adding together the cost estimates by the Joint Committee on Taxation (JCT) of the changes to the top corporate rate, DPAD, the AMT, NOLs, and FDII yields -\$1.54 trillion. Conceptual differences between the JCT estimates and our calculation include the timing of tax payments (our τ_t includes marginal taxes paid in future years for firms currently in loss and our Γ_t^s includes the present value of depreciation deductions, whereas JCT forecasts on a cash-flow accounting basis) as well as several elements included in the JCT static score such as the re-labeling of income, additional tax revenue from payout taxes, and changes in corporate form. Our model-implied mechanical changes should be viewed neither as affirmation nor refutation of the JCT.

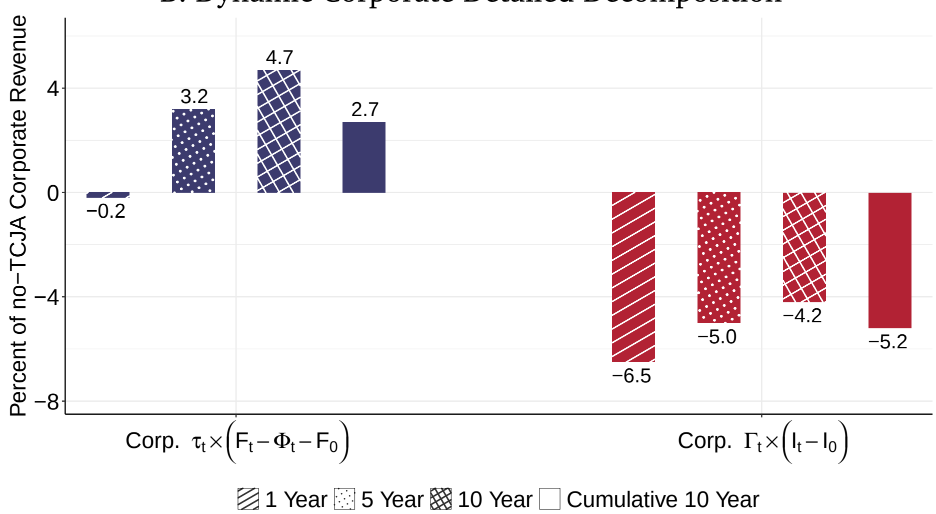
[40] The explanation for a muted dynamic response of corporate tax revenue goes beyond the details of our model. Consider a domestic firm with all bonus-eligible investment, so that $\Gamma = \tau$ post-TCJA. Absent adjustment costs, this firm chooses K to maximize $(1-\tau)\left(F(K) - (\rho+\delta) P^K K\right)$, giving $K^* = (\alpha/(\rho+\delta))^{1/(1-\alpha)}$. In addition to illustrating the well-known result (Hall and Jorgenson, 1971) that when $\tau = \Gamma$ changes in taxes do not distort capital, this result also implies that the elasticity of long-run corporate revenue $\tau K^\alpha - \Gamma \delta K$ to K is $\alpha\rho/(\rho + (1-\alpha)\delta)$, which equals about 0.4 at our parameter values. While we are not aware of other estimates of the dynamic revenue effects of corporate tax and depreciation changes in isolation, Joint Committee on Taxation (2017, footnote 8) notes the offsetting revenue impacts of higher depreciation allowances when they discuss their dynamic scoring methodology: "The extension of bonus depreciation in the bill is an important contributor to increased investment incentives created by the bill. Because of the more generous deduction created for new investment by this provision, the increased investment reduces the taxable base during the time period when this provision is in force, thus reducing the amount of revenue feedback associated with the increase in GDP."

Figure 7: Revenue Effects by Component over Various Horizons

A. By Broad Category and Overall



B. Dynamic Corporate Detailed Decomposition



Notes: Panel A shows the mechanical corporate (purple bars), dynamic corporate (red bars), personal (yellow bars), and total (blue bars) revenue effects of the TCJA corporate provisions in years 1, 5, and 10 after the TCJA as well as the cumulative effect over 10 years. Panel B decomposes the dynamic corporate response into the part coming from changes in taxable income gross of depreciation allowances (blue bars) and the part coming from changes in investment (red bars). The bars in Panel B do not exactly sum to the red bars in Panel A because they omit the dynamic effects of FDII and GILTI.

of C-corporation shares are held by taxable entities (Rosenthal and Burke, 2020) and the preferential tax rate on dividend and capital gains income (Cooper et al., 2016).[41] Offsetting this

[41] We use a 12.1% average marginal payout tax rate for taxable domestic accounts (25% of payouts) and a 16.8% average withholding tax rate on dividends paid to foreign owners (25% of ownership, 45% of which is subject to withholding). Following Cooper et al. (2016), 50% of payouts are dividends. We treat all payouts as

gain, payouts to owners of pass-throughs decrease due to higher labor costs, which we evaluate at a 20% rate. In combination, higher personal taxes offset 7.7% of the corporate revenue decline in year 10.

Overall, the dynamic revenue response and higher personal taxes over the first 10 years offset 3.4% of pre-TCJA corporate revenue. As a result, the total revenue effect closely mirrors the mechanical corporate effect. After year 10 these additional changes close roughly 20% of the mechanical revenue decline.

Table 6 decomposes the 10 year revenue changes by major provision and compares the "cost-per-unit-of-capital".[42] Changes to the METR have the largest effect on K but also cause the largest reduction in tax revenue, with a unit cost of 10.0% of baseline revenue per year per additional 1p.p. of capital. Expensing has much lower cost-per-unit-of-capital, reflecting that it applies only to new investment while the corporate rate reduction also affects income accruing to the existing capital stock. GILTI raises revenue in addition to increasing domestic capital. This result follows because of complementarity; had we instead estimated substitution between domestic and foreign capital, GILTI would have raised revenue but reduced domestic capital. Appendix Table G.12 shows that these conclusions on the relative cost-per-capital of different provisions hold when extending the horizon to year 30. Appendix Table G.13 shows that the 10 year revenue decline diminishes by roughly 10% with phase-out of bonus expensing, although the effect on the capital stock also diminishes in this scenario.

7.4 Robustness

Table 7 shows how our conclusions vary with alternative model assumptions. The table reports four outcomes: the percent change in domestic C-corporation investment two years after the policy, the percent change in the C-corporate capital stock after 10 years, the percent change in the wage after 10 years, and the percent change in tax revenue over the first 10 years relative to pre-TCJA corporate revenue. The first row reproduces our baseline model output.

Rows 2 and 3 consider changes in the discount rate that cause general equilibrium dampening. Row 2 parameterizes the interest rate sensitivity using a semi-elasticity of savings to the interest rate of 50 (Moll, Rachel and Restrepo, 2022), causing the discount rate to slowly rise toward a value roughly 5 basis points higher in the new steady state. Row 3 instead parameter-

going to equity holders. See Moore and Pecoraro (2021) for further discussion. Marginal tax rates and the share subject to withholding come from Office of Tax Analysis (2015) and IRS published statistics (https://www.irs.gov/statistics/soi-tax-stats-foreign-recipients-of-us-income-statistics).

[42]The expensing column also includes the effect of the FDII 10% threshold, which amounts to an additional tax change of 37.5% × the marginal rate × the export share × 10% of domestic tangible capital.

Table 6: Revenue Effects through Year 10

	Percent of no-TCJA corporate revenue			
	METR only	Exp. only	GILTI only	Total
1. Mechanical corporate	−39.0	−3.5	0.0	−41.6
2. Dynamic and personal	2.2	−1.0	1.4	3.4
3. Total	−36.8	−4.5	1.4	−38.2
4 (memo): Year 10 K (%)	3.7	1.8	0.6	5.3
5 (memo): (3)/(4)	−10.0	−2.5	2.5	−7.2

Notes: The table shows the total (undiscounted) corporate and personal income tax changes for changes to the METR only, to expensing only, to GILTI only, and for all tax changes simultaneously, expressed as a share of no-TCJA steady state corporate revenue. Row 1 shows the corporate revenue effects of changes in $\Gamma, \bar{\Gamma}, \tau, \bar{\tau}$ holding K and $\bar{K}$ fixed at their no-TCJA level. Row 2 shows the revenue effects of changes in K and $\bar{K}$ evaluated at the TCJA tax rates and of payout taxes. Row 3 shows overall revenue effects. Row 4 shows the percent increase in domestic capital after 10 years. Appendix Figure F.3 displays the dynamic path of capital corresponding to these one-policy-at-a-time counterfactuals.

izes the interest rate change as a one-time permanent increase at date 0 using a sensitivity of 2.0 basis points per percentage point of federal debt (Neveu and Schafer, 2024; Mian, Straub and Sufi, 2022) applied to the cumulated ten year deficit of 0.65% of GDP in Joint Committee on Taxation (2017). In both scenarios, investment and capital respond modestly less than in the baseline. Of course, firms may pay less attention to small changes in interest rates versus large changes in corporate taxes (Gormsen and Huber, 2023).

Row 4 incorporates an upward-sloping supply of capital goods (Orchard, Ramey and Wieland, 2023). Like an increase in the discount rate, higher capital goods prices increase general equilibrium dampening. However, the most recent evidence on the supply elasticity of capital goods does not find any price response even at short horizons (House, Mocanu and Shapiro, 2022), and we would expect if anything a smaller response at longer horizons.

Rows 5 and 6 incorporate forces that reduce dampening. In partial equilibrium, a higher markup dampens the response of investment to taxes for any given level of the returns to scale in the production function, because it makes the firm's revenue function slope downward more steeply. However, we directly recover the revenue function curvature α. Fixing this parameter, a higher markup implies less diminishing returns to scale in production, which governs the general equilibrium response (see footnote 38). Thus, attributing part of the concavity of the revenue function to markups results in a higher response of capital in row 5. Likewise, allowing in row 6 for a positive uncompensated labor supply of 0.2 (Congressional Budget Office, 2012)

Table 7: Robustness to Other GE Features

Feature	I_2	K_{10}	P^L_{10}	$(1/10)\int_{h=0}^{10} \text{Taxes}_h dh$
1. Baseline	10.2	5.3	0.8	−38.2
Additional GE forces				
2. Savings semi-elasticity = 50	9.5	4.9	0.7	−38.3
3. Discount rate $\rho \uparrow$ 13 b.p.	7.9	4.2	0.6	−38.2
4. Investment supply elasticity = 5	8.0	4.5	0.6	−39.0
5. Markup $\mathscr{M} = 1.25$	10.6	5.6	1.1	−36.8
6. Labor supply $\nu_L = 0.2$	10.4	5.5	0.8	−37.5
Bonus phase-out				
7. Unexpected bonus phase-out	10.2	4.1	0.6	−36.3
8. Anticipated bonus phase-out	11.3	4.6	0.7	−35.7
Alternative χ_{SR}				
9. $\chi_{SR} = 1.8$	10.5	5.1	0.7	−37.9
10. $\chi_{SR} = 1.0$	9.5	5.5	1.0	−38.4
GILTI payers' $\hat{\bar{\tau}} \neq 0$				
11. $\hat{\bar{\tau}} = +0.05$	9.5	4.9	0.7	−38.5
12. $\hat{\bar{\tau}} = -0.05$	10.3	5.4	0.8	−37.7

Notes: The column labeled I_2 shows the percent change in domestic corporate investment after 2 years. The column labeled K_{10} shows the percent change in the domestic corporate capital stock after 10 years. The column labeled P^L_{10} shows the percent change in the domestic wage after 10 years. The final column shows the 10 year average percent change in revenue relative to pre-TCJA corporate revenue. Row (1) repeats our baseline calibration. Row (2) sets $\rho_t = \rho_0 + \log\left(\tilde{K}_t/\tilde{K}_0\right)/50$, where $\tilde{K}$ denotes total business capital including the non-corporate sector. In row (3), ρ jumps by 13 basis points at date 0. Row (4) sets $P^K_t = \left(\tilde{I}_t/\tilde{I}_0\right)^{1/5}$. Row (5) sets the markup $\mathscr{M} = 1.25$. Row (6) sets the uncompensated labor supply elasticity $\nu^L = 0.2$. Rows (7) and (8) include unexpected and expected phase-out of bonus depreciation, respectively. Rows (9) and (10) change the ratio of short-to-long-run capital χ_{SR} to 1.8 and 1.0, respectively. Rows (11) and (12) change the foreign marginal keep rate $1-\bar{\tau}$ for GILTI payers by +5% and −5%, respectively.

yields less general equilibrium dampening than in our baseline.

Rows 7 and 8 explore the importance of our baseline assumption that 100% bonus depreciation would become a permanent feature of tax policy (Appendix Figure F.4 plots the dynamic response). Row 7 assumes firms did not expect phase-out but it occurs anyway. This scenario results in the same short-run behavior by construction but a lower terminal capital stock. Row 8 assumes that firms expected phase-out of expensing as written into the TCJA law. In the short run, these expectations increase investment and capital relative to the permanent case because the intertemporal substitution toward investment in periods with higher expensing outweighs the dampening effect of a lower terminal capital stock. By year 10, capital is slightly below the baseline case.[43]

Rows 9 and 10 report robustness to higher and lower values of χ_{SR}, where for each alternative value we re-estimate the other model parameters. These changes do not substantially affect aggregate investment in the short-run. Intuitively, our data contain the short-run firm-level response, making this horizon relatively insensitive to χ_{SR} even in general equilibrium. It follows that the long-run capital response roughly scales with χ_{SR}. However, even at year 10 the capital stock and wage are relatively insensitive to the precise value, which also highlights the difficulty of calibrating adjustment costs to match impulse response dynamics.

Finally, rows 11 and 12 consider alternative assumptions for the change in the foreign marginal tax rate. Row 11 re-estimates the model parameters and computes the general equilibrium objects under the condition that the change from global taxation with deferral and firm expectations of a repatriation holiday to the GILTI regime increased the foreign marginal tax rate for GILTI payers.[44] Row 12 reports the same exercise but under the assumption that the foreign marginal tax rate fell. These alternative assumptions change the model parameters; for example, an increase in $\bar{\tau}$ implies lower foreign capital accumulation and hence requires greater complementarity to rationalize why domestic investment increased for GILTI payers, so σ falls and α rises. However, whether the domestic investment response in the data arises from less foreign capital accumulation and greater complementarity or vice versa, the implications for domestic investment, capital, and wages remain relatively unchanged.

8 Conclusion

This paper combines administrative tax data and a model of global investment behavior to investigate the effects of the TCJA—the largest corporate tax cut in U.S. history—on the level and location of investment and capital. The model characterizes four channels through which this tax policy affected investment: domestic and foreign cost-of-capital subsidies and domestic and foreign corporate tax rates. Both domestic and foreign investment of U.S. multinationals increased due to the TCJA, with the increase in domestic investment larger both at firms experiencing more favorable domestic tax changes as well as at firms with larger incentives to accumulate foreign capital. Our model interprets the latter increase as evidence of comple-

[43] The changes in rows 2-7 do not affect the identification of parameters, which does not depend on general equilibrium forces. Anticipation of bonus phase-out would affect parameter identification and in particular would break the common-scaling assumption. For comparability with row 7, row 8 reports the effects of anticipated phase-out holding the parameters fixed at their baseline values.

[44] The 5% increase is effectively an upper bound given that GILTI payers pay an average rate of 7% to foreign governments.

mentarity between domestic and foreign capital in production. Overall, we estimate a long-run increase in domestic corporate capital of 6.4% due to the TCJA's corporate provisions.

Despite the dynamic response of capital, the model produces small dynamic revenue effects. While higher investment increases corporate income and labor payments, the extra tax revenue from this activity is offset by the higher cost of depreciation deductions, which can be immediately expensed in the years following the enactment of the tax reform. Consequently, the total effect on corporate tax revenue is close to the mechanical effect, which is large given the 14-percentage-point tax rate cut and immediate expensing.

Many of the provisions of the TCJA remain contested in the political arena. Our results highlight the potentially unintended consequences of including deductions for the normal return to tangible capital in the GILTI and FDII provisions. Our framework is well suited to consider the impacts of policy reforms that change this deduction.

Our quantitative model enables an analysis of other policy counterfactuals. We decompose the effect of the reform into its constituent parts, such as expensing, lower rates, and international provisions, but much more can be done. For example, future research might extend our approach to consider other policy proposals such as a global minimum tax, country-by-country provisions, or other reforms.

A second avenue for further research concerns the consequences of the TCJA beyond our primary focus on tangible capital accumulation. Much more could be done to understand the effects of the TCJA's provisions on research and development (R&D), including the transition from expensing to amortization. Likewise, more work could be done using administrative data to assess whether the TCJA affected profit-shifting behavior by both U.S. multinationals and foreign multinationals with a U.S. presence.

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Tax Policy and Investment in a Global Economy

Online Appendix

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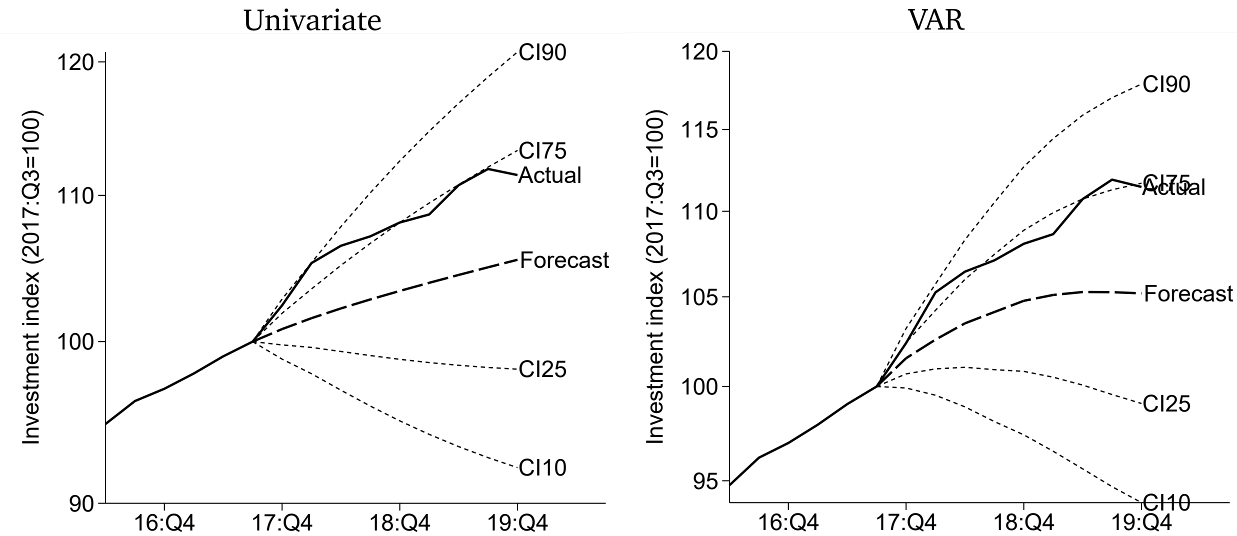
Figure A.1: Private Non-residential Investment Statistical Forecasts



Notes: In each panel, the solid line labeled "Actual" shows the path of NIPA real private non-residential investment, I, from 2016:Q2-2019:Q4. The bold dashed line labeled "Trend" shows the trend obtained as the pseudo out-of-sample forecast $\hat{I}$ using actual investment through 2017:Q3. In the left panel, the trend is computed using the univariate regression $\log I_t = b_0 + \sum_{\ell=1}^{4} \log I_{t-\ell} + e_t$. That is, $\log \hat{I}_{17:Q4,0} = \left(1, \log I_{17:Q3}, \log I_{17:Q2}, \log I_{17:Q1}, \log I_{16:Q4}\right) \mathbf{b}$ gives the forecast for 2017:Q4, $\log \hat{I}_{17:Q4,1} = \left(1, \log \hat{I}_{17:Q4,0}, \log I_{17:Q3}, \log I_{17:Q2}, \log I_{17:Q1}\right) \mathbf{b}$ gives the forecast for 2018:Q1, and so on. The dotted lines show the confidence interval bounds for the quantiles indicated. In the right panel, the trend and confidence interval bounds are computed using a VAR in log investment, the log of the price of investment relative to consumption, the log of the price of oil relative to consumption, the Gilchrist-Zakrajšek excess bond premium, and the Cleveland Fed *ex ante* 10 year real interest rate. The sample for the regressions in both panels is 1983:Q1-2017:Q3.

A Aggregate Investment After TCJA

This appendix reviews aggregate non-residential investment around the passage of TCJA.

Appendix Figure A.1 shows NIPA real private non-residential fixed investment, a trend forecast based on data through 2017:Q3, and confidence interval bands around the trend forecast. The left panel uses a univariate forecasting model with four lags. The right panel uses a VAR including four lags of the log of investment, the log of the price of investment relative to consumption, the log of the price of oil relative to consumption, the Gilchrist-Zakrajšek excess bond premium, and the Cleveland Fed *ex ante* 10 year real interest rate. According to both approaches, realized investment is above its pre-TCJA trend and around the 75th percentile of the forecast confidence interval. The magnitude implies excess investment of about 6p.p. in 2019:Q4 relative to the mean out-of-sample forecast.[1]

Appendix Table A.1 reports non-residential investment relative to pre-TCJA forecasts made by the Congressional Budget Office (CBO), the Federal Reserve Staff Tealbook forecast, and the median of the Survey of Professional Forecasters (SPF). The available forecast horizons

[1] Appendix Figure A.1 plots non-residential investment because this is the broadest measure of business investment and for comparability with the forecasts in Appendix Table A.1. The same exercises also imply out-performance of non-residential investment in equipment and structures only.

Table A.1: Private Non-residential Investment Professional Forecasts

	Value
Actual change 2017:Q3-2019:Q4	11.4%
June 2017 CBO forecast 2017:Q3-2019:Q4	5.9%
June 2017 CBO forecast error 2017:Q3-2019:Q4	+5.5p.p.
July 2017 Tealbook forecast 2017:Q3-2019:Q4	5.4%
July 2017 Tealbook forecast error 2017:Q3-2019:Q4	+6.1p.p.
Actual change 2017:Q3-2018:Q3	7.1%
2017:Q3 SPF median forecast 2017:Q3-2018:Q3	3.8%
2017:Q3 SPF median forecast error 2017:Q3-2018:Q3	+3.3p.p.

differ across the sources.[2] Non-residential investment in 2019:Q4 exceeded both the CBO and Tealbook forecasts by about 6p.p., very consistent with the time-series approaches in Appendix Figure A.1. Non-residential investment in 2018:Q3 exceeded the median SPF forecast by 3.3p.p. Kopp et al. (2019) also find excess non-residential investment growth in 2018 of about 3.5p.p. relative to (unpublished) IMF staff forecasts and that higher-than-expected investment in 2018 and 2019 did not occur in other major advanced economies. We conclude that actual U.S. non-residential investment at the end of 2019 exceeded both time series and professional forecasts by about 6p.p. and that this out-performance was unique to the U.S.

This conclusion overturns some early evaluations of TCJA using aggregate data.[3] Three main differences explain why. First, the BEA has revised up the path of aggregate non-residential investment in the quarters following TCJA. For example, in February 2020 Furman (2020) reported annualized growth of real private non-residential investment over 2017Q4-2019Q4 of 2.8% and that this performance was more than 1p.p. lower than over the period 2015Q4-2017Q4. According to the current data release, real private non-residential investment over 2017Q4-2019Q4 instead grew 4.3% at an annualized rate.[4] The upward revision of 3.1p.p. to cumulative growth over 2017Q4-2019Q4 accounts for half of the 6p.p. excess investment in 2019Q4 found above.

Second, Gravelle and Marples (2019) and Gale and Haldeman (2021) both note the growth of investment after TCJA but also the difficulty of assigning causality to the TCJA in the presence of other factors such as higher oil prices in 2018 or overall demand. Kopp et al. (2019)

[2]The CBO forecast is dated June 2017 while the Tealbook and SPF forecasts are dated July 2017. The CBO forecast assumes no change in tax policy. The Tealbook forecast assumes a fiscal expansion of 0.5% of GDP in 2018 through a cut to personal income taxes (p. 5). The SPF forecasts do not specify their assumption about fiscal policy.

[3]Indeed, relying on this earlier literature, in Chodorow-Reich, Zidar and Zwick (2024) some of us wrote that aggregate investment was not above trend post-TCJA. The analysis in this appendix supersedes what we wrote in Chodorow-Reich, Zidar and Zwick (2024).

[4]See https://www.philadelphiafed.org/-/media/FRBP/Assets/Surveys-And-Data/real-time-data/data-files/xlsx/rinvbfQvQd.xlsx for the full history of vintages of this data series.

directly dispute the claim that the oil sector drove overall business investment growth in 2018. Furthermore, transitory factors such as oil prices in 2018 cannot explain continued elevated investment in 2019. More broadly, we agree with the difficulty of drawing definitive conclusions from aggregate data alone. We instead make the weaker claim of higher post-TCJA aggregate investment of a magnitude consistent with the sharper conclusions coming from our analysis of firm-level data.

Third, some previous analyses such as Furman (2020) treat 2017Q4 as a pre-TCJA quarter. We think this is not appropriate. The expensing provisions applied immediately and in fact with additional force since investment in 2017Q4 could be immediately deducted at the pre-TCJA marginal tax rate. Importantly, aggregate investment did not simply spike and then fall in 2017Q4. Rather, while post-TCJA investment *growth* was strongest in 2017Q4 and 2018Q1, the *level* of investment remained above trend through 2019Q4. This feature is precisely the prediction of our (or any neoclassical) model—investment growth occurs immediately following passage and the level of investment remains above the pre-TCJA trend thereafter. It also explains our focus above on investment in 2019Q4 relative to pre-TCJA trend.

B Model Appendix

B.1 Derivation of Profit Function (3)

We temporarily introduce i subscripts for clarity. Firm i takes the factor prices P_t^L, P_t^M as given and faces a demand constraint $Q_{i,t} = P_{i,t}^{-\frac{\mathscr{M}}{\mathscr{M}-1}} \mathbb{Q}_t$, where $\mathbb{Q}_t \equiv \left(\int_i Q_{i,t}^{1/\mathscr{M}} di\right)^{\mathscr{M}}$ denotes aggregate output and we have normalized the aggregate price index to one. The firm solves the static optimization problem $\max_{L_i, M_i} P_{i,t} Q_{i,t} - P_t^L L_{i,t} - P_t^M M_{i,t}$. Let $Y_{i,t} = P_{i,t} Q_{i,t} = Q_{i,t}^{\frac{1}{\mathscr{M}}} \mathbb{Q}_t^{\frac{\mathscr{M}-1}{\mathscr{M}}} = \mathbb{Q}_t^{\frac{\mathscr{M}-1}{\mathscr{M}}} A_{i,t} \mathscr{K}_{i,t}^{\alpha_{\mathscr{K}}} L_{i,t}^{\alpha_L} M_{i,t}^{\alpha_M}$ denote firm revenue. The FOC are:

$$\text{FOC}\left(L_{i,t}\right): \qquad P_t^L = \frac{\alpha_L Y_{i,t}}{L_{i,t}},$$

$$\text{FOC}\left(M_{i,t}\right): \qquad P_t^M = \frac{\alpha_M Y_{i,t}}{M_{i,t}}.$$

By definition and substituting the FOC gives:

$$F\left(\mathscr{K}_{i,t}; Z_{i,t}\right) \equiv Y_{i,t} - P_t^L L_{i,t} - P_t^M M_{i,t} = (1 - \alpha_L - \alpha_M) Y_{i,t}. \tag{A.1}$$

Using

$$M_{i,t} = \left(\frac{\alpha_M}{P_t^M}\right)\left(\frac{\alpha_L}{P_t^L}\right)^{-1} L_{i,t}$$

and the FOC for $L_{i,t}$ we get an expression for revenue as a function of capital:

$$\text{Def.:} \qquad Y_{i,t} = \mathbb{Q}_t^{\frac{\mathscr{M}-1}{\mathscr{M}}} A_{i,t} \mathscr{K}_{i,t}^{\alpha_{\mathscr{K}}} L_{i,t}^{\alpha_L} M_{i,t}^{\alpha_M}$$

$$\text{Subst. prev. line:} \quad = \left(\frac{\alpha_M}{P_t^M}\right)^{\alpha_M} \left(\frac{\alpha_L}{P_t^L}\right)^{-\alpha_M} \mathbb{Q}_t^{\frac{\mathscr{M}-1}{\mathscr{M}}} A_{i,t} \mathscr{K}_{i,t}^{\alpha_{\mathscr{K}}} L_{i,t}^{\alpha_L+\alpha_M}$$

$$\text{Subst. FOC } (L)\text{:} \quad = \left(\frac{\alpha_M}{P_t^M}\right)^{\alpha_M} \left(\frac{\alpha_L}{P_t^L}\right)^{-\alpha_M} \mathbb{Q}_t^{\frac{\mathscr{M}-1}{\mathscr{M}}} A_{i,t} \mathscr{K}_{i,t}^{\alpha_{\mathscr{K}}} \left(\frac{\alpha_L}{P_t^L} Y_{i,t}\right)^{\alpha_L+\alpha_M}$$

$$= \left(\frac{\alpha_M}{P_t^M}\right)^{\frac{\alpha_M}{1-(\alpha_L+\alpha_M)}} \left(\frac{\alpha_L}{P_t^L}\right)^{\frac{\alpha_L}{1-(\alpha_L+\alpha_M)}} \mathbb{Q}_t^{\frac{\mathscr{M}-1}{\mathscr{M}}} A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}} \mathscr{K}_{i,t}^{\frac{\alpha_{\mathscr{K}}}{1-(\alpha_L+\alpha_M)}}.$$

We then have:

$$F\left(\mathscr{K}_{i,t}; Z_{i,t}\right) = (1-\alpha_L-\alpha_M) Y_{i,t} = Z_{i,t} \mathscr{K}_{i,t}^{\alpha}, \tag{A.2}$$

$$\text{where: } Z_{i,t} \equiv (1-\alpha_L-\alpha_M) \left(\frac{\alpha_M}{P_t^M}\right)^{\frac{\alpha_M}{1-(\alpha_L+\alpha_M)}} \left(\frac{\alpha_L}{P_t^L}\right)^{\frac{\alpha_L}{1-(\alpha_L+\alpha_M)}} A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}} \mathbb{Q}_t^{\frac{\mathscr{M}-1}{\mathscr{M}(1-(\alpha_L+\alpha_M))}}, \tag{A.3}$$

$$\alpha \equiv \frac{\alpha_{\mathscr{K}}}{1-(\alpha_L+\alpha_M)}. \tag{A.4}$$

The firm takes $Z_{i,t}$ as exogenous when making its choice of capital. In general equilibrium, the factor prices and aggregate output evolve endogenously.

