Global Ripple Effects of Corporate Tax Reforms*

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Abstract

We analyze the cross-country spillover effects of corporate tax reforms. Combining firm-level evidence on the 2017 U.S. Tax Cuts and Jobs Act (TCJA) with a quantitative general-equilibrium model, we show how multinational enterprises (MNEs) propagate local policy shocks throughout the global economy. Our framework emphasizes three properties of intangible capital: non-rivalry, mobile ownership, and technology spillovers. 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) in the rest of the world generates negative inward spillovers for the United States. It raises the effective tax rate on U.S. MNEs' foreign income, depressing their intangible investment, while simultaneously reducing foreign MNEs' intangible investment and thus their U.S. subsidiaries' output. These findings illustrate the complex trade-offs between tax-base protection and real economic activity in an interconnected policy environment.

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 rapidly to implement the OECD's multilateral Global Minimum Tax (GMT), the United States remains anchored to the unilateral framework established by the 2017 Tax Cuts and Jobs Act (TCJA). This regulatory divergence creates a complex environment where domestic tax reforms do not stop at the border. Because U.S.-based MNEs play an outsized role in the global economy, their responses to the TCJA generate significant ripples abroad. Conversely, as foreign jurisdictions adopt the GMT, the U.S. economy faces new exposure to policies it did not enact. This paper asks: How do these competing regimes interact, and what are the macroeconomic spillovers of this fragmented global tax landscape?

To address this question, we first document the micro-level impact of the TCJA on U.S. MNEs' investment decisions using a difference-in-differences design that exploits firm-level variation in tax cuts. We then develop a quantitative general-equilibrium model with heterogeneous firms, multinational production, and profit shifting that explicitly models the details of the TCJA provisions and the institutional design of the GMT. Our framework is uniquely well suited to capturing the bidirectional nature of tax spillovers, tracing how U.S. policy shocks propagate outward and how international reforms feedback into the U.S. economy.

Our structural model places intangible capital at the forefront, identifying it as the primary transmission mechanism for global spillovers. We incorporate three key characteristics: non-rivalry, which allows MNEs to deploy intangible capital simultaneously in multiple jurisdictions; mobile ownership, which makes the return on intangible investment highly sensitive to profit-shifting incentives and foreign tax rates; and technology externalities, through which foreign MNEs' intangible investments boost the productivity of domestic firms. These characteristics enable local tax policies to generate global repercussions. By altering the intangible investment decisions of directly exposed MNEs, a domestic reform propagates through multinational production networks to reshape investment and output worldwide.

We find that the TCJA in the United States and the GMT in the rest of the world both have quantitatively significant cross-country spillover effects. The TCJA substantially increased domestic tangible and intangible investment, raising U.S. GDP by nearly one percent. These positive effects spilled over borders, increasing output in other regions by 0.1 to 0.6 percent. Conversely, a GMT implemented outside the United States reduces both intangible investment and output by 0.8

to 1.5 percent in adopting regions. Crucially, the United States is not insulated: even without adoption, U.S. intangible investment falls by 2.2 percent—more than double the decline in the European Union—causing U.S. GDP to contract by 0.7 percent. These results illustrate that corporate tax reforms can no longer be evaluated in isolation; the "ripple effect" flowing through multinational networks are quantitatively large and economically significant.

We begin by empirically documenting the microeconomic effects of the TCJA using data on publicly-traded firms from Compustat. The TCJA cut taxes for all U.S. firms, but also introduced several provisions that change the way MNEs' intangible income is taxed, creating variation across firms in exposure to the reform. We employ a difference-in-differences design with a continuous treatment, comparing the investment of U.S. MNEs that were more versus less exposed to the TCJA reform before and after 2017. The evidence shows that the TCJA prompted a reallocation within firms' capital portfolios: although firms that experienced larger tax cuts increased both tangible and intangible investment, the increase in tangible investment is relatively greater. This evidence motivates our model analysis, which is designed to capture and aggregate these firm-level responses into macroeconomic consequences.

While our empirical analysis identifies microeconomic effects based on relative exposure, quantifying aggregate outcomes requires a structural approach. We develop a multi-country general equilibrium model based on Dyrda, Hong, and Steinberg (2024a) featuring heterogeneous firms, profit shifting, and multinational production. Crucially, the model incorporates productivity spillovers following Dyrda, Hong, and Steinberg (2024b), where local intangible investment efficiency depends on the aggregate stock of intangible capital in the region. A central contribution is our rigorous mapping of the institutional tax environment. We explicitly embed the TCJA's partial territorial system (including GILTI and FDII) and the GMT's rule priority structure. By carefully defining tax bases to account for provisions like 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.

At the core of the model is the way changes in 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 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 provide analytical insight into how these reforms interact. In isolation, we find that GILTI and FDII both reduce profit shifting but have opposing effects on the location of intangible capital. 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.

The primary advantage of our structural model is its ability to quantify these mechanisms. We provide the first framework detailed enough to embed the institutional specifics of both the TCJA and the GMT, allowing us to generate aggregate predictions for the global economy. We find that the TCJA substantially boosted U.S. investment, raising tangible and intangible capital by 3.1 and 1.7 percent, respectively, and lifting GDP by 0.8 percent. However, this expansion came at a cost: corporate tax revenues fell by more than a third. The implied aggregate semi-elasticity of capital (-0.39) 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 0.1% and the rest of the world by 0.2%, reflecting the positive outward spillovers of the reform.

Second, we find that a GMT implemented outside of the United States would reduce intangible investment by 0.8% in Europe and 1.0% in the rest of the world, reducing output in these regions by similar amounts. These estimates are larger than our findings in Dyrda et al. (2024a), reflecting the amplifying roles of tangible capital and FDI externalities in our new framework. Crucially, the United States is not insulated. Even without domestic implementation, U.S. intangible investment falls by 2.15%—more than twice the decline in Europe—driving a 0.7% drop in GDP. This large inward spillover occurs partly because foreign GMT adoption effectively nullifies the strategic incentives of the TCJA's GILTI provision. Thus, the TCJA structure actually makes the U.S. economy more, rather than less, sensitive to the implementation of minimum taxes abroad.

Our analysis also highlights the importance of intangible spillovers in propagating global ripple effects. A decline in intangible investment in any region depresses intangible investment in others, ultimately feeding back to reduce investment at home. For instance, when the minimum tax is

adopted globally, incorporating intangible spillovers more than doubles the implied GDP decline in the high-tax regions compared with a model that excludes them. This arises from both the reduction in intangible capital and the resulting contraction of multinational activity: as intangible capital falls, some firms optimally withdraw from producing in foreign markets, thereby shifting production resources to 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 (2020b), and Auerbach (2018), which discuss the expected economic impacts. Further empirical 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 (2023), and Dobridge, Kennedy, Landefeld, and Mortenson (2025) find that TCJA generated substantial and heterogeneous reductions in effective tax rates across U.S. firms and modest and uneven effects in the real activities including investment, employment, and profit shifting behavior.

In this strand, our paper is closely related to Chodorow-Reich et al. (2023), who examine the investment effects of the TCJA using administrative tax data of U.S. firms. They develop a two-country general equilibrium model in which tangible capital at home and abroad are complementary within a multinational enterprise (MNE). We extend their analysis in three key dimensions. First, we explicitly incorporate intangible capital and carefully model the TCJA provisions governing intangible income. This treatment not only captures the policy environment more fully, but also provides a microfoundation for the complementarity between tangible assets across affiliates. Second, we allow for adjustments in MNEs' profit-shifting behavior in response to the TCJA reform. Third, we investigate the role of technology spillovers in amplifying the ripple effects of local tax reforms, which we find to be quantitatively important.

The second strand of literature this paper engages with revolves around the measurement of profit shifting (Clausing, 2020a; 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). 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) use a multi-country version of this model to study the macroeconomic consequences of FDI restrictions caused by Brexit. We synthesize these two approaches by developing a model in which heterogeneous firms choose where to export, where to establish foreign affiliates, and how much to invest in nonrival intangible capital. On top of this new framework, we incorporate our theory of profit shifting, allowing firms to additionally choose whether to establish affiliates in a tax haven and how much intangible capital to shift. All this is done in the context of institutional framework of the U.S. economy. Our work is also related to the structural multinational-production models of Ramondo (2014) and Ramondo and Rodríguez-Clare (2013), which document quantitatively the trade-offs firms face between exporting and affiliate-based production. In addition, our treatment of intangible capital and cross-border knowledge spillovers is related to the diffusion-driven framework developed in Lind and Ramondo (2023), which models global innovation and diffusion as generating a multivariate Fréchet distribution of productivities across countries.

2 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 4, we will map the policy

[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."

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.

2.1 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). 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.[2] FDII provides a tax reduction for U.S. income derived from exports of goods and services 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.

[2]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% 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.

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.

2.2 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.

3 Empirical Analysis

Our empirical analysis is aimed at understanding how firms' tangible and intangible investment responded to the TCJA. 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. In ongoing work, we alternatively use Bureau van Dijk Orbis data for a more comprehensive, global sample of firms to disaggregate these effects by firm headquarter and their geographic region of activity.

3.1 Data

Our primary dataset is the Compustat North America database, which includes most publicly listed and some large private U.S. firms, from 2012 to 2022. We utilize the Annual Fundamentals dataset to extract consolidated, firm-level balance sheet and income statement information. Specifically, we obtain information on industry, domestic and foreign sales, net tangible assets and investment, net intangible assets, R&D expenditures, and total tax liabilities.

To measure the extent of multinational production, we use a linked database combining Compustat data with firm-year level disclosures of subsidiaries to the U.S. Securities and Exchange Commission (SEC), accessed through Wharton Research Data Services (WRDS). By SEC rules, public firms in the U.S. are required to disclose the jurisdiction of incorporation and names for those subsidiaries which satisfy one of three "significant subsidiary" tests requiring either subsidiary assets, investment, or income to be greater than 10% of the consolidated assets, investment, or income.

Under the Generally Accepted Accounting Principles (GAAP), reported intangible assets in the balance sheet reflect mostly externally-acquired assets, as internally-incurred expenses on intangibles are not capitalized. To measure firm-level intangible assets properly, we follow Peters and Taylor (2017) and construct a measure of internal intangible assets by capitalizing R&D expenditures using the perpetual-inventory method.[3] We then combine this internally-generated intangible capital measure with the balance-sheet measure to construct our preferred measure for total intangible assets at the firm level. We elaborate on the sample restrictions and the construction of our key variables in Appendix A.1 and A.2.

3.2 Measuring firm-level exposure to TCJA

We follow Wagner et al. (2020) in measuring the firm-level exposure to TCJA. We measure firm-level effective average tax rate (EATR) using the Compustat data in two ways: as (i) GAAP EATR, which is the ratio of total income taxes to pre-tax income, and as (ii) Cash EATR, which is the ratio of income taxes paid to pre-tax income net of special items[4]. The GAAP EATR is ultimately more suitable to delineate TCJA provisions since the Cash EATR conflates both the recurring and non-recurring effects.

