Global Ripple Effects of Corporate Tax Reforms*

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December 19, 2025

Abstract

We study international spillovers of corporate tax reforms in a fragmented global tax regime. Using firm-level evidence on the 2017 U.S. Tax Cuts and Jobs Act (TCJA) and a quantitative general-equilibrium model, we illustrate how multinational enterprises (MNEs) propagate local policy shocks throughout the global economy. Our framework emphasizes two key intrinsic properties of intangible capital: non-rivalry and mobile ownership. We find the TCJA generated positive outward spillovers: First, it boosted U.S. MNEs' intangible investment, raising their foreign subsidiaries' output. Second, it increased tangible investment of foreign MNEs' U.S. subsidiaries, incentivizing them to expand intangible investment at home. Conversely, a Global Minimum Tax (GMT) implemented by the rest of the world generates negative inward spillovers for the United States, even if U.S.-parented MNEs are exempt. These findings illustrate that there is no such thing as a purely domestic corporate tax policy.

Keywords: Multinational enterprises; intangible capital; profit shifting; global spillovers; corporate tax reform; TCJA; GILTI; FDII; global minimum tax; international tax policy.

JEL Codes: E6, F23, H25, H3

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1 Introduction

The global effort to curb profit shifting by multinational enterprises (MNEs) has fractured into two distinct policy regimes. While the European Union and other major economies are moving to implement the OECD's multilateral Global Minimum Tax (GMT), the United States continues to rely on the unilateral framework introduced by the 2017 Tax Cuts and Jobs Act (TCJA). This divergence means that corporate tax reforms can generate cross-border effects: because U.S.-parented MNEs play an outsized role in the global economy, their responses to the TCJA propagate abroad, and as foreign jurisdictions adopt the GMT, the U.S. economy becomes exposed to policies it did not enact. We study how these regimes interact and quantify the resulting macroeconomic spillovers in this fragmented global tax landscape.

We first document the micro-level impact of the TCJA on U.S. MNE investment using a difference-in-differences design that exploits firm-level variation in tax cuts. We then build a quantitative general-equilibrium model with heterogeneous firms, multinational production, and profit shifting, incorporating both the key TCJA provisions and the institutional design of the GMT. The framework captures the bidirectional nature of tax spillovers, tracing how U.S. policy changes propagate abroad and how foreign reforms feed back into the U.S. economy.

Our structural model puts intangible capital at the center of global spillovers by emphasizing two key characteristics: nonrivalry, which allows MNEs to deploy intangible capital across multiple jurisdictions at once; and mobile ownership, which makes the return to intangible investment highly sensitive to profit-shifting incentives and foreign tax rates. We also explore a third potential channel: a technology externality through which the presence of foreign MNEs' intangible capital raises domestic firms' R&D productivity. Together, these features imply that local tax reforms that affect domestic MNEs' intangible-investment decisions can propagate outward through multinational networks, reshaping investment and production worldwide.

We find that the TCJA in the United States and the GMT adopted elsewhere both generate quantitatively significant cross-country spillovers. The TCJA substantially raises U.S. tangible and intangible investment, increasing U.S. GDP by 0.3 percent. These gains spill across borders, raising output in Europe by about two-thirds as much and in the rest of the world by about one-third as much. By contrast, a GMT implemented outside the United States reduces intangible investment by 0.2–0.4 percent in adopting regions and lowers output by roughly one-sixth of that amount. The United States is not insulated: even without adopting the GMT, U.S. investment and output decline. While the GMT's level effects are smaller than the TCJA's, its policy change is also more modest in scale and scope; measured per unit of tax change, the implied spillover elasticities are comparable across the two reforms.

We begin by documenting the microeconomic effects of the TCJA using data on publicly traded firms from Compustat. Although the TCJA lowered taxes for all U.S. firms, several provisions changed the taxation of MNEs' intangible income, generating cross-firm variation in exposure to the reform. We use a difference-in-differences design with a continuous treatment, comparing investment before and after 2017 for U.S. MNEs that were more versus less exposed. The evidence points to a reallocation within firms' capital portfolios: firms receiving larger tax cuts increase both tangible and intangible investment, but tangible investment rises relatively more. These patterns motivate our quantitative model, which aggregates the firm-level responses into macroeconomic outcomes.

While our empirical analysis identifies the TCJA's effects at the firm level using variation in relative exposure, translating these estimates into aggregate and cross-country outcomes requires a structural framework. We therefore develop a multi-country general equilibrium model based on Dyrda, Hong, and Steinberg (2024a) featuring heterogeneous firms, profit shifting, and multinational production. We explicitly embed the TCJA's partial territorial system, including the Global Intangible Low-Taxed Income (GILTI) and Foreign-Derived Intangible Income (FDII) components, and the GMT's rule priority structure. By carefully defining tax bases to account for provisions like Qualified Business Asset Investment (QBAI) deductions and substance-based carve-outs, our framework captures how specific policy details shape the global allocation of capital and profits, and our results show that these details matter. A central contribution is our rigorous mapping of the institutional tax environment. In an extension, we incorporate productivity spillovers following Dyrda, Hong, and Steinberg (2024b), whereby local intangible investment efficiency depends on the stock of intangible capital deployed by foreign MNEs in the region.

At the core of the model is a theory of how effective tax rates shape multinationals' investment decisions. Because intangible capital is non-rival and its ownership is mobile, MNEs can deploy it globally while shifting the associated profits to low-tax jurisdictions. Policies such as GILTI, FDII, and the GMT operate by compressing the tax wedge between the U.S. parent and its foreign affiliates. While this successfully reduces profit shifting, it also lowers the after-tax return on intangible assets, dampening the incentive to invest in innovation. Counteracting this, substance-based provisions such as the QBAI deduction under GILTI or substance-based carve-outs under the GMT reduce the user cost of tangible capital in targeted jurisdictions. Through these competing channels, tax reforms that reallocate profits across jurisdictions also alter the size, composition, and global allocation of MNEs' investments.

Before turning to the quantitative analysis, we analytically characterize how these reforms interact. In isolation, we find that GILTI and FDII both reduce profit shifting but have opposing effects on the intangible investment. When combined with the GMT, the interactions are non-trivial. We show that GILTI and the GMT act as substitutes: both raise the effective tax floor on foreign affiliates, meaning the binding constraint is simply the higher of the two rates. In contrast, FDII and the GMT act as complements: the GMT raises the foreign rate while FDII lowers the domestic rate on foreign-derived income, jointly compressing the tax wedge to reinforce the incentive to keep intangible capital in the United States. This framework clarifies how domestic and international provisions can either reinforce or offset one another.

Our structural model allows us to quantify these mechanisms, providing the first framework detailed enough to embed the institutional specifics of both the TCJA and the GMT. We find that the TCJA substantially boosted U.S. investment, raising tangible and intangible capital by 3.1 and 1.0 percent, respectively, and lifting GDP by 0.3 percent. However, this expansion came at a cost: corporate tax revenues fell by more than a third. The implied aggregate semi-elasticity of capital aligns with the empirical consensus, validating the model's calibration. Crucially, these changes rippled beyond U.S. borders: investment rose globally, increasing GDP in Europe by 0.2% and the rest of the world by 0.1%, reflecting the positive outward spillovers of the reform.

We find that a GMT implemented outside the United States reduces intangible investment by 0.4 percent in Europe and 0.2 percent in the rest of the world, lowering output in each region by about 0.05 percent. Even when U.S.-parented MNEs are exempt from the GMT (our baseline case), the United States is not insulated: U.S. GDP falls by roughly half of the EU/RoW output response. While these effects are smaller than under the TCJA, they should be interpreted relative to the size of the underlying tax changes. The TCJA reduced effective corporate tax rates by nearly ten percentage points for firms operating in the United States, whereas the GMT raises taxes only for a narrow subset of non-U.S. MNEs—those shifting profits to low-tax jurisdictions; the average effective tax-rate change for MNEs headquartered in Europe and the rest of the world is only a few basis points. Viewed on a per–tax-point basis, the GMT therefore generates sizable cross-border spillovers.

Our analysis also highlights the importance of intangible spillovers in propagating global ripple effects. When intangible investment declines in one region, the resulting reduction in foreign intangible presence lowers the efficiency of intangible accumulation elsewhere, which in turn feeds back to further reduce investment at home. For example, when the GMT is adopted globally, incorporating intangible spillovers more than doubles the model-implied GDP decline in the high-tax regions relative to a version without spillovers. This amplification reflects both lower intangible capital and a contraction in multinational activity: as intangibles fall, some firms optimally withdraw from serving foreign markets, reallocating production toward less productive domestic firms.

Related Literature. This paper contributes to several strands of literature in international economics, public finance, and macroeconomics. The first strand of literature focuses on evaluating the expected and actual effects of the TCJA tax reform. Initial studies in this area have primarily used calibrated models to predict the TCJA's outcomes, with significant contributions from Barro and Furman (2018), Slemrod (2018), Gale, Gelfond, Krupkin, Mazur, and Toder (2019), Clausing (2020a), and Auerbach (2018), which discuss the expected economic impacts. Further investigations by Kopp, Leigh, Mursula, and Tambunlertchai (2019), Wagner, Zeckhauser, and Ziegler (2020), Garcia-Bernardo, Jansky, and Zucman (2023), Chodorow-Reich, Smith, Zidar, and Zwick (2025), Clausing (2024), Dobridge, Kennedy, Landefeld, and Mortenson (2025), and Santacreu and Stewart (2024) find that the TCJA generated substantial and heterogeneous reductions in effective tax rates across U.S. firms and modest and uneven effects on real activity, including investment, employment, and profit-shifting behavior, particularly along intangible-related margins. Using administrative tax data, Altshuler, Boller, Roberts, and Suárez Serrato (2025) show that foreign tax planning by U.S. multinationals is associated with changes in domestic real activity, highlighting the importance of profit-shifting incentives for firms' investment and production decisions.

In this strand, our paper is closely related to Chodorow-Reich et al. (2025), who study the investment effects of the TCJA using administrative tax data and a two-country general-equilibrium model with complementarity between domestic and foreign tangible capital. We extend their framework by incorporating intangible capital and TCJA provisions governing intangible income, allowing for endogenous profit shifting, and quantifying the role of technology spillovers in amplifying the general-equilibrium effects of tax reforms.

The second strand of literature this paper engages with revolves around the measurement of profit shifting (Clausing, 2020b; Guvenen, Mataloni, Rassier, and Ruhl, 2022; Tørsløv, Wier, and Zucman, 2022) and its implications for firm behavior (Hines and Rice, 1994; Suárez Serrato, 2018; Bilicka, Devereux, and Güçeri, 2024) and the aggregate economy (Dyrda, Hong, and Steinberg, 2024a; Ferrari, Laffitte, Parenti, and Toubal, 2023). In particular, Dyrda et al. (2024a) was the first to micro-found profit shifting through transfer pricing of intangible capital and to formulate a multi-country general-equilibrium model to quantify the macroeconomic effect of profit shifting and the impact of the OECD two-pillar reform. The contribution of this paper relative to Dyrda et al. (2024a) is two-fold. First , we detail the U.S. tax code and the TCJA provisions related to MNEs with precision. Second, we integrate tangible capital into the model, which is informed by our empirical analysis and allows us to structurally study firms' capital portfolio choices in response to the tax reforms.

More broadly, we contribute to the literature that emphasizes the role of nonrival intangible capital in shaping the aggregate effects of foreign direct investment (Burstein and Monge-Naranjo, 2009; McGrattan and Prescott, 2009; Alviarez, Cravino, and Ramondo, 2023; McGrattan and Waddle, 2020). Recent work by LaBelle, Martin, and Santacreu (2025) provides complementary evidence using global patent transfers, documenting how statutory tax differentials shape the international allocation of intangible assets and royalty income, and showing that tax harmonization substantially curbs shifting while modest minimum taxes have limited effects. Specifically, McGrattan and Prescott (2009) build a neoclassical growth model in which the representative multinational invests in intangible capital that can be used simultaneously to produce output at home and abroad, and show that this channel substantially increases the gains to openness to FDI.[1] McGrattan and Waddle (2020) study the macroeconomic effects of FDI restrictions in a multi-country model with nonrival intangible capital. We build on this framework by allowing heterogeneous firms to choose export destinations, foreign affiliate locations, and intangible investment, while additionally incorporating a theory of profit shifting through tax-haven affiliates and endogenous relocation of intangible assets. Our model is tailored to the institutional features of the U.S. economy. The paper is also related to the quantitative multinational-production models of Ramondo (2014) and Ramondo and Rodríguez-Clare (2013), which analyze firms' trade-offs between exporting and affiliate production, and to Lind and Ramondo (2023), who model global innovation and cross-border knowledge diffusion.

2 Empirical Analysis

The TCJA reduced taxes for all U.S. corporations, but the magnitude of tax reduction varied substantially across firms. This variation arose from three sources: differences in pre-reform effective tax rates due to variation in the use of tax preferences; differential exposure to the new international provisions (GILTI and FDII) based on multinational status and foreign operations; and heterogeneous asset compositions that interact with the TCJA's treatment of intangible versus tangible income.

We exploit this cross-firm variation in a difference-in-differences framework with continuous treatment. Specifically, we compare the investment of firms that experienced larger versus smaller reductions in effective tax rates, before and after the reform. Our identifying assumption is that,

[1] McGrattan and Prescott (2010) show that nonrival intangible capital also has important measurement implications. Specifically, they show that it accounts for the high profitability of foreign subsidiaries of U.S. MNEs relative to U.S. subsidiaries of foreign MNEs. This helps explain why U.S. net foreign payments are positive despite the United States' negative current account and net foreign asset position—nonrival intangible capital is Hausmann and Sturzenegger (2007)'s "dark matter."

absent the TCJA, investment trends would have been parallel across firms with different levels of exposure. The event-study specification we estimate allows us to assess this assumption by examining pre-reform dynamics.

The estimates from our empirical strategy reflect the cumulative effect of the TCJA induced by various domestic and international provisions for the consolidated records of U.S. firms.

2.1 Data

Sample construction. Our primary data source is Compustat North America, which covers publicly traded and some large private U.S. firms. We focus on the period 2012–2022, providing five years of data before and after the TCJA's December 2017 enactment. We exclude financial firms and require observations to have positive sales and valid industry codes. Appendix A.1 provides complete details on sample construction. We provide summary statistics for the full estimation sample, broken down by multinational status, in Table A.1.

Measuring intangible capital. A central challenge in studying intangible investment is that U.S. accounting standards require most internally developed intangibles to be expensed rather than capitalized. The book value of intangible assets on firms' balance sheets therefore substantially understates true intangible capital stocks. Following Peters and Taylor (2017), we construct a measure of internal intangible capital by capitalizing R&D expenditures using the perpetual inventory method with a 15 percent depreciation rate. We combine this with reported intangible assets to obtain total intangible capital. Appendix A.2 provides details on our construction methodology.

Measuring multinational status. We identify multinational enterprises using the WRDS Company Subsidiary database, which provides information on subsidiaries disclosed to the SEC. Under SEC rules, public firms must disclose subsidiaries whose assets, investment, or income exceed 10 percent of consolidated totals. We classify a firm as an MNE in our preferred definition if it has at least one foreign subsidiary in any of the three preceding years and reported nonzero foreign income or foreign taxes during that period. This definition captures firms with substantive foreign operations rather than purely financial arrangements.

Measuring firm-level exposure to TCJA. Following Wagner et al. (2020), we measure firm-level exposure to the TCJA using the change in GAAP effective average tax rate (EATR) from 2016 to 2018. The GAAP EATR is defined as the ratio of total income tax expenses to pre-tax income. This measure captures the recurring impact of the TCJA while excluding one-time transition effects such as the repatriation tax on accumulated foreign earnings or re-measurement of deferred tax assets.

The mean EATR fell from 31 percent in the pre-TCJA period (2012-2016) to 22 percent in the post-TCJA period (2018-2022), a decline of approximately 8 percentage points[2]. However, this average masks substantial heterogeneity: the interquartile range of EATR changes spans from -15 to -3 percentage points, and some firms experienced EATR increases due to base-broadening provisions or changes in their income composition.

Potential concerns with the treatment measure. Using realized 2018 EATRs to measure TCJA exposure raises potential endogeneity concerns. A firm's post-reform effective tax rate reflects not only the exogenous policy shock but also endogenous responses to that shock (e.g., changes in the location of production or the intensity of profit shifting). If these responses are correlated with unobserved determinants of investment, our estimates could be biased.

Three features of our setting mitigate this concern. First, the TCJA was enacted rapidly: the bill was introduced in early November 2017 and signed into law on December 22, 2017, leaving firms little time for anticipatory adjustments that could contaminate our treatment measure. Second, substantial regulatory uncertainty persisted through 2018, with final guidance on GILTI and FDII issued only after our measurement window, limiting firms' ability to optimize against the new provisions. Third, we verify robustness to alternative treatment measures in Appendix A.4, including a simulated tax instrument that applies the post-TCJA statutory rules to pre-reform firm characteristics, effectively isolating the mechanical component of tax changes from behavioral responses.

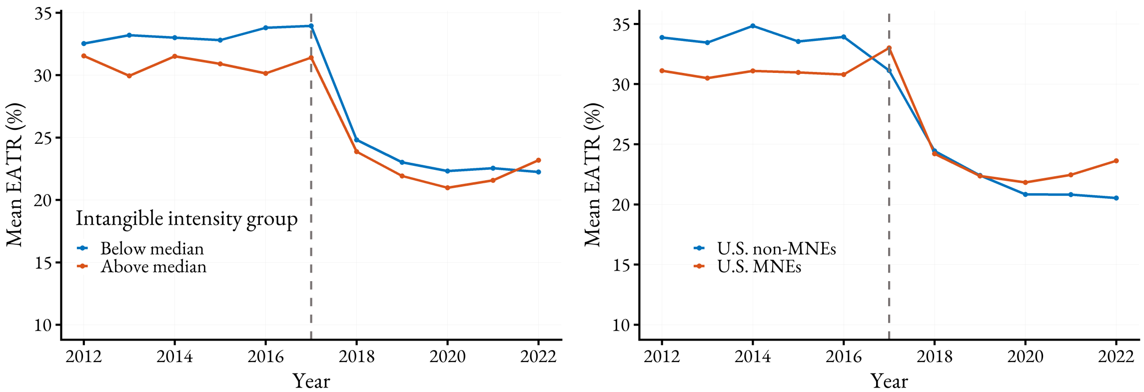
2.2 Descriptive patterns

Before presenting our regression estimates, we document several descriptive patterns that motivate our empirical strategy and preview our findings.

EATR dynamics by firm type. Figure 1 plots the evolution of mean GAAP effective tax rates for different groups of firms. Panel (a) stratifies by pre-TCJA intangible intensity (the ratio of intangible to total assets). Prior to 2017, low-intangible-intensity firms had higher mean EATRs than high-intangible-intensity firms, reflecting the differential use of R&D tax credits and patent boxes. Following the TCJA, this gap narrowed substantially as the corporate rate reduction benefited all firms while base-broadening provisions disproportionately affected intangible-intensive firms. Panel (b) stratifies by multinational status. U.S. MNEs and domestic firms exhibited similar EATR levels and dynamics through 2016, despite MNEs' greater opportunities for international tax planning. Although U.S. MNEs experience a spike in EATR levels in 2017, driven by the one-time repatriation tax, both groups experienced sharp EATR declines following 2017 and stabilization at lower levels. The similar dynamics suggest that within-industry variation in EATR changes is not dominated by MNE status alone.

[2]Table A.3 presents summary statistics for GAAP effective tax rates in our analysis sample.

Figure 1: EATRs by intangible intensity and MNE status



(a) By pre-TCJA intangible intensity

(b) By MNE status

Notes: These figures plot the unweighted U.S. GAAP EATR, defined as the ratio of total taxes, inclusive of both foreign and domestic taxes, to pre-tax income for a balanced panel of Compustat firms from 2012 to 2022. To construct pre-TCJA intangible intensity groups, we first compute the firm-level average intangible intensity, weighted by total assets, using data from 2010 to 2013. We then use the (unconditional) median to create the "high" and "low" intangible intensity groups. We characterize U.S. MNE and non-MNEs using the presence of "significant" non-U.S. subsidiaries for Compustat firms incorporated in the U.S (see A.2 for additional details on MNE identification).

Profit shifting over time. Figure 2 presents estimates of profit shifting by U.S. MNEs in our sample, using the methodology of Delis, Delis, Laeven, and Ongena (2024). Panel (a) shows aggregate profits shifted in billions of dollars, and Panel (b) shows the average share of profits shifted. Both series exhibit a marked decline after 2017, suggesting that the TCJA's anti-abuse provisions (particularly GILTI) reduced profit-shifting incentives. This motivates our structural model's explicit treatment of profit-shifting behavior.

2.3 Regression specification

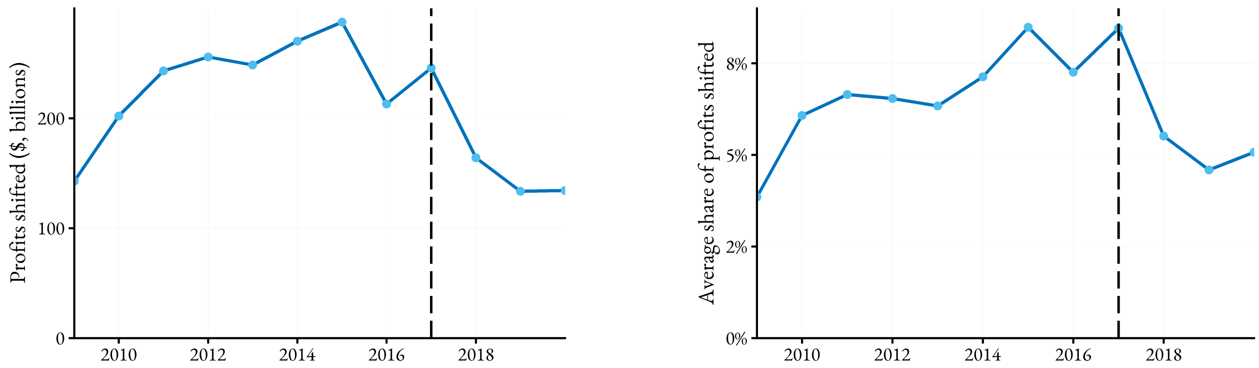
To estimate the effect of TCJA exposure on investment, we implement an event-study specification that traces out dynamic treatment effects. Specifically, we estimate:

$$y_{it} = \alpha_i + \gamma_{n(i)t} + \sum_{\tau=-5}^{5} \beta_\tau \Delta EATR_{2016\to2018,i} \times \mathbb{1}_{\{t-2017=\tau\}} + \varepsilon_{it} \tag{1}$$

where y_{it} is (logged) investment (tangible or intangible), $\Delta EATR_{2016\to2018,i}$ is the firm-level change in GAAP effective tax rate from 2016 to 2018 (our continuous treatment measure); α_i is the firm fixed effect; $\gamma_{n(i)t}$ is the industry-by-year fixed effect, where $n(i)$ denotes firm i's two-digit NAICS industry; and, ε_{it} is the idiosyncratic error term. The coefficient β_τ captures the semi-elasticity of investment with respect to the effective tax rate in event year τ.

The inclusion of industry-by-year fixed effects is important for two reasons. First, it absorbs

Figure 2: Profit shifting by U.S. MNEs



(a) Aggregate profits

(b) Share of profits shifted

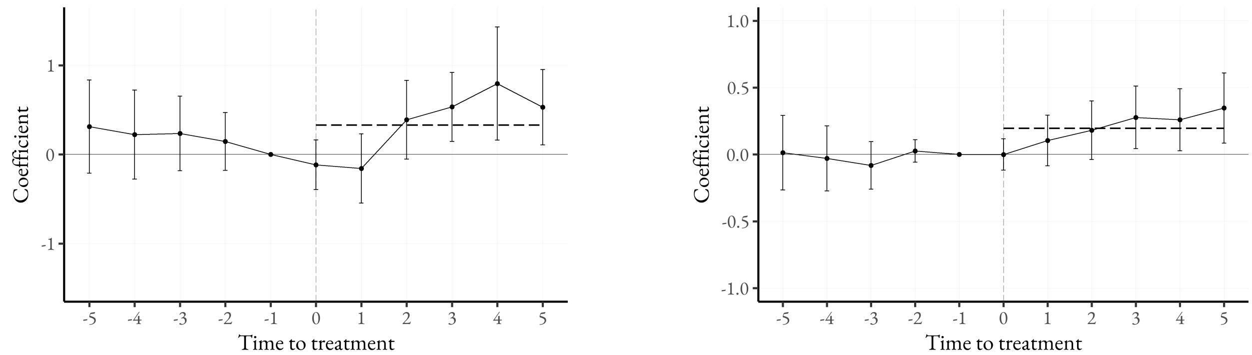
Notes: This figure reports profit shifting by U.S. MNEs in our Compustat sample, using estimates from Delis et al. (2024). Panel (a) reports aggregate profits shifted in USD billions. Panel (b) reports the (unweighted) average share of profits shifted, defined as the ratio of shifted profits to observed profits (S_{it}/π_{it}). The dashed line marks 2017, the enactment of the Tax Cuts and Jobs Act.

industry-specific trends that could confound our estimates (e.g., if intangible-intensive industries were on different growth trajectories for reasons unrelated to tax policy). Second, it ensures that identification comes from within-industry variation in EATR changes, which is more plausibly exogenous than between-industry variation. This conservative specification comes at the cost of precision, but provides stronger control for confounding factors. We cluster standard errors at the firm level to account for serial correlation in the error term within firms over time.

2.4 Empirical results

Investment response. Figure 3 presents our main results, plotting the estimated coefficients $\hat{\beta}_\tau$ with 95% confidence intervals. Panel (a) shows results for tangible investment, and panel (b) shows results for intangible investment. Several patterns emerge. First, the pre-TCJA coefficients are small in magnitude and statistically insignificant for both types of investment, supporting the parallel trends assumption. Firms with larger eventual TCJA exposure did not exhibit differential investment trends prior to the reform. Second, investment responses materialize with a lag: coefficients in 2018 and 2019 are small and imprecisely estimated, with larger and statistically significant effects emerging in 2020–2022. This delayed response is consistent with adjustment costs in capital accumulation and with the regulatory uncertainty that persisted through 2018. Third, both tangible and intangible investment respond positively to tax reductions. Averaging across post-TCJA years (2019–2022), a 10 percentage point reduction in EATR is associated with a 4.2 percent increase in tangible investment and a 2.3 percent increase in intangible investment. Both estimates are statistically significant at conventional levels. The implied semi-elasticities of -0.42

Figure 3: The effect of TCJA on investment



(a) Tangible investment

(b) Intangible investment

Notes: These figures plot the estimated dynamic effects $\hat{\beta}_\tau$ from equation (1), along with 95% confidence intervals, of the TCJA for tangible and intangible investment. Standard errors are clustered at the firm level.

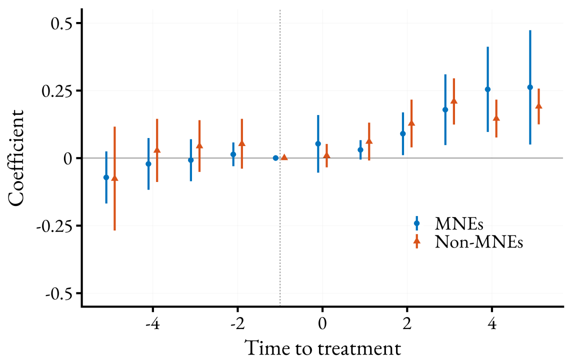
for tangible capital lies well within the -0.25 to -0.75 range summarized by Chodorow-Reich (2025).

Heterogeneity by multinational status. The TCJA's international provisions (GILTI and FDII) directly affected only multinational enterprises. To assess whether investment responses differ for firms subject to these provisions, we re-estimate our specification separately for MNEs and domestic firms. Figure 4 presents the results.

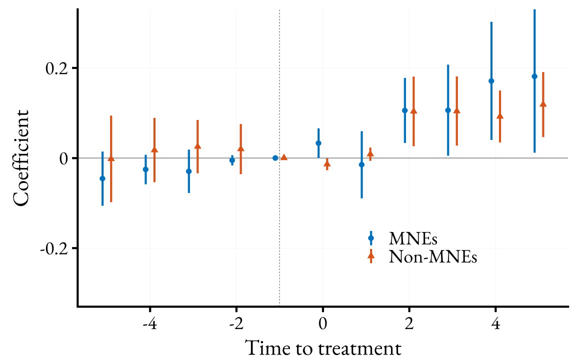
In Panel 4a, we observe that both groups increased tangible investment following the reform, confirming that the reduction in the corporate tax rate broadly stimulated physical investment. However, the dynamic profile for MNEs exhibits a more sustained acceleration in the medium run ($t \geq 3$), with point estimates exceeding those of domestic firms by approximately 10 percentage points towards the end of the sample period. This result is consistent with the presence of production complementarities: as the GILTI regime effectively lowered the user cost of foreign tangible capital (via the QBAI exemption), the resulting expansion of foreign operations by U.S. MNEs spilled over into higher domestic tangible investment, a mechanism highlighted in our general equilibrium framework.

Panel 4b reveals a sharp increase in intangible investment for MNEs. This robust response contradicts concerns that the GILTI tax on foreign intangible income would depress global R&D. Instead, it suggests that the reduced rate on foreign-derived intangible income (FDII) and the elimination of the repatriation tax alleviated financial constraints and increased the net return to innovation for globally active firms.

Figure 4: The effect of TCJA on investment, by multinational status



(a) Tangible investment



(b) Intangible investment

Notes: These figures plot the estimated dynamic effects $\hat{\beta}_\tau$ from equation (1) for the sub-sample of U.S. MNEs and non-MNEs defined using pre-TCJA status, along with 95% confidence intervals, of the TCJA for tangible and intangible investment. Standard errors are clustered at the firm level.

Heterogeneity by foreign sales share. In Appendix A.3, we provide suggestive evidence for the distinct "carrot" and "stick" mechanisms of the FDII regime modeled in Section C. As illustrated in Appendix Figures A.2 and A.3, firms with high foreign sales share, which mechanically have greater exposure to FDII provisions, exhibit a muted response in consolidated tangible investment relative to their domestic-focused peers. This result supports the existence of a "QBAI penalty," where the accumulation of domestic tangible assets reduces the FDII deduction, effectively raising the user cost of capital for exporters. Conversely, these same high-exposure firms drive the aggregate boom in intangible investment, consistent with the preferential 13.125% tax rate on foreign-derived intangible income acting as a subsidy for intellectual property formation.

In summary, our empirical analysis shows that the TCJA significantly affected MNE investment behavior, but it is limited in its ability to assess aggregate impacts. First, the estimates identify *relative* effects across firms with different TCJA exposure, but not the *absolute* effects of the policy; quantifying aggregate responses requires a general-equilibrium framework with factor-price and composition effects. Second, the empirical analysis does not capture the TCJA's global general-equilibrium effects, including transmission through trade, FDI linkages, and technology spillovers from intangible investment. Third, the reduced-form approach does not disentangle the distinct channels of the TCJA—rate reduction, territorial taxation, and provisions governing intangible income—which requires a structural model that maps institutional details into firm behavior. We introduce such a quantitative model in the next section.

