The Ripple Effects of Global Tax Reform on the U.S. Economy

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Motivation

Introduction

Multinational Enterprises (MNEs) shift large portions of their profits to tax havens, reducing tax revenues in their home countries by hundreds of billions of dollars per year

- Tørsløv et al. (2022): 36% of global MNE profits shifted to tax havens
- OECD: $240 bn. (10%) of global corporate tax revenues lost annually

In October 2021, 136 countries representing 90% of global GDP signed onto historic policy framework designed by OECD/G20 to address profit shifting

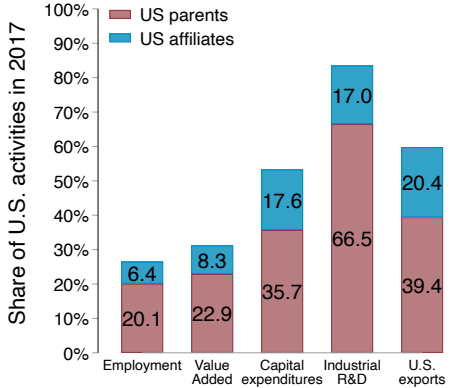
- Pillar 1: Sales-based allocation of profit taxation rights
- Pillar 2: Global minimum corporate income tax (GMT)

Since then:

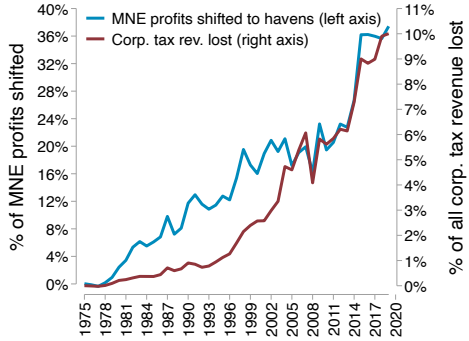
- EU has implemented GMT starting from January 1, 2024, followed by many countries.
- No progress on either pillar in the US, which implements unilateral provisions as part of TCJA

Importance of MNEs and profit shifting in the United States

Introduction



(a) Importance of MNEs



(b) Rise of profit shifting

What we do

Introduction

1. Develop a **quantitative framework** to study the effects of the GMT and TCJA on the US economy.

   → Incorporate profit shifting through transfer of the property rights to intangible capital
   → Incorporate MNEs related provisions introduced by the Tax Cuts and Jobs Act (TCJA) and their interactions with the profit shifting
   → Incorporate spillovers associated with intangible capital production technology

2. Conduct a series of **experiments**:

   → The macro effects of TCJA's provisions (GILTI today) applying to MNEs
   → All but US introduce GMT: with and without spillovers
   → All including US introduce GMT: with and without spillovers

Key takeaways

Introduction

1. Local corporate income tax reforms can have global, **ripple macroeconomic effects**:

   → The channel is through nonrival intangible capital and spillovers
   → Other countries introduce GMT: negative effect for the US
   → US introducing GMT: negative effect for the US and everyone else

2. GMT vs. GILTI:

   → GILTI curbs profit shifting while encouraging intangible and tangible investment (nonrivalry is key).
   → GMT suppresses investment: Taxes low-tax profits uniformly, reducing intangible capital and GDP without investment incentives.
   → **Design contrast:** TCJA links tax penalties to firm behavior (e.g., tangible asset base, exports), while GMT applies a mechanical top-up regardless of structure or activity.

The Model

Environment overview

- Standard multi-country GE model:
  - → Five regions: US, Europe, Rest of the World, Low Tax (LT), Tax Haven (TH)
  - → Representative consumers with standard preferences choosing consumption, labor and tangible investment.
  - → Aggregator: nontradable final goods
  - → Tradable, country-specific intermediate goods
  - → Governments collect corporate tax revenues and rebate it back to the consumers.

