Effects of Global Corporate Tax Reform on the US Economy: Extended Abstract*

Sebastian Dyrda
University of Toronto

Guangbin Hong
University of Toronto

Joseph B. Steinberg
University of Toronto

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Motivation

In October 2021, 136 countries representing 90 percent of the world's GDP signed onto a policy designed by the OECD and G20 governments to reduce profit shifting by multinational enterprises (MNE). The agreement outlines two major policy changes, or "pillars."[1] The first pillar is revenue-based profit allocation, which allocates the rights to tax some of an MNE's profits to the countries in which it operates in proportion to these countries' shares of the MNE's global sales. The second is a global minimum corporate income tax, which would require that all corporate income, regardless of where it is booked, be effectively taxed at no lower than 15 percent.

Since signing the agreement, the proposal has gained traction across the world and a number of countries have committed to implementation of a global minimum tax within the next year.[2] Notably, the Council of the European Union (EU) recently approved a directive that requires EU countries to implement such a policy by the end of 2023, and policymakers anticipate that this directive could lead to a wave of implementation around the world.[3]

At the same time, the United States—the country that hosts the largest share of MNEs in the world—has made almost no progress toward implementation of the OECD proposal.

*Steinberg: joseph.steinberg@utoronto.ca; Hong: g.hong@mail.utoronto.ca; Dyrda: sebastian.dyrda@utoronto.ca. Address: University of Toronto, Max Gluskin House, 150 St. George Street, Toronto, ON M5S 3G7, Canada.

[1]The press statement and a description of these pillars can be found here.

[2]Pillar Two Country Tracker developed by PricewaterhouseCoopers provides the status of implementation in different countries and regions, see the link here.

[3]See the press statement of the Council of the EU here.

The prospects for significant progress in the future are bleak, given the scale of political disagreements in the United States and the upcoming presidential election in 2024. How would corporate income tax reform by other countries affect the U.S. economy? Would it be better or worse for the United States to implement such reform after other countries do so? What would be the optimal U.S. response to tax reform in other countries? In this paper, we use a calibrated general equilibrium model to study these issues and elucidate the key economic mechanisms at play. Specifically, we ask:

1. How would global corporate tax reform affect U.S. MNEs? What would be their optimal response in terms of foreign affiliate location and intangible investment?

2. What are the aggregate macroeconomic and fiscal consequences of unilateral implementation of global corporate tax reform by major U.S. trade partners and FDI destinations such as the European Union, India, or China? What about multilateral implementation including the United States as well?

3. How do different elements of global corporate income tax reform interact, both at the micro and macro levels, with the MNE-related provisions introduced by the Tax Cuts and Jobs Act in 2017 (TCJA)?

4. What should be the U.S. response to a unilateral implementation of global corporate tax reform by other major global players?

Methodology

To address these questions, we extend the framework developed in Dyrda et al. (2022) and Dyrda et al. (2023) (jointly, DHS) to account for the details and specificity of the U.S. tax code regarding MNEs. The DHS framework is a general equilibrium environment with heterogeneous firms in the tradition of the international macroeconomics literature that synthesizes Helpman et al. (2004) and McGrattan and Prescott (2009). There are several "productive" regions, each populated by a representative household, a measure of heterogeneous firms, and a government. These regions differ in population, total factor productivity, trade costs, FDI costs, and corporate income taxes. Firms in each region decide the following: where to export and where to establish foreign subsidiaries; how much labor and tangible capital to hire in the parent division and each foreign subsidiary; and how much intangible capital to produce in the parent division. Intangible capital is nonrival and is used simultaneously in all of a firm's divisions. Multinational firms (firms with foreign affiliates) 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. Additionally, there is an "unproductive" tax haven that is populated by a representative household and a government, where no economic activity takes place. MNEs based in high-tax regions can also transfer their intangible capital rights to the tax haven, provided that they have established subsidiaries there. We provide a detailed description of the model in the Appendix A.

We modify the DHS framework to reflect the specific way the U.S. tax code treats multinational enterprises. Under the 2017 Tax Cuts and Jobs Act (TJCA), the United States no longer has a worldwide tax system for taxing corporate income, but it does not have a truly territorial system either. Instead, it now has a hybrid system with some worldwide taxation for certain foreign income a tax on certain cross-border transactions. One defining feature of the new rules is that U.S. MNEs can now pay foreign dividends to U.S. shareholders without paying U.S. corporate taxes; qualified dividends are now completely exempt from U.S. taxation. Understanding how global corporate income tax reform would interact with the TCJA is one of the main challenges of the project. To meet this challenge, we incorporate five key TCJA provisions that materially changed the way MNEs are taxed, especially on the income generated by their intangible capital deployed abroad:

1. Lower statutory corporate tax rate. The statutory federal corporate tax rate was lowered from 35 percent to 21 percent.