3 Model

Our model builds closely on our previous work in Dyrda et al. (2024a) and Dyrda et al. (2024b). Time is discrete and indexed by $t = 1, 2, \ldots$. There are I regions indexed by i and j, each populated by a representative household, a measure of heterogeneous firms, and a government. Regions differ in population, total factor productivity, trade and FDI costs, and corporate income taxes. Households choose consumption, labor supply, tangible investment, and bond holdings. Firms decide the following: where to export and where to open foreign subsidiaries; how much labor to hire and tangible capital to rent in the parent division and each subsidiary; and how much intangible capital to produce in the parent division. As in McGrattan and Prescott (2009). intangible capital is nonrival and is used simultaneously in all of a firm's divisions, both foreign and domestic.

Multinational firms (firms that choose to establish foreign affiliates in equilibrium) use transfer pricing to allocate the costs of producing intangible capital across their foreign affiliates in proportion to the scale at which these affiliates use this capital. Affiliates license the right to use intangible capital from the division that owns this capital, and MNEs can shift profits by selling their intangible capital to affiliates in lower-tax regions. We denote the region with the lowest corporate income tax rate by LT. Additionally, there is an unproductive tax haven that is populated by a representative household and a government, labeled as TH, where no economic activity takes place. MNEs based in high-tax regions can transfer their intangible capital rights to either the low-tax region or the tax haven, provided that they have established affiliates there.

This paper's modeling contribution relative to our previous work is a careful treatment of how the 2017 Tax Cuts and Jobs Act (TCJA) changed corporate taxation in the United States, particularly for multinational enterprises. We focus on the four key changes described above: the reduction in the statutory tax rate; the shift from worldwide to territorial taxation; the global intangible low-taxed income (GILTI) provision; and the Foreign Derived Intangible Income (FDII) provision.

Throughout this section, we use capitals to denote aggregate variables and lower-cases to denote microeconomic firm-level variables. We omit time subscripts where appropriate for brevity.

3.1 Economic environment

Households. Each region i has a representative household with preferences over sequences of consumption, $\{C_{it}\}_{t=0}^{\infty}$, and labor supply, $\{L_{it}\}_{t=0}^{\infty}$, given by

$$\sum_{t=0}^{\infty} \beta^t \left[\log\left(\frac{C_{it}}{N_i}\right) + \psi_i \log\left(1 - \frac{L_{it}}{N_i}\right)\right]. \tag{2}$$

Households choose consumption, labor supply, tangible investment, $\{X_{it}\}_{t=0}^{\infty}$, and internationally-traded bonds, $\{B_{it+1}\}_{t=0}^{\infty}$ to maximize utility subject to a sequence of budget constraints,

$$P_{it}[(1+\tau_{ict})C_{it} + K_{it+1} - (1-\delta)K_{it}] + P_{bt}B_{it+1} = (1-\tau_{i\ell t})\,W_{it}L_{it} + R_{it}K_{it} + B_{it} + D_{it}, \quad (3)$$

taking the wage, W_{it}, the labor income tax rate, $\tau_{i\ell t}$, the rental rate, R_{it}, the bond price, P_{bt}, and dividends, D_{it}, as given.

Final goods. Each region has a nontradable final good that is used by households and the government for consumption. It is a constant-elasticity-of-substitution aggregate of differentiated intermediate goods from different source countries,

$$Q_{it} = \left[\sum_{j=1}^{I} \int_{\Omega_{jit}} q_{jit}(\omega)^{\frac{\varrho-1}{\varrho}} d\omega\right]^{\frac{\varrho}{\varrho-1}}, \quad (4)$$

where $q_{jit}(\omega)$ is the quantity of intermediate variety ω from region j, Ω_{jit} is the set of intermediate goods from j available in i (determined by firms' exporting and FDI decisions specified later), and ϱ is the elasticity of substitution between varieties. The demand curve for each variety can be written as

$$p_{jit}(\omega) = P_{it}Q_{it}^{\frac{1}{\varrho}} q_{jit}(\omega)^{-\frac{1}{\varrho}}. \quad (5)$$

The aggregate price index is

$$P_{it} = \left[\sum_{j=1}^{I} \int_{\Omega_{jit}} p_{jit}(\omega)^{1-\varrho} d\omega\right]^{\frac{1}{1-\varrho}}. \quad (6)$$

Production. The production technology for intermediate goods uses labor and tangible capital, which are rival, and intangible capital, which is nonrival. Each intermediate variety ω is produced by a specific firm. The production technology for a firm from i operating in j with productivity $a(\omega)$, intangible capital $z_t(\omega)$, tangible capital $k_{ijt}(\omega)$, and labor $\ell_{ijt}(\omega)$ is

$$y_{ijt}(\omega) = \sigma_{ij} A_j a(\omega) z_t(\omega)^{\phi} k_{ijt}(\omega)^{\alpha} \ell_{ijt}(\omega)^{1-\phi-\alpha}. \quad (7)$$

The parameters of this technology are as follows. A_j is region j's aggregate total factor productivity. ϕ is the share of intangible capital and α is the share of tangible capital. $\sigma_{ij} \in [0,1]$ represents a technological FDI barrier as in McGrattan and Waddle (2020); we assume no barriers in domestic production, i.e., $\sigma_{ii} = 1$.

Research and development. Intermediate-good firms hire workers in their home regions to produce intangible capital. A firm based in region i associated with variety ω that hires $\ell^z_{it}(\omega)$ R&D workers produces $z_t(\omega)$ units of intangible capital given by

$$z_t(\omega) = A_i \ell^z_{it}(\omega). \tag{8}$$

Trade and FDI. Firms can sell their products for free in the domestic market but accessing foreign markets is costly. Firms from region i pay a fixed cost κ^X_i to export and a fixed cost κ^F_i to produce locally in a foreign region. These costs are paid on a per-destination basis and are denominated in units of the home country's labor. There is also a variable exporting cost ξ_{ij} modeled as an iceberg cost. We denote a firm's set of export destinations by $J^X_{it}(\omega) \subseteq I \setminus \{i\}$ and its set of FDI destinations by $J^F_{it}(\omega) \subseteq I \setminus \{i\}$. Given these sets, the firm's resource constraints are:

$$y_{iit}(\omega) = q_{iit}(\omega) + \sum_{j \in J^X_{it}(\omega)} \xi_{ij} q_{ijt}(\omega) \tag{9}$$

$$y_{ijt} = \hat{q}_{ijt}(\omega), \ j \in J^F_{it}(\omega) \tag{10}$$

where $q_{ijt}(\omega)$ and $\hat{q}_{ijt}(\omega)$ represent exports and locally-produced products, respectively.

Transfer pricing and profit shifting. Each of a firm's affiliates pays a licensing fee for the right to use the firm's intangible capital. The licensing fee paid by the affiliate in j of a firm based in i is $\vartheta_{ijt}(\omega) z_{it}(\omega)$, where $\vartheta_{ijt}(\omega)$ is the firm's marginal revenue product of intangible capital in j. We define $\nu_{it}(\omega) z_{it}(\omega) \equiv \sum_{j \in J^F_{it}(\omega) \cup \{i\}} \vartheta_{ijt}(\omega) z_{it}(\omega)$ as the total amount of licensing fees paid across all of the firm's divisions, including the licensing fee the parent corporation "pays" itself. Firms shift profits by selling the rights to collect these licensing fees to their affiliates in the low-tax productive region (LT) and/or the unproductive tax haven (TH), provided that the fixed costs to establish these affiliates have been paid. These sales incur costs $\mathcal{C}\left(\lambda_{i,j,t}(\omega)\right) \psi_{i,j}$, where $\mathcal{C}\left(\lambda\right) = \lambda - (1 - \lambda) \log(1 - \lambda)$. See Dyrda et al. (2024a) for a detailed treatment of our theory of profit shifting.

Profit shifting and transfer pricing in an example. Profit shifting in our framework operates through the reallocation of intellectual property (IP) and the associated flows of licensing fees across affiliates of the multinational. Figure 5 illustrates the basic mechanism with a U.S.-headquartered multinational i, which owns two foreign subsidiaries: one in the European Union j and one in Ireland j'. The U.S. parent sells part of its IP to the low-tax affiliate in Ireland (red arrow). The transaction is priced at $\varphi_{ij'} \lambda \nu_i(z) z$, where λ denotes the fraction of IP shifted, $\nu_i(z)$

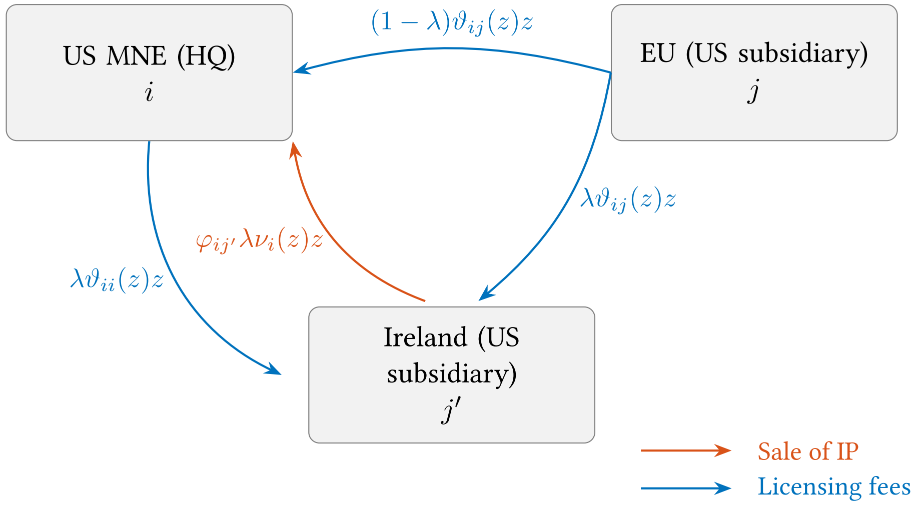


Figure 5: IP sales and licensing fee flows in a three-region version of the model.

the marginal revenue product of the technology, and $\varphi_{ij'} < 1$ a markdown factor capturing the ability to transfer IP at below arm's-length value. This intragroup sale effectively moves intangible capital out of the U.S. tax base and into the Irish affiliate.

Once the IP is booked in Ireland, the U.S. headquarters and the European subsidiary must pay licensing fees to the Irish affiliate in order to use the transferred technology (green arrows). The EU affiliate remits $(1-\lambda)\vartheta_{ij}(z)z$ on the fraction of IP it retains, and $\lambda\vartheta_{ij}(z)z$ on the portion shifted to Ireland. Similarly, the U.S. headquarters pays $\lambda\vartheta_{ii}(z)z$ to access the IP now located in Ireland. These royalty flows shift the associated profits from high-tax jurisdictions (U.S. and EU) to the low-tax affiliate. The overall effect is that a share λ of the intangible income is stripped out of the U.S. and EU tax bases and recorded in Ireland, lowering the group's global effective tax burden prior to the introduction of the global minimum tax.

3.2 Corporate profit maximization

Before describing the corporate tax system in detail, it is helpful to define the profits earned by each of a firm's subsidiaries and the general structure of the firm's profit-maximization problem. In what follows, we drop time subscripts for notational brevity. We also suppress dependence of a firm's choices on its variety ω, expressing these objects instead as functions of its productivity and intangible capital; firms with the same values of a and z make the same choices regardless of which varieties they produce.

Domestic division. The pre-tax profits of a firm's domestic division are given by

$$\begin{aligned}\pi_{ii}(a,z;J_X) =& p_{ii}(q_{ii})q_{ii} + \sum_{j\in J_X} p_{ij}(q_{ij})q_{ij} + \sum_{j\in J_F}(1-\lambda_{LT}-\lambda_{TH})\vartheta_{ij}(z)z \\ &- W_i\left(\ell_{ii} + \frac{z}{A_i} + \sum_{j\in J_X}\kappa_{iX} + \sum_{j\in J_F}\kappa_{iF} + \kappa_{i,TH}\mathbb{1}_{\{\lambda_{TH}>0\}}\right) - \delta P_i k_i \\ &- W_i\left[\mathcal{C}_{i,TH}(\lambda_{TH}) + \mathcal{C}_{i,LT}(\lambda_{LT})\right]\nu_i(z)z - (\lambda_{TH}+\lambda_{LT})\vartheta_{ii}(z)z - r_i k_i.\end{aligned} \tag{11}$$

The first line contains revenues from sales and licensing the portion of intangible capital that is not transferred to the low-tax region or the tax haven. The second line contains labor costs of domestic production workers, workers hired to set up export relationships and foreign affiliates, and depreciation expenses. The last line contains labor costs of workers hired to engage in profit shifting, licensing fees paid to the low-tax region and the tax haven, and capital expenditures net of depreciation.

High-tax affiliates. The pre-tax profits of a firm's foreign affiliates in high-tax regions are simply revenues minus wages, capital costs, and licensing fees:

$$\pi_{ij}(a,z) = p_{ij}(\hat{q}_{ij})\hat{q}_{ij} - W_j\ell_j - \delta P_j k_j - \vartheta_{ij}(z)z - r_j k_j,\ j\in J_F\setminus\{LT\}. \tag{12}$$

Note that these do not depend on the decisions the firm makes about profit shifting.

Low-tax affiliate. The pre-tax profits of a firm's affiliate in the low-tax region are

$$\begin{aligned}\pi_{i,LT}(a,z;J_X) =& p_{i,LT}(\hat{q}_{i,LT})\hat{q}_{i,LT} + \sum_{j\in J_F\cup\{i\}\setminus\{LT\}}\lambda_{LT}\vartheta_{ij}(z)z \\ &- W_{LT}\ell_{LT} - \delta P_{LT}k_{LT} - (1-\lambda_{LT})\vartheta_{i,LT}(z)z - r_{LT}k_{LT}.\end{aligned} \tag{13}$$

The first line includes revenues from sales and licensing fees generated by the portion of intangible capital that is transferred to this affiliate. The second line includes labor and capital costs, and licensing fees paid on the portion of intangible capital that is retained by the parent.

Tax-haven affiliate. The pre-tax profits of a firm's affiliate in the tax-haven region, which only include licensing fees, are

$$\pi_{i,TH}(a,z) = \sum_{j\in J_F\cup\{i\}}\lambda_{TH}\vartheta_{ij}(z)z. \tag{14}$$

Firm's problem. The objective of a firm is to maximize its worldwide after-tax profits. The firm chooses export destinations (J_X), FDI destinations (J_F), the scale of production in each location (k, ℓ), intangible investment (z), and profit shifting ($\lambda_{LT}, \lambda_{TH}$). The firm's problem can be succinctly written as

$$\max_{J_X, J_F, (k_j, \ell_j)_{j \in J_F \cup \{i\}}, z, \lambda_{LT}, \lambda_{TH}} \left\{ \pi_{ii} - T_{ii} + \sum_{j \in J_F} (\pi_{ij} - T_{ij}) + \mathbb{1}_{\{\lambda_{TH} > 0\}} \pi_{i,TH} - T_{i,TH} \right\}, \quad (15)$$

where T_{ij} denotes the firm's tax liability in jurisdiction j, which we elaborate more on below. The appendix contains a detailed description of the analytical solution to the firm's problem.

3.3 Market clearing and equilibrium

In equilibrium, the government's budget constraint must be satisfied, the markets for labor, capital, and final goods must be satisfied, and the balance of payments must hold in each productive region.

Government budget constraint. Government spending, G_i, must equal revenue from labor income taxes and corporate taxes:

$$P_{it} G_{it} = \tau_{i\ell t} W_{it} L_{it} + \sum_{j=1}^{I} \int_{\Omega_j} T_{jit}(\omega) \, d\omega \quad (16)$$

where we define T_{jit} as total tax liabilities that an MNE based in region j pays in region i. We will formulate the tax liabilities of corporations in the U.S. before and after the TCJA reform in Section C. For corporations in other non-U.S. regions, we have

$$T_{jit}(\omega) = \tau_i \pi_{jit}(\omega), \ \forall j \quad (17)$$

Government consumption, G_i, is an exogenous parameter that we set equal to total tax revenues in our calibration and hold fixed in our counterfactual experiments.

Labor market. Labor demand comes from four sources: production of intermediate goods; production of intangible capital; fixed costs of exporting and setting up foreign affiliates; and the costs of transferring intangible capital. The labor market clearing condition can be written as

$$L_{it} = \sum_{j=1}^{I} \int_{\Omega_j} \ell_{jit}(\omega)\, d\omega + \int_{\Omega_i} \left[\ell_{it}^{z}(\omega) + \sum_{j \in J_{Xt}(\omega)} \kappa_{iX} + \sum_{j \in J_{Ft}(\omega)} \kappa_{iF} + \mathbb{1}_{\{\lambda_{TH,t}(\omega)>0\}} \kappa_{i,TH} \right] d\omega$$
$$+ \int_{\Omega_i} \left[\mathcal{C}_{i,TH}(\lambda_{TH,t}(\omega)) + \mathcal{C}_{i,LT}(\lambda_{LT,t}(\omega)) \right] \nu(\omega) z_{it}(\omega)\, d\omega. \tag{18}$$

Capital market. The capital market clearing condition is

$$K_{it} = \sum_{j=1}^{I} \int_{\Omega_j} k_{jit}(\omega)\, d\omega. \tag{19}$$

Final goods market. Final goods market clearing requires that production of final goods equals the sum of private consumption, public consumption, and investment in each region:

$$Q_{it} = C_{it} + G_i + X_{it}. \tag{20}$$

Balance of payments. Each region's balance of payments must hold:

$$EX_{it}^{G} + EX_{it}^{S} - IM_{it}^{G} - IM_{it}^{S} + NFR_{it} - NFP_{it} = P_{bt} B_{it+1} - B_{it}. \tag{21}$$

Competitive equilibrium. Given a set of parameters, an equilibrium in our model is a sequence of bond prices, $\{P_{bt}\}_{t=0}^{\infty}$, a sequence of aggregate prices and quantities for each region, $\{W_{it}, P_{it}, C_{it}, L_{it}\}_{t=0}^{\infty}$, and a sequence of firm-level policy functions for each region, $\{J_{iXt}(\omega), J_{iFt}(\omega), z_{it}(\omega), \boldsymbol{\ell}_{it}(\omega), \boldsymbol{k}_{it}(\omega)\boldsymbol{q}_{it}(\omega), \boldsymbol{p}_{it}(\omega), \boldsymbol{\pi}_{it}(\omega), \boldsymbol{\lambda}_{it}(\omega)\}_{t=0}^{\infty}$, that satisfy

1. the representative household's utility maximization problem (2)–(6);
2. the firm's profit-maximization problem (15);
3. the labor market clearing condition (18);
4. the capital market clearing condition (19);
5. the government's budget constraint (16); and
6. the balance of payments (21).

A stationary equilibrium is a competitive equilibrium in which the objects listed above are constant over time. In this paper, we restrict attention to stationary equilibria in which all regions have balanced current accounts, i.e., $B_{it+1} = 0$ for all i.

3.4 Corporate tax liabilities across regimes

This subsection provides a compact characterization of the corporate tax liabilities implied by the quantitative model under each tax regime we consider. A detailed institutional background is provided in Appendix B. The mapping from Internal Revenue Service rules to model objects for the pre-TCJA and TCJA regimes is described in Appendix C, while the implementation of the global minimum tax (GMT) is detailed in Appendix D.

Pre-TCJA (worldwide with deferral). We represent the pre-TCJA worldwide system with deferral using an effective inclusion rate $\iota_j \in [0,1]$, capturing the fraction of foreign earnings from jurisdiction j that enters the U.S. tax base in a given period. The domestic tax liability of a U.S. parent is:

$$T_{ii} = \tau_i \pi_{ii} + \sum_{j \in J_F \cup \{TH\}} \iota_j \times \max\big(0, (\tau_i - \tau_j)\pi_{ij}\big). \tag{22}$$

TCJA: GILTI and FDII. Under the TCJA, a U.S. multinational's U.S. tax liability is

$$T_{ii} = \tau_i \pi_{ii} - T_{ii}^{FDII} + T_{ii}^{GILTI}. \tag{23}$$

which combines (i) the tax on domestic profits, $\tau_i \pi_{ii}$, (ii) the tax value of the FDII deduction, $\hat{T}_{ii}^{FDII}$ and (iii) the net residual tax on foreign intangible income (GILTI), T_{ii}^{GILTI}. The residual U.S. tax liability on GILTI as:

$$T_{ii}^{GILTI} = \max\left\{0,\ \tau_{US}(1-\chi^{GILTI}) \sum_{j \in J_F} \left(\pi_{ij}^{NTI} - \chi^{QBAI} P_j k_{ij}\right) - T_{ii}^{FTC}\right\}. \tag{24}$$

Here π_{ij}^{NTI} denotes net tested income for affiliate j, $\chi^{GILTI} = 0.50$ is the Section 250 deduction rate for GILTI, $\chi^{QBAI} = 0.10$ is the deemed routine return on tangible assets, and T_{ii}^{FTC} is the allowable foreign tax credit (subject to the relevant limitations; see Appendix C). Now, let π_{ii}^{FDDEI} denote foreign-derived deduction-eligible income and π_{ii}^{Total} denote total deduction-eligible income. The tax value of the FDII deduction is:

$$T_{ii}^{FDII} = \tau_{US} \times \chi^{FDII} \times \left(\pi_{ii}^{FDDEI} - \chi^{QBAI} \times p_i k_{ii} \times \frac{\pi_{ii}^{FDDEI}}{\pi_{ii}^{Total}}\right), \tag{25}$$

where $\chi^{FDII} = 0.375$.

TCJA plus Global Minimum Tax (GMT). When the global minimum tax is implemented, a U.S. multinational's low-tax foreign affiliates face a higher effective tax rate whenever their jurisdictional rate falls below the global minimum, either through a host-country Qualified Domestic Minimum Top-Up Tax (QDMTT) or, residually, through an Income Inclusion Rule (IIR) applied at the U.S. parent.

Formally, the tax liability remitted to jurisdiction j by an affiliate of an i-parented MNE becomes

$$T_{ij} = \tau_j \pi_{ij} + \mathbf{1}\{j \in J^{QDMTT}\} \max\Big\{0,\ \tau_{GMT} - \tau_{ij}^{eff}\Big\} \left(\pi_{ij} - \chi_{GMT,K} P_j k_{ij} - \chi_{GMT,L} W_j \ell_{ij}\right) \quad (26)$$

where τ_{ij}^{eff} denotes the affiliate's effective tax rate prior to the top-up, τ_{GMT} is the global minimum rate, and χ_K and χ_L are the substance-based carve-out rates for tangible capital and payroll, respectively. Thus, whenever jurisdiction j implements a QDMTT, the affiliate's tax burden rises locally and enters the firm's problem entirely through T_{ij}.

If instead the host jurisdiction does not implement a QDMTT, the residual top-up is collected by the United States under the Income Inclusion Rule (IIR). Denoting by $T_i^{IIR}(ij)$ the IIR top-up tax associated with affiliate j, the total tax liability remitted to the U.S. government by the parent is

$$T_{ii} = T_{ii}^{TCJA} + \sum_{j \in J_F} \mathbf{1}\{j \notin J^{QDMTT}\} T_i^{IIR}(ij), \quad (27)$$

where T_{ii}^{TCJA} is the TCJA liability summarized by (23). The IIR term is strictly positive only for affiliates whose jurisdictions do not implement a QDMTT and whose effective tax rates fall below the global minimum. The precise rule priority and the definition of $T_i^{IIR}(ij)$ are provided in Appendices B and D.

4 Firm-Level Mechanisms: Profit Shifting and Investment

Before turning to the model's general-equilibrium quantification, we characterize the firm-level mechanisms through which GILTI, FDII, and the global minimum tax affect profit shifting and investment decisions. See the detailed derivation in Appendix E.

GILTI, FDII, and the GMT are all designed to reduce profit shifting, indeed they all have that effect. As we describe below, this has the direct effect of reducing intangible investment of MNEs in the affected jurisdiction. However, these provisions can also affect tangible investment, both at home and abroad, which indirectly affects the return to intangible investment through the nonrivalry channel. In some cases, the direct and indirect effects operate in the same direction, whereas in others they oppose one another. In turn, the ultimate effect on intangible investment indirectly

Table 1: Directional effects of TCJA provisions and GMT on U.S. outcomes (policy in isolation).

		Direct		Indirect	
Policy	**Profit shifting** λ	**Tangible inv.** k	**Intangible inv.** z	**Tangible inv.** k	**Intangible inv.** z
GILTI	$\downarrow$	–	$\downarrow$	?	$\uparrow$
FDII	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
GMT	$\downarrow$	–	$\downarrow$	?	$\uparrow$

Notes: All three provisions reduce the incentive to shift profits by compressing the U.S.–foreign tax wedge, which implies they all have a negative direct effect on intangibles. GILTI boosts tangible investment in low-tax affiliates through its QBAI deduction, which has the indirect effect of increasing intangible investment. The indirect effect on domestic tangible investment can be positive or negative, depending on whether intangible investment ultimately rises or falls. FDII increases the effective tax rate on domestic tangibles, which directly lowers tangible investment and reinforces the direct effect on intangibles. GMT's substance-based carve-outs operate similarly to the GILTI QBAI deduction, raising tangible investment in low-tax jurisdictions and thus indirectly raising intangible investment.

alters the marginal product of domestic tangible investment, which can again amplify or attenuate the direct effect. Table 1 summarizes these direct and indirect effects.

4.1 Profit shifting

We adopt the cost-of-shifting specification $\mathcal{C}(\lambda) = \lambda - (1-\lambda)\log(1-\lambda)$. Under this cost, the optimal share of shifted IP income to a low-tax affiliate LT is

$$\lambda = 1 - \exp\left(-\frac{(\tau_p - \tau_{LT}^{\text{eff}})(1-\varphi_{LT})}{(1-\tau_p)W_{US}}\right), \tag{28}$$

where τ_p is the parent's effective rate, τ_{LT}^{eff} the affiliate's effective rate, W_{US} the unit cost of shifting, and φ_{LT} the markdown on IP sales. The wedge $(\tau_p - \tau_{LT}^{\text{eff}})$ therefore determines the incentive to shift profits.

In the absence of special provisions, the effective rate in the low-tax affiliate is simply its statutory tax rate, τ_{LT}, and the profit shifting share is

$$\lambda^{\text{Base}} = 1 - \exp\left(-\frac{(\tau_{US} - \tau_{LT})(1-\varphi_{LT})}{(1-\tau_{US})W_{US}}\right).$$

With the introduction of GILTI, however, half of the foreign affiliate's income is included in the U.S. base and credits are limited to 80 percent of foreign taxes. This raises the effective tax rate on the low-tax affiliate to $(1-\chi_{\text{GILTI}})\tau_{US} + (1-\chi_{\text{FTC}})\tau_{LT}$, where $\chi_{\text{GILTI}} = 0.5$ and $\chi_{\text{FTC}} = 0.8$. The profit shifting share becomes

$$\lambda^{\text{GILTI}} = 1 - \exp\left(-\frac{\tau_{US} - \big((1-\chi_{\text{GILTI}})\tau_{US} + (1-\chi_{\text{FTC}})\tau_{LT}\big)}{(1-\tau_{US})W_{US}}(1-\varphi_{LT})\right).$$

FDII operates on the parent side by lowering the effective U.S. tax rate on foreign-derived returns. If χ_{FDII} is the deduction rate and FDR is the share of foreign-derived income, the parent's effective rate is reduced to $(1-\chi_{\text{FDII}}FDR)\tau_{US}$, and the shifting margin becomes

$$\lambda^{\text{FDII}} = 1 - \exp\left(-\frac{((1-\chi_{\text{FDII}}FDR)\tau_{US} - \tau_{LT})(1-\varphi_{LT})}{(1-(1-\chi_{\text{FDII}}FDR)\tau_{US})W_{US}} \right).$$

Finally, the global minimum tax replaces the affiliate's statutory rate τ_{LT} with the floor τ_{GMT}. The profit shifting share is then

$$\lambda^{\text{GMT}} = 1 - \exp\left(-\frac{(\tau_{US} - \tau_{\text{GMT}})(1-\varphi_{LT})}{(1-\tau_{US})W_{US}} \right).$$

All three provisions therefore reduce the incentive to shift profits, as indicated in Table 1, but they do so in different ways: GILTI raises the effective tax rate on low-taxed foreign income, FDII lowers the parent's effective rate on foreign-derived income, and GMT directly floors the tax rate of the low-tax affiliate.

4.2 Tangible investment

Tangible investment decisions depend on the user cost of capital. Optimal tangible investment in affiliate j satisfies

$$k_{ij} = \Xi^k_{ij} \cdot R_j^{-\frac{1+(\alpha+\phi)(\varrho-1)}{1+\phi(\varrho-1)}}, \tag{29}$$

where R_j is the user cost of capital in region j and Ξ^k_{ij} is the marginal revenue product. The direct effects of these tax provision only affect the former. Under GILTI, the QBAI deduction of 10 percent of tangible assets reduces the residual U.S. levy on tangible capital abroad, lowering the effective user cost of k_{ij} in low-tax affiliates. This increases tangible investment in these affiliates but has no direct effect on domestic tangible investment. FDII works by providing a tax deduction for income that is deemed to be intangible and foreign-derived. As can be seen in (25), domestic tangible capital reduces the size of this deduction by shrinking the fraction of income that is deemed to be intangible. This has the effect of increasing the user cost of domestic tangible capital. The magnitude of this effect is increasing in the share of income that is foreign-derived, either from exporting or foreign affiliate sales, which means that firms that rely more heavily on these activities are the most impacted. Note that this channel also affects non-MNE exporting firms. Under GMT, substance-based carve-outs reduce the top-up base directly: $\partial\widehat{T}_{ij}/\partial k_{ij} = \min\{0, -\left(\tau_{\text{GMT}} - \tau^{\text{eff}}_{ij}\right)\chi_{\text{GMT},K}P_j\}$ and $\partial\widehat{T}_{ij}/\partial \ell_{ij} = \min\{0, -\left(\tau_{\text{GMT}} - \tau^{\text{eff}}_{ij}\right)\chi_{\text{GMT},L}W_j\}$. This lowers the user cost of both tangible capital and payroll in affiliates where the top-up binds. These provisions can also have amplifying or attenuating indirect effects on the marginal product term Ξ_{ij}^{k} that operate through the intangible investment decision, which we describe below.

4.3 Intangible investment

Holding other margins of adjustment constant, the direct effect on intangible investment follows directly from the dependence of z on the shifting margin. In the firm's optimality condition, intangible investment is given by

$$z = z^{NS} \cdot \Big(1 + W_{US}[\lambda \mathcal{C}'(\lambda) - \mathcal{C}(\lambda)]\Big)^{\frac{\gamma+\varrho-\varrho\gamma}{\alpha+\gamma+\varrho(1-\phi-\gamma)}}, \tag{30}$$

where $\frac{\partial z}{\partial \lambda} > 0$ and z^{NS} is intangible investment in the absence of profit shifting. A lower value of λ reduces the purely tax-motivated component of intangible investment. GILTI and GMT achieve this by raising the effective tax rate faced by foreign affiliates, while FDII does so by lowering the effective parent rate on foreign-derived returns.