We define the change in the GAAP EATR from 2016 to 2018 as the firm-level exposure to the

[3]We also create a version of internal intangible capital by additionally capitalizing 30% of the Selling, General and Administrative expenses as in Eisfeldt and Papanikolaou (2013) to proxy organizational capital. The results using this alternative measure are similar.

[4]Special items in U.S. GAAP describe non-recurring or unusual items above taxes.

Table 1: 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.

TCJA, which captures the recurring impact of the TCJA. This measure excludes transition terms, such as the one-time repatriation tax or re-measurement of deferred tax assets/liabilities, but potentially captures endogenous firm responses to the TCJA since it uses data after the enactment of the TCJA to measure how the TCJA changed firms' tax burden. Specifically, while the timing of the TCJA was plausibly unanticipated given the compressed nature of its enactment, firms' EATRs in 2018 are potentially correlated with firm unobservables, like productivity, that could result in a differential evolution of outcomes.

In support of incorporating 2018 EATRs in our exposure measure is the fact that there was still considerable uncertainty in 2018 regarding major domestic and international provisions (such as GILTI or FDII) and final regulatory guidance was only released after 2018. Since the regulation existed in a provisional form, and was subject to changes applied retroactively, we contend that the EATRs in 2018 are primarily driven by TCJA provisions and to a lesser extent by endogenous firm responses to the provisions. We show the robustness of our main results to alternatively using, in turn, a simulated tax change and a pre-TCJA exposure variable to proxy treatment in Appendix A.4.

Table 1 shows a decline in 5-year mean GAAP EATR from 0.31 to 0.22. Following the implementation of the TCJA, firms saw an average decrease of 8 percentage points. Most Compustat firms predictably saw a falling EATR after the TCJA, although some firms did see an increase in their EATR. We primarily exploit the variation in this EATR change as our firm-level measure of TCJA exposure.

To illustrate further heterogeneity in this exposure, we plot the U.S. GAAP EATR, stratified by pre-TCJA intangible intensity and MNE status, over time. Less intangible-intensive firms have higher mean EATRs before 2017, with the mean EATR gap considerably shrinking after the TCJA reform. More intangible-intensive firms have a considerably higher mean EATR in 2017, as these firms are more likely to be subject to the one-tax repatriation tax on accumulated foreign earnings.

(a) By pre-TCJA intangible intensity

(b) By MNE status

Figure 1: EATRs by intangible intensity and MNE status

Notes: These figures plot the 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.

U.S. MNEs versus non-MNEs display similar dynamics over the sample period, in part because of the overlap between high intangibles-intensive firms and MNE status.

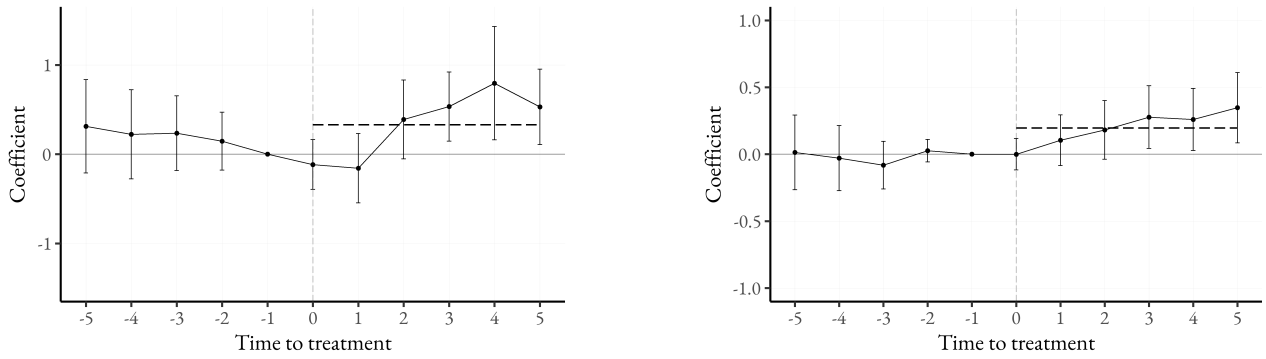
3.3 Regression analysis

To assess the impact of TCJA across firms, we run the following regression:

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

where y_{it} is the (logged) outcome variable, $\Delta EATR_{2016\to2018,i}$ captures firm-level exposure to TCJA; β_τ captures the firm-level effect of $\Delta EATR_{2016\to2018,i}$ across the years; α_i is the firm fixed effect; $\gamma_{n(i)\times t}$ is the year fixed effect which is interacted with the industry n for firm i; and, ε_{it} is the idiosyncratic error term.

We follow Wagner et al. (2020) in measuring the firm-level (recurring) exposure to TCJA using the firm-level change in the U.S. GAAP effective average tax rate (EATR) from 2016 to 2018. The outcome variables we examine include (log) tangible and intangible investment. By interacting the year FE with industry, operationalized using North American Industry Classification System (NAICS) 2-digit codes, we allow for industry-varying time paths and use variation in EATR change within industry. Although soaking up between-industry variation in EATR changes comes at the



(a) Tangible investment

(b) Intangible investment

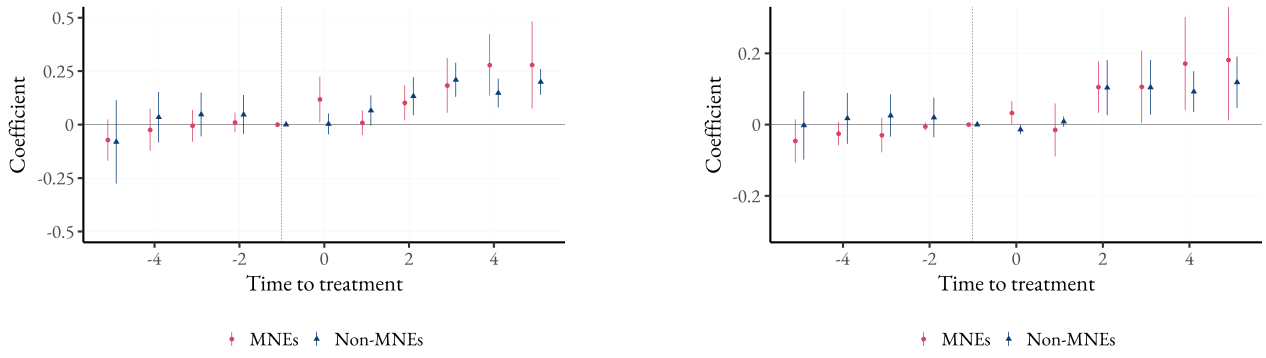
Figure 2: The effect of TCJA on investment

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.

cost of some precision, this specification provides a stronger control for confounding trends. β_τ is the parameter of interest in equation (1): it can be interpreted as the semi-elasticity of the respective outcome variable in period τ with respect to the EATR.

We present the parameter estimates of β_τ in Figure 2. The results show that a greater exposure to the TCJA for U.S. MNEs, captured by a larger reduction in EATR, is associated with increases in tangible and intangible investment. The effects on the tangible and intangible investment are statistically significant at the 95% confidence level in most years and relatively stable over time. Averaging across the post-TCJA years, a ten-percentage-point decrease in EATR is associated with a 4.2% increase in tangible investment and a 2.3% increase in intangible investment, both statistically significant at the 95% significance level. The estimates for both types of investment were insignificant for the first two years after the TCJA, suggesting a lagged response of firms to the tax reform. The average semi-elasticity estimates after the second year of TCJA are -0.58 and -0.32 for tangible and intangible investment, respectively. This semi-elasticity of tangible investment is consistent with the existing estimates in the literature, which typically fall between -0.5 and -1.0. (Hassett and Glenn Hubbard, 2002; Zwick and Mahon, 2017; Chodorow-Reich et al., 2023).

The statistically insignificant estimates for years prior to 2017 indicate that the firms with differential exposure to TCJA did not preemptively adjust their strategies prior to the reform. This is partly due to the unexpected nature of the TCJA. The bill was introduced in early November 2017 and signed into law by President Trump on December 22, 2017. In addition, prior to its pas-



(a) Tangible investment

(b) Intangible investment

Figure 3: The effect of TCJA on investment, by multinational status

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 their pre-TCJA status, along with 95% confidence intervals, of the TCJA for tangible and intangible investment. Standard errors are clustered at the firm level.

sage, there was significant uncertainty about whether a major tax reform would be enacted at all. These features of the reform give firms little time to anticipate or react to its provisions before its implementation.

These empirical results are consistent with our expectations. For tangible investment, our estimate of a positive effect of TCJA is consistent with Chodorow-Reich et al. (2023). The foreign provisions of TCJA, especially GILTI, incentivized tangible investment abroad. The estimated positive effect on intangible investment suggests complementarity between tangible and intangible capital. Moreover, the effect on both tangible and intangible investment takes a couple years after the TCJA to materialize, suggesting a role for adjustment frictions.

Heterogeneity by multinational status Figure 3 plots the estimated dynamic coefficients from an event-study specification for the sub-sample of U.S. firms which were multinationals before the TCJA ("MNEs") and the sub-sample of U.S. non-MNEs ("Non-MNEs"). This heterogeneity analysis allows us to assess whether the investment responses in Figure 2 are driven differentially by firms with international exposure who were subject to the international provisions of the TCJA (GILTI, FDII) versus purely domestic firms primarily affected by the statutory rate reduction.

In Panel 3a, 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 3b reveals an even sharper divergence in intangible investment. While domestic firms show a modest and statistically noisy response, MNEs exhibit a structural break in investment behavior, shifting to a permanently higher level of intangible accumulation starting in 2019 ($t = 2$). 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.

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 5.2. As illustrated in Appendix Figures A.1 and A.2, 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. Notably, the robust tangible investment response of non-MNE exporters (Figure A.2a) compared to the stagnation of MNE exporters (Figure A.1a) suggests that for firms unable to substitute production abroad, the scale effect of the export subsidy dominates the QBAI penalty, whereas MNEs may have substituted tangible capacity to foreign jurisdictions to exploit the GILTI QBAI exemption.

In summary, our empirical analysis reveals that TCJA has significant effects on the investment behavior of MNEs. However, the empirical analysis is limited in several ways in its assessment of the aggregate impacts of the TCJA. First, the empirical results inform the *relative* effect on firms with different exposure to TCJA, yet they do not shed light on the *absolute* effect of the policy. Second, it does not address how the TCJA affects the global economy through important general equilibrium effects, including its impacts through trade and FDI linkages and technology spillovers of intangible investment. To study these important questions, we introduce a quantitative model in the next section.

4 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.