2. Territorial tax system. Prior to TCJA, the United States had a worldwide corporate tax system under which MNEs' foreign corporate income was taxed at the domestic tax rate (35 percent) upon repatriation, with credits for taxes paid abroad. Under the TCJA, MNEs' foreign income is largely exempt from taxation through the adoption of a territorial tax system, although territorial treatment is subject to the constraints of several measures intended to protect the corporate tax base from erosion due to profit shifting.

3. A new reduced tax rate was created for domestic income from intangibles earned from foreign sources (Foreign Derived Intangible Income, or FDII).

4. The minimum tax on global intangible low-taxed income (GILTI) imposed a 10.5 percent minimum tax without deferral on profits earned abroad that exceed a firm's "normal" return (defined in the law as 10 percent on the adjusted basis in tangible property

held abroad). Companies can use 80 percent of their foreign tax credits, calculated on a worldwide basis, to offset this minimum tax.

5. A tax was placed on cross-border expenses between a parent company and its subsidiaries (Base Erosion and Anti-abuse Tax, or BEAT).

A detailed description of the model and our implementation of these provisions can be found in Appendix A.

Experiments and preliminary results

We will calibrate the model's parameters so that its equilibrium reproduces salient facts about production, trade, FDI, and profit shifting under the current international tax regime. Then, we will conduct a series of counterfactual exercises in which we change different aspects of this regime to study how they would affect the U.S. economy:

1. Abolish each TJCA component, both separately and jointly, to study the effects of these recent changes to the U.S. tax code.

2. Introduce a global minimum corporate income tax in one or more regions other than the United States to study how the U.S. economy would respond to foreign tax reform.

3. Introduce a global minimum corporate income tax in in the United States as well as in the rest of the world to study how worldwide adoption of this policy would affect the U.S. economy.

4. Combine 1 with 2 and 3 to study how the TCJA provisions interact with international corporate income tax reform.

5. Study the optimal responses for the United States to 2.

We have already conducted a preliminary version of 2 and 3 using a version of the model with three productive regions: the United States, Europe, and the rest of the world. Table 1 shows the effects of introducing a 15% global minimum corporate tax in one or more regions of the world.

Panels (a)–(c) show the effects of each region unilaterally introducing a global minimum tax on its own. A global minimum tax in the United States would reduce profit shifting by U.S. MNEs by about 2/3 and the U.S. government's corporate income tax revenue by about 2%. In terms of macroeconomic consequences, output would fall slightly in the United

States, but would actually reduce output around the world even more. The reason is that this policy would reduce U.S. MNEs' intangible investment, and these firms play large roles in many other countries' economies. By contrast, the macroeconomic consequences of a global minimum tax in Europe would largely be felt only within Europe itself; the U.S. economy and that of the rest of the world would not be materially impacted. A minimum tax in the rest of the world would hurt both the United States and Europe; in fact, this would hurt the U.S. economy more than if the United States were to unilaterally introduce a minimum corporate income tax.

Panel (d) shows the effects of a global minimum tax introduced in Europe and the rest of the world without any policy change in the United States. This would reduce intangible investment and output worldwide, although the United States would be least affected. Panel (e) shows the effects of a worldwide global minimum tax. This would hurt all regions significantly more than any of the policies in panels (a)–(d). In particular, there is an important interaction between minimum taxes in the U.S. and in the other regions. For example, the effect on U.S. GDP in panel (e) is -0.12%, which is two times larger than the the sum of the effects in panels (a) and (e).

There are two key takeaways from these preliminary results that highlight the unique role of U.S.-based MNEs in the global economy. First, a global minimum tax in the United States would have far-reaching macroeconomic consequences even if other countries do not introduce such a policy. Second, these consequences would be much more severe if, as seems likely, other countries do in fact introduce such a policy.