- Add multinational enterprises:
  - → Intangible capital as in (**McGrattan and Prescott (2009**; **2010)**) with spillover externality
  - → Theory of transfer pricing and profit shifting as in (**Dyrda et al. (2024)**)
  - → Detailed representation of the MNE-related provisions of TCJA: GILTI, FDII, BEAT

Intermediate Goods Producers: Technology

- Each productive region i has a unit measure Ω_i of firms that compete monopolistically.
- A firm from region i produces in any productive region j according to:

$$y_{ij} = \sigma_{ij} A_j a \left(z^{\phi} k_j^{\alpha} \ell_j^{\gamma} \right).$$

where z is nonrival, within MNE, intangible capital, $\sigma_{ij} \in [0, 1]$ are FDI barriers (McGrattan and Prescott, 2010) and a is idiosyncratic productivity.

- The firm's resource constraints:

$$y_{ii} = q_{ii} + \sum_{j \in J_X} \xi_{ij} q_{ij}^X,$$

$$y_{ij} = q_{ij}, \; j \in J_F,$$

where

→ ξ_{ij}: iceberg transportation cost for each unit of goods shipped abroad.
→ q_{ij}^X: exported goods
→ q_{ii}: goods that are produced and consumed in the same location
→ $J_X \subseteq I \setminus \{i\}$: set of export destinations, $J_F \subseteq I \setminus \{i\}$: set of regions with foreign affiliates

Production of Intangible Capital

- The intangible capital z is produced according to:

$$z_i = aA_i l_i^z \cdot \left(\sum_{j \neq i} \int_{\Omega_{ji}} z_j(\omega)\, d\omega \right)^{\nu}$$

  where
  - $\rightarrow$ l_i^z: the measure of R&D workers
  - $\rightarrow$ $\sum_{j \neq i} \int_{\Omega_{ji}} z_j(\omega)\, d\omega$: the total amount of foreign intangible capital used in country i
  - $\rightarrow$ ν: spillover elasticity

- Empirical evidence on significant backward spillovers to upstream industries: **Javorcik (2004)**, forward spillovers to downstream industries: **Liu (2008)**

Stage 2: Operating pre-tax profits

- The domestic parent corporation's profits are

$$\pi_i^D(a,z;J_X) = \max_{q_{ii},\{q_{ij}^X\}_{j\in J_X},\ell_i,k_i} \left\{ p_{ii}(q_{ii})q_{ii} + \sum_{j\in J_X} p_{ij}(q_{ij}^X)q_{ij}^X - W_i\ell_i - \delta P_i k_i \right\}$$

$$\text{s.t} \quad q_{ii} + \sum_{j\in J_X} \xi_{ij} q_{ij} = y_{ii}$$

- Foreign subsidiaries' profits are

$$\pi_{ij}^F(a,z) = \max_{q_{ij},\ell_j,k_j} \; p_{ij}(q_{ij})q_{ij} - W_j\ell_j - \delta P_j k_j, \; j \in J_F.$$

Stage 1: Locations, intangible capital and profit shifting.

MNE maximizes dividends:

$$d_i(a) = \max_{\substack{z, J_X, J_F, \\ \boldsymbol{\lambda} \in \Gamma}} \Big\{ \pi_{ii} + \sum_{j \in J_F \setminus \{LT\}} (1-\tau_j)\pi_{ij} + (1-\tau_{LT})\pi_{i,LT} 1_{\{LT \in J_F\}} + (1-\tau_{TH})\pi_{i,TH} 1_{\{\lambda_{TH}>0\}} - T_i^{Total} 1_{\{i=US\}} - \sum_{j \in J_F \cup \{i\}} r_j k_j \Big\}$$

subject to

$$\Gamma = \left\{ \boldsymbol{\lambda} \in [0,1]^2 : \lambda_{LT} + \lambda_{TH} \leq 1 \right\}.$$

where:

- $\boldsymbol{\lambda} = (\lambda_{LT}, \lambda_{TH})$: shares of rights to intangible capital sold to LT and TH
- π_{ii}: taxable profits of the parent division
- π_{ij}: taxable profits of affiliates in other high-tax regions
- $\pi_{i,LT}$: taxable profits of the low-tax affiliate
- $\pi_{i,TH}$: taxable profits of the tax-haven affiliate
- T_i^{Total}: Total tax liability for the U.S. firms

Taxable profits: parent division

$$\pi_{ii} = \pi_i^D(a,z;J_X) - W_i \overbrace{\left(l_i^z + \sum_{j\in J_X} \kappa_{ij}^X + \sum_{j\in J_F} \kappa_{ij}^F + \kappa_{iTH} 1_{\{\lambda_{TH}>0\}} \right)}^{\text{Costs of intangible capital production and fixed costs}}$$

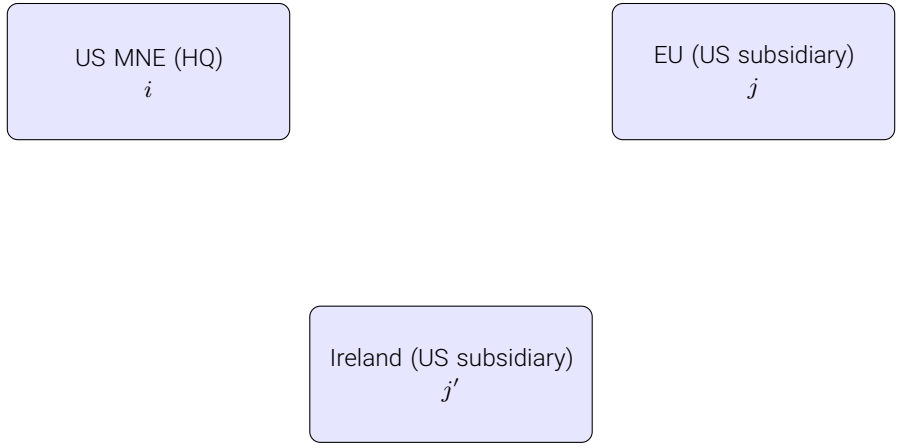
$$+ \overbrace{\left(\varphi_{iLT}\lambda_{LT} + \varphi_{iTH}\lambda_{TH}\right)\nu_i(z)z}^{\text{Proceeds from selling } z} + \overbrace{\sum_{j\in J_F}(1-\lambda_{LT}-\lambda_{TH})\vartheta_{ij}(z)z}^{\text{Licensing fee receipts}} - \overbrace{(\lambda_{LT}+\lambda_{TH})\vartheta_{ii}(z)z}^{\text{Licensing fee payments}}$$

$$- \overbrace{W_i \mathcal{C}_i(\lambda_{LT},\lambda_{TH})\nu_i(z)z}^{\text{Cost of transferring } z}.$$

where:

- κ_i^X: a fixed cost to export domestically produced goods
- κ_i^F: a fixed cost to open a foreign affiliate and produce locally
- $\vartheta_{ij}(z)z \equiv \phi p_{ij} y_{ij}/z$: licensing fee of a subsidiary in region j
- $\nu_i(z)z \equiv \sum_{j\in J_F\cup\{i\}} \vartheta_{ij}(z)z$: total amount of licensing fees across the conglomerate
- $\varphi_{iLT}, \varphi_{iTH}$: markdowns (mispricing) on selling rights to intangible capital