4.1 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,

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

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,

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

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

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

The aggregate price index is

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

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

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

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. To capture the possibility of productivity spillovers in FDI, which have been documented by Javorcik (2004) and several other papers, we assume that a country's intangible-capital production technology depends on the intangible capital of foreign MNEs that operate in that country. We use the same spillover specification as Dyrda et al. (2024b). A firm based in region i associated with variety ω that hires $\ell_{it}^{z}(\omega)$ R&D workers produces $z_t(\omega)$ units of intangible capital given by

$$z_t(\omega) = A_i \ell_{it}^{z}(\omega) \left[\sum_{j \neq i} \int_{\Omega_{jit}} z_{jt}(\omega') \, \mathrm{d}\omega' \right]^{\upsilon}. \tag{8}$$

The parameter υ governs the strength of the spillover externality. If $\upsilon = 0$, there is no externality. The larger υ is, the more effect foreign MNEs' R&D decisions have on domestic firms' ability to produce intangible capital.

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_i^X to export and a fixed cost κ_i^F 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 $J_{it}^X(\omega) \subseteq I \setminus \{i\}$ and its set of FDI destinations by $J_{it}^F(\omega) \subseteq I \setminus \{i\}$. Given these sets, the firm's resource constraints are:

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

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

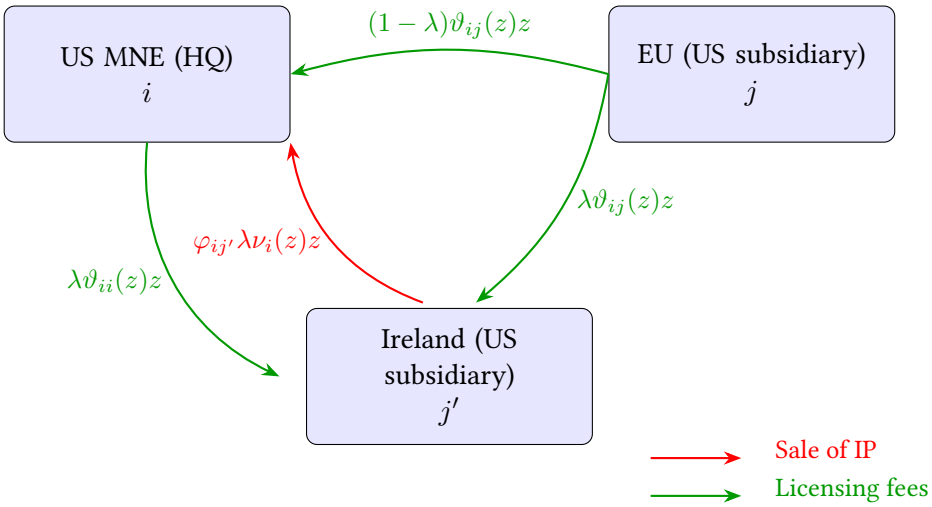


Figure 4: IP sales and licensing fees flows in the model-3 region example.

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 $\nu_{it}(\omega)z_{it}(\omega) \equiv \sum_{j\in J_{it}^F(\omega)\cup\{i\}} \vartheta_{ijt}(\omega)z_{it}(\omega)$ 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 $\mathcal{C}(\lambda) = \lambda - (1-\lambda)\log(1-\lambda)$. 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 4 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, $\nu_i(z)$ 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.

4.2 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

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

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.

4.3 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:

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

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 Sections 5.1 and 5.2. For corporations in other non-U.S. regions, we have

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

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

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

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, $\{Q_t\}_{t=0}^{\infty}$, a sequence 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.

5 Mapping the Global Tax Reforms to the Model

We now describe the corporate tax systems in place before and after the TCJA in the United States, along with the OECD's proposed global minimum tax (GMT). For each regime, we carefully map the policy provisions to the model's variables to construct the corresponding tax liabilities T_{ij}. For the TCJA reform, we focus on three key changes particularly relevant for MNEs: the decrease in the statutory corporate tax rate, the shift from a worldwide tax system to a territorial tax system, and the two provisions related to intangible income earned by MNEs: the Global Intangible Low-Tax Income (GILTI) and the Foreign-Derived Intangible Income (FDII).

5.1 Pre-TCJA corporate tax system

Prior to the TCJA, the United States operated a worldwide tax system with deferral. Under this regime, corporations were taxed on both domestic and foreign earnings but received a Foreign Tax

Credit (FTC) for income taxes paid to foreign governments, limited to the U.S. tax liability on that foreign income. We provide a detailed mapping of this system to the 2017 IRS tax code and forms in Appendix B.1.

The central feature of this period was the dichotomy between immediate taxation and deferral. While passive "Subpart F" income was taxed immediately, active foreign earnings were generally not taxed until repatriated as dividends. This created a rigorous distinction between determining the U.S. tax base and the timing of tax payments. Modeling endogenous repatriation dynamics is beyond the scope of this paper, as it would require explicit assumptions regarding firms' expectations of future tax holidays.[5]

To capture these mechanics in a stationary framework, we assume that a fraction ι of foreign earnings enters the U.S. tax base in any given period. As derived in Appendix B.1, ι represents the *effective inclusion rate*—a reduced-form parameter capturing both mandatory Subpart F inclusions and voluntary dividend repatriations.

The domestic tax liability of a U.S. firm is therefore the tax on domestic profits plus the residual tax on this included fraction of foreign profits:

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

The $\max(0, \cdot)$ operator reflects the FTC limitation: firms pay the difference between the U.S. rate τ_i and the foreign rate τ_j if the U.S. rate is higher, but they cannot use excess credits from high-tax jurisdictions to reduce their tax liability on domestic income π_{ii}. In our calibration, we estimate τ_i and ι to match the effective tax rates of U.S. MNEs and non-MNEs during the pre-TCJA period (see Section 7).

5.2 Corporate taxation under the TCJA

The 2017 Tax Cuts and Jobs Act (TCJA) fundamentally altered the U.S. corporate tax landscape. It lowered the statutory corporate rate τ_{US} from 35% to 21% and shifted the U.S. from a worldwide system to a quasi-territorial one via the *participation exemption*, which generally exempts repatriated foreign dividends from U.S. taxation. To protect the tax base under this new regime, the TCJA

[5] Several empirical papers (see, e.g., Clemons and Kinney, 2009; Brennan, 2010) have studied repatriating behavior and expectations of future tax relief after the American Jobs Creation Act (AJCA) of 2004. Moreover, U.S. MNEs exhibited accelerated foreign cash holdings in response to legislative signals of a repatriation tax (De Simone, Piotroski, and Tomy, 2019).

introduced two distinct provisions targeting intangible income: a "stick" for moving profits abroad (GILTI) and a "carrot" for keeping them at home (FDII). We provide a rigorous mapping of these provisions to the relevant IRS forms (Forms 8992, 8993, and 1118) in Appendix B.2.

Global Intangible Low-Taxed Income (GILTI). GILTI functions as a global minimum tax designed to discourage profit shifting. Crucially, unlike the OECD's country-by-country approach, the U.S. GILTI regime allows for global blending: losses or excess tangible returns in one foreign jurisdiction can offset intangible income in another.

The U.S. parent calculates its GILTI inclusion by aggregating the Net Tested Income (NTI) of all its controlled foreign corporations and subtracting a deemed return on their aggregate tangible assets (QBAI). We model the total residual U.S. tax liability on GILTI (T_{ii}^{GILTI}) as:

$$T_{ii}^{GILTI} = \max\left(0,\ \tau_{US}(1-\chi^{GILTI})\sum_{j\in J_F}\left[\pi_{ij}^{NTI} - \chi^{QBAI}P_j k_{ij}\right] - T_{ii}^{FTC}\right). \tag{23}$$

Here, π_{ij}^{NTI} is the net income of affiliate j, summed across all foreign locations. $\chi^{GILTI} = 0.50$ is the deduction rate (implying a 10.5% minimum rate), and $\chi^{QBAI} = 0.10$ is the exemption for tangible capital. T_{ii}^{FTC} represents the aggregate foreign tax credit allowed, which is subject to an 80% haircut and expense allocation limitations (see Appendix B.2 for details).

Foreign Derived Intangible Income (FDII). FDII provides a preferential tax rate for income earned by the U.S. parent from serving foreign markets (exports and royalties). It is designed to neutralize the incentive to move IP abroad by offering a tax deduction for "foreign-derived" income that exceeds a 10% return on domestic tangible assets.

The U.S. parent calculates its foreign-derived deduction eligible income (π_{ii}^{FDDEI}), which includes export revenues and licensing fees from abroad. The FDII deduction reduces the effective tax rate on this income to 13.125%. The deduction amount is calculated as:

$$\hat{T}_{ii}^{FDII} = \tau_{US} \times \chi^{FDII} \times \left(\pi_{ii}^{FDDEI} - \chi^{QBAI} \times p_i k_{ii} \times \frac{\pi_{ii}^{FDDEI}}{\pi_{ii}^{Total}}\right). \tag{24}$$

where $\chi^{FDII} = 0.375$ is the deduction rate. Note that while FDII incentivizes holding intangible capital in the U.S., the QBAI term ($\chi^{QBAI}p_i k_{ii}$) implies that increasing domestic *tangible* capital reduces the size of the deduction, effectively raising the user cost of capital for exporters. See Appendix B.2 for the detailed derivation of deduction eligible income and the specific taxable income

limitations applied to this deduction.

Total U.S. Tax Liability. Combining these provisions, the total corporate income tax liability for a U.S. multinational under the TCJA is the sum of the tax on domestic profits, the net tax on foreign intangible income (GILTI), and the tax savings from FDII. We write this as:

$$T_{ii} = \tau_i \pi_{ii} - \hat{T}_{ii}^{FDII} + T_{ii}^{GILTI}. \tag{25}$$

The first term represents the baseline tax on domestic profits at the new 21% rate. The second term ($\hat{T}_{ii}^{FDII}$) captures the FDII deduction for export-driven intangible income. The third term (T_{ii}^{GILTI}) is the aggregate residual tax on foreign earnings derived in Equation (23). Note that unlike the pre-TCJA system, where repatriation taxes applied to the stock of accumulated earnings, these provisions apply immediately to the flow of current-year global income.

5.3 Global Minimum Tax (GMT)

We implement the OECD/G20 Inclusive Framework's Pillar Two rules, which establish a global minimum effective tax rate of 15% computed on a jurisdictional basis. While the statutory rate is fixed, the policy includes *substance-based carve-outs* that exclude a fixed return on tangible assets and payroll from the minimum tax base. These carve-outs are crucial for our analysis as they introduce a wedge between the taxation of pure profits (or intangible returns) and returns to real factors of production.

The model calculates the "top-up" tax required to bring an affiliate's effective rate up to 15%. The right to collect this top-up is assigned according to the specific rule priority established by the OECD:

1. **Qualified Domestic Minimum Top-Up Tax (QDMTT):** The source jurisdiction (where production occurs) has the primary right to tax its own low-taxed income. If adopted, this preempts other jurisdictions.

2. **Income Inclusion Rule (IIR):** If the source jurisdiction does not levy a QDMTT, the jurisdiction of the ultimate parent entity (e.g., the U.S.) collects the top-up.

3. **Undertaxed Profits Rule (UTPR):** As a backstop, if neither the source nor parent jurisdictions implement the minimum tax, the right to collect the top-up is allocated to other adopting jurisdictions based on their share of the MNE's tangible assets and employees.