B.2 Derivations of Equations (11) to (18) Relating Capital to Tax Changes

This appendix derives the main result of Section 3 relating the cross steady-state change in capital to the changes in taxes.

We start by extending the model to allow for multiple types of domestic and international capital. Let $K_{s,t}$ and $K_{e,t}$ denote structures and equipment capital. We assume:

$$K_t = g\left(K_{s,t}, K_{e,t}\right)$$

and likewise for international capital. Each type of capital has its own price and depreciation schedule and obeys its own dynamic evolution equation. The firm maximizes the present value of dividends with a discount rate ρ, subject to initial conditions and the dynamic evolution equations for each type of domestic and international capital.

B.2.1 First Order Conditions and Steady State

We write the Hamiltonian:

$$\mathscr{H}\left(I_{s,t}, K_{s,t}, I_{e,t}, K_{e,t}, \bar{I}_{s,t}, \bar{K}_{s,t}, \bar{I}_{e,t}, \bar{K}_{e,t}\right) = D_t + \sum_{i\in\{s,e\}} \left(\lambda_{i,t}\left(I_{i,t} - \delta^i K_{i,t}\right) + \bar{\lambda}_{i,t}\left(\bar{I}_{i,t} - \bar{\delta}^i \bar{K}_{i,t}\right)\right).$$

Necessary conditions for $i \in \{s, e\}$:

$$I_{i,t}: \quad (1-\tau_t)\Phi_1\left(I_{i,t}, K_{i,t}\right) + \left(1-\Gamma_{i,t}\right) P_{i,t}^K = \lambda_{i,t}, \tag{A.5}$$

$$\bar{I}_{i,t}: \qquad (1-\bar{\tau}_t)\bar{\Phi}_1\left(\bar{I}_{i,t},\bar{K}_t^i\right)+\left(1-\bar{\Gamma}_{i,t}\right)P_{i,t}^{\bar{K}}=\bar{\lambda}_{i,t}, \tag{A.6}$$

$$K_{i,t}: \quad \frac{(1-\tau_t)\left(F_1\left(\partial K_t/\partial K_{i,t}\right)-\Phi_2\left(I_{i,t},K_{i,t}\right)\right)+(1-\bar{\tau}_t)\bar{F}_2\left(\partial K_t/\partial K_{i,t}\right)-\delta^i\lambda_{i,t}+\dot{\lambda}_{i,t}}{\lambda_{i,t}}=\rho, \tag{A.7}$$

$$\bar{K}_{i,t}: \quad \frac{(1-\bar{\tau}_t)\left(\bar{F}_1\left(\partial \bar{K}_t/\partial \bar{K}_{i,t}\right)-\bar{\Phi}_2\left(\bar{I}_{i,t},\bar{K}_{i,t}\right)\right)+(1-\tau_t)F_2\left(\partial \bar{K}_t/\partial \bar{K}_{i,t}\right)-\bar{\delta}^i\bar{\lambda}_{i,t}+\dot{\bar{\lambda}}_{i,t}}{\bar{\lambda}_{i,t}}=\rho. \tag{A.8}$$

Substituting the adjustment costs:

$$\text{FOC }(I_{i,t}): \quad \dot{K}_{i,t}/K_{i,t}=\left[\frac{1}{\phi}\left(\frac{\lambda_{i,t}-P_{i,t}^K\left(1-\Gamma_{i,t}\right)}{(1-\tau_t)}\right)\right]^{\frac{1}{\gamma}}, \tag{A.9}$$

$$\text{FOC}(K_{i,t}): \qquad \dot{\lambda}_{i,t}=\left(\rho+\delta^i\right)\lambda_{i,t}-(1-\tau_t)\left(F_1\left(\partial K_t/\partial K_{i,t}\right)-\Phi_2\left(I_{i,t},K_{i,t}\right)\right)-(1-\bar{\tau}_t)\bar{F}_2\left(\partial K_t/\partial K_{i,t}\right). \tag{A.10}$$

The analogous equations hold for foreign capital.

In steady state, $\dot{K}_{i,t}=\dot{\lambda}_{i,t}=0$, giving:

$$\lambda_i^*=(1-\Gamma_i)P_i^K. \tag{A.11}$$

Let $R_i^*\equiv\left(\rho+\delta^i\right)\lambda_i^*$ and likewise for foreign. From equation (A.10) we have the system of equations for the steady state:

$$\left((1-\tau)F_1^*+(1-\bar{\tau})\bar{F}_2^*\right)\left(\partial K^*/\partial K_s^*\right)=R_s^*, \tag{A.12}$$

$$\left((1-\tau)F_1^*+(1-\bar{\tau})\bar{F}_2^*\right)\left(\partial K^*/\partial K_e^*\right)=R_e^*, \tag{A.13}$$

$$\left((1-\bar{\tau})\bar{F}_1^*+(1-\tau)F_2^*\right)\left(\partial \bar{K}^*/\partial \bar{K}_s^*\right)=\bar{R}_s^*, \tag{A.14}$$

$$\left((1-\bar{\tau})\bar{F}_1^*+(1-\tau)F_2^*\right)\left(\partial \bar{K}^*/\partial \bar{K}_e^*\right)=\bar{R}_e^*. \tag{A.15}$$

Recognizing that $F_1^*=F_1\left(K^*,\bar{K}^*;Z^*\right), F_2^*=F_2\left(K^*,\bar{K}^*;Z^*\right), \bar{F}_1^*=\bar{F}_1\left(\bar{K}^*,K^*;Z^*\right), \bar{F}_2^*=\bar{F}_2\left(\bar{K}^*,K^*;Z^*\right)$, this is a system of four non-linear equations in four unknowns $K_s^*,K_e^*,\bar{K}_s^*,\bar{K}_e^*$.

We assume that structures and equipment combine according to:

$$K=g\left(K_s,K_e\right)=\left(a_s^{\frac{1}{\nu}}K_s^{\frac{\nu-1}{\nu}}+a_e^{\frac{1}{\nu}}K_e^{\frac{\nu-1}{\nu}}\right)^{\frac{\nu}{\nu-1}} \tag{A.16}$$

and define $R^*\equiv\left(a_s\left(R_s^*\right)^{1-\nu}+a_e\left(R_e^*\right)^{1-\nu}\right)^{\frac{1}{1-\nu}}$, and likewise for international capital. Standard derivations with a constant elasticity of substitution give:

$$\frac{\partial K^*}{\partial K_i^*}=a_i^{\frac{1}{\nu}}\left(\frac{K_i^*}{K^*}\right)^{-\frac{1}{\nu}}=\left(\frac{R_i^*}{R^*}\right). \tag{A.17}$$

Equation (A.17) allows us to collapse the four steady state conditions into two, as in the main text:

$$(1-\tau)F_1^* + (1-\bar{\tau})\bar{F}_2^* = R^*, \tag{A.18}$$
$$(1-\bar{\tau})\bar{F}_1^* + (1-\tau)F_2^* = \bar{R}^*. \tag{A.19}$$

B.2.2 Equations (15) to (18)

Substituting functional forms:

$$R^* = \alpha\left[(1-\tau^*)aZ^*(\mathscr{K}^*)^{\alpha+1/\sigma-1} + (1-\bar{\tau}^*)(1-\bar{a})\bar{Z}^*\left(\bar{\mathscr{K}}^*\right)^{\alpha+1/\sigma-1}\right](K^*)^{-\frac{1}{\sigma}}, \tag{A.20}$$
$$\bar{R}^* = \alpha\left[(1-\bar{\tau}^*)\bar{a}\bar{Z}^*\left(\bar{\mathscr{K}}^*\right)^{\alpha+1/\sigma-1} + (1-\tau^*)(1-a)Z^*(\mathscr{K}^*)^{\alpha+1/\sigma-1}\right]\left(\bar{K}^*\right)^{-\frac{1}{\sigma}}, \tag{A.21}$$

where recall $\mathscr{K} = \left(aK^{\frac{\sigma-1}{\sigma}} + (1-a)\bar{K}^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}$ and $\bar{\mathscr{K}} = \left(\bar{a}\bar{K}^{\frac{\sigma-1}{\sigma}} + (1-\bar{a})K^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}$.

Let $\tilde{\alpha} \equiv \sigma\alpha + (1-\sigma) = 1-\sigma(1-\alpha) \subseteq [1-\sigma, 1]$ be the elasticity-adjusted returns to scale, i.e., $\alpha = 1 \Rightarrow \tilde{\alpha} = 1$ and $\alpha = 0 \Rightarrow \tilde{\alpha} = 1-\sigma$, with $\tilde{\alpha} = \alpha$ if $\sigma = 1$. Let $\mathbb{E}_w(x,y) \equiv wx + (1-w)y$ denote the weighted average of x and y.[5] Defining $\hat{\tau} = d\tau/(1-\tau)$ and $\hat{\Gamma} = d\Gamma/(1-\Gamma)$ and using equations (11) to (14), the log-linearization around the steady state gives:

$$\text{(A.20)}: \quad r + (1/\sigma)k = s_{F_1}\left(z - \hat{\tau} + \left(\frac{\tilde{\alpha}}{\sigma}\right)\left(s_1 k + (1-s_1)\bar{k}\right)\right) + \left(1-s_{F_1}\right)\left(\bar{z} - \hat{\bar{\tau}} + \left(\frac{\tilde{\alpha}}{\sigma}\right)\left(\bar{s}_1\bar{k} + (1-\bar{s}_1)k\right)\right),$$
$$\sigma r + k = -\sigma\mathbb{E}_{s_{F_1}}\left(\hat{\tau} - z, \hat{\bar{\tau}} - \bar{z}\right) + \tilde{\alpha}\left(\mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1)k + \left(1 - \mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1)\right)\bar{k}\right),$$
$$k = \frac{\left(1-\mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1)\right)\tilde{\alpha}\bar{k} - \sigma\left(r + \mathbb{E}_{s_{F_1}}\left(\hat{\tau} - z, \hat{\bar{\tau}} - \bar{z}\right)\right)}{1 - \mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1)\tilde{\alpha}}, \tag{A.22}$$
$$\text{(A.21)}: \quad \bar{k} = \frac{\left(1-\mathbb{E}_{s_{\bar{F}_1}}(\bar{s}_1, 1-s_1)\right)\tilde{\alpha}k - \sigma\left(\bar{r} + \mathbb{E}_{s_{\bar{F}_1}}\left(\hat{\bar{\tau}} - \bar{z}, \hat{\tau} - z\right)\right)}{1 - \mathbb{E}_{s_{\bar{F}_1}}(\bar{s}_1, 1-s_1)\tilde{\alpha}}. \tag{A.23}$$

Substituting equation (A.23) into equation (A.22):

$$\left(1-\mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1)\tilde{\alpha}\right)k$$

[5] Note the following properties which we use in the derivation that follows:

$$\mathbb{E}_w(1-x, y) = 1 - \mathbb{E}_w(x, 1-y),$$
$$\mathbb{E}_w(x, 1-y) + \mathbb{E}_{\bar{w}}(y, 1-x) - 1 = (1-w-\bar{w})(1-x-y),$$
$$\mathbb{E}_{\bar{w}}(y, 1-x) = 1 - x - \bar{w}(1-x-y),$$
$$(1-\bar{w})(1-\mathbb{E}_w(x, 1-y)) - w\mathbb{E}_{\bar{w}}(y, 1-x) = (1-w-\bar{w})y.$$

$$= \left(1 - \mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1)\right)\tilde{\alpha}\left(\frac{\left(1-\mathbb{E}_{s_{\bar{F}_1}}(\bar{s}_1, 1-s_1)\right)\tilde{\alpha}k - \sigma\left(\bar{r} + \mathbb{E}_{s_{\bar{F}_1}}\left(\hat{\bar{\tau}} - \bar{z}, \hat{\tau} - z\right)\right)}{1 - \mathbb{E}_{s_{\bar{F}_1}}(\bar{s}_1, 1-s_1)\tilde{\alpha}}\right)$$

$$-\sigma\left(r + \mathbb{E}_{s_{F_1}}\left(\hat{\tau} - z, \hat{\bar{\tau}} - \bar{z}\right)\right).$$

Grouping terms and simplifying:

$$k = -\frac{\omega_{k,r} r + \left(1-\omega_{k,r}\right)\bar{r} + \omega_{k,\tau}\left(\hat{\tau} - z\right) + \left(1-\omega_{k,\tau}\right)\left(\hat{\bar{\tau}} - \bar{z}\right)}{1-\alpha}, \tag{A.24}$$

$$\text{where: } \omega_{k,r} \equiv \frac{1 - \mathbb{E}_{s_{\bar{F}_1}}(\bar{s}_1, 1-s_1)\tilde{\alpha}}{1 - \left(\mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1) + \mathbb{E}_{s_{\bar{F}_1}}(\bar{s}_1, 1-s_1) - 1\right)\tilde{\alpha}}$$

$$= \frac{1 - \left((1-s_1) - s_{\bar{F}_1}(1-s_1-\bar{s}_1)\right)\tilde{\alpha}}{1 - \left(1 - s_{F_1} - s_{\bar{F}_1}\right)(1-s_1-\bar{s}_1)\tilde{\alpha}},$$

$$\omega_{k,\tau} \equiv \frac{\left(\left(1-\mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1)\right)\tilde{\alpha}\right)\left(1-s_{\bar{F}_1}\right) + \left(1 - \mathbb{E}_{s_{\bar{F}_1}}(\bar{s}_1, 1-s_1)\tilde{\alpha}\right)s_{F_1}}{1 - \left(\mathbb{E}_{s_{F_1}}(s_1, 1-\bar{s}_1) + \mathbb{E}_{s_{\bar{F}_1}}(\bar{s}_1, 1-s_1) - 1\right)\tilde{\alpha}}$$

$$= \frac{s_{F_1} + \left(1 - s_{F_1} - s_{\bar{F}_1}\right)\bar{s}_1\tilde{\alpha}}{1 - \left(1 - s_{F_1} - s_{\bar{F}_1}\right)(1-s_1-\bar{s}_1)\tilde{\alpha}},$$

$$r = -\hat{\Gamma} + \frac{d\rho + d\delta}{\rho + \delta} + p^K,$$

$$\bar{r} = -\hat{\bar{\Gamma}} + \frac{d\bar{\rho} + d\bar{\delta}}{\bar{\rho} + \bar{\delta}} + p^{\bar{K}}.$$

Equations (15) to (18) in the main text follow from substituting the expressions for r and $\bar{r}$ and re-grouping terms to isolate the tax variables. Note that with multiple types of capital $r = a_s r_s + a_e r_e$ is a weighted average of the change in user cost of different types of capital, with the weights given by steady state expenditure shares.

B.2.3 Derivation for General Production Function

To establish the property that the coefficients in equation (A.24) multiplying r and $\bar{r}$ sum to the same total as the coefficients multiplying $\hat{\tau}$ and $\hat{\bar{\tau}}$ for general differentiable production functions over K and $\bar{K}$, we write the log-linearization of the system of first order conditions (A.18) and (A.19) as:

$$\begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix}\begin{pmatrix} k \\ \bar{k} \end{pmatrix} = \begin{pmatrix} r + \mathbb{E}_{s_{F_1}}\left(\hat{\tau}, \hat{\bar{\tau}}\right) \\ \bar{r} + \mathbb{E}_{s_{\bar{F}_1}}\left(\hat{\bar{\tau}}, \hat{\tau}\right) \end{pmatrix},$$

where:

$$c_{11} = \mathbb{E}_{s_{F_1}}\left(\frac{K^* F_{11}^*}{F_1^*}, \frac{K^* \bar{F}_{22}^*}{\bar{F}_2^*}\right), c_{12} = \mathbb{E}_{s_{F_1}}\left(\frac{\bar{K}^* F_{12}^*}{F_1^*}, \frac{\bar{K}^* \bar{F}_{21}^*}{\bar{F}_2^*}\right),$$

$$c_{21}=\mathbb{E}_{s_{\bar{F}_1}}\left(\frac{K^*\bar{F}_{12}^*}{\bar{F}_1^*},\frac{K^*F_{21}^*}{F_2^*}\right),c_{22}=\mathbb{E}_{s_{\bar{F}_1}}\left(\frac{\bar{K}^*\bar{F}_{11}^*}{\bar{F}_1^*},\frac{\bar{K}^*F_{22}^*}{F_2^*}\right).$$

Solving:

$$\begin{pmatrix}k\\\bar{k}\end{pmatrix}=\frac{1}{c_{11}c_{22}-c_{12}c_{21}}\begin{pmatrix}c_{22}&-c_{12}\\-c_{21}&c_{11}\end{pmatrix}\begin{pmatrix}r+\mathbb{E}_{s_{F_1}}\left(\hat{\tau},\hat{\bar{\tau}}\right)\\\bar{r}+\mathbb{E}_{s_{\bar{F}_1}}\left(\hat{\bar{\tau}},\hat{\tau}\right)\end{pmatrix},$$

$$k=\frac{c_{22}r-c_{12}\bar{r}+\left(s_{F_1}c_{22}-\left(1-s_{\bar{F}_1}\right)c_{12}\right)\hat{\tau}+\left(\left(1-s_{F_1}\right)c_{22}-s_{\bar{F}_1}c_{12}\right)\hat{\bar{\tau}}}{c_{11}c_{22}-c_{12}c_{21}}. \tag{A.25}$$

Letting $\tilde{b}_1,\tilde{b}_2,\tilde{b}_3,\tilde{b}_4$ denote the coefficients multiplying $r,\bar{r},\hat{\tau},\hat{\bar{\tau}}$, respectively, inspection of equation (A.25) shows $\tilde{b}_1+\tilde{b}_2=\tilde{b}_3+\tilde{b}_4$.

B.2.4 Equations (11) to (14)

Let $\chi_K\equiv\bar{K}^*/K^*$ denote the steady state ratio of international to domestic capital, $\chi_{\mathscr{K}}\equiv\bar{\mathscr{K}}^*/\mathscr{K}^*$, and $\chi_\tau\equiv(1-\bar{\tau})/(1-\tau)$, $\chi_Z\equiv\bar{Z}^*/Z^*$, $\chi_R=\bar{R}^*/R^*$, $\chi_a=\bar{a}/a$. Then:

$$s_1=\frac{a}{a+(1-a)\chi_K^{\frac{\sigma-1}{\sigma}}}, \tag{A.26}$$

$$\bar{s}_1=\frac{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}}}{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}}+(1-\bar{a})}. \tag{A.27}$$

Moreover:

$$\begin{aligned}
F_1^*&=\alpha aZ^*(K^*)^{-\frac{1}{\sigma}}(\mathscr{K}^*)^{\alpha+1/\sigma-1},\\
\bar{F}_1^*&=\alpha\bar{a}\bar{Z}^*\left(\bar{K}^*\right)^{-\frac{1}{\sigma}}\left(\bar{\mathscr{K}}^*\right)^{\alpha+1/\sigma-1}=\chi_Z\chi_K^{-\frac{1}{\sigma}}\chi_{\mathscr{K}}^{\alpha+1/\sigma-1}\chi_aF_1^*,\\
F_2^*&=\alpha(1-a)Z^*\left(\bar{K}^*\right)^{-\frac{1}{\sigma}}(\mathscr{K}^*)^{\alpha+1/\sigma-1}=\left(\frac{1-a}{a}\right)\chi_K^{-\frac{1}{\sigma}}F_1^*,\\
\bar{F}_2^*&=\alpha(1-\bar{a})\bar{Z}^*(K^*)^{-\frac{1}{\sigma}}\left(\bar{\mathscr{K}}^*\right)^{\alpha+1/\sigma-1}=\left(\frac{1-\bar{a}}{\bar{a}}\right)\chi_K^{\frac{1}{\sigma}}\bar{F}_1^*=\left(\frac{1-\bar{a}}{a}\right)\chi_Z\chi_{\mathscr{K}}^{\alpha+1/\sigma-1}F_1^*,
\end{aligned}$$

giving:

$$s_{F_1}=\frac{(1-\tau^*)F_1^*}{(1-\tau^*)F_1^*+(1-\bar{\tau}^*)\bar{F}_2^*}=\frac{a}{a+(1-\bar{a})\chi_\tau\chi_Z\chi_{\mathscr{K}}^{\alpha+1/\sigma-1}}, \tag{A.28}$$

$$\begin{aligned}
1-s_{\bar{F}_1}&=\frac{(1-\tau^*)F_2^*}{(1-\bar{\tau}^*)\bar{F}_1^*+(1-\tau^*)F_2^*}=\frac{\left(\frac{1-a}{a}\right)\chi_K^{-\frac{1}{\sigma}}}{\chi_\tau\chi_Z\chi_K^{-\frac{1}{\sigma}}\chi_{\mathscr{K}}^{\alpha+1/\sigma-1}\chi_a+\left(\frac{1-a}{a}\right)\chi_K^{-\frac{1}{\sigma}}}\\
&=\frac{1-a}{(1-a)+\bar{a}\chi_\tau\chi_Z\chi_{\mathscr{K}}^{\alpha+1/\sigma-1}}.
\end{aligned} \tag{A.29}$$

Finally, multiplying equation (A.18) by χ_R , dividing the resulting expression and equation (A.19) by $(1-\tau)$, and equating, we have that $\chi_R\left(F_1^*+\chi_\tau \bar{F}_2^*\right)=\chi_\tau \bar{F}_1^*+F_2^*$. Substituting the derivatives and manipulating gives:

$$\chi_\tau \chi_Z \chi_{\mathscr{K}}^{\alpha+1/\sigma-1}=\frac{(1-a)\,\chi_K^{-\frac{1}{\sigma}}-a\chi_R}{(1-\bar{a})\,\chi_R-\bar{a}\chi_K^{-\frac{1}{\sigma}}}, \tag{A.30}$$

which shows that s_{F_1} and $s_{\bar{F}_1}$ are functions of a,χ_R,χ_K. Moreover, this expression implicitly defines χ_K as a function of a,σ,α,χ_Z, and χ_τ. Repeating equations (A.26) and (A.27) and substituting equation (A.30) into equations (A.28) and (A.29), the four share terms that enter into the elasticity formulae are:

$$s_1=\frac{a}{a+(1-a)\,\chi_K^{\frac{\sigma-1}{\sigma}}}, \tag{A.31}$$

$$\bar{s}_1=\frac{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}}}{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}}+(1-\bar{a})}, \tag{A.32}$$

$$s_{F_1}=\frac{a\left((1-\bar{a})\,\chi_R-\bar{a}\chi_K^{-\frac{1}{\sigma}}\right)}{(1-\bar{a}-a)\,\chi_K^{-\frac{1}{\sigma}}}, \tag{A.33}$$

$$1-s_{\bar{F}_1}=\frac{(1-a)\left((1-\bar{a})\,\chi_R-\bar{a}\chi_K^{-\frac{1}{\sigma}}\right)}{(1-\bar{a}-a)\,\chi_R}. \tag{A.34}$$

B.2.5 Foreign and total capital response

The expression for $\bar{k}$ follows from symmetry of the setup:

$$\bar{k}=\frac{\omega_{\bar{k},\bar{r}}\hat{\bar{\Gamma}}+\left(1-\omega_{\bar{k},\bar{r}}\right)\hat{\Gamma}-\omega_{\bar{k},\bar{\tau}}\hat{\bar{\tau}}-\left(1-\omega_{\bar{k},\bar{\tau}}\right)\hat{\tau}+\bar{\epsilon}}{1-\alpha}, \tag{A.35}$$

$$\text{where: } \omega_{\bar{k},\bar{r}}\equiv\frac{1-\left((1-\bar{s}_1)-s_{F_1}(1-s_1-\bar{s}_1)\right)\tilde{\alpha}}{1-\left(1-s_{F_1}-s_{\bar{F}_1}\right)(1-s_1-\bar{s}_1)\,\tilde{\alpha}}, \tag{A.36}$$

$$\omega_{\bar{k},\bar{\tau}}\equiv\frac{s_{\bar{F}_1}+\left(1-s_{F_1}-s_{\bar{F}_1}\right)s_1\tilde{\alpha}}{1-\left(1-s_{F_1}-s_{\bar{F}_1}\right)(1-s_1-\bar{s}_1)\,\tilde{\alpha}}, \tag{A.37}$$

$$\bar{\epsilon}\equiv\omega_{\bar{k},\bar{\tau}}\bar{z}+\left(1-\omega_{\bar{k},\bar{\tau}}\right)z-\omega_{\bar{k},\bar{r}}\left(\frac{d\bar{\rho}+d\bar{\delta}}{\bar{\rho}+\bar{\delta}}+p^{\bar{K}}\right)-\left(1-\omega_{\bar{k},\bar{r}}\right)\left(\frac{d\rho+d\delta}{\rho+\delta}+p^K\right). \tag{A.38}$$

Finally, let $s_K=K/\left(K+\bar{K}\right)$. The total capital response (scaled by the returns to scale) is:

$$\begin{aligned}(1-\alpha)\left(s_K k+(1-s_K)\,\bar{k}\right)=&\,s_K\left(\omega_{k,r}\hat{\Gamma}+\left(1-\omega_{k,r}\right)\hat{\bar{\Gamma}}-\omega_{k,\tau}\hat{\tau}-\left(1-\omega_{k,\tau}\right)\hat{\bar{\tau}}+\epsilon\right)\\&+(1-s_K)\left(\omega_{\bar{k},\bar{r}}\hat{\bar{\Gamma}}+\left(1-\omega_{\bar{k},\bar{r}}\right)\hat{\Gamma}-\omega_{\bar{k},\bar{\tau}}\hat{\bar{\tau}}-\left(1-\omega_{\bar{k},\bar{\tau}}\right)\hat{\tau}+\bar{\epsilon}\right)\end{aligned}$$

$$= \omega^T_{k,r}\hat{\Gamma} + \left(1-\omega^T_{k,r}\right)\hat{\bar{\Gamma}} - \omega^T_{k,\tau}\hat{\tau} - \left(1-\omega^T_{k,\tau}\right)\hat{\bar{\tau}} + \epsilon^T, \quad \text{(A.39)}$$

with: $$\omega^T_{k,r} \equiv s_K\omega_{k,r} + (1-s_K)\left(1-\omega_{\bar{k},\bar{r}}\right) = \omega_{k,r} - (1-s_K)\left(\frac{1-\tilde{\alpha}}{1-\left(1-s_{F_1}-s_{\bar{F}_1}\right)(1-s_1-\bar{s}_1)\tilde{\alpha}}\right), \quad \text{(A.40)}$$

$$\omega^T_{k,\tau} \equiv s_K\omega_{k,\tau} + (1-s_K)\left(1-\omega_{\bar{k},\bar{\tau}}\right) = \omega_{k,\tau} + (1-s_K)\left(\frac{\left(1-s_{F_1}-s_{\bar{F}_1}\right)(1-\tilde{\alpha})}{1-\left(1-s_{F_1}-s_{\bar{F}_1}\right)(1-s_1-\bar{s}_1)\tilde{\alpha}}\right). \quad \text{(A.41)}$$

B.3 Derivation of Steady-state Relative Profits

This appendix derives the final moment condition relating relative profits to parameters. Let $\chi_F = \bar{F}\left(\bar{K}_t, K_t; \bar{Z}_t\right)/F\left(K_t, \bar{K}_t; Z_t\right)$ denote the ratio of foreign to domestic taxable income. Then:

$$\chi_F = \chi_Z\chi^{\alpha}_{\mathscr{K}},$$

$$\text{where: } \chi_{\mathscr{K}} = \left(\frac{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}} + (1-\bar{a})}{a + (1-a)\chi_K^{\frac{\sigma-1}{\sigma}}}\right)^{\frac{\sigma}{\sigma-1}}.$$

Using this definition together with equation (A.30) gives the moment:

$$\chi_\tau\chi_F = \left(\frac{(1-a)\chi_K^{-\frac{1}{\sigma}} - a\chi_R}{(1-\bar{a})\chi_R - \bar{a}\chi_K^{-\frac{1}{\sigma}}}\right)\chi_{\mathscr{K}}^{1-1/\sigma} = \left(\frac{(1-a)\chi_K^{-\frac{1}{\sigma}} - a\chi_R}{(1-\bar{a})\chi_R - \bar{a}\chi_K^{-\frac{1}{\sigma}}}\right)\left(\frac{\bar{a}\chi_K^{\frac{\sigma-1}{\sigma}} + (1-\bar{a})}{a + (1-a)\chi_K^{\frac{\sigma-1}{\sigma}}}\right).$$

Under the interpretation that adjustment costs are paid in units of labor (so total paid labor is split between production labor L and capital installation labor), we can associate F and $\bar{F}$ with taxable income before credits and deductions.