Intangible investment is also affected indirectly through other adjustment margins, most importantly tangible investment. An increase in tangible capital raises the marginal product of intangible capital, so policies that lower the user cost of tangibles can indirectly stimulate intangible investment even when they directly compress profit-shifting incentives. As a result, the indirect effect can dominate the direct one. This mechanism can operate across borders: under GILTI, for instance, the direct effect reduces U.S. MNEs' incentives to invest in intangibles, but the QBAI provision encourages tangible investment in foreign affiliates, which raises the return to intangible capital. In our model, this indirect channel slightly outweighs the direct effect, leading to a modest increase in intangible investment under GILTI.

4.4 Interactions between GILTI, FDII, and GMT

The effects of these provisions in combination depend on how they alter the effective tax rates entering the profit-shifting condition. In the general case, the parent's effective rate is

$$\tau_p^{\star} = (1 - \chi_{\text{FDII}} FDR)\, \tau_{US},$$

which incorporates the FDII deduction, while the effective rate of the low-tax affiliate is

$$\tau_{LT}^{\star} = \max\{\tau_{LT} + \rho_{ij}^{GILTI},\ \tau_{\text{GMT}}\},$$

Table 2: Interactions of TCJA provisions and GMT on U.S. outcomes.

Combination	Qualitative outcome
GILTI + GMT	Profit shifting: Substitutes — both raise affiliate ETRs; the higher of (GILTI residual, GMT floor) binds $\Rightarrow \lambda \downarrow$.
	U.S. investment: k mixed (binding floor changes the relative strength of QBAI vs. GMT carve-outs); $z \downarrow$ (smaller tax-driven return).
FDII + GMT	Profit shifting: Complements — GMT raises affiliate rate while FDII lowers parent rate $\Rightarrow \lambda \Downarrow$.
	U.S. investment: k mixed (FDII implies a QBAI penalty on domestic tangibles; wedge compression may reallocate activity toward the parent); $z \uparrow$ (stronger incentive to retain IP at home).
GILTI + FDII	Profit shifting: Orthogonal — GILTI acts on affiliates (via inclusion/QBAI), FDII on parent rate; both reduce λ.
	U.S. investment: k mixed (QBAI tilts k abroad; FDII penalizes k at home); z mixed (FDII $\uparrow$, GILTI $\downarrow$).

Notes: "Affiliate ETR" denotes the effective tax rate faced by low-tax subsidiaries. GILTI imposes a residual inclusion (with QBAI), GMT floors affiliate ETRs and applies substance-based carve-outs, and FDII lowers the effective U.S. rate on foreign-derived income but reduces the value of the deduction as domestic QBAI rises. "Substitutes" indicates that GILTI and GMT both act on the affiliate side, so the binding floor is the higher of the two; "complements" indicates that FDII (parent side) and GMT (affiliate side) jointly compress the wedge.

where $\rho_{ij}^{GILTI} = T_{ij}^{GILTI}/\pi_{ij}^{NTI}$ is the residual U.S. levy under GILTI and τ_{GMT} is the minimum rate under the global minimum tax. The profit-shifting share is therefore

$$\lambda^{\text{Both}} = 1 - \exp\left(-\frac{(\tau_p^\star - \tau_{LT}^\star)(1-\varphi_{LT})}{(1-\tau_p^\star)W_{US}}\right). \tag{31}$$

Expression (31) makes clear that the combined impact of the three provisions is not additive. GILTI and GMT both raise the effective tax rate on low-tax affiliates and therefore enter $\tau_{LT}^\star$ as alternative floors; whichever is higher binds, so GILTI and GMT are substitutes in their effect on profit shifting. By contrast, FDII lowers the parent's effective rate $\tau_p^\star$, which works in the same direction as a higher floor on the affiliate side. FDII and GMT are therefore complements: when the minimum tax binds abroad, the lower U.S. rate on foreign-derived returns further compresses the wedge, strengthening the incentive to retain intangibles in the United States.

The investment implications follow from the same logic. A lower λ reduces the tax-driven component of intangible investment. When GILTI and the global minimum tax operate jointly, the binding minimum tax replaces GILTI on low-tax affiliates: the QBAI channel no longer applies and tangible investment incentives are governed by the GMT's substance-based carve-outs. At the same time, wedge compression reduces the tax-driven return to intangible expansion. Table 2 summarizes the resulting qualitative predictions.

Table 3: Calibration

Statistic or parameter value	US	Europe	Low-tax	RoW	Tax haven
(a) Assigned parameters and target moments					
Elast. of substitution betw. varieties (ϱ)	5	5	5	5	–
Population (NA = 100)	100	137	17	2,041	–
Real GDP (NA = 100)	100	98	18	383	–
Effective CIT rate (%)	26.7	17.3	11.4	17.4	3.3
Effective CIT rate for MNEs (%)	26.2	–	–	–	
Foreign MNEs' VA share (%)	11.12	19.82	28.73	9.55	–
Total lost profits ($B)	143	216	–	257	–
Lost profits to TH (%)	66.4	44.5	–	71.1	–
Imports from... (% GDP)					
North America	–	1.54	0.33	8.92	–
Europe	1.01	–	2.99	8.24	–
Low tax	1.49	12.43	–	7.89	–
RoW	2.36	3.70	0.59	–	–
(b) Calibrated parameter values					
TFP (A_i)	1.00	0.75	1.20	0.24	–
Prod. dispersion (η_i)	4.68	4.71	5.19	4.56	–
Utility weight on leisure (ψ_i)	1.47	1.46	1.45	1.45	–
Intangible share (ϕ)	0.10	0.10	0.10	0.10	–
Fixed export cost (κ_i^X)	3.2e-3	6.7e-3	1.8e-3	2.7e-2	–
Variable FDI cost (σ_i)	0.44	0.54	0.51	0.54	–
Fixed FDI cost (κ_i^F)	1.97	2.66	0.81	13.4	–
High-tax repatriation share (ι_H)	0.67	–	–	–	–
Low-tax repatriation share (ι_L)	0.81	–	–	–	–
Cost of shifting profits to LT (ψ_{iLT})	0.76	0.42	–	3.19	–
Cost of shifting profits to TH (ψ_{iTH})	0.59	1.36	–	2.24	–
Fixed FDI cost to TH (κ_i^{TH})	0.26	0.09	–	0.85	–
Variable export cost (ξ_{ij}) from ...					
North America	–	3.05	3.25	1.72	–
Europe	2.14	–	1.72	1.34	–
Low tax	2.27	1.58	–	1.55	–
RoW	2.29	2.58	3.05	–	–

Notes: Population and real GDP from World Bank WDI. Corporate tax rate from Tørsløv et al. (2022). Foreign MNEs' VA share from OECD AMNE database. Fractions of firms with foreign affiliates from Compustat. Effective tax rates for U.S. from Compustat. Lost profits and non-U.S. effective tax rates from Tørsløv et al. (2022). Imports/GDP from WIOD. Dashes (–) represent "not applicable."

5 Calibration

The starting point for our calibration strategy is the approach described in Dyrda et al. (2024b). First, we partition to world into five regions: the United States (NA), Europe (EU), the low-tax region (LT), the tax haven (TH), and the rest of the world (RW). The low-tax region includes includes Belgium, Ireland, Hong Kong, the Netherlands, Singapore, and Switzerland. The tax-haven region includes several small European countries and territories like Cyprus and the Isle of Man, as well as a number of Caribbean countries like the Bahamas and the Cayman Islands. Second, we compute region-level data on production, trade, FDI, and profit shifting by aggregating or averaging country-level data as appropriate. Third, we compute firm-level moments from U.S. data, primarily Compustat. Fourth, we choose parameter values so that the model matches these data. The key parameters and the data moments that discipline them are listed below and the values are shown in Table 3.

- Population (N_i): Taken directly from the data.
- Aggregate TFP (A_i): Identified by real GDP per capita.
- Elasticity of substitution between varieties (ϱ): Set to the standard value of five.
- Utility weight on leisure (ψ_i): Identified by labor supply, which is set to one-third of the population.
- Intangible share (ϕ): Identified by the intangible income share of foreign MNEs' local affiliates.
- Trade costs (κ_i^F and ξ_{ij}): Identified by the export participation rate and bilateral trade flows.
- FDI costs (κ_i^F and σ_i): Identified by the share of firms that are MNEs and the GDP share of foreign MNEs' local affiliates.
- Corporate tax rates (τ_i): For non-U.S. regions, taken from Tørsløv et al. (2022). For the United States, measured directly from Compustat data.
- Repatriation share (ι_i): We assume that $\iota_{TH} = \iota_{LT} = \iota_L$, and $\iota_{EU} = \iota_{RoW} = \iota_H$. We identify the former by the change in aggregate shifted profits before and after TCJA calculated based on Delis et al. (2024), and the latter by the difference in effective tax rates for U.S. MNEs vs. non-MNEs prior to TCJA.
- Profit-shifting costs ($\kappa_{i,TH}$, $\psi_{i,LT}$, and $\psi_{i,TH}$): Identified by the share of firms with affiliates

in the tax-haven region, and aggregate profits shifted to the low-tax region and tax-haven region, respectively.

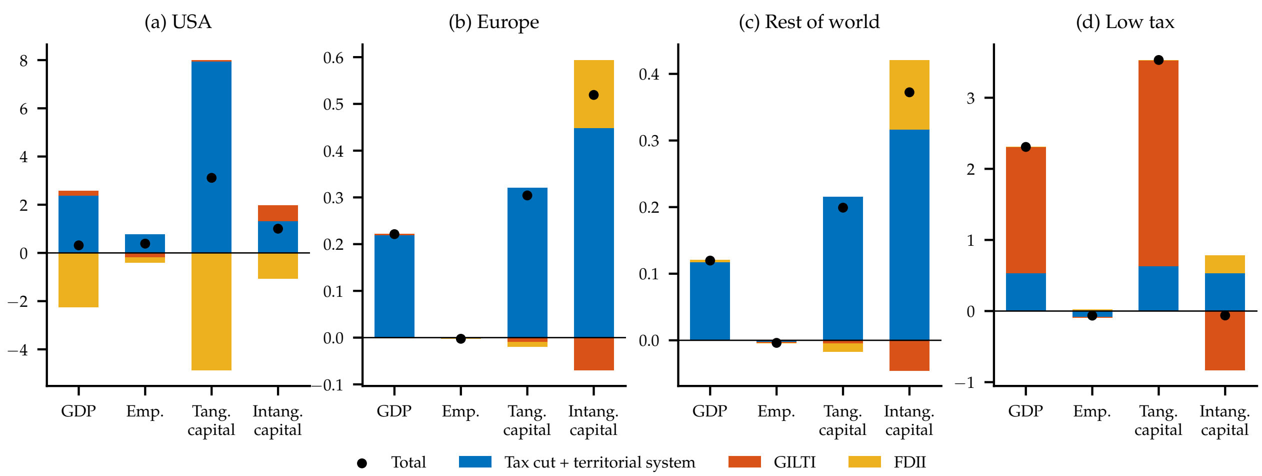
The key difference between the calibration in this paper and those in our previous work is that we calibrate the pre-TCJA version of the model where the United States has a worldwide corporate tax system, which is why we introduce the new repatriation share parameters ι_H and ι_L. This approach allows us to validate our calibration by evaluating the combined effects of the TCJA reforms, and contribute to the literature by analyzing the effects of each of these reforms in isolation.

6 Effects of the TCJA

Having described the model and its calibration, we now turn to our quantitative experiments. We begin with the TCJA. We first decompose its effects on the U.S. economy provision by provision, and then trace how the reform spills over to foreign economies through several channels. Figures 6 – 8 summarize the results.

6.1 Macroeconomic Implications

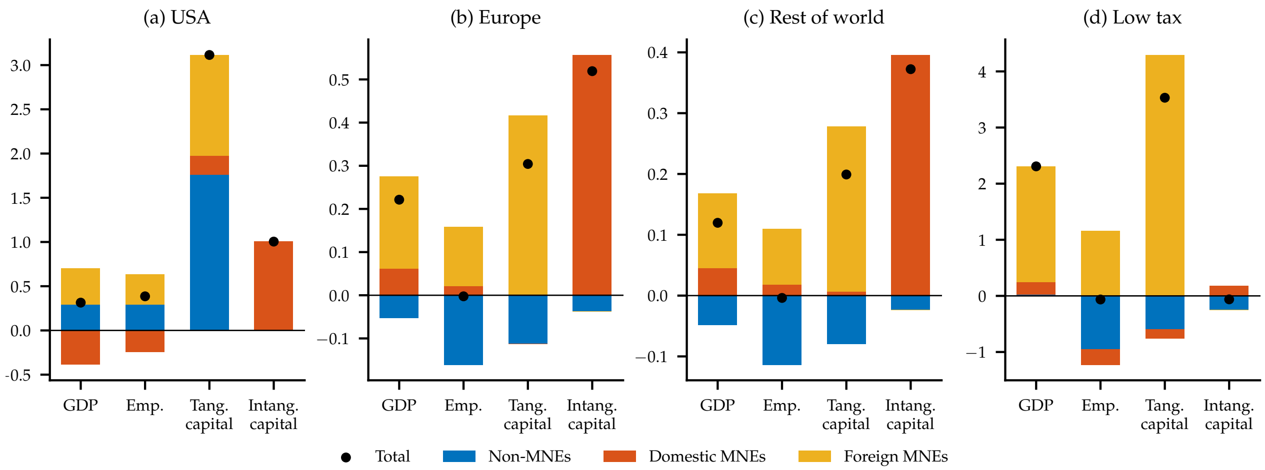
Figure 6: Macro effects of TCJA



Notes: Figure shows changes from pre-TCJA calibration to equilibrium with TCJA. Black dots show aggregate percent changes. Blue, orange, and green bars show changes in percentage points resulting from the cut in statutory tax rates and shift to territorial taxation, GILTI, and FDII, respectively. Bar values approximately sum to aggregate percent changes; the interaction between GILTI and FDII is negligible.

Figure 6 shows the macroeconomic effects of the TCJA on GDP, employment, and tangible and intangible capital across all regions in the model. It decomposes the overall effects into three provisions: (i) the statutory rate cut and the shift to territorial taxation (blue bars), (ii) GILTI (red

Figure 7: Macro effects of TCJA decomposed by firm type



Notes: Figure shows changes from pre-TCJA calibration to equilibrium with TCJA. Black dots show aggregate percent changes. Blue, orange, and green bars show changes in percentage points relative to the pre-TCJA total for non-MNEs, domestic MNEs, and foreign MNEs, respectively; bar values sum to aggregate percent changes.

bars), and (iii) FDII (yellow bars).[3]

Effects on the U.S. We start by unpacking the U.S. response, building up the aggregate effects provision by provision. Consider first the statutory corporate rate cut and the shift to territorial taxation (blue bars in Figure 6(a)). This reform lowers effective tax rates for U.S. firms and works through the standard user-cost-of-capital channel. By reducing the cost of installing capital, it induces a broad-based expansion in investment: tangible capital rises by about 8 percent, and intangible capital by about 1.3 percent. Panel (d) of Table F.2 shows that investment increases for all firm types, with domestic MNEs contributing the most—primarily through intangibles—consistent with their higher productivity and scale. Employment increases by about 0.8 percent across firm types, and U.S. GDP rises by roughly 2.4 percent (Figure 6(a)). Because the expansion is broad-based yet concentrated in the most productive firms, this component of the TCJA generates little distortionary reallocation.

Next, we add GILTI on top of the statutory rate cut and the shift to territorial taxation. Unlike the rate cut—which works mainly through the user cost of domestic capital—GILTI primarily affects the taxation of foreign-source income and the after-tax return to intangibles booked abroad. In Figure 6(a) (orange bars), GILTI increases U.S. intangible capital by about 0.65 percent, with only modest effects on tangible capital and employment. It also shifts intangible ownership back toward

[3]We measure changes in each region's real GDP by deflating changes in its nominal GDP by its GDP deflator. See Appendix F for the exact numbers used to generate these figures.

the United States (see Section 6.2). The main driver is the QBAI carve-out: by exempting a routine return on tangible capital in low-tax jurisdictions from the GILTI base, it encourages U.S. MNEs to expand tangible investment abroad; through nonrivalry, this raises the desired stock of intangibles in the headquarters. Overall, this channel raises U.S. GDP by about 0.2 percent, a gain is driven almost entirely by domestic MNEs.

FDII, implemented on top of the statutory rate reduction and transition to a territorial system, , introduces two conceptually distinct channels. The first channel operates by lowering the effective tax rate on income associated with foreign sales booked in the United States, which encourages firms to serve foreign demand by exporting from the United States instead of producing abroad through foreign affiliates.[4] The second, quantitatively dominant channel operates through the QBAI-based investment wedge. Because the deduction applies only to profits exceeding a routine return on domestic tangible capital, higher domestic capital reduces the FDII base and diminishes the value of the deduction, discouraging domestic investment. As emphasized by Clausing (2024), this feature creates a perverse disincentive for domestic capital accumulation, particularly for firms with high foreign sales shares. This prediction is borne out in the empirical analysis presented in Appendix A.3. As shown in Figure A.2a, U.S. MNEs with high foreign sales share exhibit a muted tangible investment response relative to their domestic-focused peers, consistent with the QBAI penalty mechanism. Quantitatively, FDII reduces U.S. tangible capital by about 5 percent (yellow bars in Figure 6(a)), driven largely by a decline of roughly 3 percent of aggregate capital among domestic MNEs. Through complementarity between tangible and intangible capital, intangible capital falls by about 1 percent as well. Employment among domestic MNEs declines, and composition effects reduce U.S. GDP by approximately 2 percent.

Taken together, the net effect of all TCJA provisions increases U.S. tangible capital by 3.1 percent. As shown in Figure 7(a), this aggregate increase is driven by expansions among non-MNEs and foreign MNEs, which more than offset a contraction in tangible capital held by domestic MNEs. Aggregate intangible capital rises by about 1 percent, but this increase is driven entirely by domestic MNEs. There is a small increase in aggregate employment, but also a substantial reallocation of workers: the expansion in tangible capital raises labor demand among non-MNEs and foreign MNEs, whereas U.S. MNEs' domestic labor demand falls due to the contraction caused by FDII.

Ripple effects of the TCJA The macroeconomic effects of the TCJA in Europe and the Rest of the World are qualitatively similar. The reduction in the U.S. statutory tax rate and the transition

[4] We currently shut this channel down for tractability. Specifically, we fix the foreign-derived ratio ρ in (C.3) at its pre-TCJA level. Experiments that relax this assumption indicate that this margin is weakly elastic and does not materially affect the quantitative results.

to a territorial system lead U.S.-headquartered multinationals to expand activity in these regions, raising tangible capital, employment, and output (Figures 6 and 7 panels (b)–(c)). These gains are partially offset as higher wages and rental rates crowd out non-MNE activity through general-equilibrium effects. At the same time, for Europe- and RoW-headquartered MNEs, the expansion of the U.S. economy creates new opportunities to scale production and deploy nonrival intangible assets more intensively, leading to a strong increase in intangible capital despite higher factor costs. Together, the expansion of foreign-MNE activity and the rise in intangible capital account for most of the positive GDP response in both regions under the TCJA.

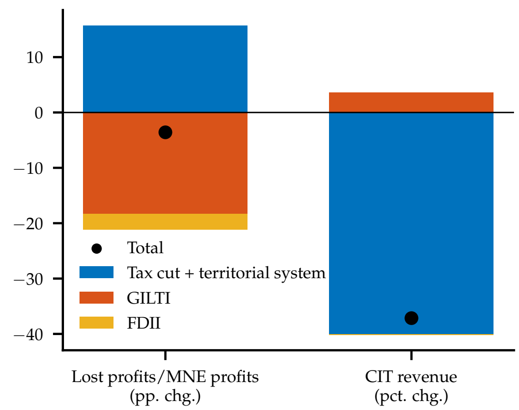
Adding GILTI modestly attenuates these gains. By reducing profit-shifting incentives and reallocating tangible capital toward U.S.-headquartered MNEs, GILTI slightly reduces the scale and profitability of non-U.S. MNE activity, leading to a small decline in intangible investment in Europe and the RoW through general-equilibrium competition effects. In contrast, FDII generates positive spillovers for foreign firms. The FDII QBAI penalty contracts U.S. domestic-MNE and non-MNE activity, lowering factor demand and competitive pressure in U.S. markets and thereby increasing the profitability of operating U.S. affiliates for foreign MNEs. EU and RoW MNEs respond by expanding activity through their U.S. subsidiaries, which contributes positively to U.S. GDP. Through complementarity between production scale and nonrival intangible capital, this expansion raises the return to intangible investment at foreign headquarters, producing a modest increase in intangible capital in Europe and the RoW even though FDII is a U.S.-specific policy. Overall, the TCJA raises GDP in Europe and the RoW by about 0.22 percent and 0.12 percent, respectively, with near-zero effects on aggregate employment but sizable reallocations toward both tangible and especially intangible investment.

Overall, the U.S.-specific corporate tax reform spills over to Europe and the RoW by modestly, raising their GDPs by 0.22 and 0.12 percent, respectively (Figure 6 panels (b),(c)), with near-zero effects on aggregate employment but sizable increases in investment, reflecting the central role of multinational linkages and non-rival technologies in transmitting the reform abroad.

The Low-Tax region exhibits a distinct adjustment pattern under the TCJA (Figures 6 and 7 panel (d)). Driven primarily by the QBAI exemption in GILTI, U.S.-headquartered MNEs expand tangible investment in low-tax jurisdictions, producing a large increase in aggregate capital. Higher local factor prices then crowd out domestic firms, which contract in both capital and employment through general-equilibrium effects. Despite the contraction in domestic activity, the expansion of foreign MNEs dominates, so output rises sharply: GDP in the Low-Tax region increases by about 2.3 percent.

6.2 Lost profits and tax revenue effects

Figure 8: Effects of TCJA on public finances



Notes: Figure shows changes from pre-TCJA calibration to equilibrium with TCJA. Blue, orange, and green bars show changes in resulting from the cut in statutory tax rates and shift to territorial taxation, GILTI, and FDII, respectively. Bar values approximately sum to aggregate changes; the interaction between GILTI and FDII is negligible.

Figure 8 summarizes the effects of the TCJA on profit shifting and corporate income tax (CIT) revenue. Lost profits, measured as a share of total MNE profits, fall by 3.6 percentage points, from about 8.2 percent to 4.6 percent (a decline of more than 40 percent). The decomposition is sequential: the reported effects of GILTI and FDII are computed relative to a counterfactual that already includes the statutory rate cut and the shift to territorial taxation.

Under this sequential decomposition, the statutory rate cut and the shift to territorial taxation increase profit shifting by nearly 16 percentage points, as the domestic investment boom raises profits and the stock of intangibles and thereby strengthens shifting incentives. Adding GILTI then more than reverses this effect: profit shifting falls by about 18 percentage points as intangible income is reallocated back to the United States. FDII has only a small additional effect, reducing profit shifting by roughly 1 percentage point. Overall, these offsetting forces imply a sizable net decline in profit shifting relative to the pre-TCJA baseline.

On the revenue side, total U.S. corporate income tax (CIT) revenue falls by 37.1 percent, close to the 38.2% decline estimated by Chodorow-Reich et al. (2025). Figure 8 shows that this revenue loss is driven primarily by the statutory rate cut and the shift to territorial taxation; in our decomposition, the revenue effects of GILTI and FDII are quantitatively small. Overall, the TCJA trades a roughly one-third decline in CIT revenue for a modest 0.3 percent increase in GDP, driven largely by the expansion of foreign-owned multinationals operating in the United States.

6.3 Consistency with the empirical evidence

Elasticity of capital. Because our counterfactual compares steady states before and after the TCJA, the appropriate validation target is the long-run, general-equilibrium semi-elasticity of capital with respect to taxation. In the model, the roughly 8 percentage point decline in firm-level effective tax rates implies a 3.1 percent increase in aggregate tangible capital, corresponding to a semi-elasticity of about -0.39.[5]

Empirical studies typically estimates the elasticities of capital investment to the user cost of capital, where the latter includes changes in taxation, interest rates, and depreciation. Chodorow-Reich (2025) provides a theory-consistent summary of the empirical estimates. Specifically, he shows that the short-run, firm-level semi-elasticities of capital to the user cost is typically within in the range of -0.25 to -0.75. In our model, all firms face the same interest rate but differ in their effective tax rates, hence the semi-elasticity of capital to the user cost is equivalent to the semi-elasticity to taxation. In general equilibrium, the aggregate semi-elasticity of capital to taxation is dampened by the endogenous response in the interest rate. Indeed, our model-implied semi-elasticity for tangible capital (-0.39) is smaller than our firm-level empirical estimate (-0.42) that falls between the typical range, consistent with the theoretical prediction.

Share of profits shifted. Finally, we deliberately do not target the share of profits shifted by U.S. MNEs, shown in Figure 2, in the calibration procedure. This data moment, and in particular its change following the TCJA, therefore serves as another piece of validation of the calibrated model. As mentioned above, the profit-shifting share in the model declines from 8.2 percent prior to the TCJA to 4.6 percent afterward. In the data, which we take from Delis et al. (2024), this share falls from an average of 8.1 percent during 2015-2017 to an average of 5.1 percent from 2018-2020. This validation confirms the model's ability to assess the public-finance consequences of large tax reforms that specifically larger multinational enterprises.

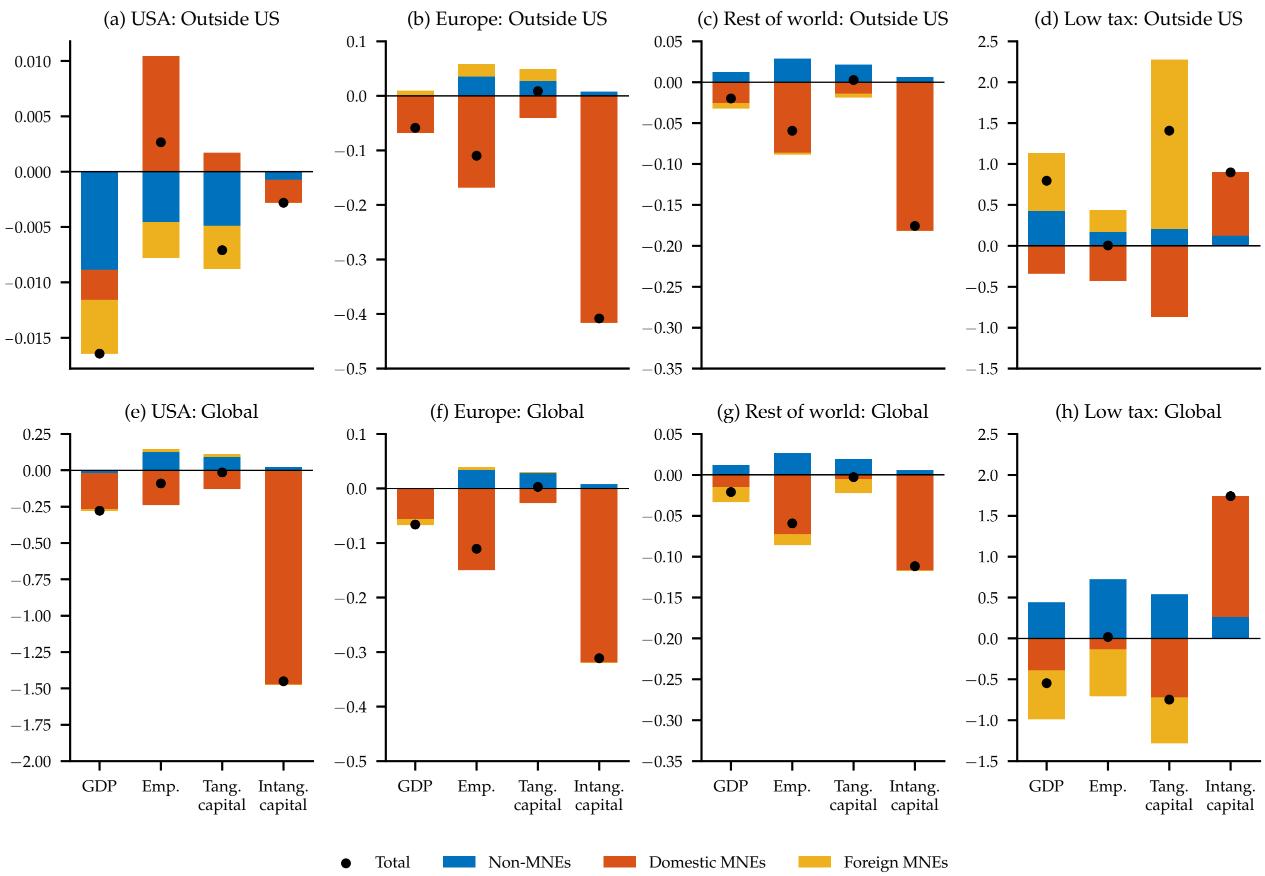
7 Effects of a global minimum corporate tax

Our second set of experiments examines the effects of a global minimum corporate income tax (GMT). Taking the TCJA equilibrium as the status quo, we consider two GMT scenarios. In the first, U.S.-parented MNEs are exempt from the GMT but remain subject to GILTI. In the second, U.S.

[5]The 8 percentage point decline in effective tax rates is computed using publicly traded firms in Compustat, consistent with the roughly 7 percentage point decline for profitable large corporations reported by the U.S. Government Accountability Office. Dobridge et al. (2025) document offsetting increases in effective tax rates for private domestic firms, which account for a relatively small share of aggregate corporate investment and tax revenue.

MNEs are subject to a QDMTT top-up tax on profits reported in low-tax and tax-haven regions.[6] Figures 9 and 10 report the results.

Figure 9: Macro effects of GMT decomposed by firm type



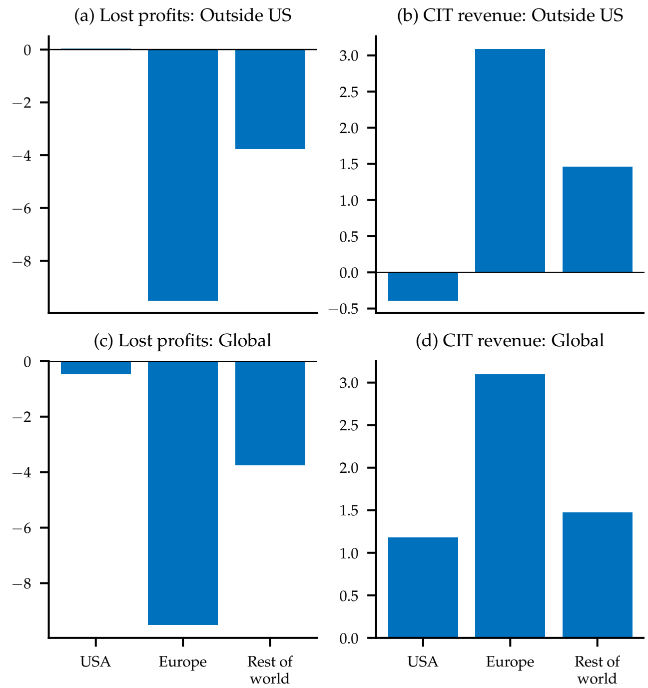
Notes: Figure shows changes from TCJA equilibrium to equilibria with different GMT configurations. First row: GMT outside of United States, including in low-tax region and tax haven. Second row: worldwide GMT. Black dots show aggregate percent changes. Blue, orange, and green bars show changes in percentage points relative to the initial TCJA total for non-MNEs, domestic MNEs, and foreign MNEs, respectively; bar values sum to aggregate percent changes.