Three-region illustration. Figure 5 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 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.

Total U.S. Tax Liability under GMT. When the GMT is implemented, the total tax liability paid by the U.S. parent to the U.S. government expands to include any IIR top-up taxes owed on its low-taxed foreign affiliates. We write the final liability as:

$$T_{ii} = \underbrace{T_{ii}^{TCJA}}_{\text{Domestic + GILTI/FDII}} + \underbrace{\sum_{j \in J_F} T_i^{IIR}(ij)}_{\text{GMT Top-up (IIR)}}. \tag{26}$$

The first term, T_{ii}^{TCJA}, is the standard liability under the TCJA (incorporating domestic tax, GILTI, and FDII), derived in previouse section and summarized by equation (25). The second term captures the additional top-up tax collected by the U.S. on its own foreign subsidiaries (j) if their effective rate is below 15% and the host jurisdiction has not levied a QDMTT. Note that the UTPR is excluded here; while the U.S. government might collect UTPR revenue from *foreign-parented* MNEs operating in the U.S., this does not constitute a liability for the U.S. parent itself.

Additional Government Revenues (UTPR). While the U.S. parent is only liable for its own taxes, the U.S. government may collect additional revenue from *foreign-parented* MNEs operating within the United States. If a foreign MNE is undertaxed in its home jurisdiction (and no IIR applies there), the U.S. collects a share of the top-up tax via the Undertaxed Profits Rule (UTPR), allocated based on the tangible assets and employees the foreign firm locates in the U.S. We denote this additional revenue stream as:

$$R_{US}^{UTPR} = \sum_{m \neq US} \sum_{j} T_{US}^{UTPR}(mj). \tag{27}$$

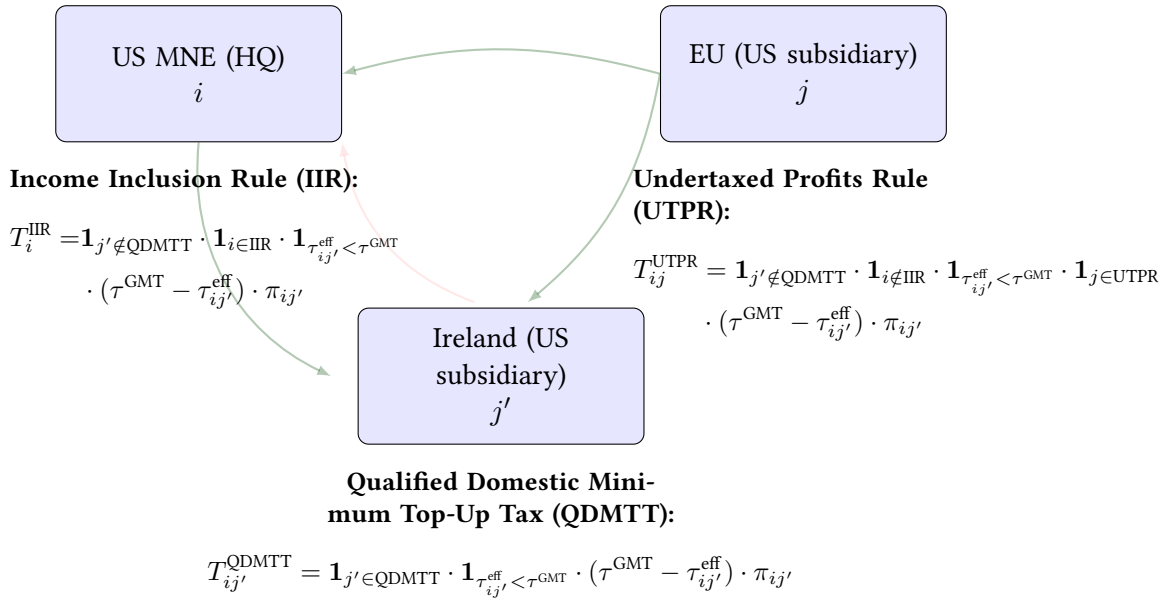


Figure 5: Global Minimum Tax (GMT) in the model-3 region example.

Here, the summation is over all foreign multinational groups (m) that have low-taxed income in jurisdictions (j) not covered by a QDMTT or IIR. These revenues do not affect the decision-making of U.S. firms but do relax the U.S. government's budget constraint.

6 Impact of GILTI, FDII, and GMT on macro outcomes

Before turning to the model's general-equilibrium quantification, we discuss the qualitative effects of the MNE-related provisions we have incorporated into our framework in partial equilibrium at the firm level. See the detailed derivation in Appendix D. 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 alters the marginal product of domestic tangible investment, which can again amplify or attenuate the direct effect. Table 2 summarizes these direct and indirect effects.

Table 2: 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.

6.1 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, 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.

6.2 Tangible investment

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

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

where R_j is the user cost of capital in region j and Ξ_{ij}^{k} 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 (24), 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: $\partial\widehat{T}_{ij}/\partial k_{ij} = \min\{0, -\left(\tau^{\text{GMT}} - \tau_{ij}^{\text{eff}}\right)\chi_{\text{GMT},K}P_j\}$ and $\partial\widehat{T}_{ij}/\partial \ell_{ij} = \min\{0, -\left(\tau^{\text{GMT}} - \tau_{ij}^{\text{eff}}\right)\chi_{\text{GMT},L}W_j\}$. This lowers the user cost of both tangible capital and payroll in affiliates where the top-up binds.

These provisions can also have indirect effects on the marginal product term Ξ_{ij}^k that operate through the intangible investment decision, which we describe below. These effects can either attenuate or amplify the direct effect, depending on whether intangible investment goes in the same direction as the user cost. In the case of GILTI, where there is no direct effect on domestic tangible investment through the user cost, the only effect is the indirect effect.

6.3 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 by other adjustment margins, especially the response of tangible investment. For example, when a firm's tangible investment increases in response to a drop in the user cost of tangible capital, the marginal product of intangible capital also increases. In some cases, tax provisions that make profit shifting, and thus intangible investment, less attractive also make tangible investment more attractive, and quantitatively the indirect effect from the latter channel can be stronger than the direct effect from the former. Importantly, these indirect effects can work across, not just within, national boundaries. For example, the direct effect of GILTI is to reduce intangible investment of U.S. MNEs. At the same time, however, GILTI also increases tangible investment in these MNEs' foreign affiliates, which increases the marginal product of their intangible investments. In our model, the second effect is slightly stronger than the first, leading MNEs to do slightly more intangible investment in the presence of GILTI than in its absence.

6.4 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

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

where $\rho_{ij}^{RT} = T_{ij}^{RT}/\pi_{ij}^{NTI}$ 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) shows that the combined impact of the three provisions is not simply additive. GILTI and GMT both raise the effective tax rate on low-tax affiliates, and thus enter $\tau_{LT}^\star$ as alternative floors. In practice, whichever of the two is higher will bind, 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 the 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, reinforcing the incentive to keep intangible capital at home.

The implications for investment follow directly. A lower λ reduces the tax-driven component of intangible investment, while the QBAI deduction under GILTI and the substance-based carve-outs under GMT reduce the user cost of tangibles and payroll. As a result, when GILTI and GMT operate together, the incentives for tangible investment abroad are reinforced, but the margins for intangible expansion are curtailed. When FDII and GMT are combined, the result is a further shift of intangible capital toward the U.S. parent. Taken together, these interactions clarify why the overall impact of domestic and international reforms cannot be inferred from their isolated effects: some provisions offset one another, while others reinforce each other's effects on the allocation of capital and profits.

Table 3 summarizes how the provisions interact when implemented jointly. GILTI and the global minimum tax are substitutes, since both operate by raising the effective tax rate on low-tax

Table 3: 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: $k \downarrow$ (QBAI + carve-outs shift tangibles abroad); $z \downarrow$ (smaller tax-driven return).
FDII + GMT	Profit shifting: Complements — GMT raises affiliate rate while FDII lowers parent rate $\Rightarrow \lambda \Downarrow$. U.S. investment: $k \uparrow$ (lower domestic user cost under FDII); $z \uparrow$ (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 raises 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 adds substance carve-outs, and FDII lowers the effective U.S. rate on foreign-derived income. "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.

affiliates. In practice the binding floor is whichever regime imposes the higher rate, so combining the two does not multiply their effect on profit shifting but rather shifts real activity abroad through QBAI and carve-outs, reducing domestic tangibles and dampening intangible investment. By contrast, FDII and the global minimum tax are complements: the former lowers the effective U.S. rate on foreign-derived income while the latter raises the affiliate rate, so together they compress the wedge on both sides. This joint effect reinforces the incentive to retain intangibles at home and modestly increases domestic tangible investment. Finally, GILTI and FDII affect different margins—GILTI through the taxation of foreign affiliates and FDII through the taxation of the U.S. parent—so their effects are largely orthogonal. In combination they both reduce profit shifting, but with mixed consequences for the allocation of real and intangible investment across jurisdictions. Taken together, these interactions show that the aggregate impact of domestic and international reforms cannot be inferred from their isolated effects, as some provisions reinforce one another while others substitute for each other's role.

7 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

Table 4: Calibration

Statistic or parameter value	US	Europe	Low-tax	RoW	Tax haven
(a) Assigned parameters and target moments					
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	1.19	0.24	–
Prod. dispersion (η_i)	4.74	4.75	5.23	4.59	–
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	–
R&D spillover (ν)	0.40	0.40	0.40	0.40	–
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)	1.96	2.70	0.82	13.4	–
Repatriation share (ι)	0.76	–	–	–	–
Cost of shifting profits to LT (ψ_{iLT})	1.01	0.43	–	3.19	–
Cost of shifting profits to TH (ψ_{iTH})	0.72	1.35	–	2.25	–
Fixed FDI cost to TH (κ_i^{TH})	0.23	0.10	–	0.85	–
Variable export cost (ξ_{ij}) from …					
North America	–	3.04	3.25	1.72	–
Europe	2.14	–	1.73	1.34	–
Low tax	2.27	1.57	–	1.55	–
RoW	2.29	2.58	3.06	–	–

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."

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 4.

- Population (N_i): Taken directly from the data.
- Aggregate TFP (A_i): Identified by real GDP per capita.
- 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): Identified by the difference in effective tax rates for MNEs vs. non-MNEs.
- 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.
- Spillover parameter (υ): Identified by the effect of FDI on domestic firms' productivity as estimated by Javorcik (2004).

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 worlwide corporate tax system. This 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.

8 Effects of the TCJA

Having described the model and its calibration, we turn now to our quantitative experiments. In the first set of experiments, we study the effects of the TCJA. We first evaluate the effect of the reform in its entirety, and then we then shut down the provisions that affect MNEs' intangible income (GILTI and FDII) to measure their contributions to the overall impact. We conduct each experiment twice: in our baseline model with spillovers, and in an alternative model without spillovers. As we will see, spillovers play a crucial role in creating what we call ripple effects: large responses in one region to a tax reform in other regions. Tables 5 and 6 show the results.