Table 1: Preliminary results for global minimum corporate income tax

Region	Lost profits (benchmark = 1)	Corp. tax rev. (% chg.)	Value added (% chg.)				Tech. capital (% chg.)		
			Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs
(a) US only									
USA	0.34	1.91	-0.02	0.02	-0.07	0.00	-0.11	0.07	-0.23
Europe	1.00	-0.02	-0.07	-0.07	-0.07	-0.08	-0.08	-0.04	-0.12
Low tax	0.96	-0.67	-0.09	-0.06	-0.10	-0.14	0.01	-0.01	0.03
Rest of world	1.00	-0.00	-0.04	-0.04	-0.04	-0.07	-0.00	-0.00	-0.00
(b) Europe only									
USA	1.00	0.03	0.01	0.02	0.01	-0.05	0.02	0.02	0.01
Europe	0.26	3.03	-0.08	-0.04	-0.17	-0.02	-0.32	-0.06	-0.53
Low tax	0.70	-4.43	-0.08	-0.02	-0.08	-0.18	0.01	0.00	0.03
Rest of world	1.00	-0.01	-0.00	0.00	-0.00	-0.05	-0.00	0.00	-0.01
(c) Rest of world only									
USA	1.00	0.03	-0.03	-0.02	-0.03	-0.07	-0.05	-0.01	-0.08
Europe	1.00	-0.05	-0.08	-0.07	-0.07	-0.09	-0.08	-0.08	-0.09
Low tax	0.83	-2.55	-0.16	-0.05	-0.06	-0.45	-0.06	-0.00	-0.11
Rest of world	0.19	1.62	-0.04	0.00	-0.08	-0.01	-0.15	0.01	-0.26
(d) All regions except US									
USA	1.00	0.01	-0.04	-0.02	-0.03	-0.14	-0.03	-0.02	-0.04
Europe	0.26	3.00	-0.13	-0.07	-0.21	-0.09	-0.38	-0.09	-0.62
Low tax	0.54	-6.97	-0.22	-0.04	-0.14	-0.56	0.01	-0.00	0.01
Rest of world	0.19	1.62	-0.04	0.00	-0.08	-0.06	-0.15	0.01	-0.26
(d) All regions including US									
USA	0.34	1.85	-0.12	-0.06	-0.15	-0.18	-0.20	-0.02	-0.32
Europe	0.26	3.00	-0.17	-0.11	-0.25	-0.16	-0.38	-0.09	-0.62
Low tax	0.49	-7.62	-0.28	-0.09	-0.18	-0.66	0.01	-0.00	0.01
Rest of world	0.19	1.61	-0.09	-0.04	-0.12	-0.14	-0.15	0.01	-0.26

Notes: Lost profits are measured relative to the status quo. Note that for the low-tax region, lost profits are negative in both the benchmark equilibrium and in the policy counterfactuals, i.e., profits are shifted inward to the low-tax region. However, the magnitude of these lost profits are smaller in the counterfactuals.

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Appendix

A Quantitative model

Here we provide more details about the quantitative model, which builds closely on Dyrda et al. (2022) and Dyrda et al. (2023). 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 costs, FDI costs, labor income taxes, and corporate income taxes. Households choose consumption, labor supply, tangible investment, and bond holdings. Intermediate firms in each region differ in productivity a. Each intermediate firm produces a unique variety ω, which is used to produce final goods by final good producers in each region. Intermediate 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 with foreign affiliates) 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.

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.

A.1 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

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

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,

$$P_{it}[(1+\tau_{ict})C_{it} + X_{it}] + P_{bt}B_{it+1} = (1-\tau_{i\ell t})\, W_{it}L_{it} + (1-\tau_{ikt})R_{it}K_{it} + B_{it} + D_{it}, \tag{A.2}$$

a law of motion for tangible capital,

$$K_{it+1} = (1-\delta)K_{it} + X_{it}, \tag{A.3}$$

and initial conditions on capital and bonds, K_{i0} and B_{i0}. Households take 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. The first-order conditions of the household's problem are

$$\frac{C_{it}/N_i}{1 - L_{it}/N_i} = \frac{(1-\tau_i)W_{it}}{(1+\tau_{cit})P_{it}}, \tag{A.4}$$

$$P_{bt} = \beta \frac{C_{it}}{C_{it+1}} \frac{P_{t+1}}{P_t}, \tag{A.5}$$

$$1 = \beta \frac{C_{it}}{C_{it+1}} \left(1 - \delta + \frac{(1-\tau_{ikt+1})R_{it+1}}{P_{it+1}}\right). \tag{A.6}$$

We define r_{it} as the ex-depreciation rental rate on tangible capital. Note that in a steady state, the Euler equation for capital is

$$1 = \beta\left(1 - \delta + \frac{(1-\tau_{ik})R_i}{P_i}\right) \Rightarrow R_i = \frac{P_i}{(1-\tau_{ik})}\left[\frac{1-\beta}{\beta}\delta\right]. \tag{A.7}$$

A.2 Final goods

Each region has a representative final-good producer that combines domestic and foreign products into a nontradable aggregate that is bought by households and the government for consumption. The final good is a constant-elasticity-of-substitution aggregate of products

from different source countries.

$$Q_{it} = \left[\sum_{j=1}^{J} \int_{\Omega_{jit}} q_{jit}(\omega)^{\frac{\varrho-1}{\varrho}} d\omega \right]^{\frac{\varrho}{\varrho-1}}, \tag{A.8}$$

where $q_{jit}(\omega)$ is the quantity of variety ω from region j, Ω_{jit} is the set of 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

$$p_{jit}(\omega) = P_{it} Q_{it}^{\frac{1}{\varrho}} q_{jit}(\omega)^{-\frac{1}{\varrho}}. \tag{A.9}$$