7.1 GMT outside U.S.

Panels (a)—(d) of Figure 9 report the macro effects of a GMT implemented outside the United States. Because U.S.-parented MNEs are exempt in this scenario, the minimum tax binds only for EU- and RW-based MNEs. With lower returns to profit shifting, these firms substantially reduce intangible investment, leading to declines in aggregate employment, tangible investment, and output in these

[6] There are ongoing discussions within the G7 on a "side-by-side" system for the OECD's Pillar Two rules and the U.S. international tax regime. While the details are still under development, one proposed approach would exempt U.S.-parented MNEs, including their foreign subsidiaries, from Pillar Two. See here for a recent discussion on the latest development.

Figure 10: Effects of GMT on public finances



Notes: Figure shows changes from TCJA equilibrium to equilibria with different GMT configurations. First row: GMT outside of United States, including in low-tax region and tax haven. Second row: worldwide GMT. First column: changes in lost profits/total MNE profits in percentage points. Second column: percent changes in corporate tax revenues.

regions. Reallocation of tangible factors towards non-MNEs mitigates these losses slightly, and in the EU, where FDI barriers are lower, expansion by U.S.-based MNEs acts as a countervailing force as well. In the low-tax region, output rises by about 0.8 percent due to expansion by foreign MNEs taking advantage of the GMT's substance-based carve-outs. The U.S. economy shrinks slightly, led by contractions among foreign MNEs based in GMT-affected regions and declines in exports to these regions among domestic exporters.

Although the macro effects of the GMT appear small relative to the effects of the TCJA, they should be viewed relative to the scale and breadth of the reform. Whereas the TCJA reduces effective tax rates of all U.S. firms by almost ten percentage points, the GMT only affects multinationals, and only increases their effective tax rates by a few tenths of a percent on average (recall that only a small number of firms engage in profit shifting in our calibration). Thus, the elasticity of the macro effects of the GMT relative to change in taxes is actually quite large. The spillover effect on the United States, a drop in GDP of about 0.02 percent, is the same order of magnitude as some estimates of major tax reforms (for example, the estimates for NAFTA of Caliendo and Parro, 2014).

Panels (a)–(b) of Figure 10 show the effects on profit shifting and tax revenue. The GMT significantly reduces the share of profits shifted by EU- and RW-based MNEs by 9.5 and 3.8 percentage points, respectively. As a result, corporate income tax revenue increases by 3.1% in the EU and 1.5% in the RW. Revenue in the low-tax region also rises by 3.4%, driven by top-up GMT taxes collected on the local earnings of the affected MNEs. Conversely, although the U.S. is not directly subject to the GMT in this scenario, its corporate tax revenue declines by 0.4%. This revenue loss is driven by the expansion of U.S. MNEs in the low-tax region: as these firms increase their tangible capital investment, they generate larger QBAI deductions, thereby lowering their GILTI liability.

7.2 Worldwide GMT

Finally, we consider a scenario in which the GMT is adopted worldwide and U.S. MNEs are fully subject to it. In this regime, the GMT effectively replaces GILTI for profits booked in low-tax and tax-haven jurisdictions. This change affects U.S. MNEs through two channels. First, it raises the effective tax rate faced by U.S. affiliates in those jurisdictions, reducing the return to profit shifting. Second, it changes incentives for tangible capital and labor because the GILTI QBAI deduction is replaced by the GMT's smaller substance-based carve-out.

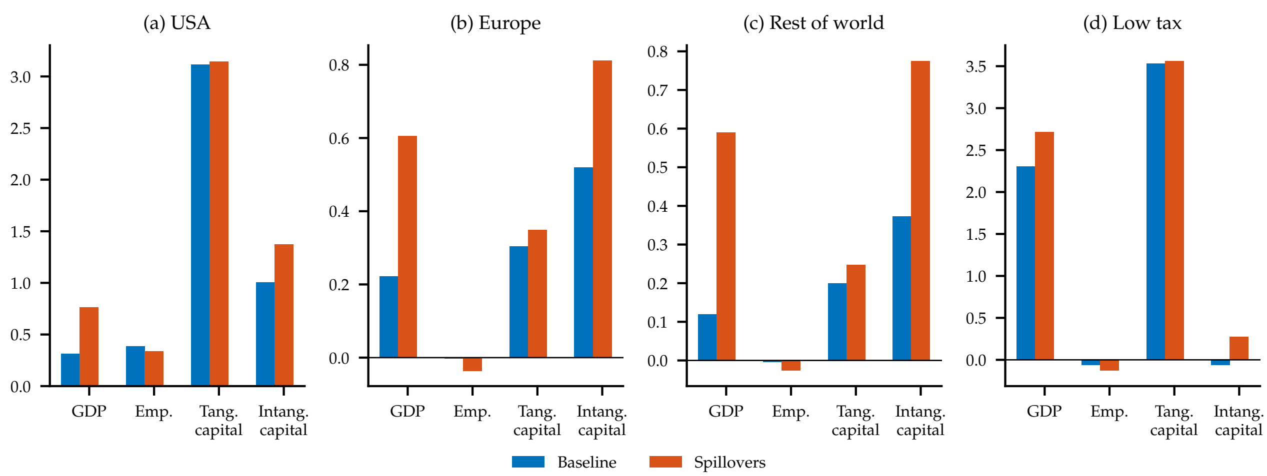
Panels (e)–(h) of Figure 9 report the effects on GDP, employment, and investment across regions. Relative to the U.S.-exempt scenario, a worldwide GMT generates sizable GDP declines in the United States and the low-tax region, while GDP in the EU and the RoW is nearly unchanged. The U.S. output loss is driven primarily by a sharp 1.5 percent decline in intangible capital, attributable to the response of U.S.-parented MNEs. In addition, tangible capital and labor reallocate away from the most productive MNEs toward less productive non-MNEs, amplifying the decline in GDP. In the EU and the RoW, U.S. MNE activity contracts, but domestic MNEs expand relative to the U.S.-exempt scenario, partially filling the gap. In this sense, bringing U.S. MNEs under the GMT increases the relative competitiveness of EU- and RoW-parented MNEs in global markets.

The sharp decline in U.S. intangible investment reflects both channels described above. First, by reducing the return to profit shifting, the worldwide GMT lowers repatriated intangible income for U.S. MNEs, which in turn reduces intangible investment at headquarters. Second, the GMT changes incentives for tangible investment abroad. Under GILTI, the QBAI deduction creates a strong incentive for U.S. MNEs to install tangible capital in low-tax jurisdictions; given complementarity, this also raises the desired stock of intangible capital at headquarters. Under a worldwide GMT, this incentive weakens because the substance-based carve-out is smaller, so U.S. MNEs reduce tangible investment abroad and intangible in the headquarters. Together with the reallocation of tangible capital and labor away from domestic MNEs, these responses account for the U.S. output losses.

Panels (c)–(d) of Figure 10 show that the participation of U.S. into the GMT can indeed increase its corporate tax revenue by 1.2%. As the GMT further reduces the tax gap between the U.S. and the low-tax and tax-haven regions relative to GILTI, the share of shifted profits further decreases by 0.46 percentage point, which is around one-tenth of the post-TCJA profit share shifted by U.S. MNEs (Figure 2). This relatively small response is due to the fact that the TCJA's GILTI provision and the GMT are highly substitutable in terms of their effects on profit shifting incentives. However, the macroeconomic results described in the previous paragraph show that the GMT has a much larger effect on U.S. MNEs' investment incentives.

8 Effects of FDI externalities

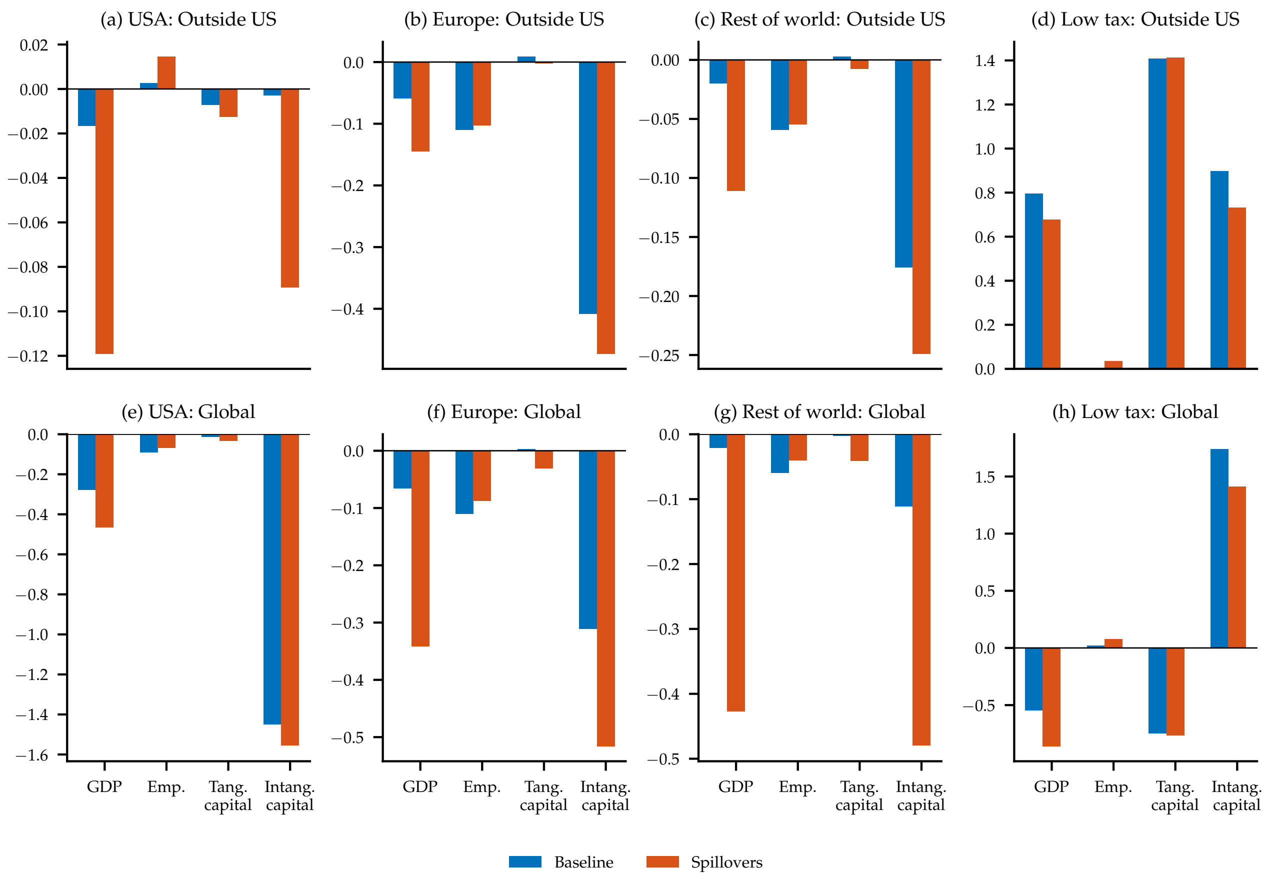
Figure 11: Macro effects of TCJA with FDI externality



Notes: Figure shows changes from pre-TCJA calibration to equilibrium with TCJA. Blue: baseline model. Orange: model with FDI externality, where intangible capital deployed by affiliates of foreign MNEs raises domestic firms' intangible investment efficiency.

We have shown that the the effects of corporate tax reforms propagate across borders primarily through its impact on investment. Given the well-documented technology spillovers from foreign direct investment (FDI) on the host country (Javorcik, 2004; Blalock and Gertler, 2008; Poole, 2013), we now study the effects of FDI externalities in our model. As we have shown, the corporate tax reforms have significant effects on the intangible investment by MNEs across the world. These investment responses could also generate technology spillovers through multinational networks. By raising the efficiency of foreign firms' intangible investment, these spillovers would further amplify the ripple effects of tax reforms.

Figure 12: Macro effects of GMT with FDI externality



Notes: Figure shows changes from TCJA equilibrium to equilibria with different GMT configurations. First row: GMT outside of United States, including in low-tax region and tax haven. Second row: worldwide GMT. Blue bars: baseline model. Orange bars: model with FDI externality, where intangible capital deployed by affiliates of foreign MNEs raises domestic firms' intangible investment efficiency.

We follow Dyrda et al. (2024b) and model intangible spillovers as a multiplicative shifter to the efficiency of intangible investment. With spillovers, the production technology for intangible capital in region i is

$$z_t(\omega) = A_i \ell^z_{it}(\omega) \left[\sum_{j \neq i} \int_{\Omega_{jit}} z_{jt}(\omega') \, \mathrm{d}\omega' \right]^{\upsilon}, \tag{32}$$

where $\sum_{j \neq i} \int_{\Omega_{jit}} z_{jt}(\omega') \, \mathrm{d}\omega'$ is total intangible capital deployed in region i, and υ governs the strength of the spillover externality. If $\upsilon = 0$, spillovers are absent. Higher values of υ imply that foreign MNEs' R&D decisions more strongly raise domestic firms' efficiency in producing intangible capital.

The results of the TCJA and GMT exercises with the FDI externality are shown in Figures 11 and 12. We set $\nu = 0.4$ following Dyrda et al. (2024b). With spillovers, the macro effects of both reforms are amplified in every region. Under the TCJA, U.S. intangible investment rises by 1.0 percent in the baseline model without spillovers, and by 1.4 percent with spillovers; U.S. GDP growth more than doubles, from 0.3 percent to 0.8 percent. Similar amplification appears in the other regions.

Spillovers also strengthen the GMT's cross-border effects. When the GMT is implemented outside the United States, the U.S. experiences larger inward spillovers: the GDP decline increases from 0.02 percent in the no-spillovers model to 0.12 percent with spillovers, and GDP declines are also larger in the adopting regions. When the GMT is implemented globally, the decline in U.S. intangible capital generates stronger outward spillovers; through both multinational production linkages and reduced intangible-investment efficiency abroad, the U.S. GDP decline deepens to 0.5 percent, compared with 0.3 percent without spillovers. Overall, FDI spillovers materially magnify the ripple effects of global tax reforms.

9 Conclusion

We develop and quantify a multi-country general-equilibrium model of multinational enterprises (MNEs) that jointly choose tangible and intangible investment and the location of reported profits. The framework maps detailed features of the U.S. Tax Cuts and Jobs Act (TCJA) and the OECD's proposed Global Minimum Tax (GMT) into the firm's decision problem, allowing us to measure the effects of these policies on the economies of the implementing jurisdictions as well as their cross-border spillover effects.

Our results indicate that the TCJA raised investment and output in the United States and generated meaningful positive spillovers abroad, largely through changes in MNEs' investments and the reallocation of their activity across locations. In contrast, when the GMT is implemented outside the United States, intangible investment and output decline in adopting regions, and the

United States is not insulated: even if U.S.-parented MNEs are exempt, the contractions in foreign economies feed back onto U.S. investment and GDP. In the presence of technology externalities, whereby domestic firms benefit from intangible capital deployed locally by foreign MNEs, these international feedback effects become substantially stronger.

More broadly, our analysis underscores two lessons for policy evaluation. First, corporate tax reforms should not be assessed in isolation: in a world with globally-active MNEs and intangible capital that is nonrival and highly mobile across tax jurisdictions, unilateral policy changes can transmit sizable macroeconomic effects across borders. Second, the institutional specifics of tax reforms, such as QBAI-style deductions and the GMT's substance-based carve-outs, play a material role in determining the magnitude these spillovers; macroeconomic policy analysis needs to grapple with these specifics as well as the headline changes in statutory tax rates.

Finally, our findings have several important implications for policymakers. First, the welfare and revenue consequences of minimum-tax regimes depend critically on both the breadth of adoption as well as the hierarchy and interactions between overlapping systems, such as the hierarchy of GILTI and the GMT's top-up taxes. Second, policies that primarily target reported profits can induce large real responses when they interact with investment margins that determine tax bases, especially for MNEs' intangible capital. As a result, seemingly modest reforms in terms of average effective tax-rate changes can have material macroeconomic effects. Designing base-erosion schemes with clear coordination rules and careful treatment of substance-based carve-outs is therefore central to limiting unintended cross-border distortions while achieving revenue objectives.

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Appendix

A Empirics

A.1 Sample construction and descriptives

Our empirical analysis draws on several data sources, which we merge at the firm-year level. The primary source is the Compustat North America Fundamentals Annual database, which provides comprehensive financial statement data for publicly traded U.S. firms from 1950 to 2024. We supplement this with quarterly Compustat data to capture the immediate effects of the Tax Cuts and Jobs Act (TCJA), which was signed into law on December 22, 2017.

To construct measures of intangible capital, we merge our sample with the Peters and Taylor (2017) dataset, available through Wharton Research Data Services (WRDS), which provides estimates of knowledge capital and organizational capital stocks at the firm-year level. Knowledge capital is constructed by capitalizing and depreciating research and development (R&D) expenditures, while organizational capital is constructed from a fraction of selling, general, and administrative (SG&A) expenses. These measures allow us to examine how intangible-intensive firms respond differentially to corporate tax reforms.

We identify multinational enterprises using the WRDS Company Subsidiary database, which provides information on firm subsidiaries and their geographic locations from 1995 to 2024. This database allows us to determine the number and location of foreign subsidiaries for each firm-year observation. We supplement this with information on foreign pre-tax income and foreign taxes paid from Compustat to construct multiple definitions of multinational status.

Geographic segment data on foreign sales come from Compustat's Geographic Segments database, which provides information on sales by geographic region. Following changes in segment reporting standards in 1998, we adjust our construction of foreign sales shares to account for differences in how export sales are reported before and after this date.

We construct our analysis sample through the following steps. First, for firms that report under both industrial and financial services formats in Compustat, we retain only the industrial format observation to avoid double-counting. Second, we require firms to have a valid two-digit North American Industry Classification System (NAICS) code. Third, we restrict our sample to firm-year observations with positive net sales. Fourth, we require intangible intensity—defined as the ratio of intangible assets to the sum of intangible assets and gross property, plant, and equipment—to lie within the unit interval. This restriction eliminates observations with missing or implausible values of either intangible or physical capital. Fifth, we limit the sample period to 1995–2023, corresponding to the availability of the WRDS Company Subsidiary database.

A central challenge in studying multinational enterprises is defining which firms qualify as multinationals. We construct three alternative definitions that capture different dimensions of multinational activity, allowing us to examine the robustness of our results and to distinguish between firms with varying degrees of international engagement.

Summary statistics. Table A.1 presents summary statistics for our estimation sample of 1,867 firms, partitioning the data by multinational status to highlight the distinct economic profile of globally engaged firms. Multinational U.S. firms differ systematically from domestic U.S. firms in scale, asset composition, and tax planning behavior. As shown in Panel B, MNEs invest significantly more than non-MNEs, with average log tangible investment of 3.73 compared to 3.08, and log intangible investment of 4.29 compared to 2.42. MNEs also operate at a much larger scale, with average sales of $6.6 billion versus $2.8 billion for domestic firms. Panel C reveals that MNEs are structurally more reliant on intangible capital. The average intangible intensity for MNEs is 0.51, compared to 0.33 for non-MNEs. Consistent with their global reach, MNEs report a foreign sales share of 40%, whereas non-MNEs report only 3%. Finally, Panel D highlights the prevalence of profit-shifting opportunities among multinationals. Nearly half (48%) of the MNEs in our sample own at least one subsidiary in a tax haven, compared to only 10% of non-MNEs. Consequently, the estimated profit-shifting ratio, defined as the fraction of observed profits attributable to shifting, is significantly higher for MNEs (0.13) than for domestic firms (0.02).

To validate our empirical strategy, we first examine the variation in treatment intensity and test the parallel trends assumption. Table A.2 summarizes firm characteristics across quartiles of the treatment variable, defined as the change in the GAAP effective average tax rate (EATR) from 2016 to 2018. Panel A confirms substantial cross-sectional variation in exposure to the reform. Firms in the first quartile (Q1), which received the largest tax cuts, experienced a mean EATR reduction of 26 percentage points, whereas firms in the fourth quartile (Q4) saw an average increase of 18 percentage points. This yields a statistically significant difference in treatment intensity of 44 percentage points between the most and least exposed groups. Crucially, Panel B supports the identifying assumption that, absent the reform, investment trends would have been similar across groups. The pre-reform growth rates (2012–2016) for both tangible and intangible investment are statistically indistinguishable between Q1 and Q4 firms. The difference in pre-trends is 0.02 for log tangible investment and -0.01 for log intangible investment, neither of which is statistically significant. Panel C documents level differences in firm characteristics. Firms receiving larger tax cuts (Q1) tend to be larger, with mean log total assets of 6.4 compared to 5.8 for Q4 firms. However, they are less intangible-intensive (0.39 vs. 0.46) and less likely to be multinational enterprises

Table A.1: Summary Statistics

	Full Sample	By MNE Status		
	Mean	MNEs	Non-MNEs	Diff.
Panel A: Treatment Variable				
ΔEATR (2016 to 2018)	-0.06	-0.04	-0.07	0.04^{***}
	[0.21]	[0.21]	[0.20]	
Panel B: Outcome Variables				
Log tangible investment	3.41	3.73	3.08	0.65^{***}
	[2.19]	[2.06]	[2.27]	
Log intangible investment	3.38	4.29	2.42	1.87^{***}
	[2.24]	[2.03]	[2.03]	
Sales ($ millions)	4743.03	6618.90	2789.51	3829.38^{***}
	[17457.69]	[22746.01]	[8717.57]	
Panel C: Firm Characteristics				
Log total assets	6.00	6.56	5.42	1.14^{***}
	[2.42]	[2.16]	[2.53]	
Intangible intensity	0.42	0.51	0.33	0.19^{***}
	[0.32]	[0.27]	[0.33]	
Foreign sales share	0.25	0.40	0.03	0.37^{***}
	[0.28]	[0.25]	[0.15]	
Profit shifting indicator	0.41	0.66	0.14	0.51^{***}
	[0.49]	[0.47]	[0.35]	
Panel D: Sample Composition				
Share MNE	0.51	–	–	–
	[0.50]			
Share with tax haven subsidiary	0.30	0.48	0.10	0.38^{***}
	[0.46]	[0.50]	[0.30]	
Profit shifting ratio	0.07	0.13	0.02	0.11^{***}
	[0.12]	[0.13]	[0.07]	
Unique firm observations	1,867	875	992	

Notes: This table presents descriptive statistics for the estimation sample. Panel A reports the treatment variable: the change in GAAP effective tax rate from 2016 to 2018. Panels B and C report pre-TCJA (2012–2016) means for outcome variables and firm characteristics. Panel D reports sample composition. MNEs are firms with at least one foreign subsidiary and nonzero foreign income or taxes in the three years prior to 2017. Intangible intensity is intangible assets divided by total assets. Foreign sales share is constructed from Compustat Geographic Segments. The "Diff." column reports the difference (MNE − Non-MNE) with significance from a two-sample t-test. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

(42% vs. 64%). These baseline level differences are absorbed by firm fixed effects in our regression specifications.

Table A.2: Pre-TCJA Characteristics by Treatment Intensity

	Quartile of ΔEATR (2016–2018)				
	Q1 (Largest cut)	Q2	Q3	Q4 (Smallest cut)	Q4−Q1
Panel A: Treatment Variable					
ΔEATR	−0.26	−0.12	−0.04	0.18	0.44***
Panel B: Pre-TCJA Outcome Trends (2012–2016 Growth)					
Δ Log tangible investment	0.03	0.05	0.04	0.01	0.02
Δ Log intangible investment	0.06	0.03	0.06	0.05	−0.01
Panel C: Pre-TCJA Firm Characteristics					
Log total assets	6.4	6.5	6.1	5.8	−0.6**
Intangible intensity	0.39	0.34	0.49	0.46	0.07***
Share MNE	0.42	0.44	0.60	0.64	0.22***
Foreign sales share	0.18	0.16	0.31	0.36	0.18***
Pre-TCJA EATR (2012–2016)	0.35	0.34	0.30	0.27	-0.08***
Unique firm observations	467	466	467	467	

Notes: This table compares pre-TCJA characteristics across quartiles of the treatment variable (ΔEATR from 2016 to 2018). Q1 contains firms with the largest tax cuts; Q4 contains firms with the smallest cuts (or increases). Panel A confirms substantial variation in treatment intensity. Panel B reports pre-reform trends in outcome variables; the insignificant Q4−Q1 differences support the parallel trends assumption. Panel C documents that firms with larger tax cuts tend to be larger, less intangible-intensive, more likely to be MNEs, and had higher pre-TCJA effective tax rates. The industry×year fixed effects in our specification absorb much of this heterogeneity. The Q4−Q1 column reports the difference with significance from a two-sample t-test. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

A.2 Description of key variables

A.2.1 MNE identification

Our baseline measure classifies a firm as a multinational enterprise in year t if it satisfies two conditions: (i) the firm had at least one foreign subsidiary in any of the preceding three years, as recorded in the WRDS Company Subsidiary database; and (ii) the firm reported nonzero foreign pre-tax income or nonzero foreign income taxes in any of those same years. This definition extends the approach of Erel, Jang, and Weisbach (2020), who classify firms as multinationals based solely on having nonzero foreign pre-tax income. Our additional requirement of documented foreign subsidiaries provides a stricter classification that better captures operational foreign presence rather than purely financial arrangements. For the year 2017, this definition classifies approximately 30 percent of sample firms as multinationals, compared to roughly 40 percent under the Erel et al.

Table A.3: Summary statistics for GAAP EATR

	Mean	SD	Min	P25	P50	P75	Max
Pre-TCJA 5-year average	0.31	0.10	0.00	0.27	0.33	0.37	0.74
Post-TCJA 5-year average	0.22	0.10	0.00	0.18	0.22	0.26	0.88
Change from 2016 to 2018	-0.08	0.11	-0.33	-0.15	-0.10	-0.03	0.29

Notes: This table presents the (unweighted) mean GAAP EATR pre-TCJA from 2012 to 2016 and post-TCJA, from 2018 to 2022 for our panel of Compustat firms from 2012 to 2022.

(2020) definition.

Our second measure takes a more restrictive, contemporaneous approach: a firm is classified as a multinational if it has at least one foreign subsidiary in the current year. This definition does not employ the three-year look-back window and thus captures only firms with active foreign operations in a given year. We do this since using a 3-year look-back smooths transitory fluctuations but may misclassify firms that are transitioning into or out of multinational status around the TCJA.

Our third measure classifies a firm as a multinational if more than 5 percent of its sales occur in foreign regions in a given year. We construct foreign sales shares using Compustat's Geographic Segments data, accounting for changes in segment reporting requirements in 1998. Before 1998, we sum export sales reported in both domestic and foreign segments; from 1998 onward, we use only export sales from domestic segments, as the reporting standard changed to include export sales solely within domestic segment disclosures. This definition captures firms with significant international commercial activity, regardless of whether that activity occurs through foreign subsidiaries or exports from domestic operations.

We also construct indicators for whether a firm has ever been classified as a multinational under each definition for our sample period before the TCJA's enactment.

A.2.2 Measures of intangible capital and investment

Intangible capital plays a central role in our analysis given its non-rival nature and mobile ownership, properties that make intangible-intensive firms particularly responsive to corporate tax incentives. We construct several measures of intangible capital stocks and investment flows.

Our baseline measure of intangible capital is the book value of intangible assets reported on firms' balance sheets (Compustat item INTAN). This measure captures recognized intangibles such as goodwill, patents, trademarks, and other acquired intangible assets. However, because U.S. Generally Accepted Accounting Principles require most internally developed intangibles to be expensed rather than capitalized, this measure understates the true stock of intangible capital.

To address this limitation, we construct two augmented measures following Peters and Taylor

(2017). Our second measure adds the stock of knowledge capital—constructed by capitalizing R&D expenditures using a perpetual inventory method with a 15 percent depreciation rate—to the book value of intangibles. Our third measure further adds the stock of organizational capital, constructed by capitalizing 30 percent of SG&A expenses (excluding R&D) with a 15 percent depreciation rate. The 30 percent capitalization rate follows the methodology of Eisfeldt and Papanikolaou (2013), which is based on estimates from the Bureau of Labor Statistics.

To measure the stock of intangible capital at the firm level, we follow the perpetual inventory method (PIM) framework established by Corrado, Hulten, and Sichel (2005) and adapted for firm-level analysis by Eisfeldt and Papanikolaou (2013) and Peters and Taylor (2017). We define total intangible capital, K_{it}^{int}, for firm i in year t as the sum of externally-acquired intangibles and two distinct classes of internally-created capital: knowledge capital and organizational capital. Formally:

$$K_{it}^{int} = K_{it}^{ext} + K_{it}^{know} + K_{it}^{org} \tag{A.1}$$

Externally-acquired intangible capital represents assets purchased from other entities, such as patents, brands, or goodwill arising from mergers and acquisitions. We measure K_{it}^{ext} as the sum of Goodwill (GDWL) and Intangible Capital (INTAN) reported on the balance sheet in Compustat.

Knowledge capital captures the stock of scientific and technological know-how generated through Research and Development (R&D). We accumulate the stock of knowledge capital using the standard PIM law of motion:

$$K_{it}^{know} = (1 - \delta_{know})K_{i,t-1}^{know} + I_{it}^{know} \tag{A.2}$$

where I_{it}^{know} is real R&D expenditure (Compustat item XRD), deflated by the Consumer Price Index (CPI). Following Li and Hall (2020) and the BEA standard, we apply a depreciation rate of $\delta_{know} = 0.15$.

Organizational capital reflects investments in firm-specific resources such as brand equity, human capital, and distribution systems. As these investments are rarely capitalized on the balance sheet, we proxy for them using Selling, General, and Administrative (SG&A) expenses.

Because Compustat often includes R&D expenses within reported SG&A, we first isolate the relevant flow of investment by netting out R&D[7]:

[7] This adjustment is necessary because standard accounting rules allow firms to report R&D within SG&A. Peters and Taylor (2017) verify the prevalence of this practice, finding that in a random sample of 100 Compustat firms, 90 bundled R&D entirely into SG&A, while seven allocated it to Cost of Goods Sold (COGS).

$$\text{SG\&A}_{it}^{net} = \text{XSGA}_{it} - \text{XRD}_{it} \tag{A.3}$$

Treatment of in-Process R&D We define the investment flow for organizational capital as SG&A expenses net of reported R&D. Theoretically, this netting procedure should also exclude acquired in-process R&D (RDIP), as these expenditures represent a transfer of knowledge capital rather than an investment in organizational processes. However, we do not subtract RDIP from our measure of organizational investment due to significant inconsistencies in historical accounting treatment.