Table 5 shows the macroeconomic effects of the TCJA in our baseline model and the model with no spillovers. Focus on the baseline model first. In the United States, both tangible and intangible investment rise substantially (3.1% and 1.7%, respectively), leading to an increase in GDP of 0.8%. Total corporate taxes fall by 37.1%, primarily from the decrease in statuary corporate tax rate. The model-implied increase in tangible capital is smaller than the result in Chodorow-Reich et al. (2023), which predicts that the TCJA increases capital investment by 6.4% in the long-run steady state. This difference likely arises because we abstract from other TCJA provisions designed to incentivize investment, such as accelerated depreciation and repeal of Domestic Production Activities Deduction (DPAD). Our predicted decline in total corporate tax revenue, on the other hand, is nearly identical to the 38.2% decrease predicted by Chodorow-Reich et al. (2023).

Profit shifting, measured as the share of intangible capital shifted from the headquarters, increases slightly relative to the pre-TCJA baseline. The reason that profit shifting increases despite the introduction of the GILTI and FDII provisions is the shift from worldwide to territorial taxation. On its own, this dramatically reduces the effective tax rate that U.S.-based MNEs pay on their income in the low-tax and tax-haven regions, which increases the incentive for these MNEs to shift profits, and GILTI and FDII are not quite powerful enough to counteract this effect. In the other regions, investment also increases, especially in intangible capital, leading to smaller but still sizeable increases in output.

The 3.1% increase in aggregate tangible capital from an average decline of 8 percentage point in firm-level ETR (from Table 1) translate to an aggregate-level semi-elasticity of capital with respect to the tax rate as -0.39.[6] This is within the range of the aggregate-level semi-elasticity es-

[6]The 8 percentage point decline in firm-level ETR is calculated only using public-traded firms in the Compustat data, which is consistent with 7 percentage point decline for profitable large corporations estimated by the U.S. Government Accountability Office. Dobridge et al. (2025) find that the average ETRs increased for private domestic firms after the TCJA. Given their limited contribution to the total corporate tax revenue and investment, we deem the 8 percentage

Table 5: Macro effects of TCJA

Region	Baseline model					No spillovers				
	Lost profits	CIT rev.	GDP	Tan. cap.	Int. cap.	Lost profits	CIT rev.	GDP	Tan. cap.	Int. cap.
(a) All TCJA provisions										
USA	6.49	-37.06	0.80	3.10	1.72	6.51	-37.15	0.33	3.06	1.34
Europe	-0.08	0.48	0.11	0.40	0.82	-0.09	0.21	-0.25	0.35	0.49
Rest of world	-0.08	0.38	0.19	0.29	0.83	-0.07	0.24	-0.32	0.23	0.35
Low tax	8.10	1.02	0.61	3.51	0.34	7.99	0.67	0.24	3.47	-0.01
(b) No GILTI										
USA	78.59	-38.24	0.54	3.05	0.67	78.64	-38.30	0.10	3.03	0.29
Europe	0.07	0.39	-0.18	0.39	0.83	0.06	0.21	-0.43	0.35	0.59
Rest of world	-0.00	0.34	-0.20	0.27	0.70	0.02	0.25	-0.49	0.23	0.41
Low tax	6.82	1.40	-0.14	0.61	1.11	6.73	1.17	-0.40	0.59	0.84
(c) No FDII										
USA	26.82	-36.43	3.16	8.04	2.76	26.91	-36.57	2.65	8.01	2.39
Europe	-0.23	0.69	1.36	0.43	0.79	-0.26	0.32	0.85	0.36	0.35
Rest of world	-0.20	0.55	1.53	0.32	0.93	-0.19	0.36	0.80	0.24	0.25
Low tax	13.27	2.11	1.82	3.52	0.15	13.12	1.64	1.34	3.47	-0.24
(d) No MNE provisions										
USA	100.50	-37.84	2.88	7.99	1.74	100.64	-37.94	2.42	7.96	1.38
Europe	-0.10	0.60	1.04	0.41	0.76	-0.11	0.33	0.68	0.36	0.44
Rest of world	-0.12	0.51	1.14	0.30	0.79	-0.11	0.37	0.63	0.24	0.31
Low tax	11.91	2.46	1.06	0.62	0.92	11.80	2.12	0.70	0.59	0.60

Notes: All columns report percent changes relative to the pre-TCJA status quo.

timate between -0.2 and -0.4, which is summarized in the meta-analysis in Mooij and Ederveen (2008). This comparison validates our model's ability to evaluate large corporate tax reforms. The aggregate-level semi-elasticity is smaller than the firm-level one, typically found to be between -0.5 and -1.0 (Hassett and Glenn Hubbard, 2002), as increases in capital and labor demand will push up their prices and partially offset the partial equilibrium effect of the tax changes. In our case, the model-implied, aggregate-level semi-elasticity is also smaller than our estimated, firm-level semi-elasticity of -0.58.

In the no-spillover model, the impact of TCJA on intangible investment are much smaller in all regions. Without spillovers, an increase in intangible investment in the U.S. no longer decrease the cost intangible investment in other regions, muting the investment effect. The increase in tangible capital is also smaller, as tangible and intangible capital are complements in production. What is

point decrease as more relevant for imputing the aggregate semi-elasticity.

Table 6: Decomposition of TCJA effects by firm type

Region	Value added				Tangible capital				Intangible capital		
	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs
(a) All TCJA provisions											
USA	0.80	0.49	-0.17	0.48	3.10	1.76	0.17	1.16	1.72	0.04	1.68
Europe	0.11	-0.13	-0.01	0.25	0.40	-0.12	-0.00	0.52	0.82	-0.01	0.83
Rest of world	0.19	-0.03	0.07	0.15	0.29	-0.07	0.02	0.33	0.83	0.02	0.81
Low tax	0.61	-0.70	-0.22	1.53	3.51	-0.60	-0.15	4.26	0.34	-0.19	0.53
(b) No GILTI											
USA	0.54	0.45	-0.36	0.44	3.05	1.82	0.07	1.16	0.67	0.06	0.61
Europe	-0.18	-0.24	-0.11	0.17	0.39	-0.12	0.01	0.50	0.83	-0.02	0.85
Rest of world	-0.20	-0.19	-0.13	0.12	0.27	-0.08	0.02	0.33	0.70	0.00	0.70
Low tax	-0.14	-0.37	-0.08	0.31	0.61	-0.25	-0.00	0.86	1.11	-0.05	1.17
(c) No FDII											
USA	3.16	1.13	1.57	0.47	8.04	3.17	3.86	1.01	2.76	0.04	2.72
Europe	1.36	0.37	0.48	0.51	0.43	-0.10	-0.01	0.53	0.79	0.01	0.78
Rest of world	1.53	0.27	0.99	0.27	0.32	-0.30	0.28	0.34	0.93	-0.07	1.00
Low tax	1.82	-0.18	0.09	1.91	3.52	-0.59	-0.17	4.28	0.15	-0.18	0.33
(d) No MNE provisions											
USA	2.88	1.08	1.37	0.43	7.99	3.21	3.76	1.01	1.74	0.05	1.69
Europe	1.04	0.24	0.36	0.43	0.41	-0.11	0.00	0.51	0.76	-0.00	0.76
Rest of world	1.14	0.36	0.55	0.24	0.30	-0.06	0.02	0.33	0.79	0.02	0.77
Low tax	1.06	0.15	0.23	0.68	0.62	-0.24	-0.02	0.88	0.92	-0.04	0.96

Notes: The table shows the baseline model result. "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.

particularly striking about the no-spillover results is that GDP in the Europe and RoW regions fall. Compared with the results in Panel (c) (no FDII), this GDP decline occurs because FDII increases the incentive of U.S. firms to exports goods abroad, which reduces demand for foreign firms' output. This effect is strong enough to outweigh the direct positive effect of the TCJA on investment in these regions when there are no spillovers. While households in these regions likely benefit from higher consumption via increased net imports, domestic value-added decreases.

Panel (a) in Table 6 shows the effects on different groups of firms in the baseline model (see Table E.1 for the results of the no-spillovers model). In the United States, the TCJA leads to a reallocation of resources away from domestic MNEs. All U.S.-based firms invest more in both types of capital, but the increase in tangible investment is more than ten times greater for non-

MNEs. Additionally, foreign MNEs' tangible investments in the U.S. grow dramatically due to the more favorable tax treatment. This causes labor to reallocate away from domestic MNEs, and their output actually falls slightly. In other regions, domestic firms (both MNEs and non-MNEs) produce less; the increase in aggregate output is driven entirely by foreign (i.e., American) MNEs. The drop in output of domestic firms in other regions is due to the fact that the large increase in demand for tangible capital in the United States pushes the real interest rate upward, making investment more expensive in other regions whose tax rates have not changed.

8.1 Effects of GILTI

Panel (b) in tables 5 and 6 shows how the TCJA would have affected the global economy if the reform did not include the GILTI provision. For the United States, the macroeconomic consequences would be similar but profit shifting would increase dramatically. It is important to note that this would have only a modest effect on corporate income tax revenues, which would decline by 38.2 percent versus 37.1 percent under the full TCJA. Clearly, the drop in the overall effective tax rate is far more impactful for the government budget than the small number of MNEs that shift profits. Qualitatively, the effect of GILTI on tangible investment is positive, consistent with Chodorow-Reich et al. (2023), but fairly small.

For the rest of the world, GILTI has material macroeconomic consequences. Without GILTI, the TCJA would have caused output in other regions to fall, rather than rise. There are two reasons for this. First, output of U.S. MNEs' foreign affiliates in these regions rises less because GILTI provides an incentive for tangible investment abroad. Note that this incentive directly affects these foreign affiliates' tangible investment, but also indirectly affects U.S. MNEs' intangible investment, which increases by almost 2/3 less in this version of the TCJA. Second, the drop in U.S. MNEs' intangible investment generates fewer spillovers in the rest of the world, leading firms in these regions, especially non-MNEs, to do less intangible investment themselves. Consequently, output of domestic firms in these regions falls more than in the full version of the TCJA.

8.2 Effects of FDII

Panel (c) in tables 5 and 6 shows how the TCJA would have affected the global economy if the reform did not include the FDII provision. For the United States, the main effect of FDII is on investment, both tangible and intangible, which would both rise by 150 percent more than in the full TCJA analysis. The difference is most pronounced for U.S.-based MNEs, but investment of non-MNEs also rises significantly. This is driven by the fact that even though the FDII provision

is intended to provide a tax deduction, it also actually raises the after-tax marginal cost of domestic tangible capital, and this distortion is increasing in the fraction of a firm's income that is foreign-derived. Our results indicate that FDII incentivizes MNEs and non-MNE exporters to invest substantially less in tangible capital. This has the effect of reducing the marginal after-tax return to intangible investment, and this effect dominates the direct effect of the tax deduction (which increases this return). FDII also reduces profit shifting, but much less than GILTI. Without the FDII provision, the TCJA would increase U.S. lost profits by about a quarter, a third of the increase in the TCJA without GILTI.