Profit Shifting Example



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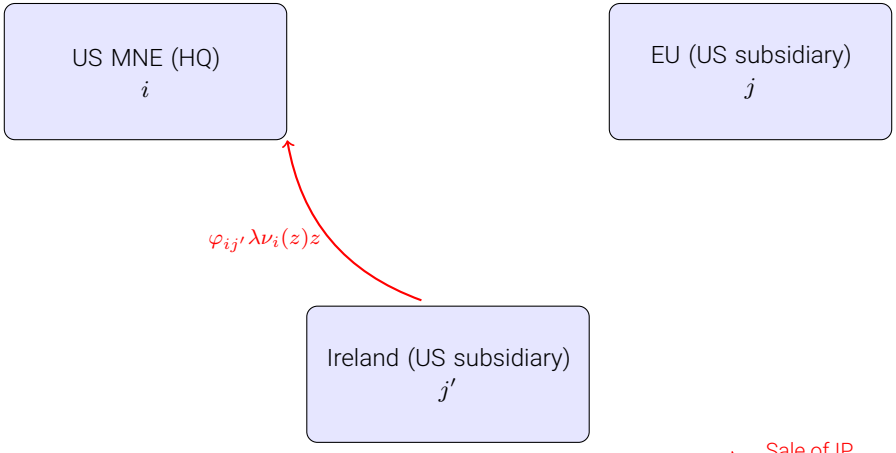

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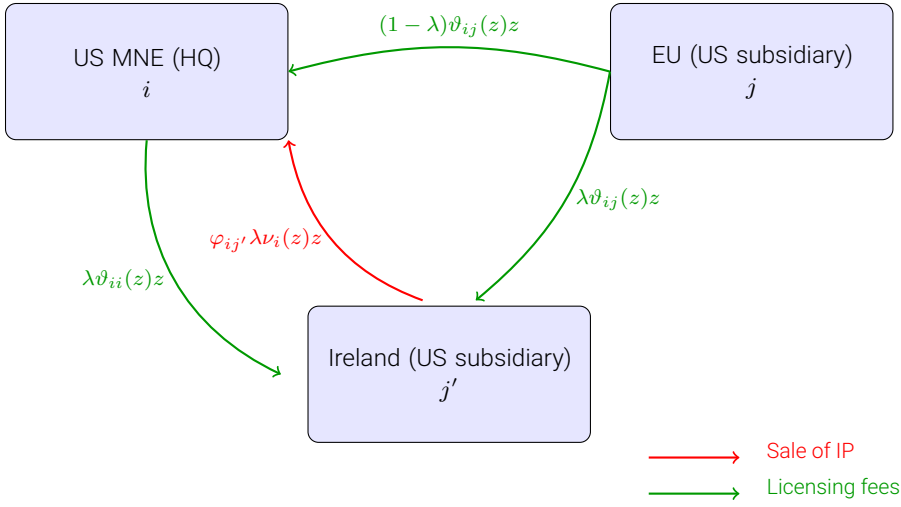


Global intangible low-taxed income (GILTI)

- Net Tested Income (NTI) is defined as follows

$$\pi_i^{NTI} = \sum_{j \in J_F \setminus J_F^{HT}} \pi_{ij} + \pi_{iTH}$$

where $J_F^{HT} = \{j \in J_F | \tau_j > 0.9 \times \tau_{US}\}$

- GILTI base becomes:

$$\pi_i^{GILTI} = \underbrace{\left(1 - \chi^{GILTI}\right)}_{\substack{\text{tax base adjustment} \\ \chi^{GILTI} = 50\%}} \times \left(\pi_i^{NTI} - \sum_{j \in J_F \setminus J_F^{HT}} \underbrace{\chi^{QBAI} \times P_j k_j}_{\substack{\text{tax exemption for} \\ \text{tangible assets base} \\ \text{with } \chi^{QBAI} = 10\%}} \right)$$

→ The QBAI deduction incentivize tangible investment in low-tax subsidiaries

Total Tax Liability

- Foreign tax credits (FTC):