The primary concern is the ambiguity of reporting prior to 2009. During this period, firms frequently classified in-process R&D as a non-recurring "special item" rather than a standard operating expense. Since Compustat excludes special items from the SG&A variable (RDIP), subtracting RDIP would erroneously reduce the organizational capital estimate for firms that had never included it in their SG&A to begin with.

Furthermore, the accounting treatment underwent a structural break with the adoption of SFAS 141R in 2009. This standard requires firms to capitalize acquired in-process R&D at fair value on the balance sheet rather than expensing it immediately. Consequently, in the post-2009 sample, these costs are mechanically absent from the SG&A line item. To maintain consistency across the panel and avoid measurement error derived from classification ambiguity, we rely solely on the deduction of XRD from XSGA.

Following Hulten and Hao (2008) and Eisfeldt and Papanikolaou (2013), we assume that only a fraction of these expenses represents long-term investment (as opposed to current operating costs). We denote this investment fraction as γ and accumulate the stock as:

$$K_{it}^{org} = (1 - \delta_{org})K_{i,t-1}^{org} + \gamma \text{SG\&A}_{it}^{net} \tag{A.4}$$

We adopt the standard parameterization in the literature, setting the investment fraction $\gamma = 0.30$ and the depreciation rate $\delta_{org} = 0.20$.

For the first year a firm appears in the Compustat sample from 1950-2023, we initialize the capital stock for each asset class $type \in \{know, org\}$ using the steady-state assumption:

$$K_{i,0}^{type} = \frac{I_{i,0}^{type}}{g + \delta_{type}} \tag{A.5}$$

where $I_{i,0}^{type}$ is the initial investment flow and g is the average real growth rate of investment in the firm's 2-digit NAICS industry over the sample period.

Intangible intensity. We measure intangible intensity as the ratio of intangible capital to total capital, where total capital is the sum of intangible capital and gross property, plant, and equipment (PPEGT). We construct this ratio using each of our three intangible capital measures, yielding three alternative intangible intensity measures:

$$\text{Intangible Intensity}_1 = \frac{\text{INTAN}}{\text{INTAN} + \text{PPEGT}}, \tag{A.6}$$

$$\text{Intangible Intensity}_2 = \frac{\text{INTAN} + K^{\text{know}}}{\text{INTAN} + K^{\text{know}} + \text{PPEGT}}, \tag{A.7}$$

$$\text{Intangible Intensity}_3 = \frac{\text{INTAN} + K^{\text{know}} + K^{\text{org}}}{\text{INTAN} + K^{\text{know}} + K^{\text{org}} + \text{PPEGT}}, \tag{A.8}$$

where K^{know} denotes knowledge capital and K^{org} denotes organizational capital. This ratio captures the extent to which a firm's productive capacity relies on intangible versus physical assets.

A.2.3 Investment measures

We construct several measures of investment flows.

Physical investment is measured as capital expenditures (CAPX), with net physical investment subtracting sales of property, plant, and equipment (SPPE).

For **intangible investment**, our baseline measure sums R&D expenditures and the change in book value of intangible assets:

$$I_1^{\text{intan}} = \text{XRD} + \left(\text{INTAN}_t - \text{INTAN}_{t-1}\right). \tag{A.9}$$

An alternative measure sums R&D expenditures and 30 percent of SG&A expenses (excluding R&D):

$$I_{\text{PT}}^{\text{intan}} = \text{XRD} + 0.3 \times \text{SGA}. \tag{A.10}$$

A third measure following Crouzet and Eberly (2021) includes R&D, advertising expenses (XAD), and net acquisitions (acquisitions minus asset sales):

$$I_{\text{CR}}^{\text{intan}} = \text{XRD} + \left(\text{AQC} - \text{SPPE}\right) + \text{XAD}. \tag{A.11}$$

Total investment is the sum of physical and intangible investment under each specification.

A.2.4 Tax-related variables

We construct several variables to measure firms' tax positions and exposure to the TCJA.

Effective tax rates We compute two measures of effective tax rates. The GAAP effective tax rate is the ratio of total income tax expense (TXT) to pre-tax income (PI):

$$\text{GAAP ETR} = \frac{\text{TXT}}{\text{PI}}. \tag{A.12}$$

The cash effective tax rate is the ratio of cash taxes paid (TXPD) to pre-tax income excluding special items (PI − SPI):

$$\text{Cash ETR} = \frac{\text{TXPD}}{\text{PI} - \text{SPI}}. \tag{A.13}$$

Following the literature, we set the cash effective tax rate to zero for observations with negative pre-tax income or effective tax rates outside the $[0, 1]$ range. We also compute separate GAAP effective tax rates for foreign and domestic income using foreign income taxes (TXFO), foreign pre-tax income (PIFO), and their domestic counterparts.

Deferred tax liabilities. Net deferred tax liabilities are computed as the difference between deferred tax liabilities (TXNDBL) and deferred tax assets (TXNDBA). The TCJA's reduction in the corporate tax rate from 35 percent to 21 percent required firms to remeasure their deferred tax positions, with net deferred tax liabilities declining in value and net deferred tax assets increasing. We construct a measure of this remeasurement effect for fiscal year 2017 observations as:

$$\text{DTL Remeasurement} = \text{Net DTL}_t - \frac{21}{35} \times \text{Net DTL}_{t-1}. \tag{A.14}$$

Repatriation tax. The TCJA imposed a one-time repatriation tax on accumulated foreign earnings that had not previously been subject to US tax. We estimate each firm's repatriation tax burden using the change in current tax expense (TXC) in fiscal year 2017, relative to the prior year's effective tax rate applied to current-year income. For firms with December fiscal year-ends:

$$\text{Repatriation Tax} = \text{TXC}_t - \text{PI}_t \times \frac{\text{TXC}_{t-1}}{\text{PI}_{t-1}}. \tag{A.15}$$

For firms with non-calendar fiscal years, we adjust this calculation to account for the portion of the fiscal year falling under the old (35 percent) versus new (21 percent) statutory rate. We also obtain nonrecurring income tax expense (NRTXTQ) from quarterly Compustat for the first fiscal quarter ending after December 22, 2017, which directly captures the one-time transition tax charges recorded by many firms.

Recurring tax effects. We measure the recurring effect of the TCJA on each firm's tax burden as the difference between the average GAAP effective tax rate in 2018 and the average GAAP effective tax rate in 2016:

$$\text{Recurring Effect} = \overline{\text{GAAP ETR}}_{2018} - \overline{\text{GAAP ETR}}_{2016}. \tag{A.16}$$

This measure captures the change in tax burden after the transition effects have dissipated.

A.2.5 Tax haven and low-tax subsidiaries

Using the WRDS Company Subsidiary database, we construct indicators for whether firms have subsidiaries in tax havens or low-tax jurisdictions. The complete list of countries, taken from Tørsløv et al. (2022), is: Andorra, Anguilla, Antigua, Aruba, the Bahamas, Bahrain, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Curacao, Cyprus, Gibraltar, Grenada, Guernsey, the Isle of Man, Jersey, Lebanon, Liechtenstein, Luxembourg, Malta, Marshall Islands, Mauritius, Monaco, the Netherlands Antilles, Panama, Puerto Rico, Samoa, Seychelles, Sint Maartin, St. Kitts & Nevis, St. Vincent & the Grenadines, St. Lucia, the Turks & Caicos, and Vanuatu.

For each firm-year, we compute the number of subsidiaries in tax haven and low-tax jurisdictions and construct indicator variables for firms with at least one subsidiary in this category. These measures allow us to examine whether firms with greater opportunities for profit shifting respond differentially to domestic tax reforms.

A.2.6 Profit shifting

To quantify the intensity of profit shifting at the firm-year level, Delis et al. (2024) employ a semi-parametric identification strategy within the standard tax-response framework established by Hines and Rice (1994) and Huizinga and Laeven (2008). Unlike traditional approaches that estimate a single global elasticity of pre-tax profits to tax incentives, their methodology allows for heterogeneous profit-shifting responses across firms and time.

In line with the literature, the authors assume that the observed pre-tax profits of firm i in year t, denoted as π_{it}, represents the sum of "true" profits generated from productive activities and "shifted" profits driven by tax arbitrage. True profits are modeled as a Cobb-Douglas function of capital and labor inputs. The resulting estimation equation, in logs, is:

$$\ln \pi_{it} = g_{it} CT_{it} + \alpha \ln K_{it} + \beta \ln L_{it} + \delta X_{it} + \mu_i + \lambda_t + \epsilon_{it} \tag{A.17}$$

where π_{it} is the observed pre-tax profit; K_{it} and L_{it} represent capital (fixed assets) and labor (compensation or number of employees), respectively; X_{it} is a vector of control variables, including GDP per capita (a proxy for local productivity); and, μ_i and λ_t denote firm and year fixed-effects, respectively.

Tax incentive variable, CT_{it} The crucial independent variable capturing the incentive to shift profits is the composite tax differential, CT_{it}. For a firm i belonging to a multinational group with N affiliates, CT_{it} is defined as the unweighted difference between the statutory tax rate of the firm's host country, τ_i, and the tax rates of all other affiliates k in the group, τ_k[8]:

$$CT_{it} = \frac{1}{N} \sum_{k \neq i} \frac{\tau_i - \tau_k}{1 - \tau_i} \tag{A.18}$$

A positive (negative) CT_{it} implies that firm i faces a higher (lower) tax rate compared to the average of its group affiliates, creating an incentive to shift profits out of (into) firm i.

The authors relax the assumption that the semi-elasticity of reported profits to tax differentials is constant ($g_{it} = g$) and employ local linear regressions to non-parametrically estimate a specific coefficient g_{it} for each observation in the sample. This approach estimates the slope of the profit function with respect to CT_{it} within a localized bandwidth around each data point, allowing the profit-shifting intensity to vary nonlinearly with the magnitude of the tax incentive.

The estimated parameter g_{it} represents the semi-elasticity of reported profits with respect to the tax differential for firm i in year t, which Delis et al. (2024) use to calculate the dollar volume of shifted profits, S_{it}. Following Huizinga and Laeven (2008), the relationship between observed profits, π_{it}, and true profits, T_{it}, is given by $\pi_{it} = T_{it} e^{g_{it} CT_{it}}$. Rearranging this yields the volume of shifted profits[9]:

$$S_{it} = \pi_{it} - T_{it} = \pi_{it} \left(\frac{g_{it} CT_{it}}{1 + g_{it} CT_{it}} \right) \tag{A.19}$$

From this volume, we can derive two distinct intensity measures:

1. **Profit-shifting ratio:** Defined as S_{it}/π_{it}. This measures the fraction of *observed* profits that are the result of shifting. This metric is particularly relevant for low-tax affiliates (inbound shifting) where observed profits are inflated.

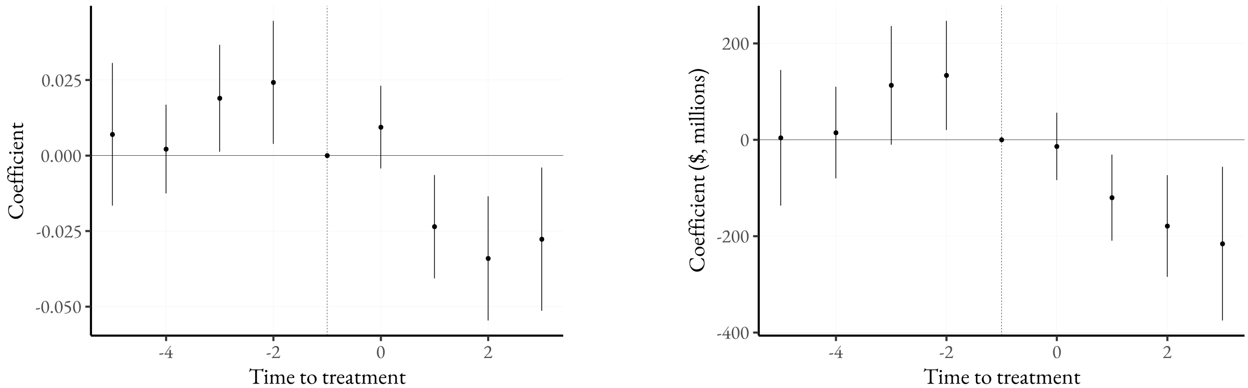
2. **True profit-shifting ratio:** Defined as S_{it}/T_{it}, where $T_{it} = \pi_{it} - S_{it}$. This measures the fraction of *true* generated profits that are shifted away. This metric is preferred for high-tax affiliates (outbound shifting) where observed profits are eroded.

These firm-level estimates can be further aggregated to construct measures of profit-shifting intensity at the MNE, country, and industry levels.

[8] The estimate uses an unweighted average to maximize sample coverage, incorporating affiliates even when financial weights (e.g., assets or sales) are unavailable.

[9] For small values of $g_{it} CT_{it}$, this approximates to $S_{it} \approx \pi_{it} g_{it} CT_{it}$.

Figure A.1: The effect of the TCJA on profit-shifting for U.S. MNEs



(a) Profit-shifting ratio

(b) Total profits shifted

Notes: This figure reports event-study estimates, with 95% confidence intervals, of the TCJA's effect on profit shifting. Outcomes are (a) the profit-shifting ratio, defined as shifted profits divided by observed profits, S_{it}/π_{it}, and (b) total profits shifted, S_{it}. Shifted profits S_{it} are constructed following Delis et al. (2024): shifted profits are inferred from observed pre-tax profits π_{it} and a firm-year semi-elasticity of reported profits with respect to a composite tax differential, yielding S_{it}. The treatment group consists of U.S. MNEs, and the control group consists of foreign-headquartered firms with U.S. affiliates. Firms are treated starting in 2017.

We adapt the event study specification in (1) by taking the treatment variable to be an indicator for whether the firm is a U.S. MNE for a Compustat North America sample inclusive of foreign MNEs. Specifically, we consider a firm to be treated by the TCJA in 2017 if it is a U.S. MNE, taking firms which have their headquarters outside the U.S. but have U.S. affiliates as the control group[10].

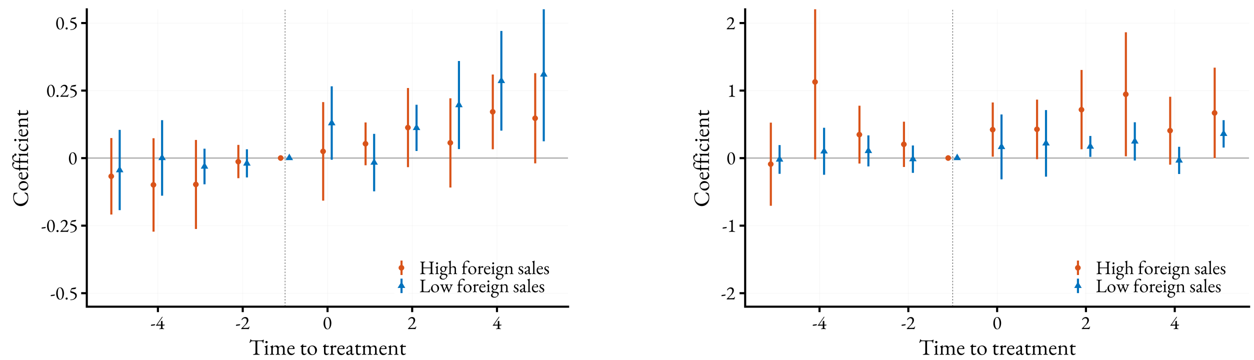
A.3 Heterogeneity by foreign sales share

To disentangle the mechanisms driving the investment response, Figure A.2 plots the dynamic treatment effects split by pre-TCJA foreign sales intensity. This heterogeneity analysis provides a direct test of the FDII channel emphasized in our structural model.

Panel A.2a reveals a striking pattern in the tangible investment response: firms with low foreign sales (red series) exhibit a robust and statistically significant increase in physical capital accumulation, whereas firms with high foreign sales (blue series) show a statistically indistinguishable response. This counter-intuitive result—that globally engaged firms invested *less* in physical capital than domestically focused firms—provides strong empirical support for the specific design of the FDII regime modeled in Section C. The FDII deduction is a decreasing function of domestic tangible assets (QBAI). Consequently, MNEs with high foreign sales, who are mechanically more

[10]The definition of the control group is in-progress since U.S. affiliates of foreign-headquartered firms, which form the tentative control group, are impacted by the decrease in statutory corporate tax rate, in tandem with base-broadening provisions such as the Base Erosion and Anti-Abuse Tax and more stringent interest deductibility limitations to inhibit profit-shifting.

Figure A.2: The effect of the TCJA on investment for U.S. MNEs, by foreign sales share



(a) Tangible investment

(b) Intangible investment

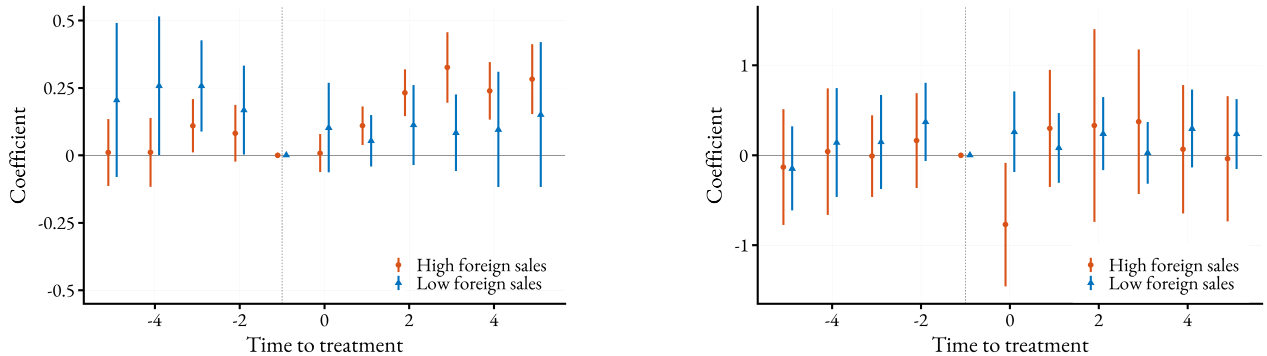
Notes: These figures plot the estimated dynamic effects $\hat{\beta}_\tau$ from equation (1), along with 95% confidence intervals, of the TCJA for tangible and intangible investment for the sub-samples of U.S. MNEs with "high" (above median) foreign sales share and "low" (below median) foreign sales share before the TCJA. Standard errors are clustered at the firm level.

exposed to the FDII regime, face a "QBAI penalty" that effectively raises their user cost of domestic capital relative to the pure statutory rate cut enjoyed by firms with low foreign sales.

Conversely, Panel A.2b demonstrates that the increase in intangible investment for MNEs is driven entirely by firms with high foreign sales. This divergence aligns with the "carrot" component of the FDII provision. For firms with significant foreign market access, the reform lowers the effective tax rate on foreign-derived intangible income to 13.125%, creating a large wedge compared to the 21% domestic rate. This preferential treatment significantly raises the after-tax return on intellectual property for exporters, incentivizing the sharp portfolio reallocation toward intangibles observed in the blue series. Together, these results validate the model's central prediction: the TCJA's complex incentive structure simultaneously stimulated physical investment for domestic firms while shifting the asset composition of export-intensive MNEs toward intangibles.

A key challenge in interpreting the muted tangible investment response of foreign sales-intensive U.S. MNEs (documented in Figure A.2) is distinguishing between two potential mechanisms: the FDII "QBAI penalty" (which discourages domestic tangible accumulation) and the substitution of capital to foreign subsidiaries (incentivized by the GILTI QBAI exemption). To isolate these channels, Figure A.3 replicates the foreign sales heterogeneity analysis for a subsample of U.S. non-MNEs. By definition, these firms cannot shift production abroad, shutting down the substitution channel.

Panel A.3a presents the results for tangible investment. Unlike their multinational counterparts, non-MNEs with high foreign sales (blue) exhibit a robust and statistically significant increase in



(a) Tangible investment (b) Intangible investment

Figure A.3: The effect of TCJA on investment for U.S. non-MNEs, by foreign sales share

Notes: These figures plot the estimated dynamic effects $\hat{\beta}_\tau$ from equation (1), along with 95% confidence intervals, of the TCJA for tangible and intangible investment for the sub-samples of U.S. non-MNEs with “high" (above median) foreign sales share and “low" (below median) foreign sales share before the TCJA. Standard errors are clustered at the firm level.

physical capital, with point estimates often exceeding those of low foreign sales firms (red). This reversal is instructive. It suggests that for firms constrained to domestic production, the “scale effect” of the FDII export subsidy—which increases the after-tax profitability of serving foreign markets—dominates the marginal disincentive of the QBAI penalty. This finding implies that the stagnation observed in Figure A.2 for export-intensive MNEs was likely driven by the substitution of tangible capital to foreign jurisdictions, rather than the FDII penalty alone.

Panel A.3b shows the response for intangible investment. Here, we find no significant differential effect for exporters; if anything, domestic-focused firms (red) drive the aggregate increase. This muted response for exporters may reflect the composition of the non-MNE sector: unlike the IP-intensive multinationals driving Figure A.2b, non-MNE exporters are likely more reliant on tangible manufacturing processes. Consequently, their “deemed intangible income” is lower, limiting their ability to utilize the FDII deduction and thereby dampening the incentive to reallocate toward intangible assets.

A.4 Robustness checks

A.4.1 Simulated tax instrument

A central challenge in estimating the investment response to the TCJA is the endogeneity of the realized effective tax rate. A firm’s realized ETR in the post-reform period reflects not only the exogenous legislative shock but also endogenous operational responses—such as profit shifting, the timing of deductions, or the reallocation of productive assets—which are simultaneously determined with investment decisions. To address this simultaneity bias and isolate the variation in tax burden driven solely by the legislative reform, we construct a simulated tax instrument.

We construct the instrument by mechanically applying the post-TCJA statutory tax code to firms' *pre-reform* financial characteristics. Specifically, we "freeze" each firm's balance sheet, geographic income distribution, and asset composition at their 2016 levels prior to the drafting and enactment of the TCJA. This approach ensures that the variation in our tax measure stems entirely from the interaction between the new statutory rules and pre-existing firm structures, filtering out endogenous adjustments to the policy.

Let $\mathcal{T}_t(\cdot)$ denote the statutory tax function in year t, and let $\mathbf{y}_{i,2016}$ represent the vector of firm i's financial characteristics in 2016. We define the simulated change in the tax burden, $\Delta\tau_i^{sim}$, as:

$$\Delta\tau_i^{sim} = \frac{\mathcal{T}_{2018}(\mathbf{y}_{i,2016}) - \mathcal{T}_{2016}(\mathbf{y}_{i,2016})}{\mathtt{PI}_{i,2016}} \tag{A.20}$$

where the numerator calculates the difference in tax liability solely attributable to the change in the tax code. $\mathcal{T}_{2018}$ applies the 21% flat corporate rate to domestic income in 2016 and models the GILTI regime for foreign income by applying the 10.5% effective rate to the 2016 stock of foreign pre-tax earnings.

This simulated instrument captures the "intention to treat" of the policy. Variation in $\Delta\tau_i^{sim}$ is driven by cross-sectional differences in pre-reform exposure to the specific provisions of the TCJA. For purely domestic firms, the shock is driven by the reduction in the statutory rate applied to their domestic income base. For multinational enterprises (MNEs), the shock additionally incorporates exposure to the GILTI and FDII regimes, determined by their 2016 foreign intangible intensity and subsidiary locations.

To estimate the average treatment effect over the post-reform period, we collapse the time-varying interaction terms into a single interaction between firm-level exposure and a post-reform indicator. We estimate the following static specification:

$$y_{it} = \beta \left(\Delta\text{EATR}_i \times \mathbb{1}_{\{t \geq 2018\}}\right) + \alpha_i + \gamma_{n(i)t} + \varepsilon_{it}, \tag{A.21}$$

where y_{it} denotes the outcome variable (i.e., the log of tangible or intangible investment) for firm i in year t. The term ΔEATR_i represents the firm-level exposure to the TCJA, defined as the change in the GAAP effective average tax rate from 2016 to 2018. The indicator $\mathbb{1}_{\{t \geq 2018\}}$ takes the value of one for all years following the enactment of the TCJA and zero otherwise. We include firm fixed effects, α_i, to absorb time-invariant unobservables, and industry-by-year fixed effects, $\gamma_{n(i)t}$, to control for time-varying sectoral shocks. The coefficient of interest, β, represents the semi-elasticity of investment with respect to the tax cut.

We estimate the static parameter β using $\Delta\tau_i^{sim}$ as an instrument for the realized tax change. The first-stage regression isolates the variation in the realized tax change predicted by the simulated instrument:

$$\left(\Delta\text{EATR}_i \times \mathbb{I}_{\{t\geq 2018\}}\right) = \delta\left(\Delta\tau_i^{sim} \times \mathbb{I}_{\{t\geq 2018\}}\right) + \mu_i + \lambda_{n(i)t} + \nu_{it}. \tag{A.22}$$

In the second stage, we regress the outcome variable on the predicted treatment interaction from the first stage:

$$y_{it} = \beta\big(\widehat{\Delta\text{EATR}_i \times \mathbb{I}}_{\{t\geq 2018\}}\big) + \alpha_i + \gamma_{n(i)t} + \varepsilon_{it}. \tag{A.23}$$

The exclusion restriction requires that, conditional on fixed effects and industry trends, a firm's pre-determined 2016 financial structure affects post-2017 investment outcomes only through its exposure to the tax reform. Given that the specific details of the TCJA—particularly the mechanics of GILTI and the magnitude of the rate cut—were largely unanticipated in 2016, this instrument provides a robust basis for causal identification.

To interpret the economic magnitude of these coefficients, we scale the independent variable such that a unit change corresponds to a 10 percentage point reduction in the effective tax rate, roughly approximating the magnitude of the corporate rate cut under the TCJA.

Table A.4: 2SLS estimates of investment response to the TCJA

	(i) ln(Tangible Investment)		(ii) ln(Intangible Investment)	
	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Post $\times$ Δ EATR	0.0164**	0.0241***	0.0155*	0.0181***
	(0.0054)	(0.0030)	(0.0086)	(0.0029)
Fixed Effects				
Firm	Yes	Yes	Yes	Yes
Industry $\times$ Year	Yes	Yes	Yes	Yes
Observations	9,469	9,469	15,759	15,759
First-stage F-statistic		91.61		515.73

Notes: This table presents estimates from the static difference-in-differences specification outlined in Equation (A.21). The dependent variables are the log of tangible investment (columns 1-2) and the log of intangible investment (columns 3-4). The independent variable is the interaction of a post-2017 indicator and the firm-level change in EATR from 2016 to 2018. Columns (2) and (4) estimate the specification using the simulated tax instrument defined in the text. Standard errors are clustered at the firm level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Under this interpretation, our 2SLS estimate implies that the tax reform generated a 2.41% increase in firm-level tangible investment. Converting this to a standard semi-elasticity, our result implies a semi-elasticity of approximately -0.24 with respect to the tax rate. This estimate is somewhat more conservative than recent estimates derived from administrative data on private firms (e.g., Zwick and Mahon, 2017; Chodorow-Reich et al., 2025).

A.4.2 TCJA exposure

While the reduction in the statutory corporate tax rate affected all firms, the TCJA's international reforms, specifically the introduction of GILTI and FDII, disproportionately altered the investment incentives for firms reliant on intangible capital. These provisions introduced a schedule of effective tax rates contingent on the ratio of foreign and domestic income to tangible assets (QBAI). Consequently, firms with high pre-existing stocks of intangible capital faced a distinct policy shock relative to their tangible-intensive counterparts.

To exploit this variation, we construct a firm-level exposure measure, $Intan_i^{2016}$, defined as the pre-reform share of intangible assets in the firm's total capital stock:

$$Intan_i^{2016} = \frac{K_{i,2016}^{int}}{K_{i,2016}^{int} + K_{i,2016}^{tan}} \tag{A.24}$$

where K^{tan} is the book value of property, plant, and equipment, and K^{int} is the stock of intangible capital constructed using the perpetual inventory method applied to R&D and SG&A expenditures.

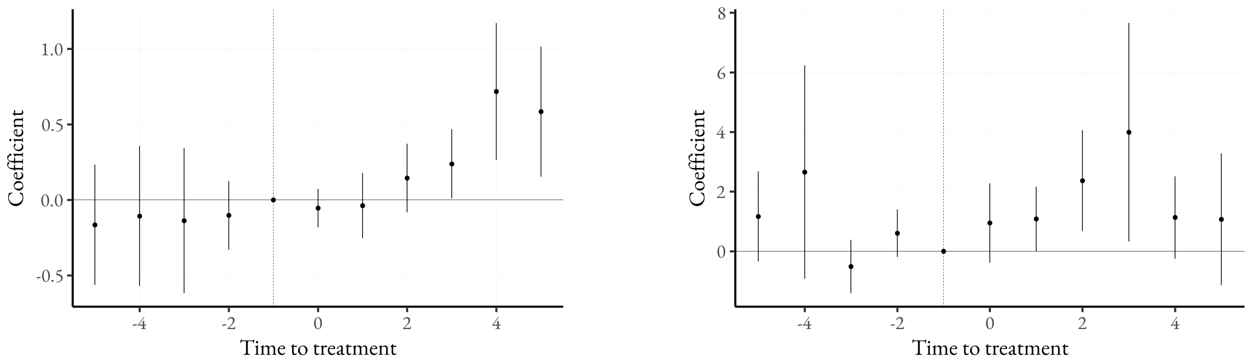
We posit that $Intan_i^{2016}$ serves as a valid proxy for the intensity of the treatment administered by the international tax provisions. High-$Intan$ firms are mechanically more likely to be subject to the GILTI inclusion (which taxes returns exceeding 10% of foreign tangible assets) and eligible for the FDII deduction (which subsidizes domestic returns exceeding 10% of domestic tangible assets). We estimate the differential investment response using the following dynamic difference-in-differences specification:

$$y_{it} = \alpha_i + \gamma_{n(i)t} + \sum_{k \neq 2016} \beta_k \left(\mathbb{1}_{\{t=k\}} \times Intan_i^{2016} \right) + \mathbf{X}_{it}' \delta + \varepsilon_{it} \tag{A.25}$$

where β_k traces the evolution of investment for intangible-intensive firms relative to tangible-intensive firms.

The identifying assumption in this framework is that, absent the tax reform, investment trends would not have diverged systematically by intangible intensity. A primary concern is that intangible-intensive firms (e.g., technology or pharmaceutical companies) may be on different secular growth trajectories than traditional manufacturing firms. To mitigate this concern, we include

Figure A.4: The effect of the TCJA on investment for U.S. MNEs



(a) Tangible investment

(b) Intangible investment

Notes: These figures plot the estimated dynamic effects $\hat{\beta}_k$ from equation (A.25), along with 95% confidence intervals, of the TCJA for tangible and intangible investment for the sub-sample of U.S. MNEs defined using their pre-TCJA status. Standard errors are clustered at the firm level.

industry-by-year fixed effects ($\gamma_{n(i)t}$), absorbing all time-varying shocks common to firms within the same 2-digit NAICS sector. The coefficient of interest, β_k, therefore identifies the effect of the tax reform from *within-industry* variation in asset composition.