The other regions in the economy are also hurt by the FDII provision, especially in the baseline model with spillovers. In equilibrium, the large increase in output in the United States in the absence of FDII increases demand for MNEs and exporting firms in the other regions, inducing these firms to invest more and ultimately produce more at home as well. This effect is observed even in the model without spillovers, indicating that the increase in U.S. demand in the absence of FDII would outweigh the investment-pull effect that reduces investment in the rest of the world under the full TCJA.

8.3 Effects of GILTI and FDII combined

Panel (d) in tables 5 and 6 shows the effects of a version of the TCJA without either the two profit-shifting provisions. In this scenario, profit shifting would double, indicating that these provisions' effects are largely orthogonal and do not amplify or attenuate each other. The effects on investment and output would be similar in all regions to the effects without FDII, which is not surprising given the relative magnitudes of the two provisions' effects on these margins.

9 Effects of a global minimum corporate tax

Our second set of experiments focuses on the effects of a global minimum corporate income tax (GMT). While the most likely version of this policy is implementation in all regions of the world economy except for the United States, we also study the effects of a GMT in the United States alone and a worldwide GMT. Again, we conduct two versions of each exercise: in our baseline model with spillovers and in the no-spillover alternative. Here, spillovers create even larger ripple effects. Here, we conduct these exercises starting from the TCJA equilibrium, which is the current status quo.

Table 7: Macroeconomic effects of GMT outside United States

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
(a) Baseline model					
USA	-65.59	2.40	-0.71	-0.04	-2.15
Europe	-73.01	2.79	-0.78	-0.05	-0.91
Rest of world	-80.29	1.31	-0.96	-0.07	-0.82
Low tax	-52.32	2.93	-1.51	-3.77	1.57
(b) No spillovers					
USA	-65.63	2.59	-0.38	-0.01	-1.94
Europe	-73.01	3.10	-0.34	-0.00	-0.55
Rest of world	-80.29	1.47	-0.35	-0.01	-0.28
Low tax	-52.29	3.29	-1.03	-3.74	2.02

Notes: All columns report percent changes relative to the TCJA equilibrium.

Table 8: Effects of GMT outside of US on factor allocations

	Value added				Tangible capital				Intangible capital		
Region	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs
(a) Baseline model											
USA	-0.71	-0.14	-0.46	-0.10	-0.04	0.13	-0.16	-0.01	-2.15	0.01	-2.16
Europe	-0.78	-0.25	-0.34	-0.18	-0.05	0.04	-0.05	-0.04	-0.91	-0.03	-0.89
Rest of world	-0.96	-0.10	-0.75	-0.10	-0.07	0.26	-0.29	-0.03	-0.82	0.07	-0.89
Low tax	-1.51	0.37	-0.46	-1.42	-3.77	0.60	-0.69	-3.68	1.57	0.25	1.32
(b) No spillovers											
USA	-0.38	-0.02	-0.33	-0.02	-0.01	0.13	-0.16	0.02	-1.94	0.03	-1.98
Europe	-0.34	-0.09	-0.18	-0.07	-0.00	0.04	-0.04	-0.00	-0.55	0.01	-0.56
Rest of world	-0.35	-0.11	-0.19	-0.05	-0.01	0.03	-0.02	-0.02	-0.28	0.01	-0.29
Low tax	-1.03	0.56	-0.33	-1.27	-3.74	0.58	-0.70	-3.62	2.02	0.31	1.71

Notes: "Total" columns report percent changes relative to TCJA equilibrium. Other columns report changes in percentage points relative to the TCJA equilibrium for that category; other columns in each category sum to the total percent change.

9.1 GMT outside the United States

We first study the effects of a global minimum corporate income tax rate of 15% as prescribed by Pillar Two in all regions of the world economy *except* for the United States (EU, LT, and RW). Tables 7 and 8 show the results of this experiment, both with and without spillovers.

The implementation of the GMT by the rest of the world acts as a negative supply shock for

the United States by structurally raising the user cost of capital for U.S. multinationals. Once low-tax jurisdictions impose Qualified Domestic Minimum Top-Up Taxes (QDMTTs), U.S. MNEs face a binding 15% minimum tax on their foreign earnings, effectively replacing the lower GILTI burden that previously applied on a blended basis. Because intangible capital is nonrival within the firm—one unit of IP generates returns across all affiliates worldwide—this increase in the tax burden on foreign income directly lowers the global after-tax return to innovation. U.S. multinationals respond by sharply reducing intangible investment to re-align with the higher user cost.

This direct contraction is amplified by an "inward ripple" operating through technology spillovers. Foreign MNEs also scale back innovation in response to higher post-GMT taxes (e.g. domestic European MNEs reduce intangible investment by 0.55% to 0.91%), slowing the global technological frontier. The erosion of the global knowledge pool feeds back onto U.S. firms, further depressing productivity and inducing an additional pullback in investment. In the baseline equilibrium with spillovers (Panel (a))), these propagation forces deepen the decline in U.S. intangible capital to 2.16% and almost double the contraction in U.S. GDP (from -0.38% to -0.71%). These mechanisms illustrate a central point of the paper: when innovation relies on nonrival IP and cross-border spillovers, local tax reforms generate global general-equilibrium effects.

Despite the contraction in real activity, the reform produces a fiscal windfall for the U.S. Treasury: corporate tax revenue rises by 2.40%. This increase does not arise from collecting top-up taxes—foreign QDMTTs crowd those out—but from a collapse in profit shifting. Because the GMT compresses tax differentials between the United States and traditional hubs, the incentive to reallocate profits abroad falls, and "lost profits" decline by roughly 66%. Thus, the U.S. tax base expands even as real activity contracts.

Taken together, the results highlight a clear policy trade-off. The GMT is highly effective at protecting the U.S. corporate tax base and curbing offshore income shifting, but it achieves this by raising the cost of capital for U.S. MNEs, depressing innovation, intangible investment, and ultimately output. More broadly, the findings underscore the main message of the paper: corporate tax reforms have global effects, and the United States cannot insulate itself from the impact of the GMT, even by abstaining from its implementation.

9.2 GMT in the United States only

It is extraordinarily unlikely that the United States would implement a global minimum tax on its own without the rest of the world, but this scenario still provides a useful illustration of the potential for such policies to create cross-country ripple effects. Tables 9 and 10 show the results

Table 9: Macroeconomic effects of GMT in United States only

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
(a) Baseline model					
USA	-70.06	2.06	-0.16	-0.01	-0.61
Europe	0.03	-0.08	-0.21	-0.01	-0.04
Rest of world	0.01	-0.05	-0.27	-0.01	-0.11
Low tax	-14.84	-2.68	-0.23	-0.18	0.11
(b) No spillovers					
USA	-70.09	2.10	-0.12	-0.01	-0.59
Europe	0.03	-0.02	-0.13	-0.00	0.02
Rest of world	0.01	-0.02	-0.13	-0.00	0.01
Low tax	-14.82	-2.61	-0.15	-0.18	0.17

Notes: All columns report percent changes relative to the TCJA equilibrium.

Table 10: Effects of GMT in United States only on factor allocations

	Value added				Tangible capital				Intangible capital		
Region	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs
(a) Baseline model											
USA	-0.16	-0.02	-0.12	-0.02	-0.01	0.04	-0.05	0.00	-0.61	0.01	-0.61
Europe	-0.21	-0.08	-0.08	-0.06	-0.01	0.00	0.00	-0.02	-0.04	-0.01	-0.03
Rest of world	-0.27	-0.11	-0.13	-0.02	-0.01	-0.00	-0.00	-0.01	-0.11	-0.01	-0.10
Low tax	-0.23	-0.02	-0.02	-0.19	-0.18	0.07	0.04	-0.28	0.11	0.02	0.10
(b) No spillovers											
USA	-0.12	-0.01	-0.10	-0.00	-0.01	0.04	-0.05	0.01	-0.59	0.01	-0.60
Europe	-0.13	-0.05	-0.05	-0.03	-0.00	0.00	0.00	-0.01	0.02	0.00	0.02
Rest of world	-0.13	-0.05	-0.06	-0.02	-0.00	0.00	0.00	-0.01	0.01	0.00	0.01
Low tax	-0.15	0.01	-0.00	-0.16	-0.18	0.06	0.03	-0.27	0.17	0.02	0.14

Notes: "Total" columns report percent changes relative to TCJA equilibrium. Other columns report changes in percentage points relative to the TCJA equilibrium for that category; other columns in each category sum to the total percent change.

of this experiment, both with and without spillovers as before.

The ripple effects of a global minimum corporate tax in the United States are quite large. In fact, in the baseline model output falls more in Europe and the rest of the world than in the United States. This mirrors the result from Section 9.1 where we saw that a global minimum tax in other regions has larger macro effects in the United States. Spillovers play a smaller role in the ripple effects

Table 11: Macroeconomic effects of worldwide GMT

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
(a) Baseline model					
USA	-65.71	2.72	-0.70	-0.04	-2.16
Europe	-73.01	2.79	-0.77	-0.05	-0.91
Rest of world	-80.29	1.31	-0.95	-0.07	-0.82
Low tax	-52.40	2.91	-1.52	-3.79	1.58
(b) No spillovers					
USA	-65.74	2.91	-0.37	-0.01	-1.95
Europe	-73.01	3.10	-0.34	-0.00	-0.55
Rest of world	-80.29	1.48	-0.34	-0.01	-0.27
Low tax	-52.37	3.27	-1.04	-3.76	2.04

Notes: All columns report percent changes relative to the TCJA equilibrium.

here, however; even in the model without spillovers output in Europe and the rest of the world declines substantially. The reason for this difference is the outsize importance of U.S.-based MNEs in these countries, relative to the importance of foreign MNEs in the United States. The drop in U.S. MNEs' intangible investment caused by a global minimum tax in the United States materially reduces output in Europe and the rest of the world regardless of the presence of spillovers. In the baseline model, the ripple effects are amplified because the spillovers cause MNEs in these regions to do less intangible investment themselves. Nevertheless, it is clear that spillovers play a larger role in inward ripple effects on the U.S. economy caused by reforms in other regions than outward ripple effects on other regions caused by U.S. reforms.

9.3 Worldwide GMT

We now study the effects of implementing a global minimum corporate income tax in all productive regions: the United States, Europe, the rest of the world, and the low-tax region. Tables 11 and 12 shows the results.