The aggregate price index is

$$P_{it} = \left[\sum_{j=1}^{J} \int_{\Omega_{jit}} p_{jit}(\omega)^{1-\varrho} d\omega \right]^{\frac{1}{1-\varrho}}. \tag{A.10}$$

A.3 Intermediate firm

We describe the intermediate firm's before-tax profits in this section, followed by the tax treatment of MNEs under the Tax Cut and Job Act (TCJA). More details on the intermediate firm's problem can be found in Dyrda et al. (2023).

The domestic parent corporation's before-tax profits, $\pi_{ii}(a, z; J_x)$, are given by

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

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. Before-tax profits in foreign affiliates in high-tax

regions are given by

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

where we use $\hat{q}_{ij}$ to denote intermediate goods produced by a region i based MNE's foreign affiliate in region j. The low-tax affiliates' before-tax profits are

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

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. Finally, the before-tax profits of the tax-haven affiliate, which only include licensing fees, are given by

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

It is also useful to define $\hat{\pi}$ as follows

$$\pi_{ii}(a,z;J_X) = (1-\tau_i)\left(p_{ii}(q_{ii})q_{ii} + \sum_{j\in J_X} p_{ij}q_{ij} - W_i\ell_{ii} - \delta P_i k_{ii}\right) - r_i k_{ii} \tag{A.15}$$

and

$$\hat{\pi}_{ij}(a,z) = (1-\tau_j)(p_{ij}(\hat{q}_{ij})\hat{q}_{ij} - W_j\ell_{ij} - \delta P_j k_{ij}) - r_j k_{ij}. \tag{A.16}$$

A.4 Taxing MNEs under TCJA

The Tax Cut and Job Act (TCJA) introduces several rules for the taxation of multinational enterprises, including Global Intangible Low-Taxed Income (GILTI), Foreign Derived Intangible Income (FDII), and Base Erosion and Anti-abuse Tax (BEAT). We present how these new rules affect tax liabilities of MNEs, either based in the U.S. or have foreign subsidiaries in the U.S., through the lens of our model here.

A.4.1 GILTI

Global intangible low-taxed income (GILTI) is an income category that is earned abroad by U.S.-controlled foreign corporations (CFCs) and is subject to special treatment under the U.S. tax code. Before GILTI, dividends earned by CFCs are subject to U.S. corporate income tax when they are repatriated. GILTI decreases tax liabilities of income earned from intangible assets by U.S. MNEs' foreign CFCs. Thus, it is designed to discourage businesses from shifting easily movable intangible assets to low-tax jurisdictions for the purpose of profit shifting.

Consider an MNE based in the U.S., denoted by i, with a subsidiary in a jurisdiction j. First, let us define the net tested income (NTI) as $\pi_{ij}^{NTI} \equiv \pi_{ij}$, and the subsidiary's tax payments in jurisdiction j as $T_{ij} \equiv \tau_j \times \pi_{ij}$. Then, apply the Qualified Business Asset Investment (QBAI) deduction, which is a 10 percent tax exemption for U.S. multinationals based on the tangible depreciable asset base. The GILTI tax base is calculated as $\chi^{GILTI} =$ 50% of NTI net of $\chi^{QBAI} = 10\%$ of QBAI:

$$\pi_{ij}^{GILTI} \equiv \chi^{GILTI} \times \left(\pi_{ij}^{NTI} - \chi^{QBAI} \times p_j k_{ij}\right). \tag{A.17}$$

The tax liability on GILTI is then given by

$$T_{ij}^{GILTI} \equiv \tau_i \times \pi_{ij}^{GILTI}. \tag{A.18}$$

Now, the company has to calculate its foreign tax credits that would deduct its tax liability on GILTI. The deduction is the minimum of two accounting terms, namely deemed paid foreign taxes (DPFT) and foreign tax credit limitation (FTCL). First, businesses can use $\chi^{DPFT} = 80\%$ of their foreign tax payments to offset GILTI. Thus deemed paid foreign taxes (DPFT) is

$$T_{ij}^{DPFT} \equiv \chi^{DPFT} \times T_{ij}. \tag{A.19}$$

Second, foreign tax credit rules require some U.S. expenses to be allocated to foreign income. Assume that x_{ij} of U.S. expenses are allocable to the foreign subsidiary in j, which in the model is the fixed entry cost κ_{ij} to set up a foreign subsidiary in j. Then, we subtract those expenses from the GILTI tax base to define deemed foreign income (DFI), $\pi_{ij}^{DFI} \equiv \pi_{ij}^{GILTI} - \kappa_{ij}$. The foreign tax credit limitation (FTCL) is then calculated as