Panel A.4a presents the results for tangible investment. The coefficients on the interaction terms for $t < 0$ are small in magnitude and statistically indistinguishable from zero, supporting the parallel trends assumption. Prior to the reform, intangible-intensive firms were on the same physical capital accumulation trajectory as their tangible-intensive counterparts. Following the reform, we see a delayed but robust increase in tangible investment.

Panel A.4 displays the results for intangible investment. The estimates show a large, positive response that materializes more rapidly than for tangible capital. We observe statistically significant coefficients of 2.37 and 3.99 in 2019 and 2020, respectively. These magnitudes suggest a highly elastic response to the reduction in the user cost of intangible capital driven by the FDII deduction (which lowered the effective rate on IP income to 13.125%) and the transition to a territorial system. We note, however, that the estimates for intangible investment are less precise than those for physical capital, as evidenced by the wider confidence intervals. Despite this noise, the sharp structural break in the coefficients immediately following the reform ($t > 0$) strongly suggests that the TCJA succeeded in stimulating new IP formation among the firms most exposed to its incentives.

B Institutional Background

In this section, we provide background on the U.S. Tax Cuts and Jobs Act (TCJA) of 2017 and the OECD Pillar Two rules. After presenting the structural model in Section 3, we will map the policy provisions to model variables and discuss how each policy changes affect the optimal decisions of multinational enterprises (MNEs) and how these two reforms interact with each other.

B.1 The Tax Cuts and Jobs Act of 2017

The Tax Cuts and Jobs Act (TCJA) of 2017 involves a comprehensive change of the U.S. corporate tax code. The legislation was adopted in a relatively short legislative window and passed by the 115th Congress in December 2017 with limited time for extended deliberation, producing large, rapid changes to statutory tax rules. We review here three key aspects of the TCJA that are particulatly relevant for U.S. MNEs and U.S.affiliates owned by foreign MNEs.

First, the TCJA substantially lowered the statutory federal corporate income tax rate from 35 percent to a flat 21 percent. This rate reduction was intended to incentivize investment in the U.S. and to improve competitiveness of the U.S. corporate tax system. Second, the TCJA moved the United States away from a classical worldwide system toward a partial territorial system. Under the previous regime, U.S. parents were taxed on foreign-source earnings when those earnings were repatriated, with credits for foreign taxes paid. The TCJA introduced participation-exemption style relief (effectively a 100% dividends received deduction for the foreign-source portion of dividends from specified 10% owned foreign corporations), which largely exempts repatriated foreign earnings from U.S. taxation while preserving several targeted anti-abuse and base-protection measures.

Third, the TCJA introduced two companion provisions to address profit shifting of MNEs: Global Intangible Low-Taxed Income (GILTI) and Foreign-Derived Intangible Income (FDII).[11] Both provisions are designed to alter the tax treatment of income associated with intangible assets, which are often mobile and easily shifted across borders for tax planning purposes. GILTI functions as a minimum-style tax of 10.5% on intangible income booked in foreign subsidiaries: it captures residual income above a deemed 10 percent return on tangible assets (Qualified Business Asset Investment, or QBAI) and requires U.S. shareholders to include that income in taxable income.[12] FDII provides a tax reduction for U.S. income derived from exports of goods and services

[11]The TCJA also introduced the Base Erosion and Anti-Abuse Tax (BEAT), which penalizes large MNEs that shift profits via deductible payments to foreign affiliates. Due to its narrow scope and coverage, it is far less important compared to GILTI and FDII. According to the IRS, total paid BEAT tax in 2018 was less than 1% of GILTI tax and 4% of FDII credits. While we account for BEAT in our model, our quantitative result shows that no firm in the model is subject to it.

[12]When GILTI was enacted in 2017, it applied to all low-taxed foreign income of U.S. multinationals. In 2020, the U.S. Treasury revised the rule by creating the high-tax exclusion (HTE), which allows foreign income taxed above 90%

Table B.1: Comparison of U.S. International Corporate Tax Regimes & the OECD GMT

Policy Dimension	Pre-TCJA (before 2017)	Post-TCJA (after 2017)	Global Minimum Tax (OECD Pillar Two)
Statutory Corporate Tax Rate	35%	21%	15% minimum floor
Tax System Type	Worldwide with deferral	Quasi-territorial (participation exemption)	Supplements existing systems via top-up tax
Treatment of Foreign Dividends	Taxed upon repatriation with Foreign Tax Credit	100% dividends received deduction (generally exempt)	Not directly affected; top-up applies to undertaxed income
Foreign Earnings Inclusion	Subpart F (immediate) for passive income; active earnings deferred until repatriation	Participation exemption for dividends; GILTI for low-taxed intangible income	All foreign income subject to 15% floor via IIR/UTPR
Minimum Tax on Foreign Income	None (high-tax exclusion at $\geq$ 31.5% ETR)	GILTI: Effective 10.5% minimum rate on residual intangible income (high-tax exclusion at $\geq$ 18.9% ETR)	15% minimum rate (jurisdictional basis)
Calculation Basis	Worldwide with global blending	Global blending (aggregate across CFCs)	Country-by-country (no blending)
Intangible Income Provisions	None specific	GILTI (stick) + FDII (carrot)	No specific intangible provisions; applies to all undertaxed income
Substance-Based Carve-Outs	Not applicable	QBAI: 10% return on tangible assets excluded	8% of tangible assets + 10% of payroll excluded
Foreign Tax Credit	Full credit up to limitation	20% haircut on deemed paid taxes for GILTI	Top-up reduced by local taxes paid
Effective Rate on Export Intangible Income	35%	13.125% (via FDII deduction)	Not directly affected (FDII is U.S.-specific)
Rule Priority/Enforcement	Repatriation-based	Immediate inclusion (GILTI)	QDMTT $\rightarrow$ IIR $\rightarrow$ UTPR hierarchy
Scope	All U.S. corporations with CFCs	All U.S. corporations with CFCs	MNEs with $\geq$€750M consolidated revenue

that are attributed to domestic intangible assets: it taxes export-related intangible income, defined as total export income in excess of 10% of the return on tangible assets (QBAI), at an effective rate of 13.125% that is lower than the staturary 21%. Both provisions also provide foreign tax credits to avoid double taxation.

Together, the rate reduction, territorial shift, and the GILTI/FDII regime represent a coordinated policy package intended to lower the U.S. effective tax rate while mitigating incentives for profit shifting by incentivizing MNEs to booking intangible income within the United States.

B.2 OECD Pillar Two

The OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting (BEPS) developed the Pillar Two, or Global Anti-Base Erosion (GloBE), rules to ensure a minimum level of tax on multinational profits. Pillar Two establishes a global minimum effective tax rate of 15 percent for Multinational Enterprises (MNEs) with annual consolidated revenue above €750 million, calculated on a jurisdictional basis. The GMT rule include tax base carve-outs equal to 8% of tangible assets and 10% of payroll, which reduce the minimum-tax base for subsidiaries that perform real economic activities.

The primary enforcement mechanism is the Income Inclusion Rule (IIR), under which the Ultimate Parent Entity's jurisdiction applies a "top-up" tax when a constituent entity's foreign income is taxed below the 15 percent minimum. Jurisdictions may also impose a Qualified Domestic Minimum Top-Up Tax (QDMTT), allowing them to collect the top-up on low-taxed domestic income before foreign IIR or UTPR rules apply. As a backstop, the GMT also introduce the Undertaxed Profits Rule (UTPR) that enables other jurisdictions where the MNE operates to deny deductions or make adjustments to collect any remaining top-up tax if the IIR is not applied.

The OECD's broader two-pillar framework also includes Pillar One, which reallocates taxing rights over a portion of residual profits to market jurisdictions based on their share of a firm's sales. Implementation of Pillar One has been slower and more politically complex than Pillar Two: negotiations over scope, nexus, and dispute-resolution mechanisms have delayed widespread adoption, so many jurisdictions have prioritized Pillar Two's more administrable minimum-tax rules while Pillar One remains in various stages of bilateral and multilateral implementation.

C Mapping Model to Internal Revenue Services Concepts

In this section, we bridge the gap between our theoretical framework and the administrative reality of the U.S. corporate tax code. We provide a detailed mapping of model variables to specific line

of the U.S. corporate rate to be excluded from the GILTI base. We apply the updated HTE rule when introducing GILTI in the model.

items on IRS tax return forms for both the pre-2018 and post-2017 tax regimes.

This mapping serves two purposes. First, it validates that our definitions of tax bases—particularly for complex provisions like GILTI and FDII—adhere to the statutory formulas governing U.S. multinational enterprises. Second, it clarifies how theoretical concepts such as "profit shifting" and "intangible capital" translate into reported taxable income, foreign tax credits, and final tax liabilities.

We structure the appendix chronologically to mirror the policy transition analyzed in the paper:

- Section C.1: The pre-TCJA "Worldwide" system, characterized by deferral and the repatriation tax.
- Section C.2: The post-TCJA "Territorial" system, characterized by the participation exemption and the new intangible income provisions (GILTI and FDII).

We reference the specific IRS forms and line items (e.g., Form 1120, Form 8993) that correspond to our equations to ensure institutional precision.

C.1 Pre-TCJA "Worldwide" Tax System (2017)

In the pre-TCJA worldwide system, a U.S. parent's tax base began with its domestic profits and then added: (1) immediately taxable foreign earnings under Subpart F, (2) repatriated dividends from non-Subpart F earnings, and (3) a notional "gross-up" of foreign taxes paid on those earnings (per IRC §78).

Unlike the current regime, there was generally no dividends-received deduction (DRD) for foreign-source dividends (old IRC §245 applied only to U.S.-source dividends). Instead, the U.S. taxed this worldwide income at the statutory rate of 35% and provided relief via a Foreign Tax Credit (FTC) under IRC §902 (repealed 2017). The result was that the U.S. collected a "residual" tax whenever the foreign tax rate was lower than 35%.

We map these concepts to the **2017** versions of the relevant IRS forms:

- Form 1120 (2017): U.S. Corporation Income Tax Return.
- Form 1118 (2017): Foreign Tax Credit.
- Form 5471 (2017): Information Return of U.S. Persons With Respect to Certain Foreign Corporations.

C.1.1 Foreign Earnings of the U.S. Parent

Subpart F Inclusion Subpart F (IRC §951) is the anti-deferral regime for passive/mobile income. Pre-TCJA, a high-tax exception applied if the foreign effective rate was $\geq 90\%$ of the U.S. rate

$(0.9 \times 0.35 = 31.5\%)$. Define the high-tax set:

$$J_F^{HT,pre} \equiv \left\{ j \in J_{F \bigcup \{TH\}} \;\middle|\; \frac{\text{Foreign Taxes Paid}}{\pi_{ij}} \geq 0.315 \right\}.$$

The Subpart F set is the complement: $J_F^{SF} = J_F \setminus J_F^{HT,pre}$. The immediate Subpart F inclusion is:

$$\pi_{ii}^{SubF} = \sum_{j \in J_F^{SF}} \pi_{ij} + \pi_{iTH}. \qquad \text{[Form 1120 (2017), Sch C, Line 14]}$$

Repatriated Dividends Under a static full-repatriation assumption, the U.S. parent receives dividends from the after-tax profits of high-tax (deferred) subsidiaries. Note that dividends are paid out of *after-tax* profits:

$$DIV_i = \sum_{j \in J_F^{HT,pre}} (\pi_{ij} - \tau_j \pi_{ij}). \qquad \text{[Form 1120 (2017), Sch C, Line 13]}$$

Section 78 Gross-up To claim a credit for taxes paid by the subsidiary, the U.S. parent must "gross up" its income by the amount of those taxes (effectively treating the tax payment as a deemed dividend under §78). The deemed taxes associated with *both* Subpart F inclusions and Repatriated Dividends are:

$$T_i^{Deemed} = \sum_{j \in J_F^{SF}} \tau_j \pi_{ij} + \sum_{j \in J_F^{HT,pre}} \tau_j \pi_{ij}. \qquad \text{[Form 1118 (2017), Sch A, Col 3]}$$

The Section 78 Gross-up added to income is equal to these deemed taxes:

$$G_i = T_i^{Deemed}. \qquad \text{[Form 1120 (2017), Sch C, Line 15]}$$

Worldwide Gross Income The total income appearing on the U.S. return includes domestic profit plus the full pre-tax value of foreign earnings (cash dividends + inclusions + tax gross-up):

$$\begin{aligned} \pi_i^{WWGI} &= \pi_{ii} + \pi_{ii}^{SubF} + DIV_i + G_i \\ &= \pi_{ii} + \sum_{j \in J_F} \pi_{ij} + \pi_{iTH}. \end{aligned} \qquad \text{[Form 1120 (2017), Pg 1, Line 10]}$$

C.1.2 Regular Tax Liability

Taxable Income Pre-TCJA, there was no deduction for foreign-source dividends. Thus, Taxable Income is simply the Worldwide Gross Income:

$$\pi_i^{TI,pre} = \pi_i^{WWGI}.$$

The pre-credit U.S. tax liability is:

$$T_i^{reg} = \tau_{US}^{pre} \times \pi_i^{TI,pre}, \qquad \text{[Form 1120 (2017), Sch J, Line 2]}$$

where $\tau_{US}^{pre} = 0.35$.

C.1.3 Foreign Tax Credit (FTC)

FTC Limitation The credit is limited to the U.S. tax that *would* be paid on the foreign-source income under IRC §904. Foreign-Source Taxable Income (FSTI) is the sum of Subpart F, Dividends, and the Gross-up:

$$\pi_i^{FSTI} = \pi_{ii}^{SubF} + DIV_i + G_i = \sum_{j \in J_F} \pi_{ij} + \pi_{iTH}. \qquad \text{[Form 1118 (2017), Sch B, Part II, Line 6]}$$

The limitation is:

$$FTC^{limit} = \tau_{US}^{pre} \times \pi_i^{FSTI}. \qquad \text{[Form 1118 (2017), Sch B, Part II, Line 10]}$$

Allowed Credit The allowed credit is the lesser of actual taxes deemed paid or the limitation:

$$FTC^{allowed} = \min\left(T_i^{Deemed},\ FTC^{limit}\right). \qquad \text{[Form 1118 (2017), Sch B, Part II, Line 13]}$$

Total U.S. Tax Liability

The final liability is the regular tax minus the allowed credit.

$$\begin{aligned} T_{US}^{Total} &= T_i^{reg} - FTC^{allowed} \qquad \text{[Form 1120 (2017), Sch J, Line 10]} \\ &= \tau_{US}^{pre}(\pi_{ii} + \pi_i^{FSTI}) - \min\left(T_i^{Deemed},\ \tau_{US}^{pre}\pi_i^{FSTI}\right) \\ &= \underbrace{\tau_{US}^{pre}\pi_{ii}}_{\text{Tax on Domestic}} + \underbrace{\max\left(0,\ \tau_{US}^{pre}\pi_i^{FSTI} - T_i^{Deemed}\right)}_{\text{Residual Tax on Foreign}}. \end{aligned}$$

This equation demonstrates the pre-TCJA "top-up" mechanic: MNEs paid full U.S. tax on domestic profits, plus the difference between the U.S. rate and the foreign rate on foreign profits (if the foreign rate was lower).[13]

C.1.4 Model Implementation: The Effective Inclusion Rate (ι)

The detailed derivation above highlights that under the pre-TCJA system, the U.S. residual tax applied only to a subset of foreign earnings: those deemed distributed under Subpart F (π_{ii}^{SubF}) and those voluntarily repatriated as dividends (DIV_i). The remaining active earnings could be deferred indefinitely.

To map this complex legal structure into our stationary general-equilibrium framework—without explicitly modeling the dynamic timing of repatriation decisions—we introduce a reduced-form parameter, ι. This parameter represents the *effective inclusion rate*, or the fraction of total foreign pre-tax earnings ($\sum \pi_{ij}$) that enters the U.S. tax base in a given period, either through mandatory Subpart F inclusions or voluntary repatriation. We allow ι to vary by region to reflect the variation in the share of repatriated profits.

Substituting this parameter into the Total U.S. Tax Liability equation derived above, and assuming for tractability that the foreign tax credit limitation is calculated against this aggregate included fraction, we arrive at the reduced-form tax function used in the main text:

$$T_{ii} \approx \tau_{US}^{pre}\pi_{ii} + \sum_{j \in J_F \bigcup \{TH\}} \iota_j \times \max\left(0,\ (\tau_{US}^{pre} - \tau_j)\pi_{ij}\right). \tag{C.1}$$

Here, the term $\max(0, \tau_{US}^{pre} - \tau_j)$ captures the residual tax mechanic (regular tax minus FTC) derived in the previous subsection.

C.2 Post-TCJA "Territorial" Tax System (2018+)

The 2017 Tax Cuts and Jobs Act fundamentally shifted the U.S. from a worldwide system with deferral to a quasi-territorial system. The cornerstone of this shift is the **Participation Exemption** (IRC §245A), which allows U.S. corporations to deduct 100% of the foreign-source portion of dividends received from specified 10%-owned foreign corporations.

In the model, we implement the participation exemption implicitly: unlike the pre-TCJA framework, we do not include repatriated dividends in the U.S. tax base. Instead, U.S. taxation of foreign earnings is strictly limited to the new intangible income regimes. We match model concepts to the

[13] We abstract from the Corporate Alternative Minimum Tax (AMT), which imposed a 20% minimum tax on a broader definition of income (see IRC §55). While the TCJA repealed the Corporate AMT, its effects in the pre-TCJA period are implicitly captured in our calibration of the effective tax rate rather than explicitly modeled.

following forms:

1. Form 1120 (U.S. Corporation Income Tax Return)
2. Form 1118 (Foreign Tax Credit)
3. Form 8991 (BEAT)
4. Form 8992 (GILTI Inclusion)
5. Form 8993 (Section 250 Deduction)

C.2.1 U.S. Parent Taxable Income

We begin with the pre-tax profit at the MNE level, defined as:

$$\pi_i^{MNE} \equiv \pi_{ii} + \sum_{j \in J_F} \pi_{ij} + \pi_{iTH},$$

where π_{ii} represents the total pre-tax income reported by the U.S. parent corporation. In IRS terminology, this corresponds to **Taxable Income Before Net Operating Loss and Special Deductions**. It includes domestic gross receipts, export income, and royalties received, net of domestic deductions, but excludes dividends and inclusions from foreign subsidiaries (which are added later via Schedule C).

We map π_{ii} to Line 28 of Form 1120:

$$\pi_{ii} = \underbrace{\sum_{j \in J_X \cup \{i\}} p_{ij} q_{ij}}_{\text{Gross Receipts (Line 1)}} + \underbrace{(\varphi_{LT}\lambda_{LT} + \varphi_{TH}\lambda_{TH}) z_i \sum_{j \in J_F \cup \{i\}} \vartheta_{ij}(z_i)}_{\text{IP Transfer Proceeds (Line 10)}}$$
$$+ \underbrace{(1-\lambda_i) z_i \sum_{j \in J_F} \vartheta_{ij}(z_i)}_{\text{Royalties/License Fees (Line 6)}}$$
$$- \Bigg(\underbrace{W_i l + \delta P_i k}_{\text{COGS \& Deductions}} + \underbrace{\lambda \vartheta_{ii}(z_i) z_i}_{\text{Royalties Paid}}$$
$$+ \underbrace{W_i \big(\mathcal{C}_{i,LT}(\lambda_{LT}) + \mathcal{C}_{i,TH}(\lambda_{TH})\big) z_i \sum_{j \in J_F \cup \{i\}} \vartheta_{ij}(z_i)}_{\text{Cost of Profit Shifting}} \Bigg)$$
$$- \underbrace{\left(\frac{W_i}{A_i}\right) z_i}_{\text{R\&D Exp (Line 26)}} - \underbrace{W_i \left(\sum_{j \in J_X} \kappa_{jX} + \sum_{j \in J_F} \kappa_{jF} \right)}_{\text{Other Deductions (Line 26)}} \qquad \text{[Form 1120, Line 28]}$$

This definition captures the domestic tax base prior to the application of international provisions. Note that the subset J_X appears here because exports are part of the domestic tax base, while J_F (foreign production) generally is not, except through the specific profit-shifting mechanisms detailed above.

C.2.2 Foreign Affiliate Income (Tested Income)

To determine the inclusion amounts for GILTI, we must also define the pre-tax income for foreign subsidiaries, which maps to the *Earnings and Profits* (E&P) or *Tested Income* concepts found on Form 5471.

For subsidiaries in high-tax regions ($j \in J_F \setminus \{LT\}$), profit is defined as local revenue less operational costs and royalty payments for the use of intellectual property (IP):

$$\pi_{ij} = p_{ij} q_{ij} - W_j l_j - \delta P_i k_j - \vartheta_{ij}(z_i) z_i.$$

For the subsidiary in the low-tax region (LT), the profit equation accounts for the profit-shifting mechanics. This affiliate receives income from shifting IP (licensing fees from other affiliates) but pays for the acquisition of that IP (transfer pricing):

$$\pi_{iLT} = p_{LT}q_{LT} - W_{LT}l_{LT} - \delta P_{LT}k_{LT}$$
$$- \underbrace{\varphi_{LT}\lambda_{LT}\sum_{j\in J_F\cup\{i\}}\vartheta_{ij}(z_i)}_{\text{Cost of Acquired IP}} + \underbrace{\sum_{j\in J_F\cup\{i\}\setminus\{LT\}}\lambda_{LT}\vartheta_{ij}(z_i)z_i}_{\text{Royalties Received}} - \underbrace{(1-\lambda_{LT})\vartheta_{iLT}(z_i)z_i}_{\text{Royalties Paid to Parent}}.$$

Finally, the tax haven affiliate (TH) acts purely as a holding entity for shifted IP. Its income consists solely of royalties received on shifted IP, net of the transfer price paid to acquire it:

$$\pi_{iTH} = \sum_{j\in J_F\cup\{i\}}\lambda_{TH}\vartheta_{ij}(z_i)z_i - \varphi_{TH}\lambda_{TH}\sum_{j\in J_F\cup\{i\}}\vartheta_{ij}(z_i).$$

C.2.3 Global Intangible Low-Taxed Income (GILTI)

GILTI is governed by IRC §951A and computed on Form 8992. On Form 1120, the section 951A inclusion is reported on Schedule C, line 17 and is aggregated into "Dividends and inclusions" on Schedule C, line 23 (column (a)), which flows to page 1, line 4. The associated section 250 deduction is computed on Form 8993 and reported on Schedule C, line 22 (column (c)); the total of special deductions on Schedule C, line 24 (column (c)) is carried to page 1, line 29b.[14]

We construct Net Tested Income (NTI) in accordance with Form 8992, Part I. Jurisdictions whose effective tax rate is at least 90 percent of the U.S. rate fall under the high-tax exclusion of 26 CFR §1.951A-2(c)(6). Define

$$J_F^{HT} \equiv \left\{ j \in J_F \;\middle|\; \frac{T_{ij}^{loc}}{\pi_{ij}} \geq 0.9\,\tau_{US} \right\}.$$

Net Tested Income is then

$$\pi_{ii}^{NTI} = \sum_{j\in J_F\setminus J_F^{HT}}\pi_{ij}, \qquad \text{[Form 8992, Part I, line 3]}$$

Next, we compute the Deemed Tangible Income Return (DTIR), equal to 10% of Qualified Business Asset Investment (QBAI) across all non–high-tax foreign affiliates, as specified in

[14]See the official Instructions for Form 1120 (2024), especially Schedule C instructions for lines 17, 22–24, and Form 1120 page 1 lines 4 and 29b.

IRC §951A(b)(2):

$$DTIR = \chi^{QBAI} \sum_{j \in J_F \setminus J_F^{HT}} P_j k_{ij}, \qquad \chi^{QBAI} = 0.10, \qquad \text{[Form 8992, Part II, line 2]}$$

Since the model contains no deductible interest, Net DTIR equals DTIR (Form 8992, line 5). The GILTI base (section 951A inclusion before the section 250 deduction) is therefore

$$\pi_{ii}^{GILTI} = \pi_{ii}^{NTI} - DTIR. \qquad \text{[Form 8992, Part II, line 5]}$$

The §250 deduction for GILTI (together with FDII) is computed on Form 8993 and reported on Schedule C, line 22 (column (c)). On Form 1120, the gross inclusion flows to Page 1, Line 4 (via Schedule C), while the deductible portion is reported on Page 1, Line 29b. In the model, we collapse these steps to represent the net contribution to Taxable Income (Line 30) as:

$$\text{Net GILTI in Tax Base} \;=\; (1 - \chi^{GILTI})\, \pi_{ii}^{GILTI} \qquad \text{[Form 1120, Line 30]}$$

where $\chi^{GILTI} = 0.50$.

Foreign Tax Credit (FTC). The Foreign Tax Credit for the GILTI basket is governed by IRC §960(d) and computed on Form 1118. First, we calculate the Deemed Paid Foreign Taxes (DPFT). Under §960(d)(1), the U.S. corporation is deemed to have paid 80% of the foreign income taxes associated with the net tested income. Aggregating across the relevant foreign affiliates:

$$T_{ii}^{DPFT} = \chi^{FTC} \sum_{j \in J_F \setminus J_F^{HT}} \tau_j \pi_{ij}, \qquad \chi^{FTC} = 0.80. \qquad \text{[Form 1118, Sched B, Part I]}$$

Next, we compute the Foreign Tax Credit Limitation (FTCL) under IRC §904. The limitation restricts the credit to the U.S. tax liability allocable to foreign-source taxable income. This base is the taxable GILTI inclusion net of allocated domestic expenses (modeled here as the fixed entry costs κ_{ij}^F):

$$\pi_{ii}^{Lim} = (1 - \chi^{GILTI})\, \pi_{ii}^{GILTI} - \sum_{j \in J_F \setminus J_F^{HT}} \kappa_{ij}^F. \qquad \text{[Form 1118, Sched J, Part I, Line 11]}$$

The allowable Foreign Tax Credit is the lesser of the deemed paid taxes and the U.S. tax on the limitation base:

$$T_{ii}^{FTC} = \min\left(T_{ii}^{DPFT},\ \tau_{US} \times \max\left(0, \pi_{ii}^{Lim}\right)\right). \qquad \text{[Form 1118, Sch B, Pt II, Line 14]}$$

Finally, the residual U.S. tax liability for GILTI is the tax on the inclusion minus the allowable credit. This net liability represents the GILTI contribution to the total tax due on Form 1120 and corresponds exactly to Equation (23) in the main text:

$$T_{ii}^{GILTI} = \max\left(0,\ \tau_{US}(1-\chi^{GILTI})\pi_{ii}^{GILTI} - T_{ii}^{FTC}\right). \qquad \text{[Form 1120, Sch J, Line 2 – 5a]}$$

C.2.4 Foreign-Derived Intangible Income (FDII)

FDII provides a deduction for income derived from serving foreign markets and is governed by IRC §250. It is computed on Form 8993 and flows to Form 1120 alongside GILTI. The calculation proceeds in four steps: determining deduction eligible income, deemed intangible income, the foreign-derived ratio, and finally the deduction limitation based on taxable income.

Step 1: Deduction Eligible Income (DEI) We start by defining the Deduction Eligible Income (DEI) of the U.S. parent. This corresponds to the gross income of the corporation determined without regard to certain exclusions (e.g., subpart F income, dividends from CFCs). For the model, we map this to the total net income from Form 1120, Line 28:

$$\pi_{ii}^{DEI} \equiv \pi_{ii}. \qquad \text{[Form 8993, Part I, Line 6]}$$

Step 2: Deemed Intangible Income (DII) Next, we calculate the Deemed Tangible Income Return (DTIR), which exempts a fixed return on tangible assets from the intangible income base. This equals 10% of the U.S. parent's domestic Qualified Business Asset Investment (QBAI):

$$DTIR = \chi^{QBAI} \times QBAI_i = \chi^{QBAI} \times p_i k_{ii}, \qquad \chi^{QBAI} = 0.10. \qquad \text{[Form 8993, Part II, Line 7a]}$$

Subtracting this tangible return from DEI yields Deemed Intangible Income (DII):

$$\pi_{ii}^{DII} \equiv \pi_{ii}^{DEI} - DTIR. \qquad \text{[Form 8993, Part II, Line 8]}$$

Step 3: Foreign-Derived Deduction Eligible Income (FDDEI) To isolate the portion of intangible income derived from foreign markets, we calculate the ratio of foreign-derived gross receipts to total gross receipts (ρ). The numerator includes exports, royalties received from foreign affiliates, and proceeds from IP transfers. The denominator adds domestic sales and domestic IP use:

$$\begin{aligned}\rho \equiv & \frac{\text{FDDEI Gross Receipts}}{\text{Total DEI Gross Receipts}} \\ = & \frac{\sum_{j\in J_X} p_{ij}q_{ij} + (\varphi_{LT}\lambda_{LT} + \varphi_{TH}\lambda_{TH})z_i \sum_{j\in J_F} \vartheta_{ij}(z_i) + (1-\lambda_i)z_i \sum_{j\in J_F} \vartheta_{ij}(z_i)}{\sum_{j\in J_X \cup \{i\}} p_{ij}q_{ij} + (\varphi_{LT}\lambda_{LT} + \varphi_{TH}\lambda_{TH})z_i \sum_{j\in J_F \cup \{i\}} \vartheta_{ij}(z_i) + (1-\lambda_i)z_i \sum_{j\in J_F} \vartheta_{ij}(z_i)}.\end{aligned} \tag{C.2}$$

Using this ratio, we allocate deductions to the foreign activity. Note that licensing fees paid by the U.S. parent to foreign affiliates for domestic IP use are excluded here, as they relate to domestic revenue. The FDDEI-allocated deductions are:

$$\begin{aligned}\text{Allocated Deductions} = \rho \Bigg[& W_i l + \delta P_i k + \left(\frac{W_i}{A_i}\right) z \\ & + W_i\big(\mathcal{C}_{i,LT}(\lambda_{LT}) + \mathcal{C}_{i,TH}(\lambda_{TH})\big) z \sum_{j\in J_F \cup \{i\}} \vartheta_{ij}(z) \Bigg] + W_i \left(\sum_{j\in J_X} \kappa_{jX} + \sum_{j\in J_F} \kappa_{jF} \right).\end{aligned}$$

[Form 8993, Part III, Line 18]

FDDEI is then gross receipts minus these allocated deductions:

$$\pi_{ii}^{FDDEI} \equiv \text{FDDEI Gross Receipts} - \text{Allocated Deductions}.$$ [Form 8993, Part III, Line 19]

Step 4: FDII Calculation We determine the Foreign-Derived Ratio (FDR) and apply it to the Deemed Intangible Income to find the final FDII base:

$$FDR = \frac{\pi_{ii}^{FDDEI}}{\pi_{ii}^{DEI}},$$ [Form 8993, Part III, Line 20]

$$\pi_{ii}^{FDII} = FDR \times \pi_{ii}^{DII}.$$ [Form 8993, Part III, Line 21]

Step 5: Section 250 Deduction Limitation The deduction for FDII and GILTI is limited if the sum of these inclusions exceeds the corporation's taxable income. Using inputs from Form 8992 (GILTI), we sum the components:

$$\pi_{ii}^{Sum} = \pi_{ii}^{GILTI} + \pi_{ii}^{FDII}.$$ [Form 8993, Part IV, Line 23]

We compare this to the corporation's taxable income (π_{ii}). The excess amount is:

$$\pi^{Excess} = \pi_{ii}^{Sum} - \pi_{ii}.$$ [Form 8993, Part IV, Line 25]

If $\pi^{Excess} > 0$, the base for the deduction must be reduced. The reduction is allocated pro-rata. For FDII:

$$R^{FDII} = \begin{cases} 0 & \text{if } \pi^{Excess} \leq 0, \\ \frac{\pi_{ii}^{FDII}}{\pi_{ii}^{Sum}} \times \pi^{Excess} & \text{if } \pi^{Excess} > 0. \end{cases}$$ [Form 8993, Part IV, Line 26]

For GILTI:

$$R^{GILTI} = \begin{cases} 0 & \text{if } \pi^{Excess} \leq 0, \\ \pi^{Excess} - R^{FDII} & \text{if } \pi^{Excess} > 0. \end{cases}$$ [Form 8993, Part IV, Line 27]

Step 6: Final Tax Liability The final deductions are calculated by applying the statutory rates ($\chi^{FDII} = 0.375$ and $\chi^{GILTI} = 0.50$) to the reduced bases:

$$D^{FDII} = \chi^{FDII} \times \left(\pi_{ii}^{FDII} - R^{FDII}\right),$$ [Form 8993, Part IV, Line 28]

$$D^{GILTI} = \chi^{GILTI} \times \left(\pi_{ii}^{GILTI} - R^{GILTI}\right).$$ [Form 8993, Part IV, Line 29]

The final Taxable Income reported on Form 1120 is the DEI plus the GILTI inclusion, minus the Section 250 deductions:

$$\pi_{ii}^{TI} = \pi_{ii}^{DEI} + \pi_{ii}^{GILTI} - D^{FDII} - D^{GILTI}.$$ [Form 1120, Line 30]

This yields the regular tax liability (before BEAT):

$$T_{ii}^{Reg} = \tau_{US} \times \pi_{ii}^{TI}.$$ [Form 1120, Line 31]

C.2.5 Total tax liability

Expanding terms, we can map this statutory calculation directly to the economic components presented in Equation (23) of the main text. By substituting the definitions of D^{FDII} and D^{GILTI}, and subtracting the Foreign Tax Credit (T_{ii}^{FTC}) derived in Section C.2.3, the total final tax liability T_{ii} is:

$$T_{ii} = T_{ii}^{Reg} - T_{ii}^{FTC}. \tag{C.3}$$

Substituting the components:

$$T_{ii} = \tau_{US}\pi_{ii}^{DEI} - \underbrace{\tau_{US}D^{FDII}}_{\hat{T}_{ii}^{FDII}} + \underbrace{\left(\tau_{US}(\pi_{ii}^{GILTI} - D^{GILTI}) - T_{ii}^{FTC}\right)}_{T_{ii}^{GILTI}}. \tag{C.4}$$

where:

1. $\tau_{US}\pi_{ii}^{DEI}$ is the baseline tax on domestic profits (first term of Equation (23)).