B.4 Dynamic Accumulation of Intangible Capital Extension

This extension shows that a dynamic choice of intangible capital provides one possible microfoundation for complementarity between domestic and foreign capital.

We introduce intangible capital by augmenting the domestic and foreign production functions to include the factor $\mathscr{H}_t$:

$$Q_t = \left(A_t\mathscr{H}_t^{\alpha_{\mathscr{H}}}\mathscr{K}_t^{\alpha_{\mathscr{K}}}L_t^{\alpha_L}M_t^{\alpha_M}\right)^{\mathscr{M}}, \quad \text{(A.42)}$$

$$\bar{Q}_t = \left(\bar{A}_t\mathscr{H}_t^{\alpha_{\mathscr{H}}}\bar{\mathscr{K}}_t^{\alpha_{\mathscr{K}}}\bar{L}_t^{\alpha_L}\bar{M}_t^{\alpha_M}\right)^{\mathscr{M}}. \quad \text{(A.43)}$$

Importantly, the same quantity $\mathscr{H}_t$ enters into both the domestic and foreign production functions; the non-rivalry of $\mathscr{H}_t$ distinguishes it as intangible capital. The domestic concentrated earnings function becomes:

$$F\left(K_t, \bar{K}_t, \mathscr{H}_t; Z_t\right) = Z_t \mathscr{H}_t^{\alpha_{\mathscr{H}}\alpha/\alpha_{\mathscr{K}}} \mathscr{K}_t^{\alpha}, \tag{A.44}$$

and likewise for the foreign operation. We assume $\alpha_{\mathscr{H}} < \alpha_{\mathscr{K}}/\alpha = 1-\alpha_L-\alpha_M$, so that there are not increasing returns to intangible capital in the earnings function. A natural benchmark is that intangible capital is tangible capital-augmenting, so that $\alpha_H = \alpha_{\mathscr{K}}$. Intangible capital obeys the law of motion $\dot{\mathscr{H}}_t = I_{\mathscr{H},t} - \delta^{\mathscr{H}}\mathscr{H}_t$, with adjustment costs $\Phi^{\mathscr{H}}\left(I_{\mathscr{H},t}, \mathscr{H}_t\right)$. We assume for simplicity that all intangible investment (i.e. R&D) occurs domestically.[6]

The necessary conditions for tangible investment and capital remain unaltered in this setup. With convex adjustment costs, the new necessary conditions relating to the accumulation of intangible capital are:

$$\text{FOC } (I_{\mathscr{H},t}): \qquad \dot{\mathscr{H}}_t/\mathscr{H}_t = \left[\frac{1}{\phi^{\mathscr{H}}}\left(\frac{\lambda_{\mathscr{H},t} - P_t^{\mathscr{H}}\left(1-\Gamma_{\mathscr{H},t}\right)}{(1-\tau_t)}\right)\right]^{\frac{1}{\gamma}}, \tag{A.45}$$

$$\text{FOC}(\mathscr{H}_t): \qquad \dot{\lambda}_{\mathscr{H},t} = \left(\rho+\delta^{\mathscr{H}}\right)\lambda_t^{\mathscr{H}} - (1-\tau_t)\left(F_3 - \Phi_2^{\mathscr{H}}\right) - (1-\bar{\tau}_t)\bar{F}_3. \tag{A.46}$$

Combining these equations, the steady state has the additional condition:

$$R_{\mathscr{H}}^* = (1-\tau)F_3^* + (1-\bar{\tau})\bar{F}_3 \tag{A.47}$$

$$= \frac{\alpha_{\mathscr{H}}\alpha}{\alpha_{\mathscr{K}}}\left[(1-\tau)F\left(K^*, \bar{K}^*, \mathscr{H}^*; Z^*\right) + (1-\bar{\tau})\bar{F}\left(\bar{K}^*, K^*, \mathscr{H}^*; \bar{Z}^*\right)\right](\mathscr{H}^*)^{-1}, \tag{A.48}$$

with $R_{\mathscr{H}}^* = \left(\rho+\delta^{\mathscr{H}}\right)P^{\mathscr{H}}(1-\Gamma_{\mathscr{H}})$ being the user cost of intangible capital.

As in the baseline model, we derive the long-run response of capital to changes in tax policy. As a preliminary step, define the revenue shares:

$$s_{RK} = \frac{R^*K^*}{(1-\tau)F\left(K^*, \bar{K}^*, \mathscr{H}^*; Z^*\right) + (1-\bar{\tau})\bar{F}\left(\bar{K}^*, K^*, \mathscr{H}^*; \bar{Z}^*\right)},$$

$$s_{\bar{R}\bar{K}} = \frac{\bar{R}^*\bar{K}^*}{(1-\tau)F\left(K^*, \bar{K}^*, \mathscr{H}^*; Z^*\right) + (1-\bar{\tau})\bar{F}\left(\bar{K}^*, K^*, \mathscr{H}^*; \bar{Z}^*\right)},$$

and note:

$$\frac{\alpha_{\mathscr{H}}\alpha}{\alpha_{\mathscr{K}}} = \frac{R_{\mathscr{H}}^*\mathscr{H}^*}{(1-\tau)F\left(K^*, \bar{K}^*, \mathscr{H}^*; Z^*\right) + (1-\bar{\tau})\bar{F}\left(\bar{K}^*, K^*, \mathscr{H}^*; \bar{Z}^*\right)}.$$

Let $\hbar = d\log\mathscr{H}$. It is straightforward to show that the numerators in the expressions for k and $\bar{k}$ in equations (A.22) and (A.23) gain the new term $-\alpha_{\mathscr{H}}\alpha\hbar/\alpha_{\mathscr{K}}$. In addition, linearizing equation (A.48) gives:

$$\alpha_{\mathscr{H}}\alpha\hbar/\alpha_{\mathscr{K}} = \zeta_{\mathscr{H}}\left(s_{RK}k + s_{\bar{R}\bar{K}}\bar{k} - r_{\mathscr{H}}\right), \tag{A.49}$$

[6] This assumption is inessential to the results characterizing how the presence of intangible capital affects the responses of domestic and foreign tangible capital to the main tax terms.

where: $$\zeta_{\mathcal{H}} = \frac{\alpha_{\mathcal{H}}\alpha/\alpha_{\mathcal{K}}}{1-\alpha_{\mathcal{H}}\alpha/\alpha_{\mathcal{K}}} = \frac{\alpha_{\mathcal{H}}}{1-\alpha_L-\alpha_M-\alpha_{\mathcal{H}}} \subseteq [0,\infty].$$

Substituting equation (A.49) into the augmented equations (A.22) and (A.23) and solving gives the result for the response of tangible capital in the presence of dynamic accumulation of intangible capital:

$$k = -\frac{\omega_{k,r} r + \left(1-\omega_{k,r}\right)\bar{r} + \omega_{k,\tau}\left(\hat{\tau}-z\right) + \left(1-\omega_{k,\tau}\right)\left(\hat{\bar{\tau}}-\bar{z}\right) + \zeta_{\mathcal{H}} r_{\mathcal{H}}}{1-\alpha-\zeta_{\mathcal{H}}\left(s_{RK}+s_{\bar{R}\bar{K}}\right)}, \tag{A.50}$$

$$\text{where: } \omega_{k,r} \equiv \frac{1-\zeta_{\mathcal{H}}\sigma s_{\bar{R}\bar{K}} - \mathbb{E}_{s_{\bar{F}_1}}\left(\bar{s}_1, 1-s_1\right)\tilde{\alpha}}{1-\left(\mathbb{E}_{s_{F_1}}\left(s_1,1-\bar{s}_1\right)+\mathbb{E}_{s_{\bar{F}_1}}\left(\bar{s}_1,1-s_1\right)-1\right)\tilde{\alpha}},$$

$$\omega_{k,\tau} \equiv \frac{s_{F_1} + \left(1-s_{F_1}-s_{\bar{F}_1}\right)\left(\zeta_{\mathcal{H}}\sigma s_{\bar{R}\bar{K}} + \bar{s}_1\tilde{\alpha}\right)}{1-\left(\mathbb{E}_{s_{F_1}}\left(s_1,1-\bar{s}_1\right)+\mathbb{E}_{s_{\bar{F}_1}}\left(\bar{s}_1,1-s_1\right)-1\right)\tilde{\alpha}}.$$

In particular, equation (A.50) shows that intangible capital introduces a force akin to complementarity between K and $\bar{K}$. Indeed, setting $a = \bar{a} = s_1 = \bar{s}_1 = s_{F_1} = s_{\bar{F}_1} = \mathbb{E}_{s_{F_1}}\left(s_1, 1-\bar{s}_1\right) = \mathbb{E}_{s_{\bar{F}_1}}\left(\bar{s}_1, 1-s_1\right) = 1$ so that foreign capital does not directly enter the domestic production function, we have:

$$\omega_{k,r}\left(a=\bar{a}=1\right) = \frac{1-\zeta_{\mathcal{H}}\sigma s_{\bar{R}\bar{K}}-\tilde{\alpha}}{1-\tilde{\alpha}} = \frac{1-\alpha-\zeta_{\mathcal{H}} s_{\bar{R}\bar{K}}}{1-\alpha} < 1. \tag{A.51}$$

The positive response of domestic capital to the foreign cost of capital occurs because the accumulation of foreign tangible capital induces more intangible investment, which also benefits domestic tangible capital. In addition to this force on $\omega_{k,r}$, the additional term in the denominator of the expression for k tends to increase the capital elasticities, because of the crowding in of intangible investment.

B.5 Intangible Capital Location Choice Extension

This extension augments our baseline environment to allow the firm to choose the location of intangible capital in order to shift profits into low tax jurisdictions. The firm has a stock of intangible capital of $\mathcal{H}_t$, divided into intangible capital booked domestically H_t and booked abroad $\bar{H}_t$. To focus on the location choice, we now take the overall stock $\mathcal{H}$ as exogenous. Intangible capital is non-rival and multiplicatively scales Z_t and $\bar{Z}_t$; since it is now exogenous, the precise elasticity of earnings to intangible capital does not matter.

The firm applies a transfer price P_t^H to the use of intangible capital located in a different jurisdiction. Let $\Delta_{H,t} = \bar{H}_t - H_t$ denote the stock located abroad in excess of the domestic stock. Hence the domestic branch receives net royalties $P_t^H\left(H_t-\bar{H}_t\right) = -P_t^H\Delta_{H,t}$ and the foreign branch receives net royalties $P_t^H\Delta_{H,t}$. The firm may pay a cost from too-aggressive transfer pricing, given by $\Psi^H\left(\Delta_{H,t}, K_t, \bar{K}_t\right)$. This cost represents the legal risk and compliance cost of locating intangible capital differently from the location of tangible capital. Total cash flows are thus augmented by transfer pricing profits net of costs $\left(\tau_t-\bar{\tau}_t\right)P_t^H\Delta_{H,t} - \Psi^H\left(\Delta_{H,t}, K_t, \bar{K}_t\right)$.

With this setup, equation (6) and its foreign counterpart remain unchanged. The necessary conditions for K and $\bar{K}$ and the new necessary condition for Δ_H become:

$$K_t: \qquad \dot{\lambda}_t = (\rho+\delta)\lambda_t - (1-\tau_t)(F_1-\Phi_2) - (1-\bar{\tau}_t)\bar{F}_2 + \Psi_2^H\left(\Delta_{H,t}, K_t, \bar{K}_t\right), \tag{A.52}$$

$$\bar{K}_t: \qquad \dot{\bar{\lambda}}_t = (\rho+\delta)\bar{\lambda}_t - (1-\bar{\tau}_t)\left(\bar{F}_1-\bar{\Phi}_2\right) - (1-\tau_t)F_2 + \Psi_3^H\left(\Delta_{H,t}, K_t, \bar{K}_t\right), \tag{A.53}$$

$$\Delta_{H,t}: \qquad \Psi_1^H = (\tau_t - \bar{\tau}_t)P_t^H. \tag{A.54}$$

The FOC ($\Delta_{H,t}$) says that at the margin increasing foreign intangible assets generates tax savings $(\tau_t - \bar{\tau}_t)P_t^H$ and increases the transfer pricing burden by Ψ_1^H.

Define the steady state user cost as $R^* = (\rho+\delta)(1-\Gamma^*)P^K + \Psi_2^H\left(\Delta_{H,t}, K_t, \bar{K}_t\right)$. The following linearized relationship still holds with the parameters $\omega_{k,r}, \omega_{k,\tau}$ defined as in equations (16) and (17):

$$k = \frac{-\omega_{k,r} r - \left(1-\omega_{k,r}\right)\bar{r} - \omega_{k,\tau}\hat{\tau} - \left(1-\omega_{k,\tau}\right)\hat{\bar{\tau}} + \epsilon}{1-\alpha}.$$

Immediately, if the decision to shift profits via the location of intangible capital does not depend on physical capital, $\Psi_2^H\left(\Delta_{H,t}, K_t, \bar{K}_t\right) = 0$, then nothing changes in the firm's physical capital decision.

To understand the implications for investment when the location choice depends on physical capital, we parameterize $\Psi^H\left(\Delta_{H,t}, K_t, \bar{K}_t\right) = \left(\psi_1^H/2\right)\left(\Delta_{H,t} - \psi_2^H\left(\bar{K}_t - K_t\right)\right)^2$. With this functional form, we have:

$$\Delta_{H,t} - \psi_2^H\left(\bar{K}_t - K_t\right) = \frac{(\tau_t - \bar{\tau}_t)P_t^H}{\psi_1^H}. \tag{A.55}$$

The difference between the allocation of intangible and tangible capital is increasing in the tax gap and decreasing in the cost shifter ψ_1^H. The parameter ψ_2^H specifies how the allocation of intangibles moves with tangible capital. The domestic user cost becomes: $R^* = (\rho+\delta)(1-\Gamma^*)P^K + \psi_2^H(\tau_t - \bar{\tau}_t)P_t^H > (\rho+\delta)(1-\Gamma^*)P^K$. The additional term arises because an additional unit of domestic capital requires an additional ψ_2^H of reallocation of intangibles, which costs $(\tau_t - \bar{\tau}_t)P_t^H$ of total profits. Thus, a reduction in τ reduces the user cost and stimulates investment above the usual effect, because the lost profits from reduced intangible-shifting that come with higher K are smaller when τ falls, so there is less disincentive to accumulate K. At the same time, the steady state user cost is larger, which implies a larger coefficient on $\hat{\Gamma}$. The foreign user cost becomes: $\bar{R}^* = \left(\bar{\rho}+\bar{\delta}\right)\left(1-\bar{\Gamma}^*\right)P^K - \psi_2^H(\tau_t - \bar{\tau}_t)P_t^H < \left(\bar{\rho}+\bar{\delta}\right)\left(1-\bar{\Gamma}^*\right)P^K$.

To see how these changes modify equation (15), define the share contributions of the intangible terms to the user cost:

$$s_H = \frac{\psi_2^H(\tau-\bar{\tau})p^H}{R^*} \subseteq [0,1], \qquad \bar{s}_H = \frac{\psi_2^H(\tau-\bar{\tau})p^H}{\bar{R}^*}.$$

Then:

$$r = -(1-s_H)\hat{\Gamma} + s_H\frac{d(\tau-\bar{\tau})}{\tau-\bar{\tau}}, \qquad \bar{r} = -(1+\bar{s}_H)\hat{\bar{\Gamma}} - \bar{s}_H\frac{d(\tau-\bar{\tau})}{\tau-\bar{\tau}}$$

and hence:

$$k = \frac{\omega_{k,r}\left(1-s_H\right)\hat{\Gamma}+\left(1-\omega_{k,r}\right)\left(1+\bar{s}_H\right)\hat{\bar{\Gamma}}-\omega_{k,\tau}\hat{\tau}-\left(1-\omega_{k,\tau}\right)\hat{\bar{\tau}}+\left(\left(1-\omega_{k,r}\right)\bar{s}_H-\omega_{k,r}s_H\right)\frac{d(\tau-\bar{\tau})}{\tau-\bar{\tau}}+\epsilon}{1-\alpha}. \tag{A.56}$$

B.6 Interest Deduction Extension

A firm with debt of B_t can deduct interest $i_t B_t$ from its taxable earnings. We assume the firm also pays a cost (i.e., insurance) that is increasing in its (domestic) leverage and given by $\Psi^B(B_t, K_t)$. Cash flows are therefore augmented by $\tau_t i_t B_t - \Psi^B(B_t, K_t)$. The changes to the necessary conditions are:

$$K_t: \qquad \dot{\lambda}_t = (\rho+\delta)\lambda_t - (1-\tau_t)(F_1-\Phi_2) - (1-\bar{\tau}_t)\bar{F}_2 + \Psi_2^B(B_t, K_t), \tag{A.57}$$

$$B_t: \qquad \tau_t i_t = \Psi_1^B. \tag{A.58}$$

Define the steady state user cost as $R^* = (\rho+\delta)(1-\Gamma^*)P^K + \Psi_2^B(B_t, K_t)$. The following linearized relationship still holds with the parameters $\omega_{k,r}, \omega_{k,\tau}$ defined as in equations (16) and (17):

$$k = \frac{-\omega_{k,r}r-\left(1-\omega_{k,r}\right)\bar{r}-\omega_{k,\tau}\hat{\tau}-\left(1-\omega_{k,\tau}\right)\hat{\bar{\tau}}+\epsilon}{1-\alpha}.$$

Immediately, if the financial capital structure decision does not depend on physical capital, $\Psi_2^B\left(\Delta_{B,t}, K_t\right) = 0$, then nothing changes in the firm's physical capital decision.

To understand the implications for investment when the financial capital structure decision does depend on physical capital, we follow Barro and Furman (2018) and parameterize $\Psi^B(B_t, K_t) = \left(\psi^B\right)^{-\theta}\left(B_t/\left(P_t^K K_t\right)\right)^{1+\theta} P_t^K K_t/(1+\theta)$. With this functional form, the steady state domestic user cost becomes $R^* = (\rho+\delta)(1-\Gamma^*)P^K - \frac{\psi^B\theta P^K}{1+\theta}(\tau^* i^*)^{1+1/\theta}$. Defining $s_B \equiv \frac{\frac{\theta}{1+\theta}\tau_t i_t B_t/K_t}{R^*}$, we have:

$$k = \frac{\omega_{k,r}\left(1-s_B\right)\hat{\Gamma}+\left(1-\omega_{k,r}\right)\hat{\bar{\Gamma}}-\left(\omega_{k,\tau}-\omega_{k,r}s_B\left(\frac{1+\theta}{\theta}\right)\left(\frac{\tau}{1-\tau}\right)\right)\hat{\tau}-\left(1-\omega_{k,\tau}\right)\hat{\bar{\tau}}+\epsilon}{1-\alpha}. \tag{A.59}$$

B.7 Global Value Chain Interpretation

This extension derives expressions analogous to equation (3) for a firm maximizing composite global output of locally-produced inputs. The production and revenue functions are:

$$\text{Domestic input: } Q_t = A_t K_t^{\alpha_K} L_t^{\alpha_L},$$

$$\text{Foreign input: } \bar{Q}_t = \bar{A}_t \bar{K}_t^{\alpha_K} \bar{L}_t^{\alpha_L},$$

$$\text{Final output: } Y_t = \left(a_Y Q_t^{\frac{\sigma_Y-1}{\sigma_Y}} + (1-a_Y)\bar{Q}_t^{\frac{\sigma_Y-1}{\sigma_Y}}\right)^{\frac{\sigma_Y}{\sigma_Y-1}}.$$

The firm's static maximization problem is:

$$\max_{L,\bar{L}} Y_t - P_t^L L_t - P_t^{\bar{L}} \bar{L}_t.$$

The FOC are:

$$P_t^L = a_Y \alpha_L \frac{Q_t}{L_t} \left(\frac{Q_t}{Y_t} \right)^{-\frac{1}{\sigma_Y}}, \; P_t^{\bar{L}} = (1 - a_Y) \alpha_L \frac{\bar{Q}_t}{\bar{L}_t} \left(\frac{\bar{Q}_t}{Y_t} \right)^{-\frac{1}{\sigma_Y}}.$$

Substituting the FOC and solving gives:

$$\begin{aligned}
Q_t &= \left(Z_t^Q\right)^{\frac{\sigma_Y}{\sigma_Y - 1}} K_t^{\frac{\alpha_K}{1-\alpha_L\left(\frac{\sigma_Y-1}{\sigma_Y}\right)}} Y_t^{\frac{\alpha_L}{\alpha_L + (1-\alpha_L)\sigma_Y}}, \\
\bar{Q}_t &= \left(\bar{Z}_t^Q\right)^{\frac{\sigma_Y}{\sigma_Y - 1}} \bar{K}_t^{\frac{\alpha_K}{1-\alpha_L\left(\frac{\sigma_Y-1}{\sigma_Y}\right)}} Y_t^{\frac{\alpha_L}{\alpha_L + (1-\alpha_L)\sigma_Y}}, \\
\text{with: } Z_t^Q &\equiv \left(A_t \left(\frac{a_Y \alpha_L}{P_t^L} \right)^{\alpha_L} \right)^{\frac{\sigma_Y}{(1-\alpha_L)\sigma_Y - 1}} \\
\bar{Z}_t^Q &\equiv \left(\bar{A}_t \left(\frac{a_Y \alpha_L}{P_t^{\bar{L}}} \right)^{\alpha_L} \right)^{\frac{\sigma_Y}{(1-\alpha_L)\sigma_Y - 1}}.
\end{aligned}$$

Thus:

$$\begin{aligned}
Y_t &= \mathcal{K}_t^{\alpha}, \\
\text{where: } \mathcal{K}_t &\equiv \left(a_t K_t^{\frac{\sigma-1}{\sigma}} + \bar{a}_t \bar{K}_t^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \\
a_t &\equiv a_Y Z_t^Q, \\
\bar{a}_t &\equiv (1 - a_Y) \bar{Z}_t^Q, \\
\sigma &\equiv \frac{\alpha_L + (1-\alpha_L)\sigma_Y}{\alpha_L + \alpha_K + (1 - \alpha_K - \alpha_L)\sigma_Y}, \\
\alpha &\equiv \frac{\alpha_K}{1 - \alpha_L}.
\end{aligned}$$

Domestic and foreign current costs are:

$$\begin{aligned}
P_t L_t &= \alpha_L s_t Y_t, \\
\bar{P}_t \bar{L}_t &= \alpha_L (1 - s_t) Y_t, \\
\text{where: } s_t &= a_Y \left(\frac{Q_t}{Y_t} \right)^{\frac{\sigma_Y - 1}{\sigma_Y}}.
\end{aligned}$$

If a share s_t of total revenues are assigned to the domestic jurisdiction for tax purposes, then total domestic and foreign taxable incomes are:

$$F\left(K_t, \bar{K}_t; A_t, \bar{A}_t\right) = s_t (1 - \alpha_L) \mathcal{K}_t^{\alpha}, \tag{A.60}$$

$$\bar{F}\left(\bar{K}_t, K_t; \bar{A}_t, A_t\right) = (1-s_t)(1-\alpha_L)\mathscr{K}_t^{\alpha}. \tag{A.61}$$

Equations (A.60) and (A.61) take the same form as equation (3), with the additional restriction that $\mathscr{K} = \bar{\mathscr{K}}$ and with time-varying shares in the composite capital variable.

B.8 FDII and GILTI

Let $\tau^{s}, \bar{\tau}^{s}, \Gamma^{s}, \bar{\Gamma}^{s}$ denote the ex-FDII and ex-GILTI domestic and foreign marginal tax rates and present values of allowances ("s" for statutory), which we now distinguish from the GILTI and FDII-inclusive effective marginal tax rates and costs of capital.

The GILTI (Global Intangible Low Taxed Income) Internal Revenue Code (IRC) Section 951A tax applies to foreign income. The TCJA defines global deemed intangible income as after-tax foreign income in excess of $\theta_t^{\text{GILTI-T}} = 0.1$ of foreign tangible property ("T" for tangible), i.e., GILTI $= (1-\bar{\tau}^{s})\bar{F}\left(\bar{K}_t, K_t, \bar{Z}_t\right) - \bar{\Phi}\left(\bar{I}_t, \bar{K}_t\right) - \theta_t^{\text{GILTI-T}}\bar{K}_t$.[7] To account for GILTI being defined on an after-tax basis, firms must then "gross up" their GILTI, yielding a pre-deduction and credit tax base of $\bar{F}\left(\bar{K}_t, K_t, \bar{Z}_t\right) - \bar{\Phi}\left(\bar{I}_t, \bar{K}_t\right) - \theta_t^{\text{GILTI-T}}\bar{K}_t/(1-\bar{\tau}^{s})$.[8] The Section 250 deduction of $\theta_t^{\text{GILTI-D}} = 0.5$ ("D" for deduction) of the GILTI+Gross-up makes the effective U.S. tax rate 10.5% on this income. Firms can further apply foreign tax credits (FTCs) of $\theta_t^{\text{GILTI-C}} = 0.8$ ("C" for credit) of foreign taxes paid on this income. Thus, after-tax foreign profits for a GILTI-taxed firm are:

$$\begin{aligned}
&\overbrace{\left(1-\bar{\tau}_t^{s}\right)\left(\bar{F}\left(\bar{K}_t, K_t, \bar{Z}_t\right) - \Phi\left(\bar{I}_t, \bar{K}_t\right)\right)}^{\text{Profits net of foreign taxes}} \\
&-\underbrace{\left(\tau_t^{s}\left(1-\theta_t^{\text{GILTI-D}}\right) - \theta_t^{\text{GILTI-C}}\bar{\tau}_t^{s}\right)\left(\bar{F}\left(\bar{K}_t, K_t, \bar{Z}_t\right) - \Phi\left(\bar{I}_t, \bar{K}_t\right) - \theta_t^{\text{GILTI-T}}\bar{K}_t/\left(1-\bar{\tau}_t^{s}\right)\right)}_{\text{GILTI tax net of foreign tax credit}} \\
&= (1-\bar{\tau}_t)\left(\bar{F}\left(\bar{K}_t, K_t, \bar{Z}_t\right) - \Phi\left(\bar{I}_t, \bar{K}_t\right)\right) + \left(\bar{\tau}_t - \bar{\tau}_t^{s}\right)\theta_t^{\text{GILTI-T}}\bar{K}_t/\left(1-\bar{\tau}_t^{s}\right), \\
&\text{where: } \bar{\tau}_t \equiv \bar{\tau}_t^{s}\left(1-\theta_t^{\text{GILTI-C}}\right) + \tau_t^{s}\left(1-\theta_t^{\text{GILTI-D}}\right).
\end{aligned}$$

The GILTI tax is often described as a minimum tax because at $\bar{\tau}_t^{s} = 0$ it nonetheless implies $\bar{\tau}_t = \tau_t^{s}\left(1-\theta_t^{\text{GILTI-D}}\right)$. It ceases to apply when $\bar{\tau}_t^{s} \geq \tau_t^{s}\left(1-\theta_t^{\text{GILTI-D}}\right)/\theta_t^{\text{GILTI-C}} = 0.1312$.