$$T_{ij}^{FTCL} \equiv \tau_i \times \pi_{ij}^{DFI}. \tag{A.20}$$

Therefore, the additional tax the MNE pays on top of the foreign taxes already paid by the subsidiary, residual U.S. Tax (RT), is given by

$$T_{ij}^{RT} \equiv T_{ij}^{GILTI} - T_{ij}^{FTC}. \tag{A.21}$$

where $T_{ij}^{FTC} \equiv \min\left(T_{ij}^{DPFT}, T_{ij}^{FTCL}\right)$. This additional tax liability is paid by the U.S. shareholders of the foreign subsidiary.

A.4.2 FDII

Foreign Derived Intangible Income (FDII) is a special earnings category that comes from the sale of products related to intellectual property. FDII provides a low tax rate of 13.125% for this earnings category, which aims to increase the incentive of U.S. MNEs to keep the property right and related income of their intellectual properties in the U.S.

Consider the headquarter corporation of a U.S. MNE. The calculation of FDII starts with the determination of Deemed Eligible Income and Foreign-Derived Deduction Eligible Income (FDDEI) of the company:

$$\begin{aligned}
\pi_{ii}^{DEI} &\equiv \sum_{j \in J_X \cup \{i\}} p_{ij} q_{ij} + \varphi \lambda_i z_i \sum_j \vartheta_{ij}(z_i) + (1-\lambda_i) z_i \sum_{j \neq i} \vartheta_{ij}(z_i) \\
\pi_{ii}^{FDDEI} &\equiv \sum_{j \in J_X} p_{ij} q_{ij} + \varphi \lambda_i z_i \sum_j \vartheta_{ij}(z_i) + (1-\lambda_i) z_i \sum_{j \neq i} \vartheta_{ij}(z_i)
\end{aligned} \tag{A.22}$$

where DEI includes all income of the headquarter corporation and FDDEI includes income from goods exports, sales of the intangible capital, and licensing fee receipts from foreign subsidiaries. The firm's FDII is then calculated as the foreign derived income minus $\chi^{QBAI} = 10\%$ of the Qualified Business Asset Investment (QBAI) portion for the purpose of foreign income, given by

$$\pi_{ii}^{FDII} \equiv \pi_{ii}^{FDDEI} - \chi^{QBAI} \times p_i k_{ii} \times \frac{\pi_{ii}^{FDDEI}}{\pi_{ii}^{DEI}}. \tag{A.23}$$

This company would then be allowed to deduct $\chi^{FDII} = 37.5\%$ of its FDII against its taxable income. The remaining portion is taxed at the U.S. corporate tax rate. So the FDII liability is

$$T_{ii}^{FDII} \equiv \tau_i \times \left(1 - \chi^{FDII}\right) \times \pi_{ii}^{FDII}. \tag{A.24}$$

A.4.3 BEAT

The Base Erosion and Anti-abuse Tax (BEAT) works as a 10% minimum tax for MNEs that pay "base erosion payments" to foreign-related entities. BEAT applies to both U.S. MNEs and foreign MNEs that have U.S. subsidiaries. The BEAT applies only to large multinational enterprises, those with gross receipts of more than $500 million. It also applies only to a corporation that makes more than 3 percent of its total deductible payments to foreign affiliates. And it is also designed to discourage U.S. and foreign MNEs from shifting profits out of the U.S.

Consider the MNE with its parent division located in a jurisdiction j with a subsidiary in the U.S., denoted by i. As with GILTI, define the MNE's net taxable income in the U.S. as $\pi_{ji}^{NTI} \equiv \pi_{ji}$. The "base erosion payments" are this corporation's payments to a foreign subsidiary based in another country. In our case, it is the licensing fee paid to the tax haven for U.S. MNEs and the full licensing fee for foreign subsidiaries operating in the U.S.

$$\pi_{ii}^{BEAT} \equiv \lambda_i \cdot \vartheta_{ii}(z_i)\, z_i \tag{A.25}$$

$$\pi_{ji}^{BEAT} \equiv \vartheta_{ji}(z_j)\, z_j,\ \forall j \neq i. \tag{A.26}$$

Then, the BEAT modified taxable income (MTI) is $\pi_{ji}^{MTI} \equiv \pi_{ji}^{NTI} + \pi_{ji}^{BEAT}$. The BEAT tax liability is then

$$T_{ji}^{BEAT} \equiv \tau_i^{BEAT} \times \left(\pi_{ji}^{NTI} + \pi_{ji}^{BEAT}\right) \tag{A.27}$$

where $\tau_i^{BEAT} = 10\%$ and will increase to 12.5% in 2026.