2. $\hat{T}_{ii}^{FDII} = \tau_{US}D^{FDII}$ represents the tax value of the FDII deduction, see Equation (25).

3. T_{ii}^{GILTI} represents the net residual tax on GILTI after the section 250 deduction (D^{GILTI}) and foreign tax credits, see Equation (24).

D Global Minimum Tax (GMT) Model Implementation

We implement the OECD/GloBE minimum-tax regime at the affiliate-by-jurisdiction level. This requires defining the specific tax base (GloBE income), the jurisdictional effective tax rate (ETR), and the cascading revenue assignment mechanism.

D.1 GloBE Base and Top-Up Need.

Let π_{ij} denote the pre-tax profits of an affiliate in region j owned by a parent in region i, with local tax liability $T_{ij}^{\text{loc}} = \tau_j \pi_{ij}$. The GloBE rules allow for a substance carve-out based on payroll ($W_j \ell_{ij}$) and tangible assets ($P_j k_{ij}$). Using long-run carve-out factors $(\chi_{\text{GMT},L}, \chi_{\text{GMT},K})$ of 5%, we define the carve-out amount (CO_{ij}) and the GloBE tax base (Π_{ij}^G):

$$CO_{ij} \equiv \chi_{\text{GMT},L} W_j \ell_{ij} + \chi_{\text{GMT},K} P_j k_{ij}, \tag{D.1}$$

$$\Pi_{ij}^G \equiv \max\left(0,\ \pi_{ij} - CO_{ij}\right). \tag{D.2}$$

The jurisdictional effective tax rate (τ_{ij}^{eff}) is the ratio of local taxes to the GloBE base:

$$\tau_{ij}^{\text{eff}} \equiv \begin{cases} \frac{T_{ij}^{\text{loc}}}{\Pi_{ij}^G} & \text{if } \Pi_{ij}^G > 0, \\ \text{undefined} & \text{if } \Pi_{ij}^G = 0. \end{cases} \tag{D.3}$$

The total "top-up" tax required ($\widehat{T}_{ij}$) is determined by the gap between the global minimum rate ($\tau^{\text{GMT}} = 0.15$) and the effective rate:

$$\widehat{T}_{ij} \equiv \max\left(0,\ \tau^{\text{GMT}} - \tau_{ij}^{\text{eff}}\right) \times \Pi_{ij}^G. \tag{D.4}$$

If the affiliate has no excess profit ($\Pi_{ij}^G = 0$) or is already taxed above the minimum ($\tau_{ij}^{\text{eff}} \geq \tau^{\text{GMT}}$), the top-up is zero.

D.2 Rule Priority and Residualization.

The collection of the top-up tax follows a strict hierarchy of taxing rights established by the OECD Pillar Two framework. We define the three enforcement mechanisms as follows:

- **Qualified Domestic Minimum Top-Up Tax (QDMTT):** The source jurisdiction (j) has the primary right to tax its own low-taxed income to bring the effective rate up to 15%.
- **Income Inclusion Rule (IIR):** If the source jurisdiction does not levy a QDMTT, the parent jurisdiction (i) has the secondary right to collect the top-up tax on its foreign subsidiary.
- **Undertaxed Profits Rule (UTPR):** A backstop mechanism allowing other jurisdictions (r) to collect any residual top-up tax that was not collected under the QDMTT or IIR (typically via denied deductions).

To implement this, we define indicator sets for jurisdictions adopting specific rules: $\mathcal{J}^{\text{QDMTT}}$ (source jurisdictions), $\mathcal{I}^{\text{IIR}}$ (parents), and $\mathcal{J}^{\text{UTPR}}$ (backstop jurisdictions). The top-up tax is collected sequentially:

1. **QDMTT:** The host country j takes priority.

$$T_{ij}^{\text{QDMTT}} \equiv \mathbf{1}\{j \in \mathcal{J}^{\text{QDMTT}}\}\widehat{T}_{ij}. \tag{D.5}$$

2. **IIR:** Any residual amount ($\bar{T}_{ij}^{(1)}$) is collected by the parent i if it has adopted the IIR.

$$\bar{T}_{ij}^{(1)} \equiv \widehat{T}_{ij} - T_{ij}^{\text{QDMTT}}, \tag{D.6}$$

$$T_i^{\text{IIR}}(ij) \equiv \mathbf{1}\{i \in \mathcal{I}^{\text{IIR}}\}\bar{T}_{ij}^{(1)}. \tag{D.7}$$

3. **UTPR:** Any remaining residual ($\bar{T}_{ij}^{(2)}$) is allocated to other UTPR-adopting jurisdictions r. The allocation is based on substance weights w_{ir} (a composite of employees and assets in r).

$$\bar{T}_{ij}^{(2)} \equiv \bar{T}_{ij}^{(1)} - T_i^{\text{IIR}}(ij), \tag{D.8}$$

$$T_r^{\text{UTPR}}(ij) \equiv \mathbf{1}\{r \in \mathcal{J}^{\text{UTPR}}\}w_{ir}\bar{T}_{ij}^{(2)}, \quad \text{where} \sum_{r \in \mathcal{J}^{\text{UTPR}}} w_{ir} = 1. \tag{D.9}$$

Three-region illustration. Figure D.1 illustrates these strategic interactions using a network of a U.S. parent (i), an EU subsidiary (j), and a low-tax Irish subsidiary (j'). Suppose the Irish affiliate has an effective tax rate below the 15% minimum. Under the GMT rule priority, the allocation of

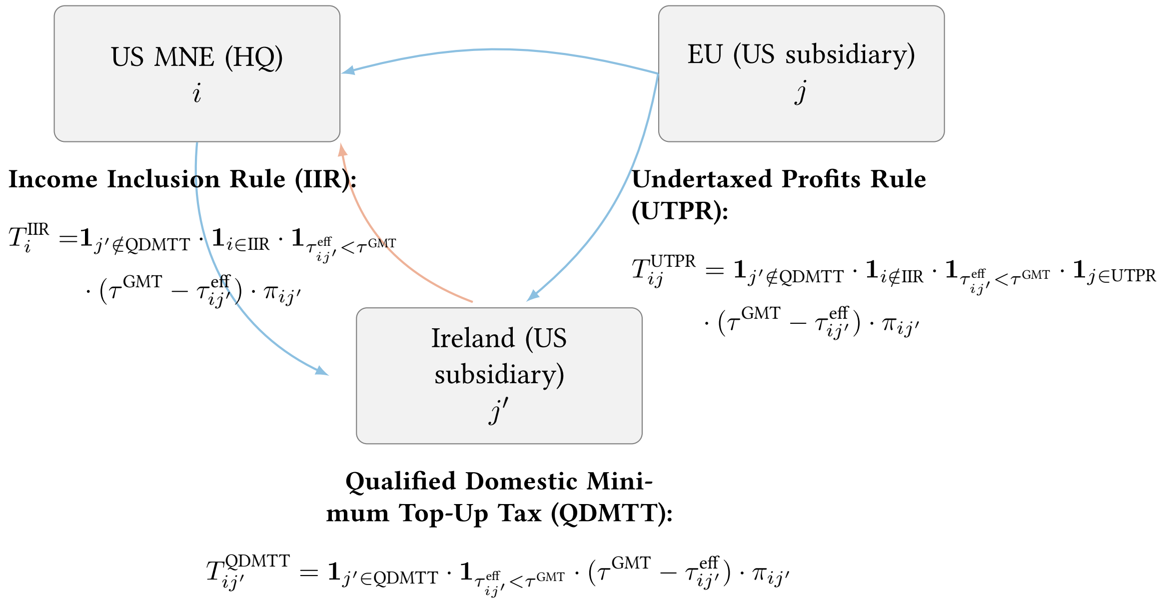


Figure D.1: Global Minimum Tax (GMT) in the three-region version of the model.

the top-up tax depends on which jurisdictions have adopted the rules. First, if Ireland implements a QDMTT, it collects the top-up ($T_{ij'}^{QDMTT}$) directly; the revenue remains in Ireland, and no further tax is owed to the U.S. or the EU. However, if Ireland abstains but the U.S. has adopted the IIR, the taxing right shifts to the headquarters, and the U.S. parent pays the top-up (T_i^{IIR}) to the U.S. government. Finally, if neither Ireland nor the U.S. implements these rules, the EU subsidiary collects the residual top-up (T_{ij}^{UTPR}) via the UTPR. This hierarchy creates strong incentives for adoption: by implementing a QDMTT, a low-tax nation retains tax revenue that would otherwise flow to foreign treasuries via the IIR or UTPR.

D.3 Mapping to Model Equations

We can now explicitly derive the tax liability and revenue equations used in the main text.

Total Tax Liability of the U.S. Parent The total tax liability T_{ii} for a U.S. parent ($i = US$) consists of its domestic liability under the TCJA (including GILTI and FDII) derived in the previous section, see Equation (C.4), plus any IIR top-up taxes it must pay on its foreign subsidiaries ($j \in J_F$) derived in (D.6). Note that UTPR payments are collected by *other* governments and do not appear in the U.S. parent's liability to the U.S. government, nor do QDMTTs which are paid to foreign governments.

$$T_{ii} = T_{ii}^{TCJA} + \sum_{j \in J_F} T_i^{IIR}(ij). \tag{D.10}$$

which corresponds to the total tax liability in Equation (27).

Additional U.S. Government Revenue While the U.S. parent does not pay UTPR to the U.S., the U.S. government may act as a backup jurisdiction ($r = US$) to collect UTPR revenue from *foreign* multinational groups ($m \neq US$) operating within the United States. This revenue is defined as:

$$R_{US}^{UTPR} = \sum_{m \neq US} \sum_{j} T_{US}^{UTPR}(mj). \tag{D.11}$$

This corresponds to the aggregation of the UTPR shares allocated to the U.S. based on its share of the foreign MNE's tangible assets and employees.

E Derivation of the Quantitative Model

In this section, we derive firms' optimal decisions in the quantitative model under three tax systems: (1) pre-TCJA, (2) TCJA, and (3) TCJA and GMT. Given the set of foreign subsidiaries J_X and exporting destinations J_F, an MNE maximizes its post-tax profits:

$$\max_{z, \lambda_{LT}, \lambda_{TH}} \left\{ \pi_{ii} - T_{ii} + \sum_{j \in J_F} (\pi_{ij} - T_{ij}) + \mathbb{1}_{\{\lambda_{TH} > 0\}} \pi_{i,TH} - T_{i,TH} \right\}, \tag{E.1}$$

where π_{ii}, π_{ij} for $j \neq TH$, and $\pi_{i,TH}$ are given by equations (11)-(14). The tax liability terms change between different tax regimes. See Dyrda et al. (2024a) for more details on the combinatorial problem of choosing J_X and J_F.

E.1 Pre-TCJA

E.1.1 Optimal decisions of U.S. MNEs

In the pre-TCJA regime, for U.S. MNEs, we have $T_{ij} = \tau_j \pi_{ij}$, and $T_{i,TH} = \tau_{TH} \pi_{i,TH}$. The total tax liabilities paid by the parent division, T_{ii} is

$$T_{ii} = \tau_{US}^{pre} \pi_{ii} + \sum_{j \in J_F \bigcup \{TH\}} \iota_j \times \max\left(0, \ (\tau_{US}^{pre} - \tau_j) \pi_{ij}\right), \tag{E.2}$$

where ι represents the repatriation rate of foreign profits.

From the profit maximization problem, we can derive the optimal decisions for tangible capital, labor, R&D investment, and profit shifting shares. In the headquarter, the optimal tangible capital and labor demand are:

$$k_{ii} = \left\{ \frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho} \right]^{\varrho} \left[P_i^{\varrho} Q_i + \sum_{j \in J_X} P_i^{\varrho} \xi_{ij}^{1-\varrho} Q_i \right] \frac{W_i^{(1-\varrho)(1-\alpha-\phi)}}{\tilde{r}_i^{\varrho(\alpha+\phi)+(1-\alpha-\phi)}} \left[A_i a (N_i z)^{\phi} \right]^{\varrho - 1} \right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.3}$$

and

$$\ell_{ii} = \left\{ \frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_i^{\varrho} Q_i + \sum_{j\in J_X} P_i^{\varrho} \xi_{ij}^{1-\varrho} Q_i\right] \frac{\tilde{r}_i^{\alpha(1-\varrho)}}{W_i^{\varrho(1-\alpha)+\alpha}} \left[A_i a (N_i z)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.4}$$

where we define $\tilde{r}_i = r_i/(1-\tau_{US}^{pre}) + P_i\delta$.

In the foreign subsidiaries, the optimal tangible capital and labor demand are:

$$k_{ij} = \left\{ \frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_j^{\varrho} Q_j\right] \frac{W_j^{(1-\varrho)(1-\alpha-\phi)}}{\tilde{r}_j^{\varrho(\alpha+\phi)+(1-\alpha-\phi)}} \left[\sigma_{ij} A_j a \left(N_j z\right)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.5}$$

and

$$\ell_{ij} = \left\{ \frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_j^{\varrho} Q_j\right] \frac{\tilde{r}_j^{\alpha(1-\varrho)}}{W_j^{\varrho(1-\alpha)+\alpha}} \left[\sigma_{ij} A_j a \left(N_j z\right)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.6}$$

where $\tilde{r}_j = r_j/(1-\tau_j) + P_j\delta$.

For the choice of profit shifting, we have

$$\begin{aligned} \lambda_{LT} &= \left(\mathcal{C}'_{i,LT}\right)^{-1} \left[\frac{1}{W_i} \frac{(\tau_{US}^{pre} - (\tau_{LT} + \iota_{LT}(\tau_{US}^{pre} - \tau_{LT})))}{1-\tau_{US}^{pre}}\right] \\ \lambda_{TH} &= \left(\mathcal{C}'_{i,TH}\right)^{-1} \left[\frac{1}{W_i} \frac{(\tau_{US}^{pre} - (\tau_{TH} + \iota_{TH}(\tau_{US}^{pre} - \tau_{TH})))}{1-\tau_{US}^{pre}}\right]. \end{aligned} \tag{E.7}$$

Lastly, for the intangible investment, we have

$$z = \left\{ \left(\frac{1-\phi+\phi\varrho}{\phi(\varrho-1)}\right) \left[\frac{(1-\tau_{US}^{pre})\, W_i/A_i}{DENOM_{US}^{PRE}}\right] \right\}^{-(1-\phi+\phi\varrho)}, \tag{E.8}$$

where

$$\begin{aligned} DENOM_{US}^{PRE} = &\sum_{j\in J_F\cup\{i\}} (1-\tau_j - \iota_j(\tau_{US}^{pre} - \tau_j))\left(\bar{R}_{ij} - \bar{C}_{ij}\right) \\ &- \sum_{j\in J_F\cup\{i\}} (\tau_{US}^{pre} - \tau_j - \iota_j(\tau_{US}^{pre} - \tau_j)) \left(\frac{\phi(\varrho-1)}{1-\phi+\phi\varrho}\right)\left(\bar{R}_{ij} - \bar{C}_{ij}\right) \\ &+ (\tau_{US}^{pre} - (\tau_{LT} + \iota_{LT}(\tau_{US}^{pre} - \tau_{LT})))\,\lambda_{LT} \sum_{j\in J_F\cup\{i\}} \left(\frac{\phi(\varrho-1)}{1-\phi+\phi\varrho}\right)\left(\bar{R}_{ij} - \bar{C}_{ij}\right) \\ &- (\tau_{US}^{pre} - (\tau_{LT} + \iota_{LT}(\tau_{US}^{pre} - \tau_{LT})))\,\varphi_{iLT}\lambda_{LT} \sum_{j\in J_F\cup\{i\}} \left(\frac{\phi(\varrho-1)}{1-\phi+\phi\varrho}\right)\left(\bar{R}_{ij} - \bar{C}_{ij}\right) \\ &+ (\tau_{US}^{pre} - (\tau_{TH} + \iota_{TH}(\tau_{US}^{pre} - \tau_{TH})))\,\lambda_{TH} \sum_{j\in J_F\cup\{i\}} \left(\frac{\phi(\varrho-1)}{1-\phi+\phi\varrho}\right)\left(\bar{R}_{ij} - \bar{C}_{ij}\right) \\ &- (\tau_{US}^{pre} - (\tau_{TH} + \iota_{TH}(\tau_{US}^{pre} - \tau_{TH})))\,\varphi_{iTH}\lambda_{TH} \sum_{j\in J_F\cup\{i\}} \left(\frac{\phi(\varrho-1)}{1-\phi+\phi\varrho}\right)\left(\bar{R}_{ij} - \bar{C}_{ij}\right) \\ &- (1-\tau_{US}^{pre})\,W_i\left(\mathcal{C}_{i,LT}(\lambda_{LT}) + \mathcal{C}_{i,TH}(\lambda_{TH})\right) \sum_{j\in J_F\cup\{i\}} \left(\frac{\phi(\varrho-1)}{1-\phi+\phi\varrho}\right)\left(\bar{R}_{ij} - \bar{C}_{ij}\right) \end{aligned} \tag{E.9}$$

and

$$\bar{R}_{ii} = \left[P_i Q_i^{\frac{1}{\varrho}} \bar{Q}_{ii}^{\frac{\varrho-1}{\varrho}} + \sum_{j\in J_X} P_j Q_j^{\frac{1}{\varrho}} \bar{Q}_{ij}^{\frac{\varrho-1}{\varrho}}\right] \times \left\{\left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_i^{\varrho} Q_i + \sum_{j\in J_X} P_j^{\varrho} \xi_{ij}^{1-\varrho} Q_j\right]\right\}^{\frac{\varrho-1}{\varrho}\frac{1-\phi}{1-\phi+\phi\varrho}} \times$$
$$\left(\frac{W_i}{1-\phi-\alpha}\right)^{-(\varrho-1)\frac{(1-\alpha-\phi)}{1-\phi+\phi\varrho}} \cdot \left(\frac{\tilde{r}_i}{\alpha}\right)^{-(\varrho-1)\frac{\alpha}{1-\phi+\phi\varrho}} \times (A_i a)^{\frac{\varrho-1}{1-\phi+\phi\varrho}} \cdot (N_i)^{\phi\frac{\varrho-1}{1-\phi+\phi\varrho}}$$
$$\bar{C}_{ii} = \left[\left(\frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}}\right)^{\frac{1}{1-\phi+\phi\varrho}} + \left(\frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}}\right)^{\frac{1}{1-\phi+\phi\varrho}}\right] \times$$
$$\left\{\left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_i^{\varrho} Q_i + \sum_{j\in J_X} P_i^{\varrho} \xi_{ij}^{1-\varrho} Q_i\right] \tilde{r}_i^{\alpha(1-\varrho)} W_i^{(1-\varrho)(1-\alpha-\phi)} \left[A_i a (N_i)^{\phi}\right]^{\varrho-1}\right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.10}$$

and

$$\bar{R}_{ij} = \left[P_j Q_j^{\frac{1}{\varrho}}\right] \times \left\{\left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \cdot P_j^{\varrho} Q_j\right\}^{\frac{\varrho-1}{\varrho}\frac{1-\phi}{1-\phi+\phi\varrho}} \times$$
$$\left(\frac{W_j}{1-\phi-\alpha}\right)^{-(\varrho-1)\frac{(1-\alpha-\phi)}{1-\phi+\phi\varrho}} \cdot \left(\frac{\tilde{r}_j}{\alpha}\right)^{-(\varrho-1)\frac{\alpha}{1-\phi+\phi\varrho}} \times (A_j \sigma_{ij} a)^{\frac{\varrho-1}{1-\phi+\phi\varrho}} \cdot (N_j)^{\phi\frac{\varrho-1}{1-\phi+\phi\varrho}}$$
$$\bar{C}_{ij} = \left[\left(\frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}}\right)^{\frac{1}{1-\phi+\phi\varrho}} + \left(\frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}}\right)^{\frac{1}{1-\phi+\phi\varrho}}\right] \times$$
$$\left\{\left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_j^{\varrho} Q_j\right] \tilde{r}_j^{\alpha(1-\varrho)} W_j^{(1-\varrho)(1-\alpha-\phi)} \left[A_j a (N_j)^{\phi}\right]^{\varrho-1}\right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.11}$$

E.1.2 Optimal decisions of non-U.S. MNEs

The optimal decisions of non-U.S. MNEs follow the same formulas as U.S. MNEs, with ι set to zero.

E.2 TCJA

E.2.1 Optimal decisions of U.S. MNEs

Under TCJA, the total tax liability paid by the parent division of a U.S. MNE, $i = US$, is

$$T_{ii} = \tau_i \left(\pi_{ii}^{DEI} + \pi_{ii}^{GILTI} - D^{FDII} - D^{GILTI}\right), \tag{E.12}$$

where each term has been defined in Section C.2. We make three simplifying assumptions when implementing GILTI and FDII: (1) for calculating the FTC of GILTI, we assume the deemed paid foreign tax (DPFT) is smaller than the foreign tax credit limit (FTCL), i.e., $T_{ii}^{DTFC} < \pi_{ii}^{lim}$, which is also assumed in Chodorow-Reich et al. (2025); (2) for FDII, we fix the value of FDR of each firm using its value in the pre-TCJA equilibrium; (3) for the final tax deductions combining FDII and GILTI, we assume $\pi^{GILTI} + \pi^{FDII} < \pi_{ii}$ such that $R^{FDII} = R^{GILTI} = 0$. We also have $T_{ij} = \tau_j \pi_{ij}$ for $j \neq TH$ and $T_{i,TH} = \tau_{TH} \pi_{i,TH}$.

By plugging the tax liabilities into equation E.1, we can then solve for U.S. MNEs' optimal decisions. For the parent division, the optimal tangible capital and labor demand are:

$$k_{ii} = \Bigg\{ \frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}} \left[\frac{\varrho-1}{\varrho}\right]^{\varrho} \left[P_i^{\varrho} Q_i + \sum_{j\in J_X} \xi_{ij}^{1-\rho} P_j^{\varrho} Q_j\right] \times \left(\frac{1-\tau_p^*}{r_i^{FDII}}\right)^{1+(\alpha+\phi)(\varrho-1)} W_i^{(1-\varrho)(1-\alpha-\phi)} \left[A_i a (N_i z)^{\phi}\right]^{\varrho-1} \Bigg\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.13}$$

and

$$\ell_{ii} = \Bigg\{ \frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}} \left[\frac{\varrho-1}{\varrho}\right]^{\varrho} \left[P_i^{\varrho} Q_i + \sum_{j\in J_X} \xi_{ij}^{1-\rho} P_j^{\varrho} Q_j\right] \times \left(\frac{1-\tau_p^*}{r_i^{FDII}}\right)^{\alpha(\varrho-1)} W_i^{-(\varrho(1-\alpha)+\alpha)} \left[A_i a (N_i z)^{\phi}\right]^{\varrho-1} \Bigg\}^{\frac{1}{1-\phi+\phi\varrho}}, \tag{E.14}$$

where we define $\tau_p^* \equiv (1-\chi_{FDII} FDR)\,\tau_{US}$ and $r_i^{FDII} \equiv r_i + \delta P_i \left(1-\tau_p^*\right) + \chi^{FDII} \frac{\pi_{ii}^{FDDEI}}{\pi_{ii}^{DEI}} \chi^{QBAI} P_i$.

For the foreign subsidiaries in the high-tax jurisdictions, the optimal tangible capital and labor demand are the same as in the pre-TCJA regime. For the foreign subsidiaries in the low-tax jurisdictions, the optimal tangible capital and labor demand are:

$$k_{iLT} = \left\{ \frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_{LT}^{\varrho} Q_{LT}\right] \frac{(W_{LT})^{(1-\varrho)(1-\alpha-\phi)}}{\left(\tilde{r}_{LT}^{GILTI}\right)^{\rho(\alpha+\phi)+(1-\alpha-\phi)}} \left[\sigma_{iLT} A_{LT} a \left(N_{LT} z\right)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.15}$$

and

$$\ell_{iLT} = \left\{ \frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_{LT}^{\varrho} Q_{LT}\right] \frac{\left(\tilde{r}_{LT}^{GILTI}\right)^{\alpha(1-\rho)}}{(W_{LT})^{\varrho(1-\alpha)+\alpha}} \left[\sigma_{iLT} A_{LT} a \left(N_{LT} z\right)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.16}$$

where $\tilde{r}_{LT}^{GILTI} = \frac{r_{LT}+(1-\tau_{LT})\delta P_{LT} - \tau_{US}\chi^{QBAI} P_{LT}}{1-\tau_{LT}-(1-\chi^{GILTI})\tau_{US}}$.

The optimal profit shifting shares can be derived from:

$$\frac{1}{W_i}\left[(1-\varphi_{LT})\left(\frac{\tau_p^* - \left(\left(1-\chi^{FTC}\right)\tau_{LT} + \left(1-\chi^{GILTI}\right)\tau_{US}\right)}{1-\tau_p^*}\right)\right] = \mathcal{C}'_{i,LT}(\lambda_{LT}) \tag{E.17}$$

and

$$\frac{1}{W_i}\left[(1-\varphi_{TH})\left(\frac{\tau_p^* - \left(\left(1-\chi^{FTC}\right)\tau_{TH} + \left(1-\chi^{GILTI}\right)\tau_{US}\right)}{1-\tau_p^*}\right)\right] = \mathcal{C}'_{i,TH}(\lambda_{TH}). \tag{E.18}$$

Lastly, the optimal intangible investment is:

$$z = \left\{ \left(\frac{1-\phi+\phi\varrho}{\phi(\varrho-1)}\right) \left[\frac{(1-\tau_i)\, W_i/A_i}{DENOM_{US}^{TCJA}}\right] \right\}^{-(1-\phi+\phi\varrho)}. \tag{E.19}$$

where $DENOM_{US}^{TCJA}$ differs from $DENOM_{US}^{PRE}$ in two ways: (1) changes in marginal product of intangible capital due to changes in optimal tangible capital and labor demand, reflected by changes in $\bar{R}$ and $\bar{C}$ terms, and (2) changes in the effective tax rates on intangible income. The full expression is available upon request

E.2.2 Optimal decisions of non-U.S. MNEs

For non-U.S. MNEs, $i \neq US$, their decision rules are the same as in the pre-TCJA regime. The changes in U.S. MNEs' decisions under the TCJA affect non-U.S. MNEs' optimal decisions through general equilibrium effects on factor prices.

E.3 TCJA and GMT when the U.S. is exempt

E.3.1 Optimal decisions of U.S. MNEs

Since the U.S. MNEs are exempt from the GMT, their optimal decisions follow the same formulas as in the TCJA regime.

E.3.2 Optimal decisions of non-U.S. MNEs

For the non-U.S. MNEs, their optimal decisions in all high-tax jurisdition subsidiaries under follow the same formulas as in the pre-TCJA regime. For the subsidiaries in LT, the optimal tangible capital and labor demand are affected by the GMT carve-out, which become:

$$k_{iLT} = \left\{ \frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} [P_{LT}^{\varrho} Q_{LT}] \frac{\left(\tilde{W}_{LT}^{GMT}\right)^{(1-\varrho)(1-\alpha-\phi)}}{\left(\tilde{r}_{LT}^{GMT}\right)^{\rho(\alpha+\phi)+(1-\alpha-\phi)}} \left[\sigma_{iLT} A_{LT} a \left(N_{LT} z\right)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}} \tag{E.20}$$

and

$$\ell_{iLT} = \left\{ \frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} [P_{LT}^{\varrho} Q_{LT}] \frac{\left(\tilde{r}_{LT}^{GMT}\right)^{\alpha(1-\rho)}}{\left(\tilde{W}_{LT}^{GMT}\right)^{\varrho(1-\alpha)+\alpha}} \left[\sigma_{iLT} A_{LT} a \left(N_{LT} z\right)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}}. \tag{E.21}$$

where $\tilde{r}_{LT}^{GMT} \equiv \frac{r_{LT}+\left((1-\tau_{GMT})\delta-\tau_{GMT}\chi_{GMT,K}\right)P_{LT}}{(1-\tau_{GMT})}$ and $\tilde{W}_{LT}^{GMT} \equiv \frac{\left(1-\left(1-\chi_{GMT,L}\right)\tau_{GMT}\right)}{(1-\tau_{GMT})} W_{LT}$.