The FDII (Foreign Derived Intangible Income) deduction applies to domestic income derived from foreign sources, i.e., exports. Let ξ denote the (fixed) share of a firm's domestic income attributable to exports. The TCJA defines DII (deemed intangible income) as domestic income in excess of $\theta_t^{\text{FDII-T}} = 0.1$ of domestic tangible property, i.e., DII $= F\left(K_t, \bar{K}_t, Z_t\right) - \Phi(I_t, K_t) - \theta_t^{\text{FDII-T}}K_t$, and FDII as the foreign part of DII, i.e., FDII $= \xi\left(F\left(K_t, \bar{K}_t, Z_t\right) - \Phi(I_t, K_t) - \theta_t^{\text{FDII-T}}K_t\right)$. A corporation can deduct $\theta_t^{\text{FDII-D}} = 0.375$ of FDII against domestic taxable income. Thus, after-

[7] For simplicity, the exposition here omits tangential factors such as the exclusion of certain categories of income from the GILTI base, allocable deductions, interest expenses in the calculation of the deemed tangible return, and interactions of multiple subsidiaries some of which may not have taxable income. The technical term for tangible property is Qualified Business Asset Investment (QBAI).

[8] The IRC Section 78 gross-up approach follows the treatment of foreign income under Subpart F. The division of $\bar{K}$ by $(1-\bar{\tau}^{s})$ occurs due to the interaction of the gross-up approach and the GILTI QBAI deduction and has been called "getting the math wrong" by Caballero (2020).

tax domestic profits for a firm with domestic income exceeding $\theta_t^{\text{FDII-T}} K_t$ are:

$$F\left(K_t, \bar{K}_t, Z_t\right) - \Phi\left(I_t, K_t\right) - \tau_t^{\text{s}} \left(F\left(K_t, \bar{K}_t, Z_t\right) - \Phi\left(I_t, K_t\right) - \underbrace{\theta_t^{\text{FDII-D}} \xi \left(F\left(K_t, \bar{K}_t, Z_t\right) - \Phi\left(I_t, K_t\right) - \theta_t^{\text{FDII-T}} K_t\right)}_{\text{FDII deduction}} \right)$$
$$= \left(1 - \tau_t\right)\left(F\left(K_t, \bar{K}_t, Z_t\right) - \Phi\left(I_t, K_t\right)\right) - \tau_t^{\text{s}} \xi \theta_t^{\text{FDII-D}} \theta_t^{\text{FDII-T}} K_t,$$

where: $\tau_t = \tau_t^{\text{s}} \left(1 - \theta_t^{\text{FDII-D}} \xi\right)$.

Putting FDII and GILTI together, the necessary conditions become:

$$I_t: \quad \lambda_t = \left(1 - \tau_t\right) \Phi_1\left(I_t, K_t\right) + \left(1 - \Gamma_t^{\text{s}}\right) P_t^K, \tag{A.62}$$
$$\bar{I}_t: \quad \bar{\lambda}_t = \left(1 - \bar{\tau}_t\right) \bar{\Phi}_1\left(\bar{I}_t, \bar{K}_t\right) + \left(1 - \bar{\Gamma}_t^{\text{s}}\right) P_t^{\bar{K}}, \tag{A.63}$$
$$K_t: \quad \dot{\lambda}_t = R_t - \left(1 - \tau_t\right)\left(F_1 - \Phi_2\left(I_t, K_t\right)\right) - \left(1 - \bar{\tau}_t\right) \bar{F}_2, \tag{A.64}$$
$$\bar{K}_t: \quad \dot{\bar{\lambda}}_t = \bar{R}_t - \left(1 - \bar{\tau}_t\right)\left(\bar{F}_1 - \bar{\Phi}_2\left(\bar{I}_t, \bar{K}_t\right)\right) - \left(1 - \tau_t\right) F_2, \tag{A.65}$$
$$\text{where:} \quad R_t = \left(\rho + \delta\right) \lambda_t + \tau_t^{\text{s}} \xi \theta_t^{\text{FDII-D}} \theta_t^{\text{FDII-T}}, \tag{A.66}$$
$$\bar{R}_t = \left(\rho + \delta\right) \bar{\lambda}_t - \theta_t^{\text{GILTI-T}} \left(\bar{\tau}_t - \bar{\tau}_t^{\text{s}}\right) / \left(1 - \bar{\tau}_t^{\text{s}}\right). \tag{A.67}$$

In particular, equations (A.62) to (A.65) characterize exactly the same dynamic system as equations (6) and (7) and their foreign counterparts, but with the redefined effective marginal tax rates and user costs. The user cost terms can be rewritten as:

$$R_t = \left(\rho + \delta\right)\left(\left(1 - \tau_t\right) \Phi_1\left(I_t, K_t\right) + \left(1 - \Gamma_t\right) P_t^K\right), \; \Gamma_t \equiv \Gamma_t^{\text{s}} - \frac{\tau_t^{\text{s}} \xi \theta_t^{\text{FDII-D}} \theta_t^{\text{FDII-T}}}{\left(\rho + \delta\right) P_t^K},$$
$$\bar{R}_t = \left(\rho + \delta\right)\left(\left(1 - \bar{\tau}_t\right) \bar{\Phi}_1\left(\bar{I}_t, \bar{K}_t\right) + \left(1 - \bar{\Gamma}_t\right) P_t^{\bar{K}}\right), \; \bar{\Gamma}_t \equiv \bar{\Gamma}_t^{\text{s}} + \frac{\left(\bar{\tau}_t - \bar{\tau}_t^{\text{s}}\right) \theta_t^{\text{GILTI-T}}}{\left(1 - \bar{\tau}_t^{\text{s}}\right)\left(\rho + \delta\right) P_t^{\bar{K}}}.$$

In this sense, the investment incentives of GILTI go through the foreign marginal tax rate and cost of capital and the incentives of FDII go through the domestic marginal tax rate and cost of capital. The impacts on the costs of capital arise because both GILTI and FDII exempt profits up to 10% of tangible capital, which implies that marginal changes in the tangible capital stock directly affect taxes owed.

Our measurement of the GILTI incentives requires additional clarifications. First, IRC 904 limits FTCs to the foreign income share of tax owed calculated as if all global income were subject to U.S. tax. In making this calculation, firms must reallocate a part of certain U.S. expenses (such as overhead or interest expenses) to their foreign subsidiaries.[9] This expense reallocation can reduce allowable FTCs by enough that firms with foreign tax rates well above the purported 13.125% limit still owe GILTI tax. However, for such firms, their GILTI tax depends only on the reallocated expenses; denoting the reallocated expenses by X_t, the FTC limitation is:

$$\tau_t^{\text{s}} \left(1 - \theta_t^{\text{GILTI-D}}\right)\left(\bar{F}\left(\bar{K}_t, K_t, \bar{Z}_t\right) - \Phi\left(\bar{I}_t, \bar{K}_t\right) - \theta_t^{\text{GILTI-T}} \bar{K}_t / \left(1 - \bar{\tau}_t^{\text{s}}\right)\right) - \tau_t^{\text{s}} X_t,$$

[9]See IRS form 1118 Schedule A column 15 and Schedule B lines 7-11 (revision 2018).

and hence if this limit binds their GILTI tax is simply $\tau_t^s X_t$ and in particular does not depend on $\bar{K}_t$. We therefore code these firms as not subject to GILTI. Second, for the reasons discussed in the main text, our preferred implementation sets $\bar{\tau}_t^s = 0$ in determining the effect of GILTI on $\bar{R}_t$ in equation (A.67).

B.9 Labor Market Clearing Condition

This appendix provides the labor market clearing condition. As a preliminary step, using $\mathbb{Q}_t = \int_i Y_{i,t} di$ (recall the normalization of the aggregate price to one), write:

$$\mathbb{Q}_t = (1-\alpha_L-\alpha_M)^{-1}\int_i Z_{i,t}\mathcal{K}_{i,t}^{\alpha} di = \left(\left(\frac{\alpha_M}{P_t^M}\right)^{\frac{\alpha_M}{1-(\alpha_L+\alpha_M)}}\left(\frac{\alpha_L}{P_t^L}\right)^{\frac{\alpha_L}{1-(\alpha_L+\alpha_M)}}\int_i A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}}\mathcal{K}_{i,t}^{\alpha} di\right)^{\frac{\mathcal{M}(1-(\alpha_L+\alpha_M))}{1-\mathcal{M}(\alpha_L+\alpha_M)}}.$$

Then:

$$Z_{i,t} = (1-\alpha_L-\alpha_M)\left(\frac{\alpha_M}{P_t^M}\right)^{\frac{\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}}\left(\frac{\alpha_L}{P_t^L}\right)^{\frac{\mathcal{M}\alpha_L}{1-\mathcal{M}(\alpha_L+\alpha_M)}}\left(\int_i A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}}\mathcal{K}_{i,t}^{\alpha} di\right)^{\frac{\mathcal{M}-1}{1-\mathcal{M}(\alpha_L+\alpha_M)}} A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}}.$$

We assume an aggregate labor supply curve $L_t/L_t^* = \left(P_t^L\right)^{\nu_L}$. For firm i with capital $\{K_{i,t}, \bar{K}_{i,t}\}$, technology $\{A_{i,t}, \bar{A}_{i,t}\}$, and taking as given the wages $\{P_t^L, \bar{P}_t^L\}$, domestic labor demand is:

$$\begin{aligned}
L_{i,t} &= \frac{\alpha_L Y_{i,t}}{P_t^L} = \frac{\alpha_L Z_{i,t}\mathcal{K}_{i,t}^{\alpha}}{(1-\alpha_L-\alpha_M)P_t^L} \\
&= \frac{\alpha_L \mathcal{K}_{i,t}^{\alpha}}{P_t^L}\left(\frac{\alpha_M}{P_t^M}\right)^{\frac{\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}}\left(\frac{\alpha_L}{P_t^L}\right)^{\frac{\mathcal{M}\alpha_L}{1-\mathcal{M}(\alpha_L+\alpha_M)}}\left(\int_i A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}}\mathcal{K}_{i,t}^{\alpha} di\right)^{\frac{\mathcal{M}-1}{1-\mathcal{M}(\alpha_L+\alpha_M)}} A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}} \\
&= \left(\frac{\alpha_M}{P_t^M}\right)^{\frac{\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}}(\alpha_L)^{\frac{1-\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}}\left(\int_i A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}}\mathcal{K}_{i,t}^{\alpha} di\right)^{\frac{\mathcal{M}-1}{1-\mathcal{M}(\alpha_L+\alpha_M)}} A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}}\mathcal{K}_{i,t}^{\alpha}\left(P_t^L\right)^{-\frac{1-\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}}.
\end{aligned}$$

Denote the pre-determined part of firm labor demand:

$$X_{i,t}^L = \left(\frac{\alpha_M}{P_t^M}\right)^{\frac{\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}}(\alpha_L)^{\frac{1-\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}}\left(\int_i A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}}\mathcal{K}_{i,t}^{\alpha} di\right)^{\frac{\mathcal{M}-1}{1-\mathcal{M}(\alpha_L+\alpha_M)}} A_{i,t}^{\frac{1}{1-(\alpha_L+\alpha_M)}}\mathcal{K}_{i,t}^{\alpha}.$$

Labor market clearing requires $\int_i L_{i,t} di = \left(\int_i X_{i,t}^L di\right)\left(P_t^L\right)^{-\frac{1-\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}} = \left(P_t^L\right)^{\nu_L} L_t^*$:

$$P_t^L = \left(\frac{\left(\int_i X_{i,t}^L di\right)\left(P_t^L\right)^{-\frac{1-\mathcal{M}\alpha_M}{1-\mathcal{M}(\alpha_L+\alpha_M)}}}{L_t^*}\right)^{1/\nu_L} = \left(\frac{\int_i X_{i,t}^L di}{L_t^*}\right)^{\frac{1-\mathcal{M}(\alpha_L+\alpha_M)}{\nu_L(1-\mathcal{M}(\alpha_L+\alpha_M))+1-\mathcal{M}\alpha_M}}. \tag{A.68}$$

With balanced growth preferences ($\nu_L = 0$), no markup ($\mathcal{M} = 1$), and no materials ($\alpha_M = 0$), equation (A.68) simplifies in our baseline model to:

$$P_t^L = \left(\frac{\int_i X_{i,t}^L di}{L_t^*} \right)^{1-\alpha_L}. \tag{A.69}$$

We impose labor market clearing by guessing a path for P_t^L (starting at the steady state), obtaining $Z_{i,t}$ and hence $\mathscr{K}_{i,t}$ for each portfolio of firms, computing X^L, and then using equation (A.68) to update the guess for the path of P_t^L until convergence.

B.10 Transition Dynamics and Short Versus Long-Run Investment Response

This appendix shows that in the case of no foreign adjustment costs, $\bar{\phi} \to 0$, the short-run and long-run elasticities of investment to the four tax terms all scale by approximately the same factor, denoted χ_{SR}. Furthermore, χ_{SR} is a sufficient statistic for the role of domestic adjustment costs.

Linearized dynamic system. We show these results using a linear approximation of the transition dynamics with quadratic adjustment costs ($\gamma = 1$). Define:

$$h\left(\lambda; \tau, \Gamma, P^K, \phi\right) = \left[\frac{1}{\phi} \left(\frac{\lambda - P^K (1-\Gamma)}{(1-\tau)} \right) \right], \tag{A.70}$$

$$\text{with: } h(\lambda^*) = 0,$$

$$h'(\lambda^*) = \frac{1}{\phi(1-\tau^*)}. \tag{A.71}$$

The dynamic system then takes the form:

$$\text{FOC } (I_t): \quad \dot{K}_t / K_t = h\left(\lambda_t; \tau_t, \Gamma_t, P_t^K, \phi\right), \tag{A.72}$$

$$\text{FOC } (K_t): \quad \dot{\lambda}_t = (\rho + \delta)\lambda_t - (1-\tau_t)(F_1 + ((1/2)h(\lambda_t) + \delta)\phi h(\lambda_t)) - (1-\bar{\tau}_t)\bar{F}_2, \tag{A.73}$$

$$\text{FOC } (\bar{I}_t): \quad \dot{\bar{K}}_t / \bar{K}_t = h\left(\bar{\lambda}_t; \bar{\tau}_t, \bar{\Gamma}_t, P_t^{\bar{K}}, \bar{\phi}\right), \tag{A.74}$$

$$\text{FOC } (\bar{K}_t): \quad \dot{\bar{\lambda}}_t = (\rho + \delta)\bar{\lambda}_t - (1-\bar{\tau}_t)\left(\bar{F}_1 + \left((1/2)h\left(\bar{\lambda}_t\right) + \delta\right)\bar{\phi} h\left(\bar{\lambda}_t\right)\right) - (1-\tau_t)F_2. \tag{A.75}$$

We take a Taylor expansion in the neighborhood of the steady state. Let $k_{t,s} = (K_t - K_s)/K_s \approx \log(K_t/K_s)$ denote the percent deviation of K_t from K_s. In particular, $k_{t,*} = (K_t - K^*)/K^*$ is the deviation from the new steady state and $k_{*,0} = (K^* - K_0)/K_0$ is the long-run percent change, simply denoted by k elsewhere in the manuscript. Note that $\dot{k}_{t,*} = \dot{K}_t / K^*$. The linear system associated with the Taylor expansion is:[10]

$$\begin{pmatrix} \dot{k}_{t,*} \\ \dot{\lambda}_t \\ \dot{\bar{k}}_{t,*} \\ \dot{\bar{\lambda}}_t \end{pmatrix} = \mathbf{A} \begin{pmatrix} k_{t,*} \\ \lambda_t - \lambda^* \\ \bar{k}_{t,*} \\ \bar{\lambda}_t - \bar{\lambda}^* \end{pmatrix}, \tag{A.76}$$

with:

$$\mathbf{A} = \begin{pmatrix} 0 & h'(\lambda^*) & 0 & 0 \\ a_{21} & \rho & a_{23} & 0 \\ 0 & 0 & 0 & h'\left(\bar{\lambda}^*\right) \\ a_{41} & 0 & a_{43} & \rho \end{pmatrix},$$
$$a_{21} = -(1-\tau^*)K^*F_{11}\left(K^*,\bar{K}^*;Z^*\right) - (1-\bar{\tau}^*)K^*\bar{F}_{22}\left(\bar{K}^*,K^*;\bar{Z}^*\right) > 0,$$
$$a_{23} = -(1-\tau^*)\bar{K}^*F_{12}\left(K^*,\bar{K}^*;Z^*\right) - (1-\bar{\tau}^*)\bar{K}^*\bar{F}_{21}\left(\bar{K}^*,K^*;\bar{Z}^*\right),$$
$$a_{41} = -(1-\bar{\tau}^*)K^*\bar{F}_{12}\left(\bar{K}^*,K^*;\bar{Z}^*\right) - (1-\tau^*)K^*F_{21}\left(K^*,\bar{K}^*;Z^*\right) = a_{23}\chi_K^{-1},$$
$$a_{43} = -(1-\bar{\tau}^*)\bar{K}^*\bar{F}_{11}\left(\bar{K}^*,K^*;\bar{Z}^*\right) - (1-\tau^*)\bar{K}^*F_{22}\left(K^*,\bar{K}^*;Z^*\right) > 0.$$

The two stable eigenvalues of **A** are:

$$d_1 = \frac{\rho}{2} - \sqrt{\left(\frac{\rho}{2}\right)^2 + \frac{\left(h'(\lambda^*)a_{21} + h'\left(\bar{\lambda}^*\right)a_{43}\right) + \sqrt{\left(h'(\lambda^*)a_{21} + h'\left(\bar{\lambda}^*\right)a_{43}\right)^2 - 4h'(\lambda^*)h'\left(\bar{\lambda}^*\right)\left(a_{21}a_{43} - a_{23}a_{41}\right)}}{2}},$$
$$d_2 = \frac{\rho}{2} - \sqrt{\left(\frac{\rho}{2}\right)^2 + \frac{\left(h'(\lambda^*)a_{21} + h'\left(\bar{\lambda}^*\right)a_{43}\right) - \sqrt{\left(h'(\lambda^*)a_{21} + h'\left(\bar{\lambda}^*\right)a_{43}\right)^2 - 4h'(\lambda^*)h'\left(\bar{\lambda}^*\right)\left(a_{21}a_{43} - a_{23}a_{41}\right)}}{2}},$$

with the eigenvector associated with the n^{th} eigenvalue:

$$\mathbf{f}_n = \begin{pmatrix} 1 \\ \frac{d_n}{h'(\lambda^*)} \\ -\left(a_{43}h'\left(\bar{\lambda}^*\right) + (\rho - d_n)d_n\right)^{-1} a_{41}h'\left(\bar{\lambda}^*\right) \\ -\left(a_{43}h'\left(\bar{\lambda}^*\right) + (\rho - d_n)d_n\right)^{-1} a_{41}d_n \end{pmatrix}.$$

The linearized solution is:

$$k_{t,*} = \frac{c_1}{k_{0,*}}k_{0,*}e^{d_1 t} + \frac{c_2}{k_{0,*}}k_{0,*}e^{d_2 t} = \left(s_{k,d}e^{d_1 t} + \left(1 - s_{k,d}\right)e^{d_2 t}\right)k_{0,*}, \tag{A.77}$$
$$\bar{k}_{t,*} = \frac{c_1\mathbf{f}_1(3)}{\bar{k}_{0,*}}\bar{k}_{0,*}e^{d_1 t} + \frac{c_2\mathbf{f}_2(3)}{\bar{k}_{0,*}}\bar{k}_{0,*}e^{d_2 t} = \left(s_{\bar{k},d}e^{d_1 t} + \left(1 - s_{\bar{k},d}\right)e^{d_2 t}\right)\bar{k}_{0,*}, \tag{A.78}$$
$$\text{where: } s_{k,d} \equiv \frac{c_1}{k_{0,*}} = \frac{\mathbf{f}_2(3) - \chi_{k_{0,*}}}{\mathbf{f}_2(3) - \mathbf{f}_1(3)} = \left(\frac{a_{23}h'(\lambda^*)}{d_2d_3 - d_1d_4}\right)\left(\frac{a_{41}h'\left(\bar{\lambda}^*\right)}{a_{43}h'\left(\bar{\lambda}^*\right) + d_2d_3} + \chi_{k_0}\right),$$

[10] To ease notation, we omit general equilibrium terms relating to changes in Z. These do not change the conclusions of this section.

$$s_{\bar{k},d} \equiv \frac{c_1 \mathbf{f}_1(3)}{\bar{k}_{0,*}} = \frac{\mathbf{f}_1(3)\left(\mathbf{f}_2(3)\chi_{k_{0,*}}^{-1} - 1\right)}{\mathbf{f}_2(3) - \mathbf{f}_1(3)}.$$

Thus, the weighted average $s_{k,d}e^{d_1 t} + \left(1 - s_{k,d}\right)e^{d_2 t}$ determines the speed of convergence of domestic capital. Furthermore:

$$\dot{k}_{t,0} = \frac{\dot{K}_t}{K_0} = \left(\frac{K^*}{K_0}\right)\dot{k}_{t,*} = \left(\frac{K^*}{K_0}\right)\left(s_{k,d}d_1 e^{d_1 t} + \left(1 - s_{k,d}\right)d_2 e^{d_2 t}\right)k_{0,*} = -\left(s_{k,d}d_1 e^{d_1 t} + \left(1 - s_{k,d}\right)d_2 e^{d_2 t}\right)k_{*,0},$$

where as in equation (15):

$$k_{*,0} = \frac{\omega_{k,r}\hat{\Gamma} + \left(1 - \omega_{k,r}\right)\hat{\hat{\Gamma}} + \omega_{k,\tau}\hat{\tau} + \left(1 - \omega_{k,\tau}\right)\hat{\hat{\tau}}}{1 - \alpha}.$$

For example, the short-run response of net investment is:

$$\dot{k}_{0,0} = \dot{K}_0 / K_0 = -\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)k_{*,0}. \tag{A.79}$$

Short-run versus long-run elasticities. We now relate the tax elasticities of short-run investment, $d\ln I_0$, to the long-run change, $k_{*,0}$. Using $d\ln I_0 = dI_0/I_0 = d\left(\dot{K}_0 + \delta\right)/I_0 = (1/\delta)\,d\dot{K}_0/K_0 = (1/\delta)\,d\dot{k}_{0,0}$, the short-run elasticities are given by the (scaled by $1/\delta$) partial derivatives of equation (A.79):

$$\frac{\partial \dot{k}_{0,0}}{\partial \hat{\Gamma}} = -\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)\frac{\partial k_{*,0}}{\partial \hat{\Gamma}} - k_{*,0}\frac{\partial\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)}{\partial \hat{\Gamma}}, \tag{A.80}$$

$$\frac{\partial \dot{k}_{0,0}}{\partial \hat{\hat{\Gamma}}} = -\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)\frac{\partial k_{*,0}}{\partial \hat{\hat{\Gamma}}} - k_{*,0}\frac{\partial\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)}{\partial \hat{\hat{\Gamma}}}, \tag{A.81}$$

$$\frac{\partial \dot{k}_{0,0}}{\partial \hat{\tau}} = -\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)\frac{\partial k_{*,0}}{\partial \hat{\tau}} - k_{*,0}\frac{\partial\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)}{\partial \hat{\tau}}, \tag{A.82}$$

$$\frac{\partial \dot{k}_{0,0}}{\partial \hat{\hat{\tau}}} = -\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)\frac{\partial k_{*,0}}{\partial \hat{\hat{\tau}}} - k_{*,0}\frac{\partial\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)}{\partial \hat{\hat{\tau}}}. \tag{A.83}$$

In each of equations (A.80) to (A.83), the left hand side is the (scaled by $1/\delta$) short-run investment elasticity and the first term on the right hand side is the long-run elasticity multiplied by a common scalar $-\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)$. However, the second term in each equation differs because the derivatives of $\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)$ with respect to different tax policies are not all the same. Specifically, $\left(s_{k,d}d_1 + \left(1 - s_{k,d}\right)d_2\right)$ is a function of the new steady state and hence the derivatives depend on the long-run elasticities, which vary across tax policies.

Equations (A.80) to (A.83) simplify in the case of no foreign adjustment costs, $\bar{\phi} \to 0$, since

$\lim_{\bar{\phi}\to 0} s_{k,d} d_1 + \left(1 - s_{k,d}\right) d_2 = d_2$.[11] Applying this limit, for each $x \in \left\{\hat{\Gamma}, \hat{\bar{\Gamma}}, \hat{\tau}, \hat{\bar{\tau}}\right\}$ we obtain:

$$\lim_{\bar{\phi}\to 0} \frac{\partial \dot{k}_{0,0}}{\partial x} = -d_2 \frac{\partial k_{*,0}}{\partial x} - k_{*,0} \frac{\partial d_2}{\partial x}, \tag{A.84}$$
$$\text{where: } \lim_{\bar{\phi}\to 0} d_2 = \frac{\rho}{2} - \sqrt{\left(\frac{\rho}{2}\right)^2 + \frac{1}{\phi\left(1-\tau\right)}\left(\frac{a_{21}a_{43} - a_{23}a_{41}}{a_{43}}\right)} < 0.$$

The first term in equation (A.84) is a common scalar $-d_2$. The second term still varies across tax variables but only involves derivatives of d_2 and hence third derivatives of the production function around the new steady state (since $a_{21}, a_{23}, a_{41}, a_{43}$ involve second derivatives of F and $\bar{F}$). Since these third derivatives are small relative to the first term, all short-run elasticities scale to the long-run elasticities by approximately the same value, given by d_2. Intuitively, the difference between the ratio of short-run to long-run elasticities to e.g. Γ and $\bar{\Gamma}$ arises primarily because both ratios depend on the magnitude of domestic adjustment costs but the short-run elasticity to $\bar{\Gamma}$ also depends on the foreign adjustment cost. When $\bar{\phi} \to 0$, the only remaining difference occurs because foreign capital does not quite jump immediately to its long-run value due to the feedback from growing domestic capital to foreign capital. This feedback effect is small. In our calibration, the ratio of the short-to-long run investment elasticity varies by less than 5% across the tax variables.

The common scaling property is exact for domestic-only firms:[12]

$$\frac{\partial \dot{k}_{0,0}(\text{domestic only})}{\partial x} = -\left(d_2 + k_{*,0}\frac{\partial d_2}{\partial k_{*,0}}\right)\frac{\partial k_{*,0}}{\partial x}, \tag{A.85}$$
$$d_2(\text{domestic only}) = \frac{\rho}{2} - \sqrt{\left(\frac{\rho}{2}\right)^2 + \frac{a_{21}}{\phi\left(1-\tau\right)}} = \frac{\rho}{2} - \sqrt{\left(\frac{\rho}{2}\right)^2 - \frac{K^* F_{KK}}{\phi}}.$$

Because the long-run elasticities are equal for domestic-only firms, $\partial k_{*,0}/\partial \hat{\Gamma} = -\partial k_{*,0}/\partial \hat{\tau}$, the term $-\left(d_2 + k_{*,0}\frac{\partial d_2}{\partial k_{*,0}}\right)$ is the common short-to-long-run ratio. Furthermore, since $k_{*,0}\frac{\partial d_2}{\partial k_{*,0}} \approx 0$, the ratio is simply approximately $-d_2$. By the same logic, allowing for adjustment costs to labor would not break common scaling because they would not affect the long-run elasticities of capital to the tax variables.