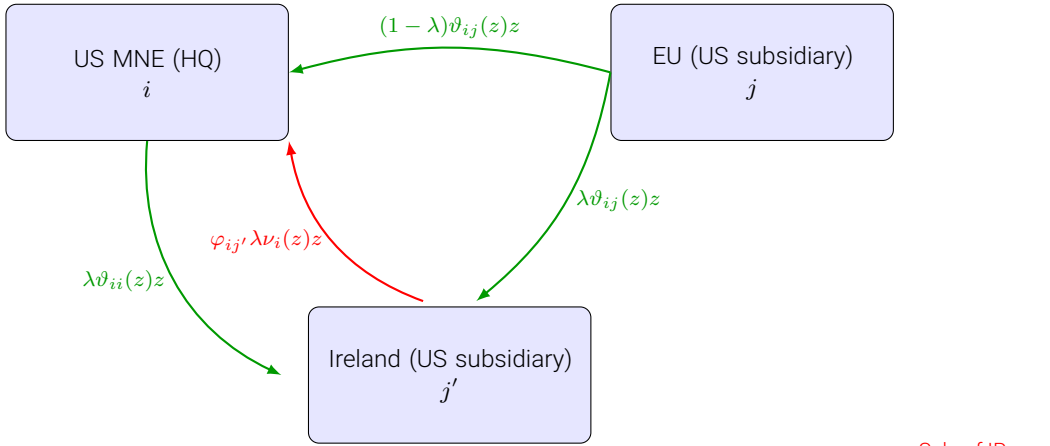
$$FTC = \min \left\{ \underbrace{\chi^{DPFT} \times \sum_{j \in J_F \setminus J_F^{HT}} (\tau_j \times \pi_{ij})}_{\substack{\text{Deemed paid foreign taxes (DPFT)} \\ \text{where } \chi^{DPFT} = 80\%}}, \quad \underbrace{\tau_{US} \times \pi_i^{GILTI}}_{\text{Foreign tax credit limitation}} \right\}$$

- Total Tax Liability:

$$T_{US}^{Total} = \tau_{US} \times \underbrace{\left(\pi_{ii} + \pi_i^{GILTI} - D^{FDII}\right)}_{\substack{\text{Taxable profits adjusted for} \\ \text{GILTI base and FDII deduction}}} + \underbrace{T_i^{BEAT}}_{\substack{\text{Adjustment} \\ \text{for BEAT liability}}} - FTC$$

▸ FDII and BEAT

Global Minimum Tax (GMT): Implementation



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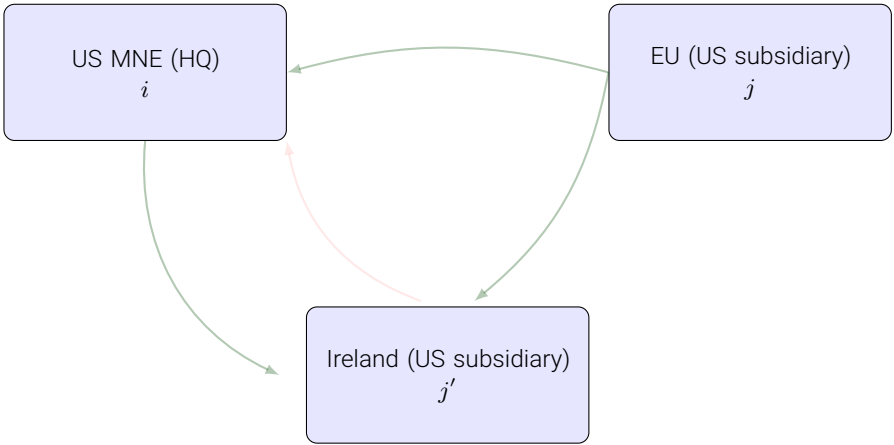

Qualified Domestic Minimum Top-Up Tax (QDMTT):

$$T_{ij'}^{\text{QDMTT}} = \mathbf{1}_{j' \in \text{QDMTT}} \cdot \mathbf{1}_{\tau_{ij'}^{\text{eff}} < \tau^{\text{GMT}}} \cdot (\tau^{\text{GMT}} - \tau_{ij'}^{\text{eff}}) \cdot \pi_{ij'}$$