The overall effect on profit shifting is impressive. Lost profits in the three high-tax regions fall by the same amounts as described in the previous exercises above: 70% for the United States as in Section 9.2, and 73% and 80% respectively for Europe and the rest of the world as in Section 9.1. Profits shifted inward to the low-tax region fall by a full 55%. However, there are also large macroeconomic effects. Output falls in all four productive regions and global GDP falls by almost 0.3%. Comparing panels (a) and (b), we see that these macro effects are driven even more strongly by the

Table 12: Effects of worldwide GMT on factor allocations

Region	Value added				Tangible capital				Intangible capital		
	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs
(a) Baseline model											
USA	-0.70	-0.14	-0.46	-0.10	-0.04	0.13	-0.16	-0.01	-2.16	0.01	-2.17
Europe	-0.77	-0.25	-0.34	-0.18	-0.05	0.04	-0.05	-0.05	-0.91	-0.03	-0.88
Rest of world	-0.95	-0.10	-0.75	-0.10	-0.07	0.26	-0.29	-0.03	-0.82	0.07	-0.89
Low tax	-1.52	0.39	-0.46	-1.45	-3.79	0.61	-0.69	-3.71	1.58	0.25	1.33
(b) No spillovers											
USA	-0.37	-0.02	-0.33	-0.02	-0.01	0.13	-0.16	0.02	-1.95	0.03	-1.98
Europe	-0.34	-0.09	-0.18	-0.07	-0.00	0.04	-0.04	-0.00	-0.55	0.01	-0.56
Rest of world	-0.34	-0.10	-0.19	-0.05	-0.01	0.03	-0.02	-0.02	-0.27	0.01	-0.28
Low tax	-1.04	0.58	-0.32	-1.30	-3.76	0.58	-0.69	-3.65	2.04	0.31	1.73

Notes: "Total" columns report percent changes relative to TCJA equilibrium. Other columns report changes in percentage points relative to the TCJA equilibrium for that category; other columns in each category sum to the total percent change.

FDI spillover externality than in the previous exercises. Intangible investment by MNEs in all three high-tax productive regions declines even in the absence of this externality, which means that in its presence there is a large self-reinforcing effect on worldwide intangible investment efficiency.

10 Conclusion

In this paper, we have used a quantitative general-equilibrium model to analyze the effects of two major corporate tax reforms, the U.S. Tax Cuts and Jobs Act (TCJA) and the proposed Global Minimum Tax (GMT) by the OECD, on the global economy. Our model incorporates multinational enterprises' (MNEs) investment decisions, profit shifting behavior, and the impact of tax policies on global capital allocation. Our findings indicate that the TCJA significally boosts tangible and intangible investment in the U.S. but decreases corporate tax revenue. The investment surge has positive spillover effects on other countries. On the other hand, if other countries implement the GMT, the largest macroeconomic effects would actually be felt in U.S. economy. If the United States were to implement such a policy unilaterally, the largest economic effects would be felt abroad.

There are two key forces driving these surprising results: (i) the outsized importance of U.S.-based multinational enterprises in the economies of both the United States as well as other countries; and (ii) the positive externalities associated with foreign direct investment, which brings new technologies that make domestic firms more productive. These two forces combine to create

what we have called "ripple effects" that transmit the effects of tax reforms in one region to other regions' economies.

In addition to underscoring the critical role of U.S. MNEs in the global economy, our analysis also highlights the intricate interplay between domestic tax provisions, such as the GILTI provision of the 2017 Tax Cuts and Jobs Act, and international tax reforms. More broadly, we contribute to the literature by providing a valuable methodological framework for policymakers and scholars alike to understand the broader economic consequences of tax policy changes and the strategic responses of multinational corporations within the evolving global tax landscape.

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Appendix

A Empirics

A.1 Sample Construction

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 **?** 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.

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. (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 sub-

sidiaries 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]:

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

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

[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).

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.

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:

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

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):

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

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

A.2.3 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.

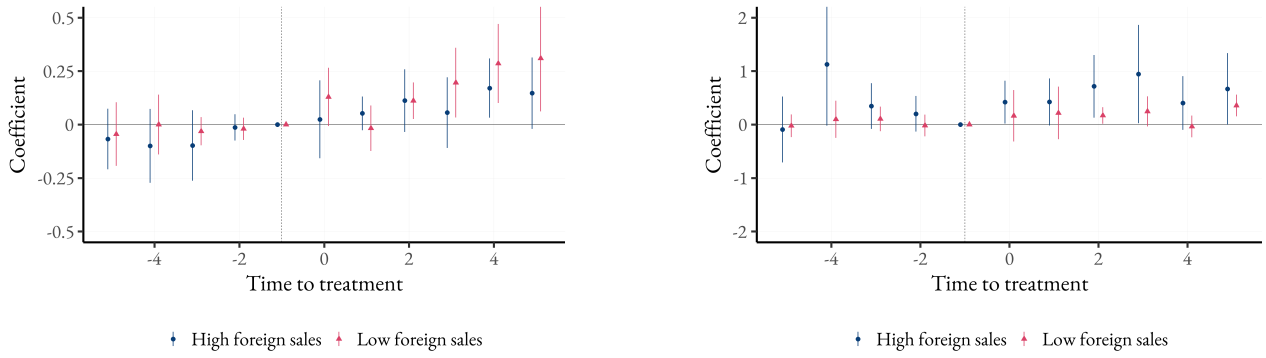
Recurring Tax Effects We measure the recurring effect of the TCJA on each firm's tax burden as the difference between the average GAAP effective tax rate in 2018 and the average GAAP effective tax rate in 2016:

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

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

A.2.4 Tax Haven and Low-Tax Subsidiary Indicators

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,



(a) Tangible investment

(b) Intangible investment

Figure A.1: The effect of TCJA on investment for U.S. 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. MNEs with "high" (above median) foreign sales share and "low" (below median) foreign sales share. Standard errors are clustered at the firm level.

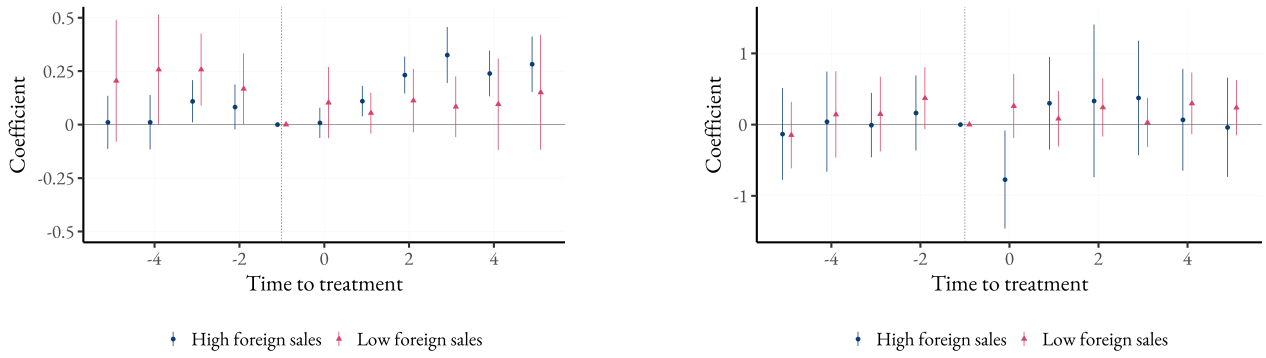
Guernsey, the Isle of Man, Jersey, Lebanon, Liechtenstein, Luxembourg, Malta, Marshall Islands, Mauritius, Monaco, the Netherlands Antilles, Panama, Puerto Rico, Samoa, Seychelles, Sint Maartin, St. Kitts & Nevis, St. Vincent & the Grenadines, St. Lucia, the Turks & Caicos, and Vanuatu.

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.3 Heterogeneity by foreign sales share

To disentangle the mechanisms driving the investment response, Figure A.1 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.1a 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 5.2. As detailed in Equation (24), the FDII deduction is a de-



(a) Tangible investment

(b) Intangible investment

Figure A.2: 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. Standard errors are clustered at the firm level.

creasing function of domestic tangible assets (QBAI). Consequently, MNEs with high foreign sales, who are mechanically more 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.1b 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.1) 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.2 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 sub-

stitution channel.

Panel A.2a 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 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.1 for export-intensive MNEs was likely driven by the substitution of tangible capital to foreign jurisdictions, rather than the FDII penalty alone.

Panel A.2b 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.1b, 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:

$$\Delta\tau_i^{sim} = \frac{\mathcal{T}_{2018}(\mathbf{y}_{i,2016}) - \mathcal{T}_{2016}(\mathbf{y}_{i,2016})}{\mathrm{PI}_{i,2016}} \tag{A.17}$$

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:

$$y_{it} = \beta \left(\Delta\text{EATR}_i \times \mathbb{1}_{\{t \geq 2018\}} \right) + \alpha_i + \gamma_{n(i)t} + \varepsilon_{it}, \tag{A.18}$$

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:

$$\left(\Delta\text{EATR}_i \times \mathbb{I}_{\{t \geq 2018\}} \right) = \delta \left(\Delta\tau_i^{sim} \times \mathbb{I}_{\{t \geq 2018\}} \right) + \mu_i + \lambda_{n(i)t} + \nu_{it}. \tag{A.19}$$

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

$$y_{it} = \beta\big(\widehat{\Delta\text{EATR}_i \times \mathbb{I}_{\{t\geq 2018\}}}\big) + \alpha_i + \gamma_{n(i)t} + \varepsilon_{it}. \tag{A.20}$$

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.1: 2SLS Estimates of Investment Response to TCJA

	(i) ln(Tangible Investment)		(ii) ln(Intangible Investment)	
	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Post × 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 × 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.18). 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., 2023).

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:

$$Intan_i^{2016} = \frac{K_{i,2016}^{int}}{K_{i,2016}^{int} + K_{i,2016}^{tan}} \tag{A.21}$$

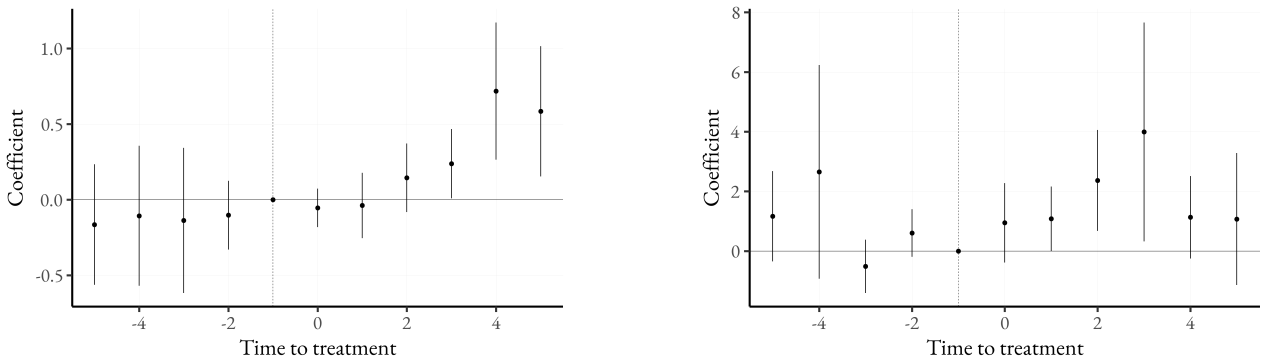
where K^{tan} is the book value of property, plant, and equipment, and K^{int} is the stock of intangible capital constructed using the perpetual inventory method applied to R&D and SG&A expenditures.