Ratio χ_{SR}. The average deviation of investment over period 0 to T relative to date 0 is:

$$\int_0^T \left(\frac{\dot{K}_t + \delta\left(K_t - K_0\right)}{T\delta K_0}\right) dt = \frac{1}{\delta T}\int_0^T \left(\delta k_{t,0} - \left(s_{k,d} d_1 e^{d_1 t} + \left(1 - s_{k,d}\right) d_2 e^{d_2 t}\right) k_{*,0}\right) dt$$
$$\approx \frac{1}{\delta T}\int_0^T \left(\delta\left(k_{t,*} + k_{*,0}\right) - \left(s_{k,d} d_1 e^{d_1 t} + \left(1 - s_{k,d}\right) d_2 e^{d_2 t}\right) k_{*,0}\right) dt$$

[11] Because $\lim_{\bar{\phi}\to 0} d_1 \to -\sqrt{h'\left(\bar{\lambda}^*\right) a_{43}} \to -\infty$, proving this limit requires application of L'Hopital's rule.

[12] Equation (A.85) applies the chain rule to equation (A.84) since for domestic-only firms d_2 does not directly depend on tax variables. The expression for d_2 in the domestic-only case uses $a_{23} = a_{41} = a_{43} = 0$ for domestic-only firms and the definition of a_{21}.

$$\approx k_{*,0} - \frac{k_{*,0}}{\delta T}\int_0^T \left(\delta\left(s_{k,d}e^{d_1 t} + \left(1-s_{k,d}\right)e^{d_2 t}\right) + \left(s_{k,d}d_1 e^{d_1 t} + \left(1-s_{k,d}\right)d_2 e^{d_2 t}\right)\right)dt$$

$$= k_{*,0}\left(1 - s_{k,d}\left(1+\frac{\delta}{d_1}\right)\left(\frac{e^{d_1 T}-1}{\delta T}\right) - \left(1-s_{k,d}\right)\left(1+\frac{\delta}{d_2}\right)\left(\frac{e^{d_2 T}-1}{\delta T}\right)\right).$$

The long run deviation of investment is:

$$\frac{\delta\left(K^* - K_0\right)}{\delta K_0} = k_{*,0}.$$

Thus, the ratio is:

$$\chi_{SR} = 1 - s_{k,d}\left(1+\frac{\delta}{d_1}\right)\left(\frac{e^{d_1 T}-1}{\delta T}\right) - \left(1-s_{k,d}\right)\left(1+\frac{\delta}{d_2}\right)\left(\frac{e^{d_2 T}-1}{\delta T}\right).$$

In particular, as $\bar{\phi} \to 0$, $\chi_{SR} \to 1-\left(1+\frac{\delta}{d_2}\right)\left(\frac{e^{d_2 T}-1}{\delta T}\right)$. Inverting this expression gives the domestic adjustment cost as a function of χ_{SR}.

B.11 Adjustment Cost Moments

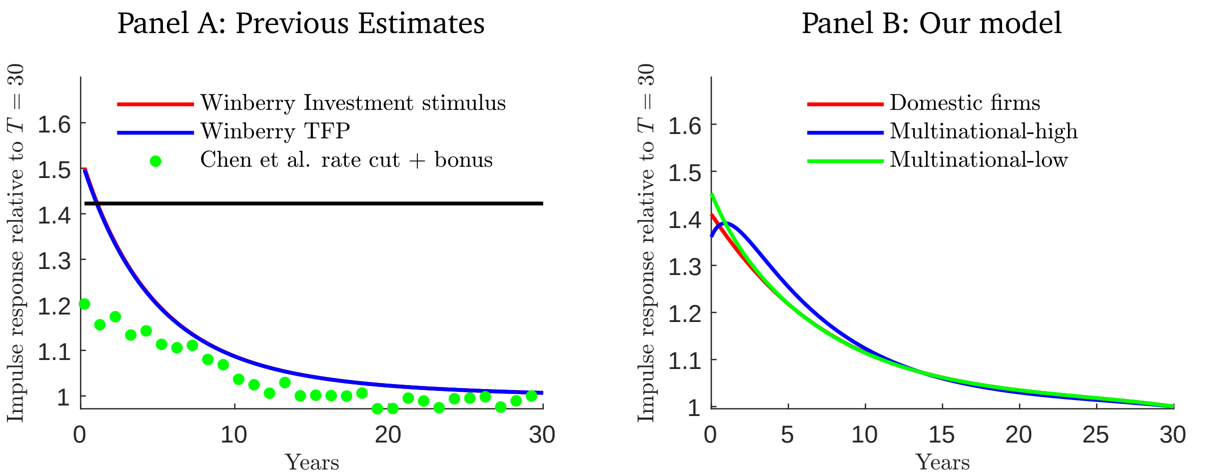
This appendix describes our analysis of the Winberry (2021) calibration. Winberry (2021) estimates a model of fixed and convex adjustment costs to match interest rate dynamics and, crucially, three targets of the firm-level investment distribution based on the SOI sample over 1998-2010, drawn from Zwick and Mahon (2017): the average investment rate, the standard deviation of investment rates, and the fraction of firm-years with an investment rate above 20%.

Using the Winberry (2021) replication code, Panel A of Appendix Figure B.1 reports first-order impulse responses of log investment to a TFP shock and to an investment stimulus shock scaled relative to a value of 1 after 30 years. Because our empirical exercise obtains firm-level investment responses to a permanent tax change, we plot these impulse responses holding the aggregate wage and interest rate fixed and setting the quarterly persistence of each shock to 0.9999. The impulse responses to a TFP and investment stimulus shock have exactly the same shape, indicating that the common scaling property derived above for a model with only convex adjustment costs carries over to models with fixed costs of adjustment as well.[13] The dashed horizontal lines shows the ratio of average log investment over the first 8 quarters (our empirical sample period) to investment after 30 years. The green dots in Panel A report the corresponding impulse response on the Chen et al. (2023) model.

Panel B reports the partial equilibrium impulse responses in our model. By construction, they initialize around the level of 1.4 found in our analysis of Winberry (small differences arise because we obtain values of ϕ using the first-order solution). The shape similarities across the domestic and multinational firms reflect the common scaling property. The small hump

[13] Of course, with fixed costs of adjustment the shape of the impulse response function is in general not invariant to the magnitude of the shock. This scale dependence disappears in the first order approximations shown in Appendix Figure B.1 and will generally be small when idiosyncratic shocks are dominant in determining when firms adjust.

Figure B.1: Impulse Responses of Firm-Level Investment



Notes: Panel A shows the partial equilibrium impulse response of log investment scaled to equal 1 after 30 years, separately for the Winberry (2021) model for investment stimulus or TFP changes and for the Chen et al. (2023) model for a combination of a rate cut and bonus depreciation. The horizontal black line shows the average response in Winberry over the first two years. Panel B reports the same impulse responses in our model.

in the multinational-high illustrates the limit of the common scaling property — as domestic capital rises, the additional response of foreign capital due to complementarity breaks common scaling, but this departure is quantitatively small.

B.12 Interpretation of a Levels Regression

This appendix considers the common regression specification of the investment-capital ratio on the level of the "tax term" in the context of our model. For simplicity, we restrict attention to domestic-only firms.

A common regression specification is:

$$\frac{I_{j,t}}{K_{j,t}} = c_1 TT_{j,t} + \alpha_j + \nu_t + e_{j,t},$$

where $TT_{j,t} = \left(1-\Gamma_{j,t}\right)/\left(1-\tau_{j,t}\right)$ denotes the "tax term." It simplifies matters to take first differences and consider the specification around a tax change at date 0:

$$\frac{I_{j,0^+}}{K_{j,0}} - \frac{I_{j,0}}{K_{j,0}} = c_0 + c_1\left(TT_j^* - TT_{j,0}\right) + \Delta e_{j,t}, \tag{A.86}$$

where $X_{j,0^+}$ denotes the value of a variable just after the tax change and TT_j^* the new tax term. We now provide an expression for c_1.

In the case of domestic-only firms, the system of (A.76) becomes:

$$\begin{pmatrix} \dot{k}_{t,*} \\ \dot{\lambda}_t \end{pmatrix} = \mathbf{A}\begin{pmatrix} k_{t,*} \\ \lambda_t - \lambda^* \end{pmatrix}, \tag{A.87}$$

with:

$$\mathbf{A} = \begin{pmatrix} 0 & h'(\lambda^*) \\ a_{21} & \rho \end{pmatrix},$$
$$a_{21} = -(1-\tau^*) K^* F_{11}(K^*; Z^*) > 0.$$

The solution is:

$$k_{t,*} = k_{0,*} e^{d_1 t}, \tag{A.88}$$
$$\lambda_t - \lambda^* = k_{0,*} d_1 \phi (1-\tau^*) e^{d_1 t}, \tag{A.89}$$

where $d_1 = \frac{\rho}{2} - \sqrt{\left(\frac{\rho}{2}\right)^2 - \phi^{-1} K^* F_{11}(K^*; Z^*)}$ is the stable eigenvalue. Furthermore, the steady state of the (domestic-only version of the) system equations (6) and (7) gives $k_{0,*} = \left(\frac{1}{1-\alpha}\right) \log(TT^*/TT_0)$, $\lambda_0 = 1 - \Gamma_0$, $\lambda^* = 1 - \Gamma^*$.

We now obtain an expression for c_1. Using equation (A.89) and the steady-state conditions gives an expression for the impact change in after-tax λ:

$$\frac{\lambda_{0^+}}{1-\tau^*} - \frac{\lambda_0}{1-\tau_0} = (TT^* - TT_0) + \left(\frac{d_1 \phi}{1-\alpha}\right) \log(TT^*/TT_0). \tag{A.90}$$

FOC (6) relates equation (A.86) to the model:

$$\frac{I_{0^+}}{K_0} - \frac{I_0}{K_0} = \frac{1}{\phi}\left(\frac{\lambda_{0^+}}{1-\tau^*} - \frac{\lambda_0}{1-\tau_0} - (TT^* - TT_0)\right). \tag{A.91}$$

Combining equations (A.86), (A.90) and (A.91), we find:

$$\begin{aligned} c_1 &= \frac{Cov\left(\frac{I_{0^+}}{K_0} - \frac{I_0}{K_0}, TT^* - TT_0\right)}{Var(TT^* - TT_0)} \\ &= \frac{Cov\left(\frac{1}{\phi}\left((TT^* - TT_0) + \left(\frac{d_1\phi}{1-\alpha}\right)\log(TT^*/TT_0) - (TT^* - TT_0)\right), TT^* - TT_0\right)}{Var(TT^* - TT_0)} \\ &= \left(\frac{d_1}{1-\alpha}\right) \frac{Cov(\log(TT^*/TT_0), TT^* - TT_0)}{Var(TT^* - TT_0)} \\ &\approx \left(\frac{d_1}{1-\alpha}\right) \times \frac{1}{TT_0}. \end{aligned} \tag{A.92}$$

The final expression in equation (A.92) contains a much more complicated mapping of parameters and policy variables into the regression coefficient than our preferred specification (see e.g. Auerbach and Hassett, 1992, for an example of this approach). Moreover, because around a tax reform firm-level heterogeneity in TT_0 likely is correlated with $TT^* - TT_0$, a cross-sectional regression need not even produce an appropriate weighted-average of $\left(\frac{d_1}{1-\alpha}\right) \times \frac{1}{TT_0}$.

A variant of equation (A.86) involves including Tobin's Q (scaled by $1-\tau$) as a separate regressor as in Desai and Goolsbee (2004). On the one hand, with quadratic adjustment costs, inspection of equation (6) shows that the regression coefficients on both $\left(\lambda_{j,0^+} - \lambda_{j,0}\right) / \left(1 - \tau_{j,0}\right)$

and $\left(TT_j^* - TT_{j,0}\right)$ equal $1/\phi$, the inverse of the adjustment cost scalar. However, if the change in λ is measured with any error (e.g., because marginal Q is not observed), this approach does not consistently estimate coefficients with any clear structural interpretation.

C Data Definitions and Variable Construction

C.1 Variable Definitions in U.S. Treasury Tax Data

For firm- and industry-level variables, we use the following lines from the following tax forms: 1120, 1118, 1125-A, 3800, 4562, and 5471.

- Investment
  - Sum of Form 4562, Page 1, part I lines 7 and 8, part II line 14, part III lines 19a(c)-19i(c) and 20a(c)-20c(c), and part IV line 12.
- Capital
  - Capital is depreciable assets less accumulated depreciation.
  - Line 10a(c) less line 10b(c) on Form 1120, Page 5, Schedule L.
- Foreign Capital
  - Line 8a column b less line 8b column b on Form 5471, Schedule F.
- Export share ξ
  - Section 250 (FDII) deduction reported on 1120 schedule C divided by 0.375× taxable income (1120 line 30) less 0.1× capital (1120 schedule L line 10a less 10b).
- Liquid Assets
  - Liquid assets are cash, government obligations, and tax-exempt securities.
  - Sum of lines 1(d), 4(d), and 5(d) on Form 1120, Page 5, Schedule L.
- Revenue
  - Line 1c on Form 1120, Page 1.
- Profits
  - Line 11 less line 27 on Form 1120, Page 1.
- Sales
  - Line 11 on Form 1120, Page 1 plus line 8 on Form 1125-A.
- Earnings before interest, taxes, and depreciation (EBITD)

  - We calculate EBITD as the sum of profits, interest paid, and net depreciation.
  - Sum of lines 11, 18, 20, less line 27 on Form 1120, Page 1.

- Labor Compensation

  - Labor compensation is compensation of officers, salaries and wages, pension, profit-sharing, and other plans, employee benefit programs, and cost of labor.
  - Sum of lines 12, 13, 23, 24 on Form 1120, Page 1, and line 3 on Form 1125-A.

- Taxable Income

  - Line 30 on Form 1120, Page 1.

- Net Foreign Income

  - Line 5a on Form 1120M-3, Page 1, part I.

- Net Foreign Loss

  - Line 5b on Form 1120M-3, Page 1, part I.

- Profits Margin

  - Profits divided by sales.
  - Line 11 less line 27 from Form 1120, Page 1; all divided by the sum of line 11 on Form 1120, Page 1, and line 8 on Form 1125-A.

- EBITD Margin

  - EBITD divided by sales.
  - Sum of lines 11, 18, 20, less line 27 on Form 1120, Page 1.; all divided by the sum of line 11 on Form 1120, Page 1, and line 8 on Form 1125-A.

- Dividends

  - Line 19(a) on Form 1120, Page 2, Schedule C.

- Company age

  - Difference between year of tax record and line C on Form 1120, Page 1.

- Industry

  - SOI Industry Code determined by SOI from principal business activity code (line 2a on Form 1120, Page 3, Schedule K), prior year data, and references.

- Marginal Effective Tax Rate (METR)

  - Authors' calculations.

- GILTI Tax
  - GILTI calculations rely on fields on Form 1118 identified with the separate category code "951A." We identify firms as GILTI payers if the GILTI inclusion less 50% deduction times 21% is greater than the separate foreign tax credit. However, we do not assign GILTI tax rates to firms paying GILTI due to credit limitations. These are GILTI payers with foreign taxes before credit limitation greater than the credit limitation.
  - GILTI inclusion less 50% deduction is Schedule A, 3(a) plus 3(b) less 14(c).
  - The separate foreign tax credit is Schedule B, line 12.
  - Foreign taxes before credit limitation is Schedule B, line 6.
  - The credit limitation is Schedule B, line 11.
- Form 5471 Tax Rate
  - The average of total amount of income, war profits, and excess profits taxes paid or accrued in USD divided by the amount of total foreign income minus the total of foreign deductions, and the total amount of income, war profits, and excess profits taxes paid or accrued in USD divided by the amount of current earnings and profits in USD.
  - Average of Schedule E, line 8 divided by Schedule C, line 18, column 2 and Schedule E, line 8 divided by Schedule H, line 5d; all on Form 5471.
- Alternative Minimum Tax
  - Line 14 on Form 4626.
- Average Tax Rate
  - Equal to the total tax settlement less net section 965 tax liability paid, divided by the sum of taxable income, labor compensation, and net depreciation.
  - Line 11 less line 12 on Form 1120, Page 3, Schedule J; all divided by the sum of lines 12, 13, 20 23, 24, 30 on Form 1120, Page 1, and line 3 on Form 1125-A.
- Net Operating Loss Carryforwards
  - Schedule K, line 12 on Form 1120.
- General Business Credits
  - Schedule J, line 5c for credits used.
  - Sum of Form 3800, Part 1, line 6; Part II, line 25; and Part II, line 36 for credits available.
- Foreign Tax Credits
  - Schedule J, line 5a for credits used.

- Domestic Production Activities Deduction
  - Line 25 on Form 1120 prior to TCJA, disallowed post-TCJA.

C.2 Economic Depreciation Controls

We use data from the Bureau of Economic Analysis (BEA) on "Implied Rates of Depreciation for Private Nonresidential Fixed Assets" and the "Net Stock of Private Nonresidential Fixed Assets" to obtain an industry-by-year level measure of economic depreciation. In our analysis, industry is defined at the 3-digit NAICS level. The construction for a given year is as follows:

- The BEA provides data on implied depreciation rates at the BEA Code (a form of industry code)-by-asset code level.
- For each BEA Code, we compute an economic depreciation rate equal to the weighted average of the implied rates for asset codes EQ00 (Equipment) and ST00 (Structures).
  - The weights are given by the BEA Code-specific values of $\frac{\text{Net Stock in EQ00}}{\text{(Net Stock in EQ00)} + \text{(Net Stock in ST00)}}$ and $\frac{\text{Net Stock in ST00}}{\text{(Net Stock in EQ00)} + \text{(Net Stock in ST00)}}$, respectively.
- We then crosswalk the BEA Codes to 3-Digit NAICS Codes using a crosswalk provided by the BEA.
  - Certain 3-digit NAICS codes are associated with more than one BEA Code. In that case, we compute a weighted average of the BEA Code-specific economic depreciation rates.
  - The weights are given by BEA Code-specific total net stock in equipment and structures (the denominator which appears in the weights defined above).

C.3 Definitions of Control Variables for Robustness Table

- 3-digit NAICS code
  - First 3 digits of the NAICS code of the firm. Used to control for industry fixed effects.
- 4-digit NAICS code
  - First 4 digits of the NAICS code of the firm. Used to control for industry fixed effects.
- Trade Shock Controls from Flaaen and Pierce (2019)
  - Cumulative new tariff rate import share of consumption.
  - Cumulative new tariff rate export share of output.
  - Cumulative new tariff share of costs.
- Pre-period Capital
  - Capital as defined above, but before 2018. Used as a control for firm size.

- Pre-period Investment
  - Investment as defined above, but before 2018. Used to control for lagged investment.
- Intangible Capital
  - Defined as research expenses divided by the sum of research expenses and investment. Divided into deciles for use a control for intangible capital.
  - Research expenses are defined as the sum of lines 9 and 28 on Form 6765: qualified expenses for credit and qualified expenses for alternative simplified credit, respectively.
- Toll Tax Paid
  - Flag for positive toll tax. Used as a control.
  - Flag for positive value in line 12 on Form 1120, Page 3, Schedule J.

C.4 Additional Discussion of METR and GILTI Calculations

To estimate marginal effective tax rates (METRs) we simulate future income, deductions, and credits using firm-specific parameters. These parameters are estimated using a panel of tax return data from 2004 to 2016 for firms that appear in the SOI corporate sample in base years 2015 and 2016.[14] In years where the firm does not appear in the corporate sample, we supplement with information from the population of Form 1120 filings.

For each firm, we calculate the standard deviation of year-over-year change in profits, or net income. We then simulate income trajectories 20 years into the future where year-over-year changes in income are drawn from a normal distribution with mean zero and the firm's calculated standard deviation. Firms begin the simulation with the observed stock of net operating loss (NOL) carryforwards in the base year. Firms carry forward losses and deduct them against income in future years. We do not model NOL carrybacks for computational tractability and because most firms choose not to amend prior tax returns to carry back losses (Zwick, 2021).

In evaluating out-of-sample prediction, we initially found that some firms are assigned a probability of switching between profit and loss that is too low. Further, we observe that losses are less persistent than gains, an asymmetry not captured by our standard deviation measure. To better match observed income dynamics, we make two adjustments to the simulated change in income. First, the standard deviation used to simulate changes in income is restricted to a minimum of half of the absolute value of base year net income. This ensures each firm has a non-trivial chance of switching between profit and loss. Second, in years immediately following losses, we assign change in income from a distribution where the standard deviation is doubled. This better matches the observed asymmetrical income volatility following profit or loss.

We calculate historical take-up of credits and deductions in two parts. We first calculate a binary take-up rate as the share of years in which the firm claimed the credit or deduction

[14] In robustness analysis, we construct "endogenous" METRs using 2018 and 2019 as base years and instrument these with the METRs derived from pre-TCJA values.

conditional on having positive tax liability after carryforwards but before credits. For General Business Credits (GBCs) and the Domestic Production Activity Deduction (DPAD), claiming rates are approximately zero for firms with no regular tax liability before credits.

In the second step, we calculate firm-specific credit or deduction amounts conditional on claiming. For DPAD, we scale claimed amounts by income after carryforwards, then take logs. We then calculate the firm-level mean and standard deviation of log values. For GBCs we assign the log mean and standard deviation of credits available as opposed to credits claimed because the repeal of corporate AMT relaxes some of the limitations on use of GBCs following TCJA.

For GBCs and DPAD, we assign each simulated firm-year a binary indicator for claiming the credit or deduction set to 1 with probability equal to the firm-specific take-up rate. We also assign a conditional credit or deduction amount drawn from a lognormal distribution with firm-specific mean and standard deviation. To estimate post-TCJA METRs, simulated DPAD is added to income with a probability equal to the firm's DPAD take-up rate.

Appendix Figure C.1 compares simulated and realized values of income, DPAD, and GBCs for 2016. Simulations use data through 2015 to predict outcomes one year in the future. We calculate the probability of outcomes (e.g., claiming GBCs) as the share of simulated or realized observations in which the outcome occurs. A 45-degree line is overlaid to compare our simulation with perfect prediction. For income, DPAD, and GBCs, predicted probabilities and levels are highly predictive of realized values. Firms claim GBCs and DPAD at slightly higher rates than our simulations would predict, but across bins, the average discrepancy is less than 5%. In general, log income, DPAD, and GBCs closely match predicted values, though they become more noisy for log values less than 2 (approximately $7,000).

Each simulated trajectory of income, deductions, and credits is compared with a trajectory in which base year income is increased by one percent of revenue. Pre-TCJA and Post-TCJA tax schedules and net operating loss rules are applied to both the baseline simulation and the simulation receiving an income shock. In the Pre-TCJA calculation, firms claim DPAD against the income shock with a probability equal to their previous DPAD takeup rate. The deduction amount is the minimum of 9%, or the income shock multiplied by the simulated value of DPAD scaled by income. METRs are estimated as the increase in the net present value of tax divided by the income shock. The net present value is calculated with a discount rate of 6%. We run this simulation 50 times for base years 2015 and 2016, then take the average value as our METR.

Our simulation does not include foreign tax credits (FTCs) as we are interested in the METR for domestic income. Firms generally face two limitations on the use of FTCs. First, FTCs are non-refundable so they cannot reduce tax liabilty below zero. Second, firms can only offset the foreign share of US tax, where the foreign share is calculated as the ratio of foreign income to the sum of foreign and domestic income.[15] On the margin, firms with negative domestic income and positive foreign income are unconstrained by this second limitation because the foreign share is greater than 1. For these firms, any additional tax can be offset by FTCs to the extent the firm has paid qualifying foreign taxes. To account for this problem, we replace taxable income in the base year with domestic income when domestic income is negative.

To model the corporate AMT in the pre-TCJA period, we estimate a linear probability model

[15]We calculate domestic income as net income minus all foreign dividends reported on Schedule C. Foreign income is the sum of all foreign dividends reported on Schedule C.

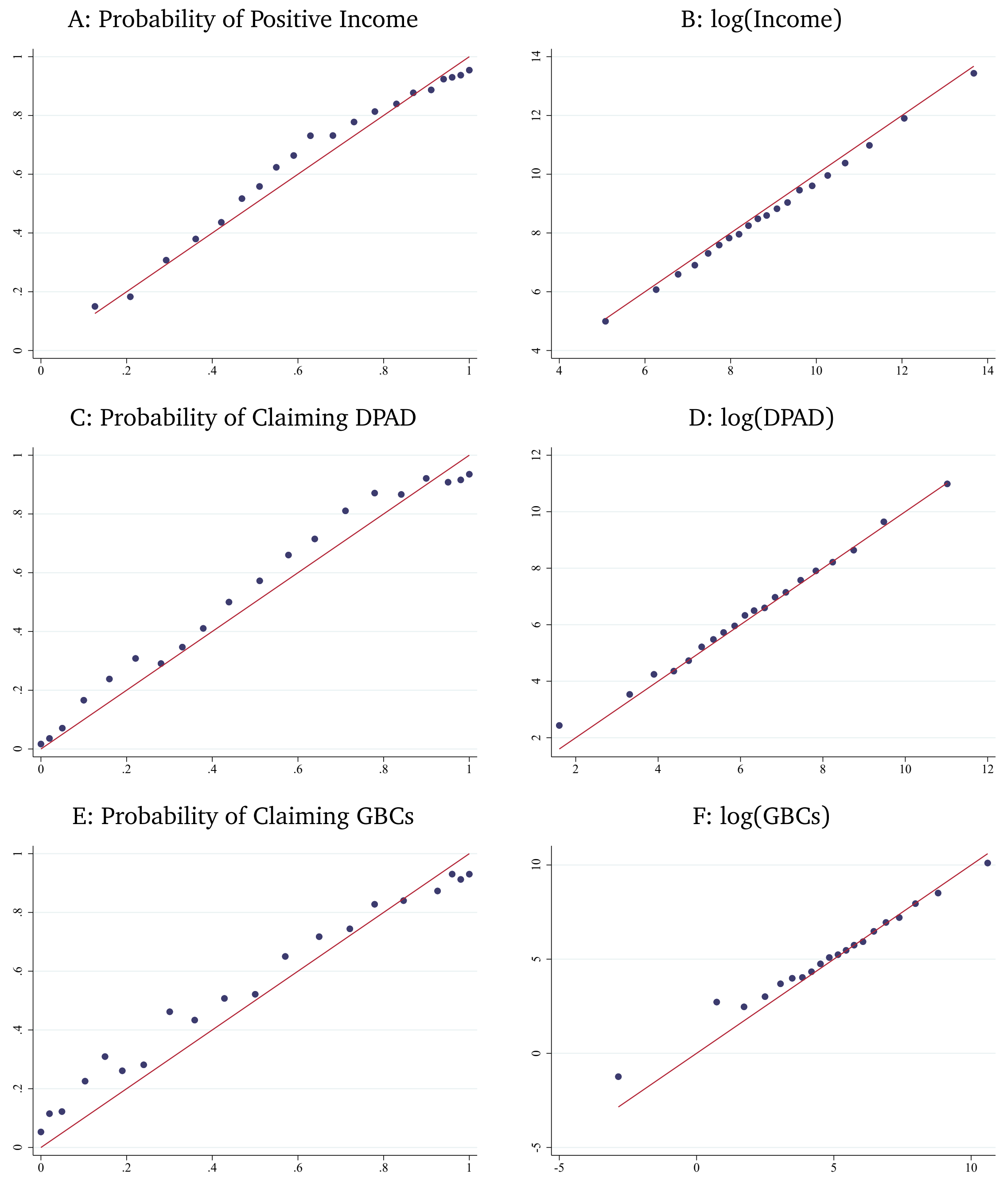
for whether a firm pays AMT in 2017 based on separate indicators for paying the AMT in 2015 or 2016. The final METR is a weighted average of the corporate AMT rate (20%) and the simulated METR with the weight being the predicted probability of paying the AMT. For firms with predicted probability of paying the AMT less than 5%, we set the weight on the AMT rate to zero.