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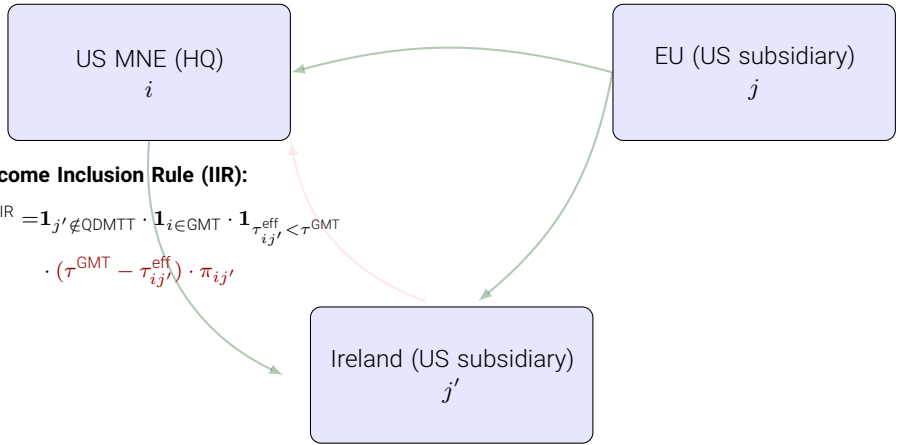

Income Inclusion Rule (IIR):

$$T_i^{\text{IIR}} = \mathbf{1}_{j' \notin \text{QDMTT}} \cdot \mathbf{1}_{i \in \text{GMT}} \cdot \mathbf{1}_{\tau_{ij'}^{\text{eff}} < \tau^{\text{GMT}}} \cdot (\tau^{\text{GMT}} - \tau_{ij'}^{\text{eff}}) \cdot \pi_{ij'}$$

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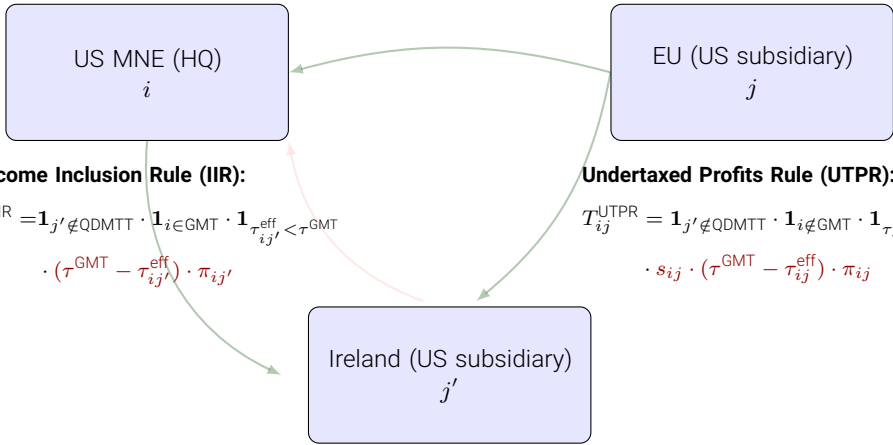

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Undertaxed Profits Rule (UTPR):

$$T_{ij}^{\text{UTPR}} = \mathbf{1}_{j' \notin \text{QDMTT}} \cdot \mathbf{1}_{i \notin \text{GMT}} \cdot \mathbf{1}_{\tau_{ij}^{\text{eff}} < \tau^{\text{GMT}}} \cdot \mathbf{1}_{j \in \text{GMT}} \cdot s_{ij} \cdot (\tau^{\text{GMT}} - \tau_{ij}^{\text{eff}}) \cdot \pi_{ij}$$

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Global Tax Reforms and Profit Shifting

Impose the cost function $\mathcal{C}(\lambda) = \lambda + (1-\lambda)\log(1-\lambda)$ per unit value of z transferred. Then:

- With no tax reform:

$$\lambda_{LT} = 1 - \exp\left(\frac{(\tau_{US} - \tau_{LT})(1-\varphi_{LT})}{(1-\tau_{US})W_{US}}\right)$$

  $\rightarrow$ $\lambda_{LT} \searrow$ in LT tax rate τ_{LT}

  $\rightarrow$ $\lambda_{LT} \searrow$ in mispricing the intangible capital φ_{LT}