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:

$$y_{it} = \alpha_i + \gamma_{n(i)\times t} + \sum_{k \neq 2016} \beta_k \left(\mathbb{1}_{\{t=k\}} \times Intan_i^{2016} \right) + \mathbf{X}_{it}'\delta + \varepsilon_{it} \tag{A.22}$$

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 industry-by-year fixed effects ($\gamma_{n(i)\times t}$), 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



(a) Tangible investment

(b) Intangible investment

Figure A.3: The effect of TCJA on investment for U.S. MNEs

Notes: These figures plot the estimated dynamic effects $\hat{\beta}_k$ from equation (A.22), 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.

tax reform from *within-industry* variation in asset composition.

Panel A.3a 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.3 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 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

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 B.1: The pre-TCJA "Worldwide" system, characterized by deferral and the repatriation tax.
- Section B.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.

B.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.

B.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):

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

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

B.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.

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

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).[8]

B.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.

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:

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

Here, the term $\max(0, \tau_{US}^{pre} - \tau_j)$ captures the residual tax mechanic (regular tax minus FTC) derived in the previous subsection. In our calibration, ι is set to match the observed effective tax rate

[8] 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.

differential between U.S. MNEs and domestic firms prior to 2018, thereby capturing the aggregate economic impact of deferral.

B.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 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)

B.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:

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

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.

B.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:

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

B.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.[9]

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 Quali-

[9] 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.

fied Business Asset Investment (QBAI) across all non–high-tax foreign affiliates, as specified in 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:

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

B.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):

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

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:

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

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:

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

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:

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

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

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:

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

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

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

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

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

For GILTI:

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

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:

$$D^{FDII} = \chi^{FDII} \times \left(\pi_{ii}^{FDII} - R^{FDII}\right), \qquad \text{[Form 8993, Part IV, Line 28]}$$
$$D^{GILTI} = \chi^{GILTI} \times \left(\pi_{ii}^{GILTI} - R^{GILTI}\right). \qquad \text{[Form 8993, Part IV, Line 29]}$$

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

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

This yields the regular tax liability (before BEAT):

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

B.2.5 Total tax liability

Expanding terms, we can map this statutory calculation directly to the economic components presented in Equation (25) 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 B.2.3, the total final tax liability T_{ii} is:

$$T_{ii} = T_{ii}^{Reg} - T_{ii}^{FTC}. \qquad \text{(B.2)}$$

Substituting the components:

$$T_{ii} = \tau_{US}\pi_{ii}^{DEI} - \underbrace{\tau_{US}D^{FDII}}_{\hat{T}_{ii}^{FDII}} + \underbrace{\left(\tau_{US}(\pi_{ii}^{GILTI} - D^{GILTI}) - T_{ii}^{FTC}\right)}_{T_{ii}^{GILTI}}. \tag{B.3}$$

where:

1. $\tau_{US}\pi_{ii}^{DEI}$ is the baseline tax on domestic profits (first term of Equation (25)).
2. $\hat{T}_{ii}^{FDII} = \tau_{US}D^{FDII}$ represents the tax value of the FDII deduction, see Equation (24).
3. T_{ii}^{GILTI} represents the net residual tax on GILTI after the section 250 deduction (D^{GILTI}) and foreign tax credits, see Equation (23).

C 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.

C.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_jk_{ij}). Using carve-out factors $(\chi_{\text{GMT},L}, \chi_{\text{GMT},K})$, we define the carve-out amount (CO_{ij}) and the GloBE tax base (Π_{ij}^G):

$$CO_{ij} \equiv \chi_{\text{GMT},L}W_j\ell_{ij} + \chi_{\text{GMT},K}P_jk_{ij}, \tag{C.1}$$

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

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

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

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:

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

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.

C.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.

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

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

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

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

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).

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

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

C.2.1 Mapping to Main Text 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 (B.3), plus any IIR top-up taxes it must pay on its foreign subsidiaries ($j \in J_F$) derived in (C.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.

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

which corresponds to the total tax liability in Equation (26).

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:

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

which corresponds to the total revenues in Equation (27). 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.

D 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:

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

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.

D.1 Pre-TCJA

D.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

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

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:

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

and

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

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

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

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

and

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

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

For the choice of profit shifting, we have

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

Lastly, for the intangible investment, we have

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

where

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

and

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

and

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

D.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.

D.2 TCJA

D.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

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

where each term has been defined in Section B.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. (2023); (2) for FDII, we fix the value of FDR of each firm using its value 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 liabitlities into equation D.1, we can then solve for U.S. MNEs' optimal decisions. For the parent division, the optimal tangible capital and labor demand are:

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

and

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

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:

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

and

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

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:

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

and

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

Lastly, the optimal intangible investment is:

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

where $DENOM_{US}^{TCJA}$ differs from $DENOM_{US}^{PRE}$ in two ways: (1) changes in marginal product of intangible capital due to chagnes 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

D.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.

D.3 TCJA and GMT outside the U.S.

D.3.1 Optimal decisions of U.S. MNEs

For the parent division and the high-tax jurisdiction foreign subsidiaries of U.S. MNEs, the optimal decisions are the same as in the TCJA regime since the GMT does not apply. For the subsidiaries in LT, the optimal tangible capital and labor demand are affected by the GMT carve-out and the GMT tax rate:

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

and

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

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 $\tilde{W}_{LT}^{GMT} \equiv \frac{\left(1-\left(1-\chi_{GMT,L}\right)\tau_{GMT}\right)}{(1-\tau_{GMT})} W_{LT}$.

The optimal profit shifting shares can be derived from:

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

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

D.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:

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

and

$$\ell_{iLT} = \left\{ \frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}} \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} [P_{LT}^{\varrho} Q_{LT}] \frac{\left(\tilde{r}_{LT}^{GMT}\right)^{\alpha(1-\rho)}}{\left(\tilde{W}_{LT}^{GMT}\right)^{\varrho(1-\alpha)+\alpha}} \left[\sigma_{iLT} A_{LT} a \left(N_{LT} z\right)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}}. \tag{D.25}$$

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

$$\begin{aligned} \bar{R}_{iLT}^{GMT} = &\left(\sigma_{iLT} A_{LT} a \left(N_{LT}\right)^{\phi}\right)^{\frac{\varrho-1}{1-\phi+\phi\varrho}} \cdot \left(P_{LT} Q_{LT}^{\frac{1}{\varrho}}\right) \times \left\{ \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} \left(P_{LT}^{\varrho} Q_{LT}\right) \right\}^{\frac{\rho-1}{\rho}\frac{1-\phi}{1-\phi+\phi\varrho}} \times \\ &\left(\frac{\tilde{W}_{LT}^{GMT}}{1-\phi-\alpha}\right)^{-(\varrho-1)\frac{(1-\alpha-\phi)}{1-\phi+\phi\varrho}} \cdot \left(\frac{\tilde{r}_{LT}^{GMT}}{\alpha}\right)^{-(\varrho-1)\frac{\alpha}{1-\phi+\phi\varrho}} \end{aligned} \tag{D.26}$$

and

$$\begin{aligned} \bar{C}_{iLT}^{GMT} = &\left[\left(\frac{(1-\phi-\alpha)^{\varrho(1-\alpha)+\alpha}}{\alpha^{\alpha(1-\varrho)}} \right)^{\frac{1}{1-\phi+\phi\varrho}} + \left(\frac{\alpha^{\varrho(\alpha+\phi)+(1-\phi-\alpha)}}{(1-\phi-\alpha)^{(1-\alpha-\phi)(1-\varrho)}} \right)^{\frac{1}{1-\phi+\phi\varrho}} \right] \times \\ &\left\{ \left[\frac{(\varrho-1)}{\varrho}\right]^{\varrho} [P_{LT}^{\varrho} Q_{LT}] \left(\tilde{r}_{LT}^{GMT}\right)^{\alpha(1-\varrho)} \left(\tilde{W}_{LT}^{GMT}\right)^{(1-\varrho)(1-\alpha-\phi)} \left[A_{LT} a \left(N_{LT}\right)^{\phi}\right]^{\varrho-1} \right\}^{\frac{1}{1-\phi+\phi\varrho}}. \end{aligned} \tag{D.27}$$

D.3.3 TCJA and GMT only in the U.S.

In this case, the optimal decisions of U.S. MNEs follow the same formulas as in the TCJA and GMT outside U.S. regime. The optimal decisions of non-U.S. MNEs follow the same formulas as in the pre-TCJA regime.

D.3.4 TCJA and GMT in all regions

In this case, the optimal decisions of both U.S. and non-U.S. MNEs follow the same formulas as in the TCJA and GMT outside U.S. regime.

E Additional Tables and Results

Table E.1: Decomposition of TCJA effects by firm type in the no-spillovers model

	Value added				Tangible capital				Intangible capital		
Region	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs	Foreign MNEs	Total	Non MNEs	Dom. MNEs
(a) All TCJA provisions											
USA	0.33	0.30	-0.38	0.41	3.06	1.76	0.17	1.13	1.34	0.01	1.33
Europe	-0.25	-0.26	-0.14	0.15	0.35	-0.12	-0.01	0.48	0.49	-0.04	0.54
Rest of world	-0.32	-0.23	-0.19	0.10	0.23	-0.08	0.00	0.32	0.35	-0.03	0.38
Low tax	0.24	-0.83	-0.31	1.38	3.47	-0.57	-0.15	4.19	-0.01	-0.24	0.23
(b) No GILTI											
USA	0.10	0.27	-0.56	0.40	3.03	1.81	0.07	1.15	0.29	0.02	0.27
Europe	-0.43	-0.32	-0.20	0.10	0.35	-0.12	0.01	0.47	0.59	-0.04	0.63
Rest of world	-0.49	-0.30	-0.26	0.08	0.23	-0.09	0.01	0.31	0.41	-0.03	0.44
Low tax	-0.40	-0.46	-0.15	0.21	0.59	-0.23	0.00	0.82	0.84	-0.09	0.93
(c) No FDII											
USA	2.65	0.93	1.34	0.37	8.01	3.17	3.86	0.97	2.39	0.00	2.39
Europe	0.85	0.19	0.29	0.37	0.36	-0.11	-0.01	0.48	0.35	-0.04	0.39
Rest of world	0.80	0.22	0.36	0.22	0.24	-0.07	-0.00	0.32	0.25	-0.02	0.27
Low tax	1.34	-0.34	-0.03	1.71	3.47	-0.56	-0.16	4.19	-0.24	-0.23	-0.01
(d) No MNE provisions											
USA	2.42	0.89	1.16	0.36	7.96	3.21	3.76	0.99	1.38	0.01	1.36
Europe	0.68	0.12	0.23	0.33	0.36	-0.11	-0.00	0.47	0.44	-0.04	0.48
Rest of world	0.63	0.15	0.29	0.20	0.24	-0.08	0.00	0.32	0.31	-0.02	0.33
Low tax	0.70	0.03	0.14	0.53	0.59	-0.22	-0.01	0.82	0.60	-0.09	0.69

Notes: "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.