A.5 Tax liabilities and dividend

With the introduction of the special tax rules in TCJA, we are now ready to derive firms' tax liabilities and after-tax dividend payout. We do this separately for U.S. and non-U.S. MNEs as they are affected by TCJA in different ways.

U.S. MNEs. U.S. MNEs' profits earned by the headquarter is subject to FDII and BEAT, and profits earned by foreign affiliates are subject to GILTI. All these extra tax liabilities are

paid by the headquarter. Then, U.S. MNEs' total dividend payout can be written as

$$
\begin{aligned}
d_i(a; J_X, J_F) =& \hat{\pi}_{ii}\left(a, z; J_X\right) + (1-\tau_i)\Bigg(-(\lambda_{LT}+\lambda_{TH})\vartheta_{ii}(z) + (1-\lambda_{LT}-\lambda_{TH})\sum_{j\in J_F}\vartheta_{ij}(z) \\
&\quad - W_i/A_i - W_i\big(\mathcal{C}_{i,LT}(\lambda_{LT}) + \mathcal{C}_{i,TH}(\lambda_{TH})\big)\nu_i(z) + \left(\varphi_{LT}\lambda_{LT} + \varphi_{TH}\lambda_{TH}\right)\nu_i(z)\Bigg)z \\
&\quad - T_{ii}^{BEAT}\left(a, z\right) + \hat{T}_{ii}^{FDII}\left(a, z\right) \\
&+ \hat{\pi}_{iLT}(a, z) + (1-\tau_{LT})\Bigg(\lambda_{LT}\sum_{j\in J_F\cup\{i\}\setminus\{LT\}}\vartheta_{ij}(z) - (1-\lambda_{LT})\vartheta_{iLT}(z) - \varphi_{LT}\lambda_{LT}\nu_i(z)\Bigg)z \\
&\quad - T_{iLT}^{RT}\left(a, z\right) \\
&+ (1-\tau_{TH})\Bigg(\lambda_{TH}\sum_{j\in J_F\cup\{i\}}\vartheta_{ij}(z) - \varphi_{TH}\lambda_{TH}\sum_{j\in J_F\cup\{i\}}\vartheta_{ij}(z)\Bigg)z - T_{iTH}^{RT}\left(a, z\right) \\
&+ \sum_{j\in J_F}\left[\hat{\pi}_{ij}\left(a, z\right) - T_{ij}^{RT}\left(a, z\right)\right] \\
&- (1-\tau_i)\left(W_i/A_i\right)z
\end{aligned} \tag{A.28}
$$

where $\hat{T}_{ii}^{FDII} = \chi^{FDII} \times \tau_i \times \pi_{ii}^{FDII}$ is the tax deduction from FDII.

Non-U.S. MNEs. Non-U.S. MNEs' profits are subject to BEAT only if they have a subsidiary in the U.S. MNEs that do not operate in the U.S. are not directly affected by the tax rules in TCJA. Then, non-U.S. MNEs' total dividend payout can be written as

$$
\begin{aligned}
d_i(a; J_X, J_F) =& \hat{\pi}_{ii}\left(a, z; J_X\right) + (1-\tau_i)\Bigg[\Bigg(-(\lambda_{LT}+\lambda_{TH})\vartheta_{ii}(z) + (1-\lambda_{LT}-\lambda_{TH})\sum_{j\in J_F}\vartheta_{ij}(z) \\
&\quad - W_i/A_i - W_i\big(\mathcal{C}_{i,LT}(\lambda_{LT}) + \mathcal{C}_{i,TH}(\lambda_{TH})\big)\nu_i(z) + \left(\varphi_{LT}\lambda_{LT} + \varphi_{TH}\lambda_{TH}\right)\nu_i(z)\Bigg)z\Bigg] \\
&+ \hat{\pi}_{iLT}(a, z) + (1-\tau_{LT})\Bigg(\lambda_{LT}\sum_{j\in J_F\cup\{i\}\setminus\{LT\}}\vartheta_{ij}(z) - (1-\lambda_{LT})\vartheta_{iLT}(z) - \varphi_{LT}\lambda_{LT}\nu_i(z)\Bigg)z \\
&+ (1-\tau_{TH})\Bigg(\lambda_{TH}\sum_{j\in J_F\cup\{i\}}\vartheta_{ij}(z) - \varphi_{TH}\lambda_{TH}\sum_{j\in J_F\cup\{i\}}\vartheta_{ij}(z)\Bigg)z \\
&+ \sum_{j\in J_F}\left(\hat{\pi}_{ij}\left(a, z\right) - 1_{\{j=US\}}T_{ij}^{BEAT}\left(a, z\right)\right) \\
&- (1-\tau_i)\left(W_i/A_i\right)z
\end{aligned} \tag{A.29}
$$