Global Tax Reforms and Profit Shifting

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- With GILTI:

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$\rightarrow$ λ_{LT} $\nearrow$ in χ^{GILTI} and $\searrow$ χ^{FTC}: GILTI raises the tax rate of income in LT to 10.5%–13.125 %

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- With GILTI + GMT

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

  $\rightarrow$ λ_{LT} $\searrow$ in τ^{GMT}: subsidiaries of US MNEs pay top-up tax in LT to 15%

Global Tax Reforms and Investment

Intangible investment by an MNE is

$$z = z^{NS} \times (\underbrace{1 + W_i \left(\lambda \mathcal{C}'(\lambda) - \mathcal{C}(\lambda)\right)}_{\Omega(\lambda)>1})^{\frac{\gamma+\rho-\rho\gamma}{\alpha+\gamma+\rho(1-\phi-\gamma)}}$$

where

- z^{NS}: optimal intangible investment when firms do not shift profits, i.e. $\lambda = 0$
- $\Omega(\lambda) > 1$: net gain from profit shifting per unit of intangible capital, $\nearrow$ in λ
- Both GILTI and GMT decrease λ, thus have a negative impact on z

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Tangible investment by a subsidiary j of MNE i is

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

where

- R_j is the post-tax user cost of capital
- GILTI (GMT) decreases (increases) R_j, thus have a positive (negative) impact on k_{ij}.

Experiments

The Global Effect of GILTI

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
	(% chg.)				
(a) Baseline model					
USA	-42.01	0.92	0.34	0.05	1.34
Europe	-0.17	0.12	0.39	0.02	0.01
Rest of world	-0.09	0.05	0.51	0.03	0.19
Low tax	-2.49	-1.10	0.91	3.38	-0.86
(b) No spillovers					
USA	-41.99	0.84	0.28	0.04	1.33
Europe	-0.17	0.00	0.23	0.00	-0.10
Rest of world	-0.10	-0.01	0.23	0.00	-0.07
Low tax	-2.52	-1.25	0.77	3.37	-0.95

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GILTI is effective at reducing profit shifting and increasing CIT in US

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At the same time, GILTI increases GDP by encouraging greater investment

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Other countries also benefit through the non-rivalry of intangible capital and the spillover effect

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The worldwide increases in GDP are significantly smaller without the spillover effect

The Global Effect of GILTI

Region	Tangible capital				Intangible capital		
	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs
			(% chg.)			(% chg.)	
(a) Baseline model							
USA	0.05	-0.15	0.25	-0.01	1.34	-0.18	1.46
Europe	0.02	0.01	-0.03	0.15	0.01	0.15	-0.00
Rest of world	0.03	0.03	0.01	0.10	0.19	0.30	0.18
Low tax	3.38	-0.88	-0.61	13.66	-0.86	-1.35	-0.79
(b) No spillovers							
USA	0.04	-0.15	0.25	-0.14	1.33	-0.22	1.45
Europe	0.00	0.00	-0.03	0.07	-0.10	0.01	-0.11
Rest of world	0.00	0.01	-0.02	0.09	-0.07	0.01	-0.08
Low tax	3.37	-0.86	-0.60	13.58	-0.95	-1.46	-0.88

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Rest of world	0.00	0.01	-0.02	0.09	-0.07	0.01	-0.08
Low tax	3.37	-0.86	-0.60	13.58	-0.95	-1.46	-0.88

GILTI increases tangible investment of US MNEs' subsidiaries in LT

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USA	0.05	-0.15	0.25	-0.01	1.34	-0.18	1.46
Europe	0.02	0.01	-0.03	0.15	0.01	0.15	-0.00
Rest of world	0.03	0.03	0.01	0.10	0.19	0.30	0.18
Low tax	3.38	-0.88	-0.61	13.66	-0.86	-1.35	-0.79
(b) No spillovers							
USA	0.04	-0.15	0.25	-0.14	1.33	-0.22	1.45
Europe	0.00	0.00	-0.03	0.07	-0.10	0.01	-0.11
Rest of world	0.00	0.01	-0.02	0.09	-0.07	0.01	-0.08
Low tax	3.37	-0.86	-0.60	13.58	-0.95	-1.46	-0.88