C.5 Decomposing Variation in Tax Shocks

This section describes three ways to decompose the tax shocks to understand the importance of different sources for variation in firm-level tax shocks. We constructed measures of our main tax variables that isolate variation from different sources: base year income differences, net operating losses, tax credits (e.g., general business tax credits), and base provisions (e.g., the domestic production activities deduction and the AMT). We then formed measures of net-of-tax rate changes based on each of these sources and saw how well these measures relate to our baseline tax rate term. One version used the full tax shock excluding variation from that specific type of provision (Appendix Figure C.2) and another only used variation from that specific type of provision (Appendix Figure C.3). We then regress our main tax shock on these different measures and report how the R-squared changes when we only use these provision-specific tax-shocks (Appendix Figure C.4). We also do a variance decomposition exercise that reports what share of the variance in the explainable variation in our main tax shock comes from each provision.

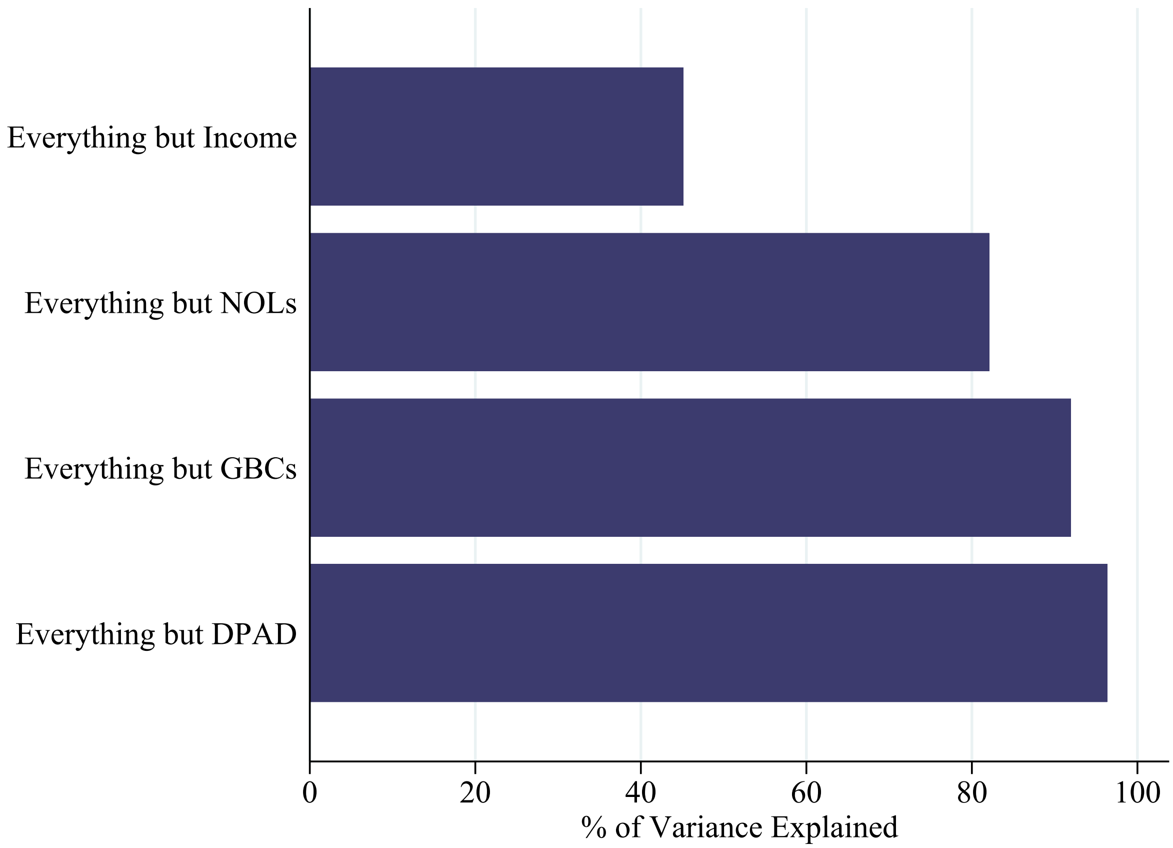
We find that each of these sources generate firm-level variation, but that base year income is the most important source of variation in the firm-level tax rate. Net operating losses and the AMT also account for material amounts of variation, whereas DPAD and business credits contribute a positive but smaller amount.

Figure C.1: Comparison of Predicted and Realized 2016 Income, Deductions, and Credits



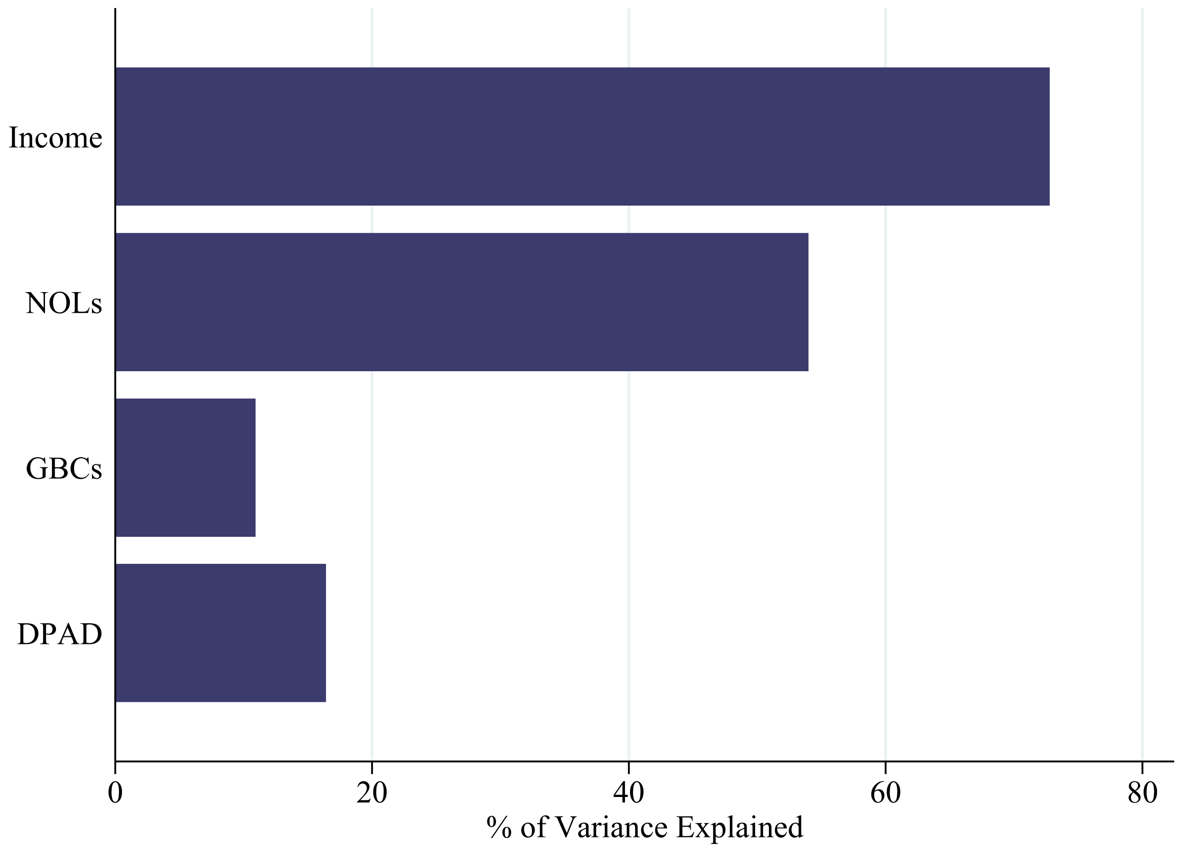
Notes: Each panel compares predicted and realized 2016 values for firms in our sample. Firm-level predictions are mean values across 50 simulations using data from 2004 to 2015 to predict one year into the future. We calculate the probability of outcomes (e.g. claiming GBCs) as the share of simulated or realized observations in which the outcome occurs. Mean predicted and realized values are calculated within 20 bins sorted by predicted values. Panel A compares the simulated probability of reporting positive income (net income minus special deductions) with the realized share of firms with positive income. Panel B compares predicted and realized log income. Panel C compares the simulated probability of claiming the domestic production activity deduction (DPAD) with the realized share of firms claiming DPAD. Panel D compares predicted and realized log DPAD deductions. Panel E compares the simulated probability of claiming General Business Credits (GBCs) with the realized share of firms claiming GBCs. Panel F compares predicted and realized log GBCs.

Figure C.2: Proportion of Explained Variance in $\hat{\tau}$ by Excluded Provision



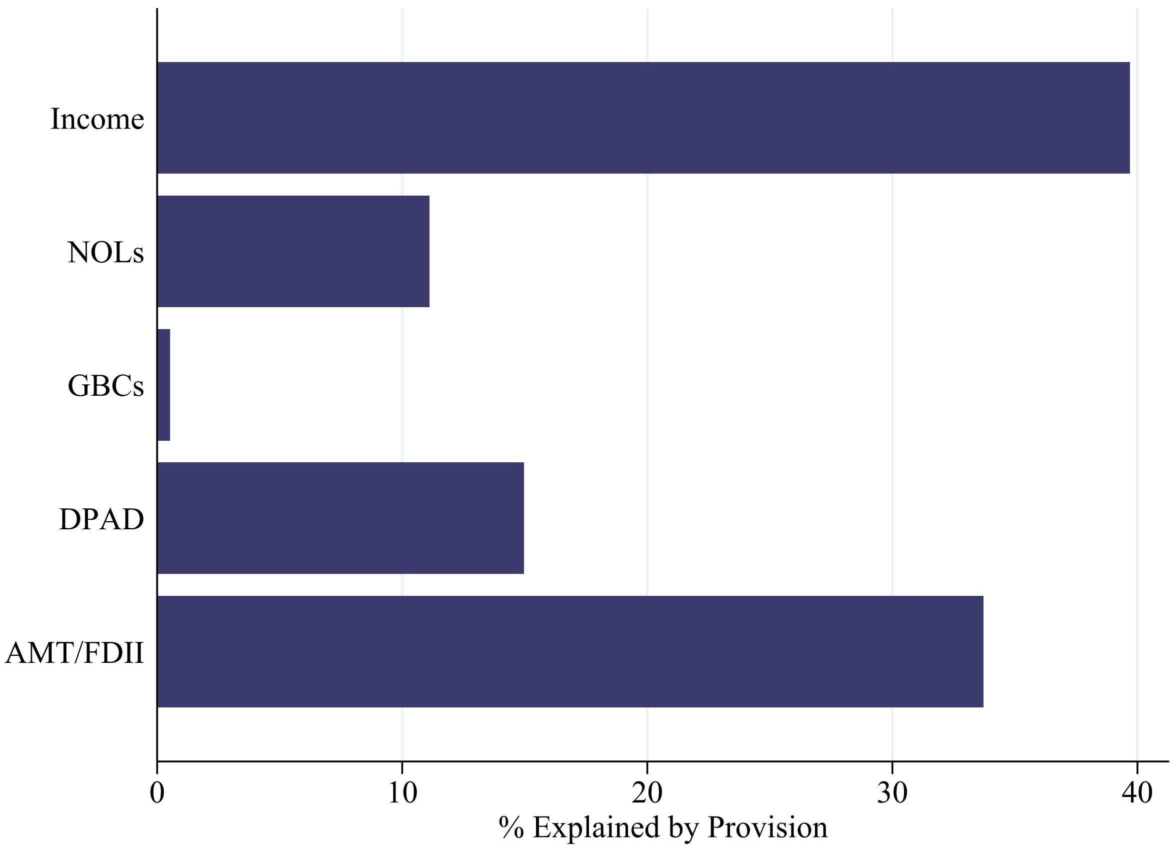
Notes: This figure plots the R^2 values, multiplied by 100 for ease of interpretation, from four regressions with $\hat{\tau}$ on the left hand side. On the right hand side of each regression is $\hat{\tau}$ after removing all variation due to one of four provisions: the reduction of the corporate income tax rate (Income); the changes to how net operating losses are treated (NOLs); changes to general business credits (GBCs); and the repeal of the Domestic Production Activities Deduction (DPAD).

Figure C.3: Proportion of Explained Variance in $\hat{\tau}$ by Provision



Notes: This figure plots the R^2 values, multiplied by 100 for ease of interpretation, from four regressions with $\hat{\tau}$ on the left hand side. On the right hand side of each regression is $\hat{\tau}$ with only the variance from one of four provisions: the reduction of the corporate income tax rate (Income); the changes to how net operating losses are treated (NOLs); changes to general business credits (GBCs); and the repeal of the Domestic Production Activities Deduction (DPAD).

Figure C.4: Decomposition of Variation in $\hat{\tau}$ by Provision



Notes: This figure decomposes the share of variance in $\hat{\tau}$ which is explained by five key provisions: the reduction of the corporate income tax rate (Income); the changes to how net operating losses are treated (NOLs); changes to general business credits (GBCs); the repeal of the Domestic Production Activities Deduction (DPAD); and the repeal of the corporate alternative minimum tax as well as the new deduction for foreign derived intangible income (AMT/FDII). Jointly, these five provisions explain 84.3% of the variation in $\hat{\tau}$. Each bar represents what share of that explained variance is due to the respective provision. Specifically, we run the regression $\hat{\tau} = \beta_0 + \sum_{j=1}^{5} \beta_j \hat{\tau}^j + \varepsilon$, where $\hat{\tau}^j$ is a measure of $\hat{\tau}$ which only includes variation due to the j'th provision. Then each bar is equal to $\frac{\mathbb{V}(\hat{\tau}^j \beta_j)}{\sum_{i=1}^{5} \mathbb{V}(\hat{\tau}^i \beta_i)}$.

D Additional Results

D.1 Foreign Capital Response

Using tax data for foreign subsidiaries of U.S. multinationals from Form 5471, Appendix Table G.1 turns to another key outcome, the response of foreign tangible capital. Through the lens of our theory, the short-run elasticity of foreign capital to $\bar{\Gamma}$ must be positive for complementarity to rationalize the positive $\bar{\Gamma}$ coefficients in Table 3. Panel A reports our baseline specification in the pooled multinational firm sample but with the log change in foreign capital as the dependent variable. The $\bar{\Gamma}$ coefficient of 0.57 is statistically significant and implies an increase in foreign capital of roughly 8% for firms subject to GILTI. For comparison, perturbing post-TCJA $\bar{\Gamma}$ around its mean value and calculating the two-year average log deviation of foreign capital $\bar{K}$ in the model yields a short-run elasticity of around 1.3. Panel B reports the location of foreign capital before and after TCJA. The foreign capital stock of U.S. multinationals grew in all regions, but grew fastest in the G7, BRIC, and other countries. The share of foreign tangible capital in tax havens fell, especially in the small island havens that had relatively low capital before TCJA. This geographic pattern suggests that the reported accumulation reflects actual foreign investment and not simply accounting gimmicks in response to GILTI and hence could plausibly complement domestic capital.

D.2 Robustness

Appendix Tables G.2 and G.3 collect robustness tests designed to support a causal interpretation of the baseline regressions.

The first row of Appendix Table G.2 repeats the baseline coefficients. The next several rows add different covariates. Row 2 addresses the particular concern of the “trade war” in 2017 by including three trade war exposure measures within manufacturing industries from Flaaen and Pierce (2019): import protection, rising input costs, and foreign retaliation measures. Row 3 includes a control in the multinational sample for whether firms paid the “toll tax” on previously unrepatriated foreign earnings under Section 965. This indicator combines reported toll tax payments from tax returns with supplemental measures hand- and GPT-collected from financial statements.[16] Row 4 adds a control for the intangible intensity of a firm’s domestic operations, measured as the mean ratio of R&D expenditure relative to the sum of R&D expenditure and investment. We include this control via indicators by decile of intangible intensity. Row 5 controls for size bins defined over pre-TCJA capital. Each of these controls leaves the tax term coefficients essentially unchanged. Row 6 adds a control for lagged investment growth, which slightly increases the magnitudes of the domestic tax terms in absolute value. Rows 7 and 8 show that the estimates are similar to the baseline with NAICS 3 or 4 digit fixed effects. These industry controls flexibly remove the influence of industry-by-time shocks, thus absorbing many possible confounding factors.

The remaining rows perturb the specification or sample. Row 9 weights the regression by lagged log capital. The tax elasticities remain quite similar. Row 10 drops industries with high

[16] Using BEA data, Albertus, Glover and Levine (Forthcoming) find no evidence of differential investment responses to the TCJA for firms with large amounts of unrepatriated cash, who would be subject to large toll tax payments.

investment through partnerships that our investment measure may miss, with small changes in the coefficients. Row 11 drops firms that have at least 50% of their foreign income in tax havens.[17] The results are similar to the baseline, suggesting firms likely to be active profit-shifters are not driving the results.

Row 12 reports coefficients from a simulated instrumental variables (IV) regression. In our baseline regression, $\hat{\tau}$ comes from applying pre and post-TCJA tax law to the projected income path starting from a firm's 2015 and 2016 tax returns to generate METRs for 2015 and 2016 with and without TCJA. The row 12 specification instead uses this measure as an excluded instrument, with the endogenous variable the difference between the average METR in 2015 and 2016, obtained by applying pre-TCJA tax law to the firm's 2015 and 2016 tax returns and simulated income paths, and in 2018 and 2019, obtained by applying post-TCJA tax law to the firm's 2018 and 2019 tax returns and simulated income paths. Differences between the excluded instrument and endogenous variable arise because of changes in firms' taxable income statuses or deductions and credits between these years. In practice these inputs are highly persistent and the simulated IV yields very similar coefficients.[18]

Row 13 includes the level of economic depreciation and its interaction (after demeaning in the sample) with each of the tax policy terms.[19] These interaction terms address the possibility that the policy change correlates with economic depreciation, which also affects the short-run response of investment to the policy change. In practice, the main effects of the policy terms do not change much when including these interactions, suggesting limited correlated between treatment effects and the policy changes or limited heterogeneity in the treatment effects.

Row 14 instruments for the METRs using versions of those tax terms that exclude all variation to the base income, which Figure C.4 shows is an important source of tax shock heterogeneity. The instrument isolates variation across firms that is driven by tax policy changes.

D.3 Alternative Assumptions on Foreign Tax Shocks

Our baseline specification assumes firm expectations of the foreign effective tax rate approximately matches their post-reform rate. This assumption simplifies our analysis by abstracting from potential heterogeneity in the effective foreign tax shock. Here we consider the robustness of our main results to alternative assumptions.

The literature presents mixed conclusions about the effect of the TCJA on foreign marginal effective rates. Dharmapala (2018) argues that, despite the move in the direction of territorial taxation, the reform nevertheless *may have increased* tax rates if firms expected a tax holiday on repatriations in the future. For example, if firms expected a holiday approximating the 2004 American Jobs Creation Act (AJCA), which offered a 5.25 percent tax rate for repatriated earn-

[17] For this categorization, we consider both income in dot havens like Bermuda and the Cayman Islands and non-dot havens like Ireland and the Netherlands. Within the sample of multinational firms, these firms account for 7% of the sample of firms and 30% of foreign and domestic capital.

[18] The simulated IV also addresses the possible role of measurement-error-induced attenuation coming from constructing the METRs using firm-level income simulations.

[19] We measure economic depreciation using the Bureau of Economic Analysis "Implied Rates of Depreciation for Private Nonresidential Fixed Assets." We aggregate the rates (which are measured at the industry-asset-year level) to the 3-digit NAICS-by-year level using additional data from the BEA on the net stock of equipment and structures in each industry-year pair. More information on this process can be found in Appendix Section C.2.

ings, the TCJA could have increased the foreign tax rate relative to this baseline. Alternatively, if firms expected a holiday rate closer to the 15.5 percent rate that applied to liquid assets, then the TCJA would have reduced the foreign tax rate going forward. Consistent with this view, Dyreng et al. (2023) finds that the effective tax rate on foreign income fell a few percentage points for listed US firms, and fell more for firms doing less profit shifting prior to the reform. Conversations with practitioners and experts suggest a range of experiences that depend on each firm's situation.

Our baseline approach—assuming a change on average equal to what transpired—can be seen as a middle ground given the uncertainty in the nature of the foreign tax shock. Here, we consider three alternative approaches that relax this assumption. First, we assume firms expected an AJCA-like holiday rate of 5.25 percent. We also incorporate the 85% limit on the use of foreign tax credits that accompanies the preferential rate. For firms paying very low effective foreign tax rates, this assumption implies an increase in foreign effective rates of a few percentage points. The second approach assumes firms are subject to a TCJA-like holiday rate of 15.5 percent, equal to the rate the reform applied to repatriations of liquid assets. This assumption implies a decrease in tax rates for firms that previously had low effective foreign tax rates. The third approach assumes firms are subject to a blended holiday rate that averages the 15.5 percent rate on liquid assets and the 8 percent rate on illiquid assets. We use firm-specific average net PPE relative to total assets reported on all Form 5471s to determine the illiquid share. This approach implies a modest decrease in effective foreign tax rates for most firms, with larger decreases for firms with more liquid assets abroad. In all cases, we derive firm-specific effective foreign tax rates paid abroad from Form 5471 following Dowd, Landefeld and Moore (2017).

Appendix Tables G.4-G.6 present summary statistics for the alternative assumptions on foreign tax shocks. The average effective foreign tax rate for all multinationals prior to TCJA is between 25 and 26 percent, which includes both taxes paid abroad and the additional expected US tax on foreign source income. In the first scenario, some firms experience a small tax decrease of 2 percentage points and others experience a substantial tax increase up to 7 percentage points. In the other two scenarios, some firms experience modest decreases of 2 to 4 percentage points, but very few firms experience increases. Note that firms paying substantial tax abroad prior to the reform experience no change in taxes, such that the median change in effective foreign tax rates is zero across all three scenarios. The non-AJCA scenarios deliver changes more in line with the empirical literature estimating effective taxes on foreign source income (Dyreng et al., 2023).

Appendix Tables G.7 and G.8 present augmented regressions that incorporate these alternative assumptions in regressions with domestic investment growth and foreign capital grwoth as the left-hand-side variables, respectively. We highlight three findings. First, adding these alternative assumptions does not change the coefficient on the domestic tax shocks or $\hat{\hat{\Gamma}}$. Second, the coefficient on $\hat{\hat{\tau}}$ is statistically insignificant in the case of domestic investment, though the magnitude is consistent with the coefficient on $\hat{\hat{\Gamma}}$. As noted above, the reform only had small effects on foreign tax rates, so there is limited power to identify effects separately. Finally, the coefficient on $\hat{\hat{\tau}}$ is larger and statistically significant in the case of foreign capital growth in the blended rate scenario. It is also notable that the coefficient has the correct sign only in the TCJA holiday rate scenarios, which supports the notion that most firms experienced the reform as a modest decrease in foreign tax rates.

A growing empirical literature, contemporaneous with our work and surveyed in Dharmapala (2024), presents related findings to ours. Using different methods to identify firms subject to GILTI, this literature finds that firms likely to be subject to GILTI increased foreign investment and both foreign and domestic M&A activity (Atwood et al., 2023; Beyer et al., 2023*b*). Crawford and Markarian (2024) compare US to Canadian multinationals and find higher global investment for US firms, especially capital-intensive and financially constrained firms. They find substantial declines in effective tax rates for multinational firms using accounting data. We document similar patterns in our companion paper Chodorow-Reich et al. (2025), which uses a synthetic matching approach to compare the trajectories of global investment and other outcomes for public US firms relative to similar foreign multinationals.

D.4 Other Outcomes

Appendix Tables G.9 and G.10 show results for other firm outcomes: the investment to capital ratio, log domestic capital accumulation, log investment by subcomponent, log tax payments, log labor compensation, log salaries and wages, log officer compensation, and log R&D. The investment-to-capital ratio increases strongly with the tax term change $\hat{\Gamma} - \hat{\tau}$ in the domestic sample. Both equipment and structures investment increase by a comparable magnitude, indicating that the total tangible investment response in the main specifications comes from a combination of both types of investment. The effects on domestic capital mirror those on investment. Various measures of labor compensation increase in the domestic sample, though the labor compensation effects in the multinational sample are less precise.[20] As expected, tax payments decline with the policy change. We also find some evidence of R&D expenditure effects but leave a full investigation of intangibles to future work.

E Mergers and Acquisitions

E.1 Related Literature

While Lyon (2020) finds that the value of U.S. acquisitions of foreign firms increased by 50% and that the acquisition of U.S. assets by foreign firms declined by 25% immediately following the passage of the TCJA, Amberger and Robinson (2023) and Dunker, Overesch and Pflitsch (2022) find that U.S. acquisitions of foreign firms decreased. Using a difference-in-differences design to compare U.S. and non-U.S. firms, Amberger and Robinson (2023) find that the probability of a U.S. firm acquiring a foreign firm decreased by 3.5-4.5 percentage points, while there was no change in the foreign mergers and acquisitions behavior of non-U.S. firms. Dunker, Overesch and Pflitsch (2022) similarly find that U.S. firms acquire firms in low-tax countries and tax havens significantly less often following the passage of the TCJA. They find that these changes are mainly driven by GILTI-affected firms and that there is no evidence of changes in mergers and acquisitions activity for firms that are unaffected.

[20] The magnitudes for these other outcomes (e.g., capital, labor) may reflect M&A activity, which makes it difficult to compare them to our main investment results. Appendix E presents some analysis of M&A patterns for U.S. multinationals following prior work.

E.2 Construction of Mergers and Acquisitions Sample

Following Dunker, Overesch and Pflitsch (2022), we construct a sample of mergers and acquisitions using the Refinitiv SDC Mergers and Acquisitions data. Starting with a sample of all cross-border mergers and acquisitions from 2010 to 2019 with non-missing deal values and non-U.S. targets, we remove deals that are declared as internal restructurings or where the acquirer does not hold a majority stake in the target. We then merge with Compustat data, only keeping deals where the acquirer is not missing financial data and dropping deals with firms in the financial or utility industries. Finally, we drop deals where the target country has fewer than 10 deals observed or where the target country switched between the low-tax and high-tax group during the sample period. A complete waterfall table comparing our sample to the sample in Dunker, Overesch and Pflitsch (2022) can be found in Appendix Table E.1. We follow them in defining GILTI-affected firms for this section.

We also use the same raw Refinitiv SDC Mergers and Acquisitions data to build a sample of U.S. mergers and acquisitions following Lyon (2020). We restrict the samples to deals where either the acquiring or target firm is based in the U.S. and at least 20% of the target firm is acquired. We also drop transactions with missing deal values or unknown locations for the target or acquirer. This results in a dataset with a total deal value of \$14.4T, which closely matches the \$14.2T in M&A deal value from Lyon (2020).

E.3 Mergers and Acquisitions Results

Appendix Figure E.1 plots the average annual M&A deal value by U.S. acquirers before and after the passage of the TCJA. Panels A and B replicate panels B and E in Figure 1 of Dunker, Overesch and Pflitsch (2022), where deals are divided by their target country. Low-tax target countries are defined as those below the 25^{th} percentile of the sample distribution. Like Dunker, Overesch and Pflitsch (2022), we find that there is an increase in the annual value of U.S. M&As after the TCJA was passed, and that this is driven by GILTI-affected firms acquiring firms in high-tax foreign countries. The GILTI-affected firms spend less on M&As in low-tax countries in the post-period.