For the profit shifting shares, the decision follows the same formulas as in the pre-TCJA regime but with GMT tax rates applied to LT and TH:

$$\frac{1}{W_i}\left[(1-\varphi_{LT})\left(\frac{\tau_i-\tau_{GMT}}{1-\tau_i}\right)\right] = \mathcal{C}'_{i,LT}(\lambda_{LT}) \tag{E.22}$$

$$\frac{1}{W_i}\left[(1-\varphi_{TH})\left(\frac{\tau_i-\tau_{GMT}}{1-\tau_i}\right)\right] = \mathcal{C}'_{i,TH}(\lambda_{TH}). \tag{E.23}$$

The intangible investment decision also follows the same formula as in the pre-TCJA regime, with $\bar{R}_{iLT}$ and $\bar{C}_{iLT}$ now becoming:

$$\bar{R}_{iLT}^{GMT} = \left(\sigma_{iLT} A_{LT} a \left(N_{LT}\right)^{\phi}\right)^{\frac{\varrho-1}{1-\phi+\phi\varrho}} \cdot \left(P_{LT} Q_{LT}^{\frac{1}{\varrho}}\right) \times \left\{\left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left(P_{LT}^{\varrho} Q_{LT}\right)\right\}^{\frac{\rho-1}{\rho}\frac{1-\phi}{1-\phi+\phi\varrho}} \times \left(\frac{\tilde{W}_{LT}^{GMT}}{1-\phi-\alpha}\right)^{-(\varrho-1)\frac{(1-\alpha-\phi)}{1-\phi+\phi\varrho}} \cdot \left(\frac{\tilde{r}_{LT}^{GMT}}{\alpha}\right)^{-(\varrho-1)\frac{\alpha}{1-\phi+\phi\varrho}} \tag{E.24}$$

and

$$\bar{C}_{iLT}^{GMT} = \left[\left(\frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}}\right)^{\frac{1}{1-\phi+\phi\varrho}} + \left(\frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}}\right)^{\frac{1}{1-\phi+\phi\varrho}}\right] \times \left\{\left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left[P_{LT}^{\varrho} Q_{LT}\right] \left(\tilde{r}_{LT}^{GMT}\right)^{\alpha(1-\varrho)} \left(\tilde{W}_{LT}^{GMT}\right)^{(1-\varrho)(1-\alpha-\phi)} \left[A_{LT} a \left(N_{LT}\right)^{\phi}\right]^{\varrho-1}\right\}^{\frac{1}{1-\phi+\phi\varrho}}. \tag{E.25}$$

E.3.3 TCJA and GMT in all regions

In this case, GILTI is replaced by GMT for the under-taxed profits booked by U.S. MNEs in the low-tax and tax-haven regions. Therefore, the optimal decisions of the U.S. MNEs' low-tax region subsidiaries and the U.S. MNEs' profit shifting shares follow the same formulas as in Section E.3.2. Optimal investment in intangible capital changes slighted because the GMT carve-out changes the marginal product of intangible capital in the low-tax region, as reflected by equations (E.24) and (E.25).

F Additional Tables and Results

Table F.1: Macro effects of TCJA

Region	Lost profits/ MNE profits	CIT rev.	GDP	Emp.	Tangible capital	Intangible capital
Baseline model						
(a) All TCJA provisions						
USA	-3.58	-37.15	0.31	0.39	3.11	1.00
Europe	0.06	0.22	0.22	-0.00	0.30	0.52
Rest of world	0.01	0.24	0.12	-0.00	0.20	0.37
Low tax	–	1.95	2.31	-0.06	3.53	-0.06
(b) No GILTI						
USA	12.85	-40.16	0.12	0.54	3.07	0.25
Europe	0.08	0.23	0.22	-0.00	0.31	0.59
Rest of world	0.02	0.27	0.12	-0.00	0.20	0.42
Low tax	–	2.36	0.54	-0.05	0.64	0.78
(c) No FDII						
USA	-2.64	-36.37	2.57	0.58	8.00	1.98
Europe	0.04	0.34	0.22	-0.00	0.31	0.38
Rest of world	0.01	0.36	0.12	-0.00	0.21	0.27
Low tax	–	3.17	2.31	-0.09	3.52	-0.30
(d) No MNE provisions						
USA	15.71	-40.00	2.38	0.77	7.94	1.33
Europe	0.06	0.35	0.22	-0.00	0.32	0.45
Rest of world	0.01	0.38	0.12	-0.00	0.22	0.32
Low tax	–	3.56	0.53	-0.08	0.63	0.53
FDI spillovers						
(e) All TCJA provisions						
USA	-3.57	-37.07	0.76	0.33	3.14	1.37
Europe	0.08	0.45	0.61	-0.04	0.35	0.81
Rest of world	0.02	0.36	0.59	-0.03	0.25	0.78
Low tax	–	2.25	2.71	-0.13	3.56	0.28
(f) No GILTI						
USA	12.81	-40.10	0.54	0.49	3.09	0.63
Europe	0.09	0.42	0.53	-0.03	0.35	0.83
Rest of world	0.02	0.36	0.47	-0.02	0.24	0.71
Low tax	–	2.58	0.86	-0.11	0.66	1.06
(g) No FDII						
USA	-2.62	-36.25	3.06	0.53	8.04	2.34
Europe	0.06	0.66	0.73	-0.05	0.37	0.77
Rest of world	-0.01	0.53	0.78	-0.04	0.28	0.86
Low tax	–	3.59	2.81	-0.16	3.57	0.08
(h) No MNE provisions						
USA	15.74	-39.91	2.84	0.72	7.97	1.70
Europe	0.07	0.62	0.64	-0.04	0.37	0.76
Rest of world	0.01	0.52	0.66	-0.03	0.27	0.79
Low tax	–	3.89	0.96	-0.14	0.67	0.86

Notes: Table shows changes from pre-TCJA calibration to equilibrium with TCJA. Lost profits/MNE profits reported in percentage point changes. All other variables are reported in percent changes.

Table F.2: Effects of TCJA by decomposed by firm type (baseline model)

Region	Value added				Emp.				Tangible capital				Intangible capital		
	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs
(a) All TCJA provisions															
USA	0.31	0.29	-0.39	0.41	0.39	0.29	-0.25	0.34	3.11	1.76	0.22	1.14	1.00	0.00	1.00
Europe	0.22	-0.05	0.06	0.21	-0.00	-0.16	0.02	0.14	0.30	-0.11	-0.00	0.42	0.52	-0.04	0.56
Rest of world	0.12	-0.05	0.05	0.12	-0.00	-0.11	0.02	0.09	0.20	-0.08	0.01	0.27	0.37	-0.02	0.40
Low tax	2.31	0.02	0.23	2.06	-0.06	-0.95	-0.28	1.16	3.53	-0.60	-0.16	4.29	-0.06	-0.25	0.18
(b) No GILTI															
USA	0.12	0.25	-0.53	0.40	0.54	0.35	-0.16	0.35	3.07	1.78	0.14	1.14	0.25	0.02	0.23
Europe	0.22	-0.06	0.07	0.21	-0.00	-0.17	0.03	0.14	0.31	-0.12	0.01	0.42	0.59	-0.04	0.63
Rest of world	0.12	-0.05	0.05	0.12	-0.00	-0.12	0.02	0.09	0.20	-0.08	0.01	0.27	0.42	-0.02	0.45
Low tax	0.54	-0.09	0.09	0.53	-0.05	-0.38	0.03	0.29	0.64	-0.25	-0.01	0.90	0.78	-0.10	0.88
(c) No FDII															
USA	2.57	0.92	1.28	0.37	0.58	0.03	0.43	0.12	8.00	3.19	3.83	0.98	1.98	0.00	1.98
Europe	0.22	-0.04	0.05	0.21	-0.00	-0.15	0.00	0.14	0.31	-0.10	-0.01	0.42	0.38	-0.03	0.41
Rest of world	0.12	-0.04	0.03	0.13	-0.00	-0.10	0.00	0.10	0.21	-0.07	0.00	0.28	0.27	-0.02	0.29
Low tax	2.31	0.03	0.21	2.06	-0.09	-0.94	-0.32	1.16	3.52	-0.59	-0.18	4.29	-0.30	-0.24	-0.06
(d) No MNE provisions															
USA	2.38	0.87	1.15	0.36	0.77	0.09	0.56	0.12	7.94	3.20	3.76	0.98	1.33	0.02	1.31
Europe	0.22	-0.05	0.05	0.22	-0.00	-0.16	0.01	0.14	0.32	-0.10	0.00	0.42	0.45	-0.04	0.48
Rest of world	0.12	-0.05	0.04	0.13	-0.00	-0.11	0.01	0.10	0.22	-0.07	0.01	0.28	0.32	-0.02	0.34
Low tax	0.53	-0.08	0.08	0.54	-0.08	-0.37	-0.01	0.30	0.63	-0.25	-0.03	0.91	0.53	-0.10	0.63

Notes: Table shows changes from pre-TCJA calibration to equilibrium with TCJA. "Total" columns report percent changes relative to pre-TCJA status quo. Other columns report changes in percentage points relative to the pre-TCJA total for that category; other columns in each category sum to the total percent change.

Table F.3: Effects of TCJA by decomposed by firm type (spillovers model)

	Value added				Emp.				Tangible capital				Intangible capital		
Region	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs
(e) All TCJA provisions															
USA	0.76	0.48	-0.18	0.47	0.33	0.26	-0.28	0.35	3.14	1.76	0.22	1.16	1.37	0.04	1.33
Europe	0.61	0.08	0.21	0.32	-0.04	-0.18	-0.01	0.15	0.35	-0.11	0.00	0.45	0.81	-0.01	0.82
Rest of world	0.59	0.14	0.28	0.17	-0.03	-0.12	-0.00	0.10	0.25	-0.06	0.02	0.29	0.78	0.01	0.76
Low tax	2.71	0.17	0.34	2.21	-0.13	-1.01	-0.30	1.18	3.56	-0.62	-0.16	4.35	0.28	-0.20	0.48
(f) No GILTI															
USA	0.54	0.17	-0.06	0.44	0.49	0.03	0.11	0.35	3.09	1.51	0.42	1.16	0.63	-0.06	0.68
Europe	0.53	0.05	0.18	0.30	-0.03	-0.19	0.01	0.15	0.35	-0.11	0.01	0.45	0.83	-0.01	0.85
Rest of world	0.47	0.08	0.22	0.17	-0.02	-0.13	0.01	0.10	0.24	-0.07	0.02	0.29	0.71	0.00	0.71
Low tax	0.86	0.04	0.18	0.65	-0.11	-0.43	0.02	0.30	0.66	-0.27	-0.01	0.94	1.06	-0.06	1.13
(g) No FDII															
USA	3.06	1.11	1.49	0.45	0.53	0.01	0.39	0.13	8.04	3.19	3.83	1.01	2.34	0.04	2.30
Europe	0.73	0.14	0.24	0.35	-0.05	-0.17	-0.03	0.16	0.37	-0.09	-0.00	0.47	0.77	0.01	0.76
Rest of world	0.78	-0.03	0.62	0.18	-0.04	-0.38	0.24	0.10	0.28	-0.30	0.28	0.29	0.86	-0.08	0.93
Low tax	2.81	0.21	0.34	2.26	-0.16	-1.01	-0.34	1.18	3.57	-0.62	-0.18	4.37	0.08	-0.19	0.27
(h) No MNE provisions															
USA	2.84	1.06	1.36	0.42	0.72	0.06	0.53	0.13	7.97	3.20	3.76	1.01	1.70	0.06	1.64
Europe	0.64	0.09	0.21	0.33	-0.04	-0.18	-0.02	0.16	0.37	-0.10	0.01	0.46	0.76	-0.00	0.76
Rest of world	0.66	0.17	0.31	0.18	-0.03	-0.12	-0.01	0.11	0.27	-0.05	0.03	0.30	0.79	0.02	0.77
Low tax	0.96	0.07	0.19	0.70	-0.14	-0.43	-0.03	0.31	0.67	-0.27	-0.03	0.97	0.86	-0.05	0.91

Notes: Table shows changes from pre-TCJA calibration to equilibrium with TCJA. "Total" columns report percent changes relative to pre-TCJA status quo. Other columns report changes in percentage points relative to the pre-TCJA total for that category; other columns in each category sum to the total percent change.

Table F.4: Macro effects of GMT

Region	Lost profits/ MNE profits	CIT rev.	GDP	Emp.	Tangible capital	Intangible capital
Baseline model						
(a) Non-US regions only						
USA	0.03	-0.39	-0.02	0.00	-0.01	-0.00
Europe	-9.50	3.09	-0.06	-0.11	0.01	-0.41
Rest of world	-3.75	1.46	-0.02	-0.06	0.00	-0.18
Low tax	–	3.36	0.80	0.00	1.41	0.90
(b) All regions						
USA	-0.46	1.18	-0.28	-0.09	-0.01	-1.45
Europe	-9.50	3.10	-0.07	-0.11	0.00	-0.31
Rest of world	-3.75	1.47	-0.02	-0.06	-0.00	-0.11
Low tax	–	2.43	-0.55	0.02	-0.75	1.74
FDI spillovers						
(a) Non-US regions only						
USA	0.02	-0.42	-0.12	0.01	-0.01	-0.09
Europe	-9.51	3.03	-0.14	-0.10	-0.00	-0.47
Rest of world	-3.76	1.43	-0.11	-0.05	-0.01	-0.25
Low tax	–	3.35	0.68	0.03	1.41	0.73
(b) Global GMT						
USA	-0.47	1.06	-0.47	-0.07	-0.03	-1.56
Europe	-9.51	2.89	-0.34	-0.09	-0.03	-0.52
Rest of world	-3.76	1.37	-0.43	-0.04	-0.04	-0.48
Low tax	–	2.22	-0.86	0.07	-0.76	1.41

Notes: Lost profits/MNE profits reported in percentage point changes. All other variables are reported in percent changes.

Table F.5: Effects of GMT decomposed by firm type (baseline model)

Region	Value added				Emp.				Tangible capital				Intangible capital		
	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs
(a) Non-US regions only															
USA	-0.02	-0.01	-0.00	-0.00	0.00	-0.00	0.01	-0.00	-0.01	-0.00	0.00	-0.00	-0.00	-0.00	-0.00
Europe	-0.06	0.00	-0.07	0.01	-0.11	0.04	-0.17	0.02	0.01	0.03	-0.04	0.02	-0.41	0.01	-0.42
Rest of world	-0.02	0.01	-0.03	-0.01	-0.06	0.03	-0.09	-0.00	0.00	0.02	-0.01	-0.00	-0.18	0.01	-0.18
Low tax	0.80	0.43	-0.34	0.71	0.00	0.17	-0.43	0.27	1.41	0.20	-0.87	2.07	0.90	0.12	0.78
(b) Global GMT															
USA	-0.28	-0.02	-0.25	-0.01	-0.09	0.13	-0.24	0.02	-0.01	0.09	-0.13	0.02	-1.45	0.02	-1.47
Europe	-0.07	0.00	-0.06	-0.01	-0.11	0.03	-0.15	0.00	0.00	0.03	-0.03	0.00	-0.31	0.01	-0.32
Rest of world	-0.02	0.01	-0.01	-0.02	-0.06	0.03	-0.07	-0.01	-0.00	0.02	-0.01	-0.02	-0.11	0.01	-0.12
Low tax	-0.55	0.44	-0.39	-0.59	0.02	0.72	-0.13	-0.57	-0.75	0.53	-0.73	-0.56	1.74	0.27	1.47

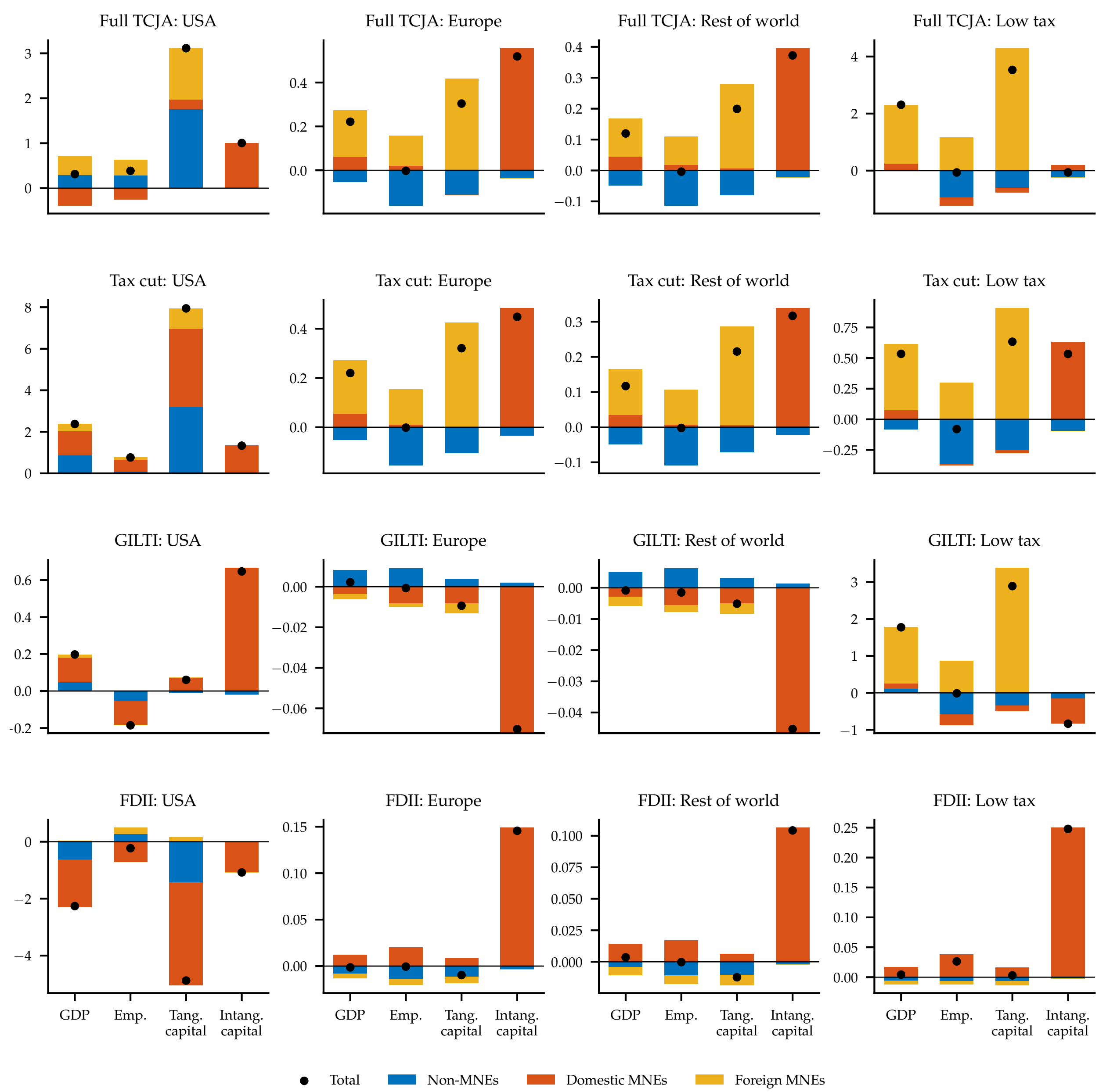
Notes: Table shows changes from pre-TCJA calibration to equilibrium with TCJA. “Total” columns report percent changes relative to pre-TCJA status quo. Other columns report changes in percentage points relative to the pre-TCJA total for that category; other columns in each category sum to the total percent change.

Table F.6: Effects of GMT decomposed by firm type (spillovers model)

Region	Value added				Emp.				Tangible capital				Intangible capital		
	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs
(a) Non-US regions only															
USA	-0.12	-0.05	-0.05	-0.02	0.01	0.00	0.02	-0.00	-0.01	-0.01	0.00	-0.01	-0.09	-0.01	-0.08
Europe	-0.14	-0.03	-0.10	-0.02	-0.10	0.04	-0.16	0.02	-0.00	0.03	-0.04	0.01	-0.47	0.00	-0.47
Rest of world	-0.11	-0.02	-0.07	-0.02	-0.05	0.03	-0.08	-0.01	-0.01	0.02	-0.02	-0.01	-0.25	-0.00	-0.25
Low tax	0.68	0.37	-0.38	0.69	0.03	0.19	-0.43	0.27	1.41	0.21	-0.87	2.07	0.73	0.10	0.63
(b) Worldwide															
USA	-0.47	-0.08	-0.32	-0.06	-0.07	0.14	-0.22	0.01	-0.03	0.10	-0.12	-0.00	-1.56	0.01	-1.57
Europe	-0.34	-0.10	-0.16	-0.09	-0.09	0.05	-0.13	-0.01	-0.03	0.03	-0.03	-0.02	-0.52	-0.01	-0.50
Rest of world	-0.43	-0.16	-0.23	-0.04	-0.04	0.03	-0.06	-0.01	-0.04	0.00	-0.02	-0.02	-0.48	-0.03	-0.45
Low tax	-0.86	0.31	-0.48	-0.69	0.07	0.77	-0.12	-0.57	-0.76	0.55	-0.72	-0.59	1.41	0.22	1.19

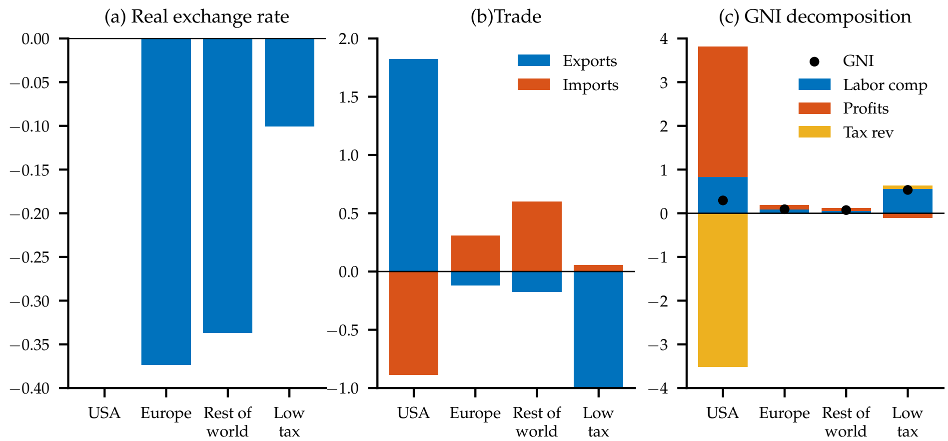
Notes: Table shows changes from pre-TCJA calibration to equilibrium with TCJA. "Total" columns report percent changes relative to pre-TCJA status quo. Other columns report changes in percentage points relative to the pre-TCJA total for that category; other columns in each category sum to the total percent change.

Figure F.1: Effects of each TCJA provision decomposed by firm type



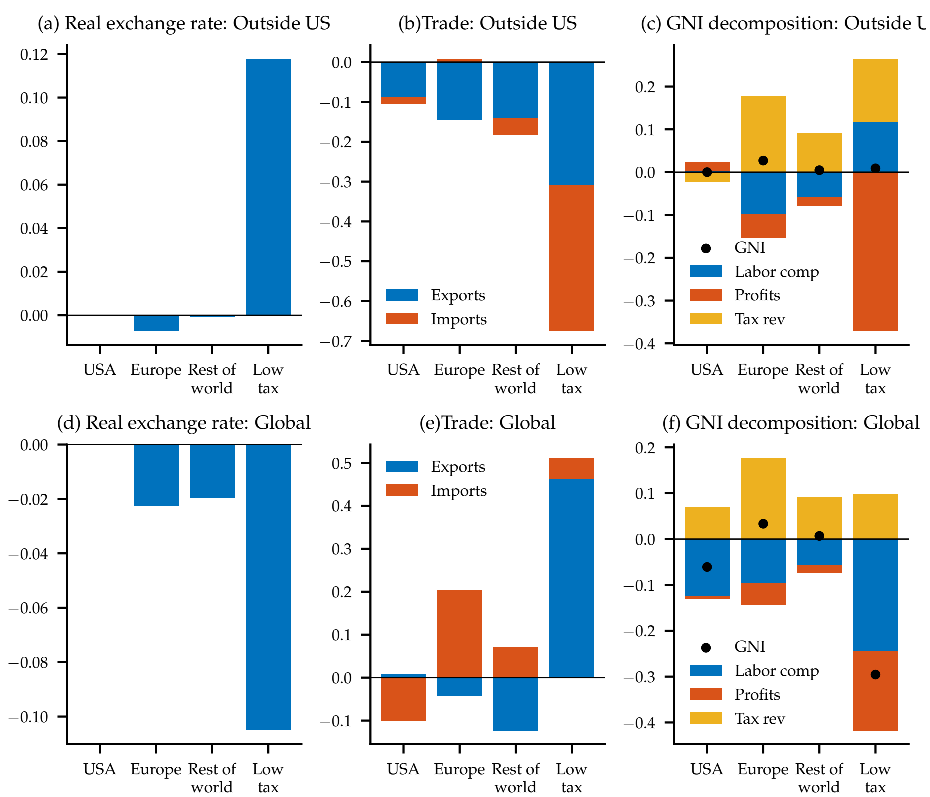
Notes: Figure shows changes from pre-TCJA status quo to equilibrium with TCJA in baseline model.

Figure F.2: Effects of TCJA on trade and composition of national income: baseline model



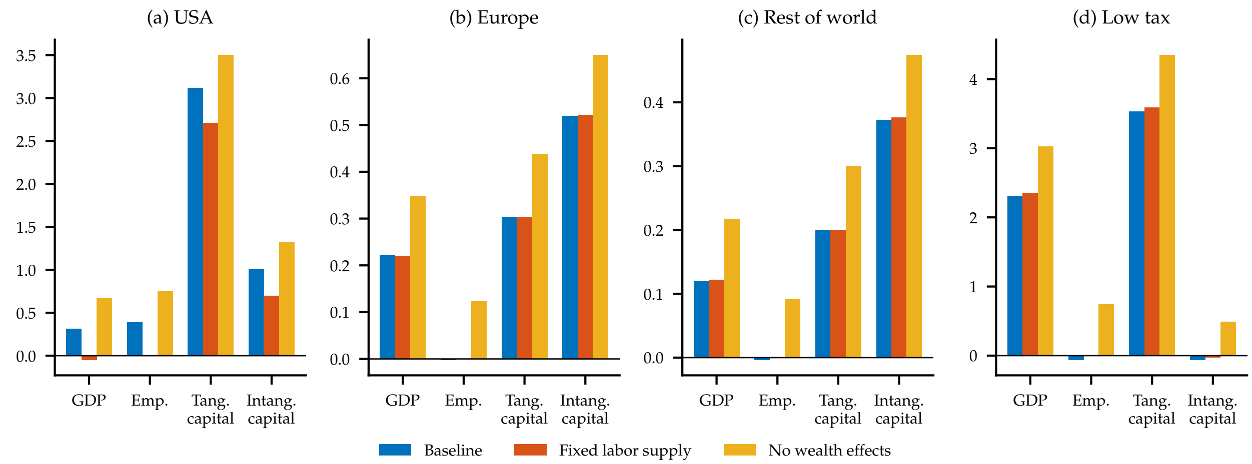
Notes: Figure shows changes from pre-TCJA status quo to equilibrium with TCJA in baseline model.

Figure F.3: Effects of GMT on trade and composition of national income: baseline model



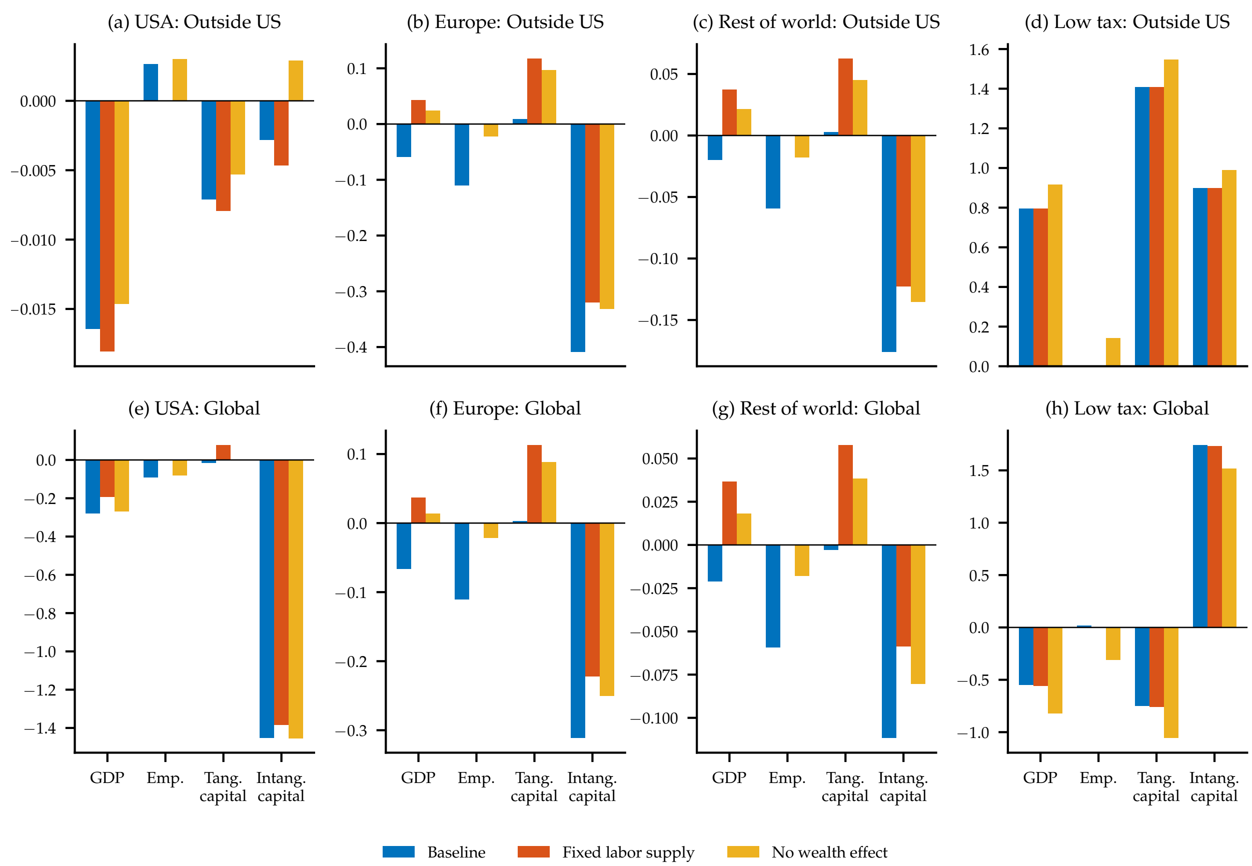
Notes: Figure shows changes from TCJA equilibrium to equilibria with different GMT configurations in baseline model.

Figure F.4: Effects of TCJA on macro variables with alternative labor supply specifications



Notes: Figure shows changes from pre-TCJA benchmark to TCJA equilibrium under alternative labor supply specifications.

Figure F.5: Effects of GMT on macro variables with alternative labor supply specifications



Notes: Figure shows changes from TCJA equilibrium to equilibria with different GMT configurations under alternative labor supply specifications.