Intermediate firm's problem. An intermediate firm's objective is to maximize its dividend payout in each period, defined by (A.28) and (A.29), by choosing the following ob-

jects: where to export and open foreign affiliates, J_X and J_F; how much intangible capital to produce, z; how much local labor and tangible capital to hire in each of its divisions, $\boldsymbol{\ell} = (\ell_{ij})_{j\in I}$ and $\boldsymbol{k} = (k_{ij})_{j\in I}$; how much to sell to each of its markets through exporting and/or FDI, $\boldsymbol{q} = (q_{ij}, \hat{q}_{ij})_{j\in I}$; and how much of its intangible capital property rights to shift, $\boldsymbol{\lambda} = (\lambda_{LT}, \lambda_{TH})$. We denote the firm's policy functions by $z_{it}(a)$, $J_{iXt}(a)$, $J_{iFt}(a)$, $\boldsymbol{\ell}_t(a)$, $\boldsymbol{k}_t(a)$, $\boldsymbol{q}_{it}(a)$, $\boldsymbol{p}_{it}(a)$, $\boldsymbol{\lambda}_t(a)$, and $\boldsymbol{\vartheta}_{it}(a)$.

A.6 Aggregation and accounting measures

We revert to expressing firms' choices as functions of their varieties (ω) for notational brevity in defining national accounting measures and other macroeconomic aggregates.

Gross domestic product. Nominal GDP in each region i is the total value of goods produced by domestic firms and local affiliates of foreign MNEs:

$$GDP_{it} = \sum_{j=1}^{I} \int_{\omega\in\Omega_j, i\in J_{Ft}(\omega)} p_{jit}(\omega) q_{jit}(\omega)\, d\omega. \tag{A.30}$$

We compute real GDP by deflating by the consumer price index P_{it} defined in (A.10).

Goods trade. Aggregate exports and imports of goods are given by

$$EX^G_{it} = \sum_{j\neq i} \int_{\Omega_i} p_{ijt}(\omega)\,(1+\xi_{ij})\, q_{ijt}(\omega)\, d\omega, \tag{A.31}$$

$$IM^G_{it} = \sum_{j\neq i} \int_{\Omega_j} p_{jit}(\omega)\,(1+\xi_{ji})\, q_{jit}(\omega)\, d\omega. \tag{A.32}$$

where ξ_{ji} is the bilateral trade cost from region j to region i.

Services trade. Intangible capital licensing fees enter the national accounts as net exports of intellectual property services. High-tax regions' services trade flows are given by

$$EX^S_{it} = \sum_{j\neq i} \int_{\Omega_i} \left[1 - \lambda_{LT,t}(\omega) - \lambda_{TH,t}(\omega)\right] \vartheta_{ijt}(\omega) z_{it}(\omega)\, d\omega, \tag{A.33}$$

$$IM^S_{it} = \sum_{j\neq i} \int_{\Omega_i} \left[\lambda_{LT,t}(\omega) + \lambda_{TH,t}(\omega)\right] \vartheta_{ijt}(\omega) z_{it}(\omega)\, d\omega + \sum_{j\neq i} \int_{\Omega_j} \vartheta_{jit}(\omega) z_{it}(\omega)\, d\omega. \tag{A.34}$$

The low-tax region's services trade flows are

$$EX^S_{LT,t} = \sum_{j \neq i} \int_{\Omega_i} \left[1 - \lambda_{TH,t}(\omega)\right] \vartheta_{ijt}(\omega) z_{it}(\omega) \; d\omega + \sum_{j \neq i} \int_{\Omega_j} \lambda_{LT,t} \vartheta_{jit}(\omega) z_{it}(\omega) \; d\omega, \tag{A.35}$$

$$IM^S_{LT,t} = \sum_{j \neq i} \int_{\Omega_i} \lambda_{TH,t}(\omega) \vartheta_{ijt}(\omega) z_{it}(\omega) \; d\omega + \sum_{j \neq i} \int_{\Omega_j} \left[1 - \lambda_{LT,t}(\omega)\right] \vartheta_{jit}(\omega) z_{it}(\omega) \; d\omega. \tag{A.36}$$

We can also write the tax haven's services exports as

$$EX^S_{TH,t} = \sum_{j=1}^{I} \int_{\Omega_j} \lambda_{TH,t} \vartheta_{jit}(\omega) z_{it}(\omega) \; d\omega. \tag{A.37}$$