We also used our replication of the Lyon (2020) sample to investigate the claims made in Lyon (2020) and Goodspeed and Hassett (2022). Panels C and D in Appendix Figure E.1 show that the dollar-value of U.S. acquisitions increased by 34% after 2017 and that foreign acquisitions of U.S. firms decreased by 31%. Lyon (2020) instead finds that the dollar-value of U.S. acquisitions increased by 50% and that foreign acquisitions decreased by 25%.[21]

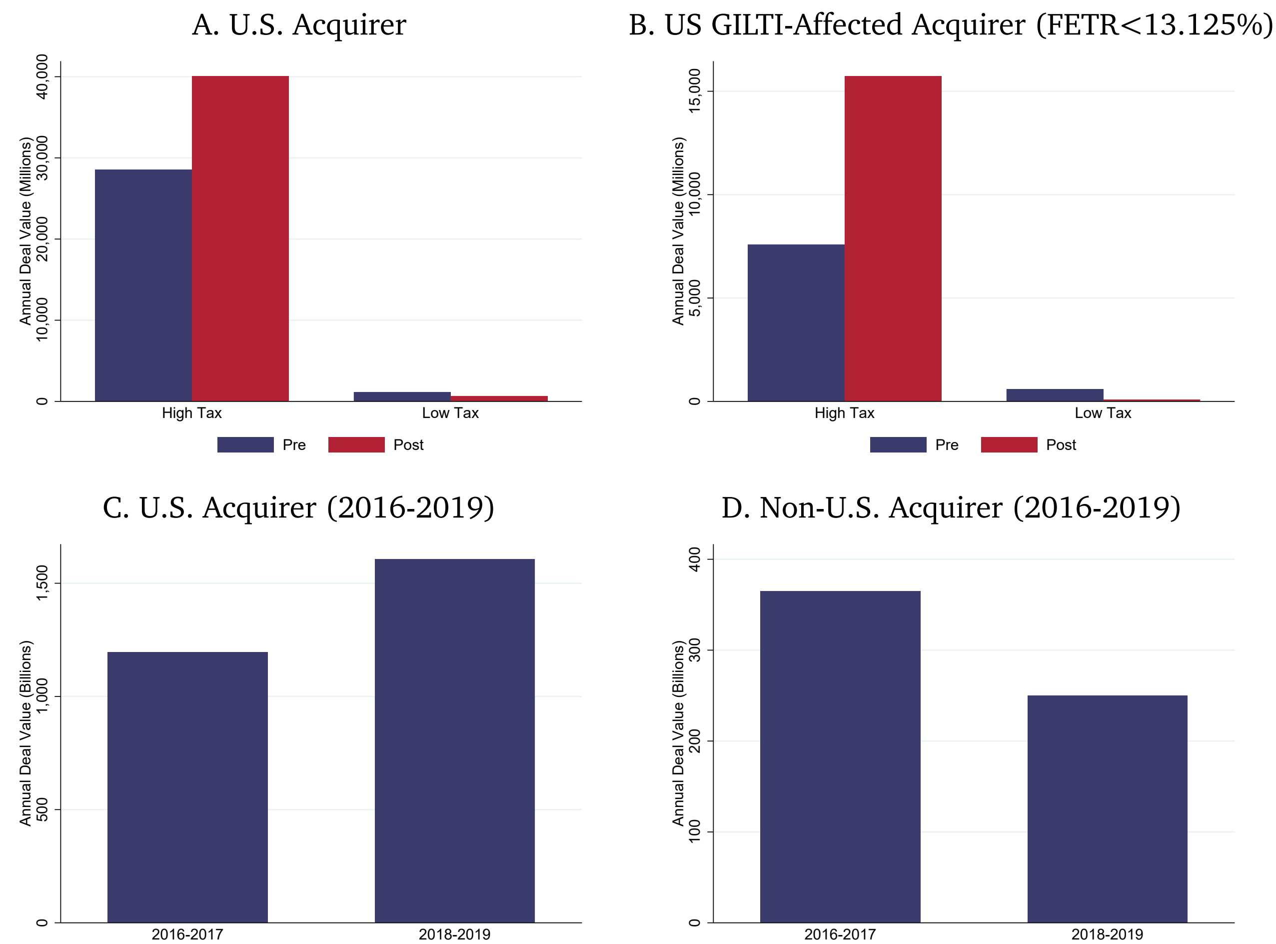
[21] Note that our sample is different from that of Lyon (2020). While we were able to closely replicate the initial dataset, which had \$14.2 trillion in domestic and cross-border M&A transactions by U.S. firms from 2010 to 2019 (roughly 1% less than the total deal value we found), Lyon (2020) then reclassified \$8.5T in redomiciliations of U.S. firms as acquisitions by foreign firms instead of acquisitions by U.S. firms. We are unable to account for these inversions in our dataset.

Table E.1: Mergers and Acquisitions Waterfall

Description	Dunker et al. (2023)	Our Sample
All cross-border M&A deals with non-missing deal value of U.S. and non-U.S. acquirers announced between 2010 and 2019 (Source: SDC Platinum). Deals with U.S. targets are excluded.	45,861	34,416
Less: M&A deals in which the acquirer does not or will not hold a majority stake in the target and deals that are declared as internal restructurings.	(11,006)	(9,098)
Less: M&A deals of acquirers not included in Compustat.	(16,918)	(17,048)
Less: M&A deals of firms from the financial and utility industries	(3,808)	(952)
Less: M&A deals with missing financial data. Also requiring at least 10 deals per target country and eliminating target countries that switch between a low-tax and high-tax group during the sample period.	(4,048)	(2,575)
Final Sample	**10,081**	**4,743**

Notes: The financial data that are required include the Compustat variables: CH (Cash); AT (Assets); PPENT (Property, Plant, and Equipment); INTAN (Intangible Assets); DLTT (Long-Term Debt); PI (Pretax Income); SALE (Sales/Turnover); ACT (Current Assets); and LCT (Current Liabilities) in year t-1 and SALE in year t-2.

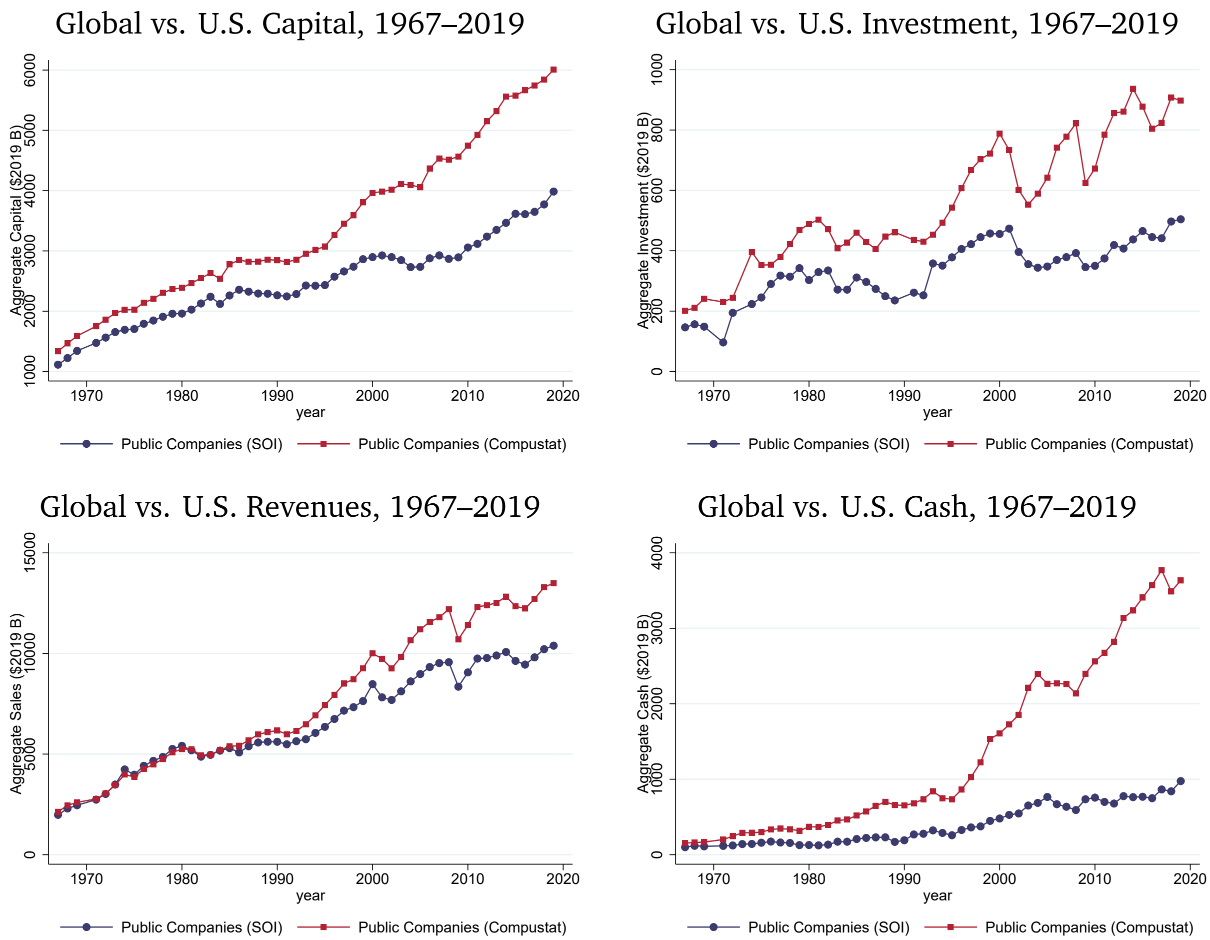
Figure E.1: Annual Aggregate Cross-Border Merger and Acquisition Deal Value Before and After the TCJA



Notes: Panels A and B use the dataset from Refinitiv following the sample restrictions from Dunker, Overesch and Pflitsch (2022), and panels C and D use the Refinitiv data with a separate set of restrictions that follow Lyon (2020). The definition of GILTI-affected in panel B follows Dunker, Overesch and Pflitsch (2022) in using a foreign effective tax rate (FETR) threshold of 13.125%, which is the threshold at which GILTI ceases to bind.

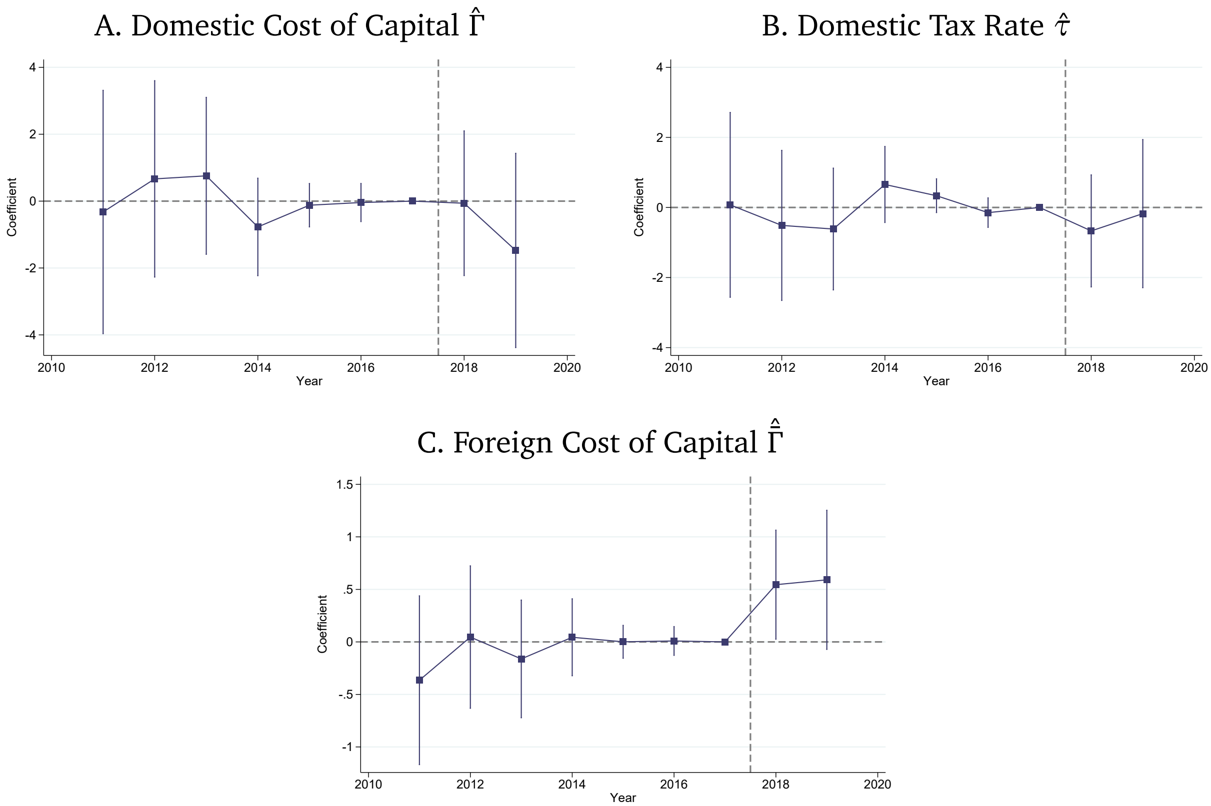
F Appendix Figures

Figure F.1: Activity by U.S. Firms is Increasingly Global (Unscaled)



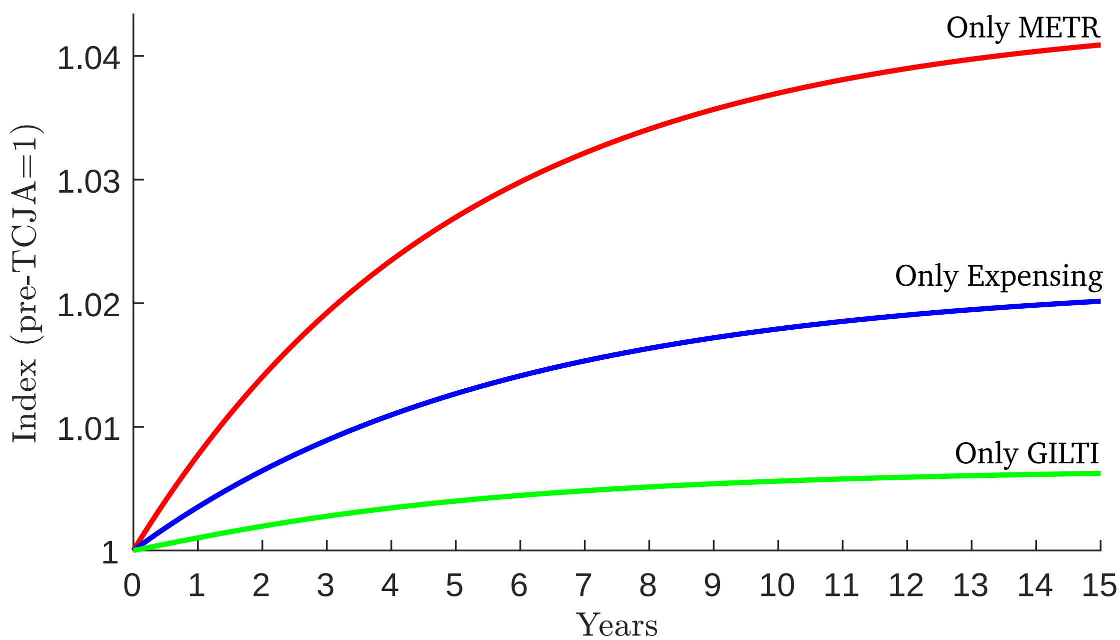
Notes: These figures present the unscaled versions of the figures in Figure 1. They use Compustat–SOI datasets to plot aggregates for domestic variables versus global variables for firms we are able to merge each year. We use the following Compustat variables for global measures: PPENT for capital, CAPX for investment, SALE for revenues, and CHE+IVAO for cash. Pre-1993 SOI investment only includes investment-tax credit-(ITC)-eligible basis, understating the divergence in the figure. The last year of Compustat PPENT excludes capitalized operating leases per a change in accounting rules using data from Compustat Snapshot. We thank Yueran Ma for guidance on this correction.

Figure F.2: Year-by-Year Foreign Capital Effects by Tax Term Component for Multinationals



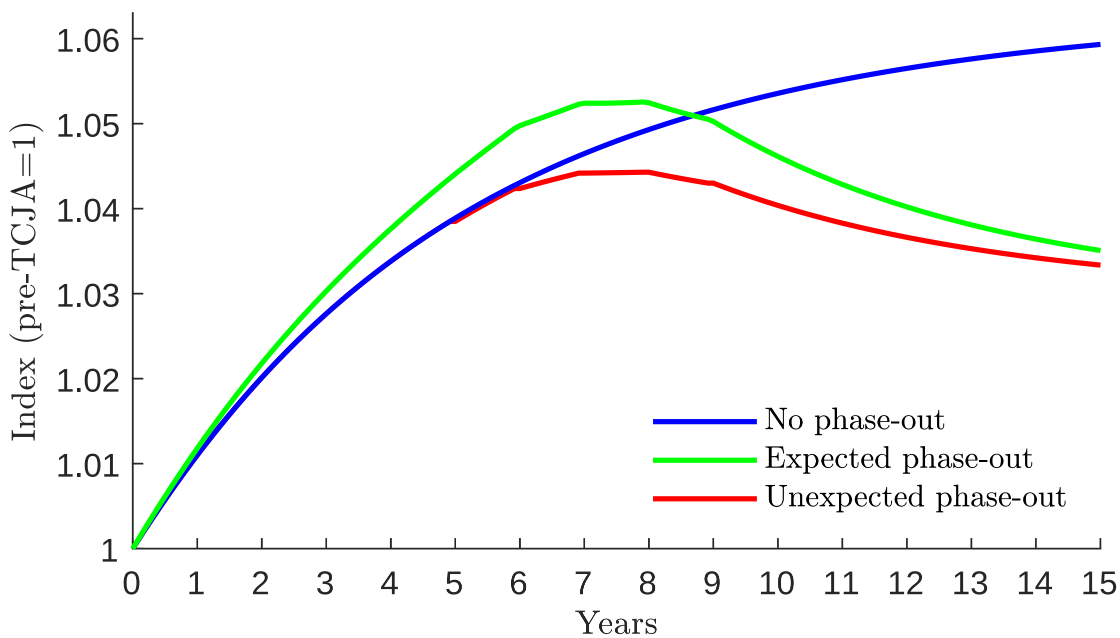
Notes: These figures plot the tax-term coefficients between 2011-2019 from an analogous regression to the one specified in equation (19), but with d log(Foreign Capital) on the left hand side, using our firm-level corporate tax data. The coefficients in each year come from separate regressions with the dependent variable the log change in foreign capital between 2017 and the year shown and the right hand side variables fixed at their pre-to-post TCJA change. All three panels report coefficients for the pooled multinational firm sample. The solid vertical lines depict 95% confidence intervals.

Figure F.3: Model-Implied Capital by TCJA Provision



Notes: The figure shows the model-implied paths of domestic corporate capital applying only the TCJA changes to the METR τ (red line), to expensing (blue line), or GILTI (green line).

Figure F.4: Role of Expensing Phase-out



Notes: The figure shows the model-implied paths of domestic corporate capital under the baseline assumption of no phase-out or expected phase-out of the expensing provisions (blue line), when firms fully anticipate phase-out of expensing as written into the TCJA law (green line), or when firms are surprised each year that bonus depreciation ratchets down (red line).

G Appendix Tables

Table G.1: Foreign Capital Growth

Panel A: Regression Estimates

Regressor:	$\hat{\Gamma}$	$\hat{\hat{\Gamma}}$	$\hat{\tau}$	N
$d\log$(Foreign Capital)	−0.22 (1.23)	0.57* (0.29)	−0.80 (0.90)	2099

Panel B: Changes in Foreign Capital by Region

Region:	Pre-Period $\bar{K}$ (\$B)	Post-Period $\bar{K}$ (\$B)	Share Pre (%)	Share Post (%)	Change in Share (p.p.)	Capital Growth (%)
Total	589.1	704.1				19.5
G7	154.6	179.2	26.2	25.5	−0.8	15.9
OECD (excluding G7)	106.7	131.3	18.1	18.7	0.5	23.1
BRIC	65.9	82.6	11.2	11.7	0.5	25.3
Developing (Non-BRIC)	24.4	30.8	4.1	4.4	0.2	26.1
Tax Haven Non-Islands	121.5	143.5	20.6	20.4	−0.2	18.1
Tax Haven Islands	73.8	79.4	12.5	11.3	−1.2	7.6
Other	42.2	57.3	7.2	8.1	1.0	35.7

Notes: Standard errors appear in parentheses. Panel A presents the results of regressing $d\log$(Foreign Capital) on our tax terms. The sample consists of all U.S. multinational firms. We winsorize $d\log$(Foreign Capital) at the 5% level. Standard errors appear in parentheses. Panel B summarizes how foreign capital (by region) changed after the TCJA. Foreign capital (Columns 1-2) is in billions of USD. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Table G.2: Robustness of Baseline Regression Estimates for High Foreign Capital Multinationals

Sample:	Domestic		Multinational-High Firms			
Regressor	$\hat{\Gamma}-\hat{\tau}$	N	$\hat{\Gamma}$	$\hat{\hat{\Gamma}}$	$\hat{\tau}$	N
Specification:						
1. Baseline	4.27***	6973	4.76*	0.90*	−4.23**	1112
	(0.51)		(1.88)	(0.40)	(1.35)	
2. Trade Controls	4.37***	6973	4.79*	0.87*	−4.29**	1112
	(0.52)		(1.90)	(0.40)	(1.36)	
3. Toll Tax Control			4.67*	0.82*	−4.14**	1112
			(1.89)	(0.42)	(1.35)	
4. Intangible Capital	4.32***	6973	4.80*	0.80*	−4.41**	1112
	(0.52)		(1.90)	(0.40)	(1.36)	
5. Size Controls	4.27***	6973	4.74*	0.90*	−4.22**	1112
	(0.51)		(1.88)	(0.40)	(1.35)	
6. Lagged Investment	4.54***	6927	5.37**	0.99**	−5.01***	1110
	(0.46)		(1.71)	(0.36)	(1.23)	
7. Industry FE (NAICS 3D)	4.08***	6973	3.52	0.73	−3.33*	1112
	(0.51)		(1.93)	(0.42)	(1.41)	
8. Industry FE (NAICS 4D)	4.19***	6973	4.16*	0.75	−3.66*	1112
	(0.52)		(2.11)	(0.45)	(1.55)	
9. Weighted	3.87***	6973	5.41**	1.10**	−4.44***	1112
	(0.57)		(1.80)	(0.38)	(1.28)	
10. Drop Industries	4.29***	6765	4.73*	0.86*	−4.23**	1104
	(0.52)		(1.91)	(0.40)	(1.37)	
11. Drop Profit Shifters			5.13*	0.67	−4.64**	878
			(2.13)	(0.46)	(1.52)	
12. Simulated IV	4.14***	6908	4.42*	0.78*	−4.02**	1107
	(0.49)		(1.73)	(0.39)	(1.31)	
13. Depreciation Controls	4.31***	6973	5.08**	0.98*	−4.39**	1109
	(0.57)		(1.91)	(0.40)	(1.37)	
14. Exclude Income IV	3.49***	6973	7.66***	1.29**	−5.24**	1112
	(0.57)		(2.29)	(0.46)	(1.64)	

Notes: This table presents the results for regressions of $d\log(\text{Investment})$ on our tax terms for domestic firms and high foreign capital U.S. multinationals under different robustness specifications. Appendix Table G.3 presents the low foreign capital multinational results. Row 1 presents our baseline results. Row 2 includes controls for trade shocks. Row 3 controls for firms paying the toll tax. Row 4 controls for intangible capital. Row 5 controls for pre-period capital, while row 6 controls for lagged investment growth. Rows 7 and 8 include 3-digit and 4-digit NAICS fixed effects. Row 9 weighs by the log of the mean capital from 2015-2016. Row 10 drops industries with high baseline investment from partnerships (2-digit NAICS 22 and 3-digit NAICS 486 and 531, which represent utilities, pipeline transportation, and real estate). Row 11 drops firms with ≥ 50% of their foreign income in tax havens. Row 12 presents a simulated IV using post-TCJA tax rates. Row 13 controls for economic depreciation rate δ (which is assigned at the 3-digit NAICS level) and the interaction between each tax policy change and demeaned δ. Row 14 instruments for our tax terms using versions of those tax terms which exclude all variation due to a firm's base year income. * $p < .05$, ** $p < .01$, *** $p < .001$

Table G.3: Robustness of Baseline Regression Estimates for Low Foreign Capital Multinationals

Sample:	Domestic		Multinational-Low Firms			
Regressor	$\hat{\Gamma} - \hat{\tau}$	N	$\hat{\Gamma}$	$\hat{\hat{\Gamma}}$	$\hat{\tau}$	N
Specification:						
1. Baseline	4.27***	6973	4.10*	−0.26	−4.95***	1146
	(0.51)		(1.79)	(0.38)	(1.32)	
2. Trade Controls	4.37***	6973	4.04*	−0.25	−4.91***	1146
	(0.52)		(1.79)	(0.38)	(1.32)	
3. Toll Tax Control			3.92*	−0.36	−4.74***	1146
			(1.78)	(0.38)	(1.32)	
4. Intangible Capital	4.32***	6973	4.09*	−0.23	−5.02***	1146
	(0.52)		(1.80)	(0.38)	(1.34)	
5. Size Controls	4.27***	6973	4.06*	−0.28	−4.93***	1146
	(0.51)		(1.79)	(0.38)	(1.32)	
6. Lagged Investment	4.54***	6927	3.93*	−0.09	−5.18***	1143
	(0.46)		(1.64)	(0.36)	(1.21)	
7. Industry FE (NAICS 3D)	4.08***	6973	3.78*	−0.04	−4.74***	1146
	(0.51)		(1.73)	(0.42)	(1.31)	
8. Industry FE (NAICS 4D)	4.19***	6973	3.49	0.14	−4.28**	1146
	(0.52)		(1.84)	(0.45)	(1.39)	
9. Weighted	3.87***	6973	2.07	−0.35	−3.18*	1146
	(0.57)		(1.82)	(0.37)	(1.37)	
10. Drop Industries	4.29***	6765	3.89*	−0.28	−4.92***	1134
	(0.52)		(1.79)	(0.38)	(1.32)	
11. Drop Profit Shifters			4.93**	−0.44	−5.49***	1032
			(1.88)	(0.40)	(1.39)	
12. Simulated IV	4.14***	6908	4.09*	−0.19	−4.63***	1140
	(0.49)		(1.68)	(0.38)	(1.30)	
13. Depreciation Controls	4.31***	6973	3.68	−0.39	−4.55***	1144
	(0.57)		(1.89)	(0.39)	(1.38)	
14. Exclude Income IV	3.49***	6973	6.00**	0.21	−4.46**	1146
	(0.57)		(1.94)	(0.39)	(1.43)	

Notes: This table presents the results for regressions of $d\log$(Investment) on our tax terms for domestic firms and low foreign capital U.S. multinationals under different robustness specifications. Appendix Table G.2 presents the high foreign capital multinational results. Row 1 presents our baseline results. Row 2 includes controls for trade shocks. Row 3 controls for firms paying the toll tax. Row 4 controls for intangible capital. Row 5 controls for pre-period capital, while row 6 controls for lagged investment growth. Rows 7 and 8 include 3-digit and 4-digit NAICS fixed effects. Row 9 weighs by the log of the mean capital from 2015-2016. Row 10 drops industries with high baseline investment from partnerships (2-digit NAICS 22 and 3-digit NAICS 486 and 531, which represent utilities, pipeline transportation, and real estate). Row 11 drops firms with $\geq 50\%$ of their foreign income in tax havens. Row 12 presents a simulated IV using post-TCJA tax rates. Row 13 controls for economic depreciation rate δ (which is assigned at the 3-digit NAICS level) and the interaction between each tax policy change and demeaned δ. Row 14 instruments for our tax terms using versions of those tax terms which exclude all variation due to a firm's base year income. * $p < .05$, ** $p < .01$, *** $p < .001$

Table G.4: $\bar{\tau}$ Statistics under Different Repatriation Expectations for All Multinationals

$\mathbb{E}$[Repatriation]	Variable	Mean	Std. Dev.	Median	P10	P90
AJCA Rate:						
	Pre-TCJA $\bar{\tau}$	0.25	0.14	0.25	0.05	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.12	0.23	0.12	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	0.00	0.03	0.00	-0.02	0.07
	$\hat{\bar{\tau}}$	0.00	0.03	-0.01	-0.03	0.07
TCJA Liquid Rate:						
	Pre-TCJA $\bar{\tau}$	0.26	0.12	0.23	0.16	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.12	0.23	0.12	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	-0.01	0.01	0.00	-0.04	0.00
	$\hat{\bar{\tau}}$	-0.01	0.02	0.00	-0.04	0.00
TCJA Blended Rate:						
	Pre-TCJA $\bar{\tau}$	0.26	0.12	0.23	0.14	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.12	0.23	0.12	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	0.00	0.01	0.00	-0.02	0.00
	$\hat{\bar{\tau}}$	-0.01	0.01	0.00	-0.03	0.00

Notes: This table provides summary statistics for all multinationals under three different assumptions of repatriation expectations. This subsample is composed of 2235 firms. "AJCA Rate" refers to the assumption that firms expected the TCJA would implement a repatriation holiday similar to the repatriation holiday in the American Job Creation Act of 2004. "TCJA Liquid" Rate refers to the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA liquid rate. "TCJA Blended Rate" refers to the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA blended rate. For disclosure reasons, we do not report true medians (or other percentiles). Instead, we report the average of observations in neighboring percentile bins.

Table G.5: $\bar{\tau}$ Statistics under Different Repatriation Expectations for Multinational-High

$\mathbb{E}$[Repatriation]	Variable	Mean	Std. Dev.	Median	P10	P90
AJCA Rate:						
	Pre-TCJA $\bar{\tau}$	0.25	0.13	0.25	0.08	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.12	0.24	0.13	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	0.00	0.03	−0.01	−0.03	0.05
	$\hat{\bar{\tau}}$	0.00	0.03	−0.01	−0.03	0.06
TCJA Liquid Rate:						
	Pre-TCJA $\bar{\tau}$	0.26	0.11	0.24	0.16	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.12	0.24	0.13	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	−0.01	0.01	0.00	−0.03	0.00
	$\hat{\bar{\tau}}$	−0.01	0.01	0.00	−0.03	0.00
TCJA Blended Rate:						
	Pre-TCJA $\bar{\tau}$	0.26	0.12	0.24	0.14	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.12	0.24	0.13	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	0.00	0.01	0.00	−0.01	0.00
	$\hat{\bar{\tau}}$	0.00	0.01	0.00	−0.02	0.00

Notes: This table provides summary statistics for multinationals with high foreign-to-domestic capital under three different assumptions of repatriation expectations. This subsample is composed of 1103 firms. "AJCA Rate" refers to the assumption that firms expected the TCJA would implement a repatriation holiday similar to the repatriation holiday in the American Job Creation Act of 2004. "TCJA Liquid" Rate refers to the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA liquid rate. "TCJA Blended Rate" refers to the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA blended rate. For disclosure reasons, we do not report true medians (or other percentiles). Instead, we report the average of observations in neighboring percentile bins.

Table G.6: $\bar{\tau}$ Statistics under Different Repatriation Expectations for Multinational-Low

$\mathbb{E}$[Repatriation]	Variable	Mean	Std. Dev.	Median	P10	P90
AJCA Rate:						
	Pre-TCJA $\bar{\tau}$	0.24	0.14	0.25	0.05	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.13	0.23	0.12	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	0.01	0.03	0.00	−0.02	0.07
	$\hat{\bar{\tau}}$	0.01	0.04	0.00	−0.03	0.07
TCJA Liquid Rate:						
	Pre-TCJA $\bar{\tau}$	0.26	0.12	0.23	0.16	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.13	0.23	0.12	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	−0.01	0.01	0.00	−0.04	0.00
	$\hat{\bar{\tau}}$	−0.01	0.02	0.00	−0.04	0.00
TCJA Blended Rate:						
	Pre-TCJA $\bar{\tau}$	0.26	0.12	0.23	0.14	0.43
	Post-TCJA $\bar{\tau}$	0.25	0.13	0.23	0.12	0.43
	Post $\bar{\tau}$ - Pre $\bar{\tau}$	−0.01	0.01	0.00	−0.03	0.00
	$\hat{\bar{\tau}}$	−0.01	0.01	0.00	−0.03	0.00

Notes: This table provides summary statistics for multinationals with low foreign-to-domestic capital under three different assumptions of repatriation expectations. This subsample is composed of 1132 firms. “AJCA Rate” refers to the assumption that firms expected the TCJA would implement a repatriation holiday similar to the repatriation holiday in the American Job Creation Act of 2004. “TCJA Liquid” Rate refers to the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA liquid rate. “TCJA Blended Rate” refers to the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA blended rate. For disclosure reasons, we do not report true medians (or other percentiles). Instead, we report the average of observations in neighboring percentile bins.

Table G.7: The Effect of Tax Term Shocks on Investment Growth under Different Repatriation Expectations

Dep. Var.:	$d\log$(Investment)								
$\mathbb{E}$[Repatriation]:	AJCA Rate			TCJA Liquid Rate			TCJA Blended Rate		
Sample:	Pooled	Multi-High	Multi-Low	Pooled	Multi-High	Multi-Low	Pooled	Multi-High	Multi-Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\hat{\Gamma}$	4.13**	4.57*	3.80*	4.14**	4.57*	3.81*	4.15**	4.58*	3.82*
	(1.30)	(1.88)	(1.78)	(1.30)	(1.88)	(1.78)	(1.30)	(1.88)	(1.78)
$\hat{\hat{\Gamma}}$	0.25	0.94*	−0.37	0.27	0.96*	−0.35	0.29	0.95*	−0.30
	(0.28)	(0.41)	(0.39)	(0.28)	(0.40)	(0.39)	(0.27)	(0.40)	(0.38)
$\hat{\tau}$	−4.37***	−4.09**	−4.70***	−4.39***	−4.10**	−4.70***	−4.41***	−4.11**	−4.75***
	(0.94)	(1.35)	(1.32)	(0.94)	(1.35)	(1.32)	(0.94)	(1.35)	(1.32)
$\hat{\hat{\tau}}$	−0.45	−0.14	−0.72	0.49	−0.42	1.31	−0.35	−1.04	0.29
	(0.62)	(0.97)	(0.82)	(1.36)	(2.14)	(1.77)	(1.69)	(2.97)	(2.08)
Observations	2,235	1,103	1,132	2,235	1,103	1,132	2,235	1,103	1,132

Notes: This table presents the results for regressions of $d\log$(Investment) on our tax terms across different samples and specifications of $\hat{\hat{\tau}}$. We winsorize $d\log$(Investment) at the 5% level. Columns 1-3 report the results when $\hat{\hat{\tau}}$ is estimated under the assumption that firms expected the TCJA would implement a repatriation holiday similar to the repatriation holiday in the American Job Creation Act of 2004. Columns 4-6 report the results when $\hat{\hat{\tau}}$ is estimated under the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA liquid rate. Columns 7-9 report the results when $\hat{\hat{\tau}}$ is estimated under the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA blended rate. Column 1 reports the results for a pooled group of all firms while columns 2 and 3 report the results for firms with high and low foreign capital separately, where high foreign capital firms have a ratio of foreign to domestic capital above 15%. The remaining columns are defined analogously at the sample level. * $p < .05$, ** $p < .01$, *** $p < .001$

Table G.8: The Effect of Tax Term Shocks on Foreign Capital Growth under Different Repatriation Expectations

Dep. Var.:	$d\log$(Foreign Capital)								
$\mathbb{E}$[Repatriation]:	AJCA Rate			TCJA Liquid Rate			TCJA Blended Rate		
Sample:	Pooled	Multi-High	Multi-Low	Pooled	Multi-High	Multi-Low	Pooled	Multi-High	Multi-Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\hat{\Gamma}$	−0.17	−0.47	0.43	−0.16	−0.47	0.44	−0.13	−0.47	0.49
	(1.24)	(1.46)	(1.85)	(1.24)	(1.47)	(1.85)	(1.23)	(1.46)	(1.85)
$\hat{\hat{\Gamma}}$	0.65*	0.56	1.11*	0.66*	0.55	1.16*	0.70*	0.53	1.27**
	(0.29)	(0.31)	(0.48)	(0.29)	(0.31)	(0.48)	(0.29)	(0.31)	(0.47)
$\hat{\tau}$	−0.82	−0.95	−0.86	−0.83	−0.95	−0.91	−0.90	−0.97	−1.01
	(0.91)	(1.03)	(1.42)	(0.91)	(1.03)	(1.42)	(0.91)	(1.03)	(1.42)
$\hat{\hat{\tau}}$	0.30	0.46	−0.49	−1.12	−1.00	−0.18	−4.92**	−2.95	−4.29
	(0.67)	(0.81)	(1.00)	(1.48)	(1.77)	(2.20)	(1.88)	(2.40)	(2.65)
Observations	2,077	1,050	1,027	2,077	1,050	1,027	2,077	1,050	1,027

Notes: This table presents the results for regressions of $d\log$(Foreign Capital) on our tax terms across different samples and specifications of $\hat{\hat{\tau}}$. We winsorize $d\log$(Foreign Capital) at the 5% level. Columns 1-3 report the results when $\hat{\hat{\tau}}$ is estimated under the assumption that firms expected the TCJA would implement a repatriation holiday similar to the repatriation holiday in the American Job Creation Act of 2004. Columns 4-6 report the results when $\hat{\hat{\tau}}$ is estimated under the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA liquid rate. Columns 7-9 report the results when $\hat{\hat{\tau}}$ is estimated under the assumption that firms expected the TCJA would implement a one-time holiday at the TCJA blended rate. Column 1 reports the results for a pooled group of all firms while columns 2 and 3 report the results for firms with high and low foreign capital separately, where high foreign capital firms have a ratio of foreign to domestic capital above 15%. The remaining columns are defined analogously at the sample level. * $p < .05$, ** $p < .01$, *** $p < .001$

Table G.9: The Effect of Tax Shocks on Other Outcomes (Domestic and Multinational-High)

Sample:	Domestic Firms		Multinational-High Firms			
Regressor:	$\hat{\Gamma} - \hat{\tau}$	N	$\hat{\Gamma}$	$\hat{\hat{\Gamma}}$	$\hat{\tau}$	N
Outcome:						
$d\,\frac{\text{Investment}}{\text{Capital}}$	0.52***	6894	0.56	0.13	−0.51	1106
	(0.09)		(0.44)	(0.10)	(0.31)	
d log(Domestic Capital)	1.60***	6885	−0.04	0.40*	−0.66	1089
	(0.18)		(0.89)	(0.19)	(0.63)	
d log(Equipment)	4.46***	6942	4.83**	0.83*	−4.08**	1108
	(0.46)		(1.75)	(0.38)	(1.26)	
d log(R&D)	1.53*	1318	2.52	0.54	−2.62*	738
	(0.68)		(1.59)	(0.30)	(1.14)	
d log(Structures)	3.97**	3560	−3.02	0.80	0.35	732
	(1.30)		(4.71)	(1.05)	(3.38)	
d log(Tax Revenue)	−2.79***	4118	2.94	1.95*	5.94**	658
	(0.63)		(2.79)	(0.76)	(2.13)	
d log(Labor Comp.)	0.78***	5972	−0.22	0.20	−0.05	975
	(0.12)		(0.56)	(0.14)	(0.42)	
d log(Salaries & Wages)	0.92***	5839	0.30	0.15	−0.53	971
	(0.14)		(0.68)	(0.17)	(0.50)	
d log(Officer Comp.)	0.48*	5008	−2.61*	−0.50	1.88*	886
	(0.22)		(1.13)	(0.26)	(0.83)	

Notes: This table contains coefficients (and observations counts) from regressions after restricting the sample to domestic firms (columns 1-2), and U.S. multinationals with high foreign capital (columns 3-6). Outcome variables appear as row names. All outcomes are winsorized at the 5% level. Standard errors appear in parentheses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Table G.10: The Effect of Tax Shocks on Other Outcomes (Multinational-Low)

Regressor:	$\hat{\Gamma}$	$\hat{\hat{\Gamma}}$	$\hat{\tau}$	N
Outcome:				
$d\,\frac{\text{Investment}}{\text{Capital}}$	0.53	−0.08	−0.85*	1136
	(0.46)	(0.10)	(0.34)	
d log(Domestic Capital)	1.37	0.08	−2.52***	1122
	(0.77)	(0.19)	(0.59)	
d log(Equipment)	3.60*	−0.31	−4.44***	1144
	(1.65)	(0.37)	(1.22)	
d log(R&D)	0.97	0.01	−1.37	659
	(1.52)	(0.34)	(1.11)	
d log(Structures)	−1.17	0.79	−3.12	742
	(4.65)	(0.95)	(3.29)	
d log(Tax Revenue)	1.57	0.93	4.05*	677
	(2.21)	(0.65)	(2.03)	
d log(Labor Comp.)	0.22	−0.10	−0.60	1011
	(0.45)	(0.12)	(0.33)	
d log(Salaries & Wages)	0.28	−0.05	−0.60	1008
	(0.52)	(0.15)	(0.38)	
d log(Officer Comp.)	0.62	0.26	−0.17	924
	(0.91)	(0.23)	(0.67)	

Notes: This table contains coefficients and observation counts from regressions after restricting the sample to U.S. multinationals with low foreign capital. Outcome variables appear as row names. All outcomes are winsorized at the 5% level. Standard errors appear in parentheses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Table G.11: Tax Change Portfolios

	Share	K_0/ firm	$100 \times \Gamma$		$100 \times \bar{\Gamma}$		$100 \times \tau$		$100 \times \bar{\tau}$		N
			Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Group:											
Domestic 1	18.7	101	13.7	8.8			16.3	9.4			3048
Domestic 2	1.4	53	21.5	14.5			33.6	21.7			439
Domestic 3	1.4	51	24.2	16.1			26.8	16.9			439
Domestic 4	13.9	75	28.4	18.6			32.9	20.3			3047
Multinat. high 1	3.9	181	14.7	8.7	17.7	17.7	17.4	9.8	28.0	28.0	356
Multinat. high 2	3.2	320	15.0	8.7	17.7	29.4	17.2	9.1	7.0	7.0	165
Multinat. high 3	0.5	442	23.9	15.7	17.7	29.4	31.3	18.8	7.0	7.0	17
Multinat. high 4	0.2	203	25.5	16.4	17.7	29.4	27.7	16.6	7.0	7.0	18
Multinat. high 5	0.1	134	26.3	18.2	17.7	17.7	32.5	21.6	27.6	27.6	17
Multinat. high 6	1.8	183	27.1	16.5	17.7	17.7	34.2	20.0	18.8	18.8	165
Multinat. high 7	0.0	24	27.2	18.3	17.7	17.7	29.7	19.1	27.3	27.3	16
Multinat. high 8	7.9	368	27.3	15.9	17.7	29.4	32.2	17.2	7.0	7.0	356
Multinat. low 1	4.5	187	13.9	8.9	17.7	17.7	16.4	9.8	22.7	22.7	400
Multinat. low 2	2.1	277	19.5	14.1	17.7	29.4	22.4	14.6	7.0	7.0	125
Multinat. low 3	0.2	283	21.9	12.9	17.7	29.4	24.3	12.8	7.0	7.0	10
Multinat. low 4	0.4	391	23.2	15.2	17.7	29.4	34.4	21.9	7.0	7.0	16
Multinat. low 5	0.5	282	24.7	16.6	17.7	17.7	33.4	21.8	36.4	36.4	29
Multinat. low 6	0.3	158	26.9	17.6	17.7	17.7	28.6	18.0	30.4	30.4	35
Multinat. low 7	4.9	319	28.1	18.2	17.7	29.4	33.0	20.1	7.0	7.0	255
Multinat. low 8	4.0	243	29.4	19.0	17.7	17.7	33.2	20.6	21.4	21.4	271
Non C-corp.	30.0	87	23.0	23.0			31.0	31.0			

Notes: Share is the share of domestic capital at firms in the group, in percent. K_0/ firm is average domestic capital per firm in billions of dollars. Pre and post refer to 2015-2016 and 2018-2019 averages.

Table G.12: 30 Year Revenue Effects

	Percent of no-TCJA corporate revenue			
	METR only	Exp. only	GILTI only	Total
1. Mechanical corporate	−39.0	−3.5	0.0	−41.6
2. Dynamic and personal	3.6	−0.1	2.0	5.7
3. Total	−35.4	−3.6	2.0	−35.9
4 (memo): Year 30 K (%)	4.3	2.2	0.7	6.3
5 (memo): (3)/(4)	−8.2	−1.6	3.0	−5.7

Notes: The table shows the present value of total corporate and personal income tax changes for changes to the METR only, to expensing only, to GILTI only, and for all tax changes simultaneously, expressed as a share of no-TCJA steady state corporate revenue. Row 1 shows the corporate revenue effects of changes in $\Gamma, \bar{\Gamma}, \tau, \bar{\tau}$ holding K and $\bar{K}$ fixed at their no-TCJA level. Row 2 shows the revenue effects of changes in K and $\bar{K}$ evaluated at the TCJA tax rates and of payout taxes. Rows 3 shows overall revenue effects in the 30 year window. Row 4 shows the percent increase in domestic capital after 30 years.

Table G.13: 10 Year Revenue Effects

	Percent of no-TCJA corporate revenue		
	Baseline	Unexp. phaseout	Exp. phaseout
1. Mechanical corporate	−41.6	−39.9	−39.9
2. Dynamic and personal	3.4	3.7	4.2
3. Total	−38.2	−36.3	−35.7
4 (memo): Year 10 K (%)	5.3	4.1	4.6
5 (memo): (3)/(4)	−7.2	−8.9	−7.7

Notes: The table shows the present value of total corporate and personal income tax changes over 10 years for our baseline with permanent full expensing, unexpected phaseout of expensing, and anticipated phaseout of expensing, expressed as a share of no-TCJA steady state corporate revenue. Row 1 shows the corporate revenue effects of changes in $\Gamma, \bar{\Gamma}, \tau, \bar{\tau}$ holding K and $\bar{K}$ fixed at their no-TCJA level. Row 2 shows the revenue effects of changes in K and $\bar{K}$ evaluated at the TCJA tax rates and of payout taxes. Row 3 shows the overall revenue effects. Row 4 shows the percent increase in domestic capital after 10 years.

Table G.14: Tax Term Change Statistics

Variable	Means		Standard Deviations	
	Pre	Post	Pre	Post
Γ	0.217	0.136	0.080	0.053
$\bar{\Gamma}$	0.177	0.191	0.000	0.039
τ	0.259	0.155	0.090	0.057
$\frac{1-\Gamma}{1-\tau}$	1.061	1.024	0.058	0.031

Notes: This table provides the means and standard deviations in our analysis sample of the three tax variables, as well as the tax term before and after the TCJA.

Table G.15: Tax Changes by Industry, Full Sample

Industry (NAICS)	Code	Γ			τ			Tax Term $(1-\Gamma)/(1-\tau)$			N
		Pre	Post	% Change	Pre	Post	% Change	Pre	Post	% Change	
Agriculture, Forestry, Fishing and Hunting	11	0.22	0.15	-33.4%	0.25	0.16	-36.2%	1.05	1.02	-2.7%	223
Mining, Oil, and Gas	21	0.18	0.12	-36.1%	0.20	0.12	-39.7%	1.03	1.01	-2.1%	317
Utilities	22	0.16	0.11	-33.7%	0.20	0.12	-40.5%	1.06	1.02	-3.8%	184
Construction	23	0.23	0.15	-34.8%	0.27	0.17	-36.9%	1.05	1.02	-2.9%	536
Manufacturing	31	0.23	0.15	-35.3%	0.28	0.17	-39.2%	1.06	1.02	-3.9%	577
Manufacturing	32	0.22	0.14	-36.2%	0.25	0.15	-40.1%	1.05	1.01	-3.2%	1338
Manufacturing	33	0.21	0.13	-38.0%	0.25	0.14	-41.6%	1.05	1.01	-3.1%	2556
Wholesale Trade	42	0.25	0.15	-38.0%	0.29	0.18	-40.2%	1.07	1.03	-3.8%	1714
Retail Trade	44	0.24	0.15	-37.1%	0.30	0.18	-39.1%	1.08	1.03	-4.1%	639
Retail Trade	45	0.22	0.14	-37.5%	0.26	0.16	-40.1%	1.06	1.02	-3.5%	157
Transport and Warehousing	48	0.23	0.14	-36.9%	0.26	0.15	-40.4%	1.04	1.01	-2.9%	392
Transport and Warehousing	49	0.22	0.15	-35.3%	0.28	0.17	-38.0%	1.07	1.03	-3.9%	51
Information	51	0.20	0.13	-37.9%	0.23	0.13	-41.8%	1.04	1.01	-2.7%	921
Real Estate	53	0.19	0.12	-37.4%	0.23	0.14	-40.0%	1.06	1.02	-3.1%	310
Professional, Scientific, and Technical Services	54	0.21	0.13	-38.8%	0.24	0.14	-41.6%	1.04	1.01	-2.7%	767
Management of Companies	55	0.22	0.14	-37.7%	0.31	0.19	-38.3%	1.12	1.06	-5.4%	978
Admin., Support, and Waste Mgmt.	56	0.23	0.14	-39.3%	0.26	0.15	-42.1%	1.05	1.02	-3.2%	280
Educational Services	61	0.21	0.13	-38.0%	0.26	0.16	-40.3%	1.07	1.03	-3.9%	78
Health Care	62	0.17	0.11	-37.7%	0.21	0.13	-39.8%	1.06	1.02	-2.9%	276
Arts, Entertainment, and Recreation	71	0.16	0.10	-35.7%	0.21	0.13	-38.7%	1.07	1.03	-3.8%	167
Accommodation and Food	72	0.18	0.11	-39.7%	0.24	0.14	-42.3%	1.09	1.04	-4.6%	322
Other Services (except Public Admin.)	81	0.19	0.12	-38.3%	0.24	0.14	-40.0%	1.07	1.03	-3.5%	126

Notes: This table summarizes tax change statistics by industry for the full sample in our analysis. For each industry (as reported in columns 1-2), columns 3-5 summarize the average value of Γ before and after the TCJA, as well as the percent change. Columns 6-8 and 9-11 report the same for τ and the tax term (respectively). Column 12 summarizes the number of firms in that industry in the full sample.

Table G.16: Tax Changes by Industry, Domestic Sample

Industry (NAICS)	Code	Γ			τ			Tax Term $(1-\Gamma)/(1-\tau)$			N
		Pre	Post	% Change	Pre	Post	% Change	Pre	Post	% Change	
Agriculture, Forestry, Fishing and Hunting	11	0.22	0.14	-33.3%	0.25	0.16	-35.9%	1.05	1.02	-2.6%	212
Mining, Oil, and Gas	21	0.18	0.12	-35.6%	0.20	0.12	-39.0%	1.03	1.01	-2.0%	260
Utilities	22	0.16	0.11	-33.3%	0.21	0.12	-40.1%	1.06	1.02	-3.8%	172
Construction	23	0.24	0.15	-34.6%	0.27	0.17	-36.7%	1.05	1.02	-2.9%	502
Manufacturing	31	0.23	0.15	-34.1%	0.27	0.17	-37.5%	1.06	1.02	-3.5%	454
Manufacturing	32	0.21	0.14	-34.8%	0.25	0.15	-38.0%	1.05	1.02	-2.8%	939
Manufacturing	33	0.21	0.14	-35.7%	0.25	0.15	-38.4%	1.05	1.02	-2.7%	1597
Wholesale Trade	42	0.25	0.15	-37.5%	0.29	0.18	-39.4%	1.07	1.03	-3.6%	1391
Retail Trade	44	0.24	0.15	-37.0%	0.29	0.18	-38.8%	1.08	1.03	-4.0%	575
Retail Trade	45	0.22	0.14	-36.9%	0.26	0.16	-39.3%	1.06	1.02	-3.2%	119
Transport and Warehousing	48	0.23	0.15	-36.2%	0.26	0.16	-39.6%	1.04	1.01	-2.9%	340
Transport and Warehousing	49	0.22	0.15	-34.9%	0.28	0.17	-37.6%	1.08	1.03	-3.9%	46
Information	51	0.22	0.14	-35.8%	0.25	0.15	-39.6%	1.04	1.01	-2.9%	581
Real Estate	53	0.19	0.12	-36.8%	0.23	0.14	-39.2%	1.06	1.02	-3.1%	266
Professional, Scientific, and Technical Services	54	0.21	0.13	-37.7%	0.24	0.14	-39.9%	1.04	1.02	-2.5%	516
Management of Companies	55	0.22	0.14	-37.7%	0.31	0.19	-38.3%	1.12	1.06	-5.4%	975
Admin., Support, and Waste Mgmt.	56	0.22	0.14	-37.5%	0.25	0.15	-39.6%	1.05	1.02	-2.8%	204
Educational Services	61	0.21	0.13	-37.8%	0.26	0.16	-39.8%	1.08	1.03	-3.9%	66
Health Care	62	0.17	0.11	-37.5%	0.21	0.13	-39.5%	1.05	1.02	-2.8%	259
Arts, Entertainment, and Recreation	71	0.16	0.10	-35.5%	0.21	0.13	-38.5%	1.07	1.03	-3.7%	155
Accommodation and Food	72	0.17	0.11	-38.8%	0.23	0.14	-41.2%	1.08	1.04	-4.3%	287
Other Services (except Public Admin.)	81	0.19	0.12	-38.0%	0.24	0.14	-39.3%	1.07	1.03	-3.4%	113

Notes: This table summarizes tax change statistics by industry for the domestic sample in our analysis. For each industry (as reported in columns 1-2), columns 3-5 summarize the average value of Γ before and after the TCJA, as well as the percent change. Columns 6-8 and 9-11 report the same for τ and the tax term (respectively). Column 12 summarizes the number of firms in that industry in the domestic sample.

Table G.17: Tax Changes by Industry, Foreign Sample

Industry (NAICS)	Code	Γ			τ			Tax Term $(1-\Gamma)/(1-\tau)$			N
		Pre	Post	% Change	Pre	Post	% Change	Pre	Post	% Change	
Agriculture, Forestry, Fishing and Hunting	11	0.26	0.17	-34.4%	0.30	0.18	-40.5%	1.06	1.01	-4.4%	11
Mining, Oil, and Gas	21	0.17	0.11	-37.8%	0.20	0.12	-42.0%	1.03	1.01	-2.4%	57
Utilities	22	0.14	0.09	-37.9%	0.18	0.10	-44.9%	1.04	1.01	-3.2%	12
Construction	23	0.22	0.14	-37.2%	0.25	0.15	-41.1%	1.04	1.01	-3.1%	34
Manufacturing	31	0.25	0.15	-38.8%	0.30	0.17	-44.1%	1.07	1.02	-5.1%	123
Manufacturing	32	0.22	0.13	-39.0%	0.26	0.14	-43.9%	1.05	1.01	-3.9%	399
Manufacturing	33	0.21	0.12	-41.2%	0.24	0.13	-46.0%	1.05	1.01	-3.7%	959
Wholesale Trade	42	0.24	0.15	-40.0%	0.29	0.16	-43.4%	1.07	1.02	-4.3%	323
Retail Trade	44	0.24	0.15	-38.0%	0.30	0.18	-42.0%	1.10	1.03	-5.7%	64
Retail Trade	45	0.21	0.12	-39.5%	0.26	0.15	-42.8%	1.07	1.03	-4.3%	38
Transport and Warehousing	48	0.22	0.13	-40.4%	0.25	0.14	-44.1%	1.04	1.01	-3.1%	52
Information	51	0.17	0.10	-42.0%	0.19	0.10	-46.4%	1.03	1.01	-2.4%	340
Real Estate	53	0.20	0.12	-39.8%	0.24	0.13	-43.7%	1.05	1.01	-3.3%	44
Professional, Scientific, and Technical Services	54	0.22	0.13	-40.8%	0.25	0.14	-44.5%	1.04	1.01	-3.1%	251
Admin., Support, and Waste Mgmt.	56	0.25	0.14	-42.1%	0.28	0.15	-46.5%	1.05	1.01	-3.8%	76
Educational Services	61	0.23	0.14	-39.2%	0.28	0.16	-42.9%	1.07	1.02	-4.2%	12
Health Care	62	0.24	0.14	-39.8%	0.29	0.17	-42.8%	1.08	1.03	-4.6%	17
Arts, Entertainment, and Recreation	71	0.20	0.13	-37.9%	0.27	0.16	-41.3%	1.09	1.04	-5.0%	12
Accommodation and Food	72	0.21	0.12	-45.1%	0.28	0.14	-49.1%	1.10	1.03	-6.4%	35
Other Services (except Public Admin.)	81	0.23	0.14	-40.9%	0.28	0.15	-45.6%	1.07	1.02	-4.8%	13

Notes: This table summarizes tax change statistics by industry for the foreign sample in our analysis. For each industry (as reported in columns 1-2), columns 3-5 summarize the average value of Γ before and after the TCJA, as well as the percent change. Columns 6-8 and 9-11 report the same for τ and the tax term (respectively). Column 12 summarizes the number of firms in that industry in the foreign sample.