Net factor receipts and payments. Net factor receipts from (payments to) are the sum total of the dividends paid by foreign subsidiaries of domestic multinationals (domestic subsidiaries of foreign multinationals):

$$NFR_{it} = \sum_{j \neq i} \int_{\Omega_i} d_{ijt}(\omega) \; d\omega, \tag{A.38}$$

$$NFP_{it} = \sum_{j \neq i} \int_{\Omega_j} d_{jit}(\omega) \; d\omega \tag{A.39}$$

where we define d_{ijt} as the profits that an MNE based in region i earns in region j net of tax liabilities paid to the government in j

$$d_{ijt}(\omega) = (1 - \tau_i)\pi_{ijt}(\omega) - \mathbb{1}_{\{j=US\}} \times T^{BEAT}_{ijt}(\omega), \; j \neq i. \tag{A.40}$$

Profit shifting. Following Dyrda et al. (2022), we define $\tilde{\pi}_{ijt}(\omega)$ as the profits a firm would have reported in region j if it did not shift profits, holding fixed all of its other policy functions. Then, we can define the profits shifted out of region j by firm ω as

$$ps_{ijt}(\omega) = \tilde{\pi}_{ijt}(\omega) - \pi_{ijt}(\omega). \tag{A.41}$$

When $ps_{ijt}(\omega) > 0$, this indicates that the firm would book more profits in region j in the absence of profit shifting, i.e., the firm has shifted profits away from region j. Aggregating firm-level shifted profits yields the total profits shifted out of region j:

$$PS_{jt} = \sum_{i=1}^{I} \int_{\Omega_i} ps_{ijt}(\omega) \; d\omega. \tag{A.42}$$

A.7 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:

$$P_{it}G_{it} = \tau_{i\ell t}W_{it}L_{it} + \sum_{j=1}^{I}\int_{\Omega_j} T_{jit}(\omega)\ d\omega \tag{A.43}$$

where we define T_{jit} as total tax liabilities that an MNE based in region j pays in region i. For corporations in the U.S., we have

$$T_{iit}(\omega) = \tau_{it}\pi_{iit}(\omega) - \hat{T}_{ii}^{FDII}(\omega) + T_{ii}^{BEAT}(\omega) + \sum_{j\in J_F\cup TH} T_{ijt}^{RT}(\omega),\ i = US \tag{A.44}$$

$$T_{jit}(\omega) = \tau_{it}\pi_{jit}(\omega) + T_{jit}^{BEAT}(\omega),\ j \neq i, i = US. \tag{A.45}$$

For corporations in other regions, we have

$$T_{jit}(\omega) = \tau_i\pi_{jit}(\omega),\ i \neq US. \tag{A.46}$$

Government consumption, G_i, is an exogenous parameter. In our calibration, we set it equal to total tax revenues, but in our counterfactual experiments we hold it fixed and adjust the labor income tax rate, τ_{ilt}, to restore fiscal balance.

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

$$\begin{aligned} L_{it} =& \sum_{j=1}^{I}\int_{\Omega_j} \ell_{jit}(\omega)\ d\omega + \int_{\Omega_i}\left[\frac{z_{it}(\omega)}{A_i} + \sum_{j\in J_{Xt}(\omega)}\kappa_{iX} + \sum_{j\in J_{Ft}(\omega)}\kappa_{iF} + \mathbb{1}_{\left\{\lambda_{TH,t}(\omega)>0\right\}}\kappa_{i,TH}\right]\ d\omega \\ &+ \int_{\Omega_i}\left[\mathcal{C}_{i,TH}(\lambda_{TH,t}(\omega)) + \mathcal{C}_{i,LT}(\lambda_{LT,t}(\omega))\right]\nu(\omega)z_{it}(\omega)\ d\omega. \end{aligned} \tag{A.47}$$

Capital market. The capital market clearing condition is

$$K_{it} = \sum_{j=1}^{I} \int_{\Omega_j} k_{jit}(\omega)\ d\omega. \tag{A.48}$$

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:

$$Q_{it} = C_{it} + G_i + X_{it}. \tag{A.49}$$

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

$$EX_{it}^G + EX_{it}^S - IM_{it}^G - IM_{it}^S + NFR_{it} - NFP_{it} = P_{bt}B_{it+1} - B_{it}. \tag{A.50}$$

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 (A.1)–(A.10);
2. the firm's profit-maximization problem (A.28) and (A.29);
3. the labor market clearing condition (A.47);
4. the capital market clearing condition (A.48);
5. the government's budget constraint (A.43); and
6. the balance of payments (A.50).

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.[4]

[4]In this class of model there are many possible stationary equilibria, each associated with a different vector of bond holdings (Kehoe et al., 2018). Given a set of initial conditions, the stationary equilibrium to which the model will converge in the long run is unique, but solving for transition dynamics is an immense computational undertaking. Our assumption that all countries have balanced current accounts is common in the literatures on both trade and international macro.