Increases the marginal product of intangible in LT, pushes up intangible investment of US MNEs

The Global Effect of GILTI

Region	Tangible capital				Intangible capital		
	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs
			(% chg.)			(% chg.)	
(a) Baseline model							
USA	0.05	-0.15	0.25	-0.01	1.34	-0.18	1.46
Europe	0.02	0.01	-0.03	0.15	0.01	0.15	-0.00
Rest of world	0.03	0.03	0.01	0.10	0.19	0.30	0.18
Low tax	3.38	-0.88	-0.61	13.66	-0.86	-1.35	-0.79
(b) No spillovers							
USA	0.04	-0.15	0.25	-0.14	1.33	-0.22	1.45
Europe	0.00	0.00	-0.03	0.07	-0.10	0.01	-0.11
Rest of world	0.00	0.01	-0.02	0.09	-0.07	0.01	-0.08
Low tax	3.37	-0.86	-0.60	13.58	-0.95	-1.46	-0.88

Non-rivalry of intangible capital pushes up tangible capital demand at home

The Global Effect of GILTI

Region	Tangible capital				Intangible capital		
	Total	Non MNEs	Domestic MNEs	Foreign MNEs	Total	Non MNEs	Domestic MNEs
			(% chg.)			(% chg.)	
(a) Baseline model							
USA	0.05	-0.15	0.25	-0.01	1.34	-0.18	1.46
Europe	0.02	0.01	-0.03	0.15	0.01	0.15	-0.00
Rest of world	0.03	0.03	0.01	0.10	0.19	0.30	0.18
Low tax	3.38	-0.88	-0.61	13.66	-0.86	-1.35	-0.79
(b) No spillovers							
USA	0.04	-0.15	0.25	-0.14	1.33	-0.22	1.45
Europe	0.00	0.00	-0.03	0.07	-0.10	0.01	-0.11
Rest of world	0.00	0.01	-0.02	0.09	-0.07	0.01	-0.08
Low tax	3.37	-0.86	-0.60	13.58	-0.95	-1.46	-0.88

Total tangible investment increases by less, as investment by other firms gets crowded out

GMT: All regions except US

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
			(% chg.)		
(a) Baseline model					
USA	0.06	-0.24	-0.25	-0.01	-0.16
Europe	-73.08	3.06	-0.14	-0.02	-0.96
Rest of world	-80.33	1.49	-0.14	-0.03	-0.60
Low tax	-45.34	5.47	-0.47	-1.11	1.13
(b) No spillovers					
USA	0.06	-0.20	0.00	-0.00	0.06
Europe	-73.08	3.17	0.02	0.00	-0.80
Rest of world	-80.33	1.55	0.01	-0.01	-0.45
Low tax	-45.32	5.61	-0.25	-1.10	1.38

GMT: All regions except US

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
			(% chg.)		
(a) Baseline model					
USA	0.06	-0.24	-0.25	-0.01	-0.16
Europe	-73.08	3.06	-0.14	-0.02	-0.96
Rest of world	-80.33	1.49	-0.14	-0.03	-0.60
Low tax	-45.34	5.47	-0.47	-1.11	1.13
(b) No spillovers					
USA	0.06	-0.20	0.00	-0.00	0.06
Europe	-73.08	3.17	0.02	0.00	-0.80
Rest of world	-80.33	1.55	0.01	-0.01	-0.45
Low tax	-45.32	5.61	-0.25	-1.10	1.38

Without adoption by US, GMT has little effect on lost profits in US, but decreases lost profits everywhere else

GMT: All regions except US

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
			(% chg.)		
(a) Baseline model					
USA	0.06	-0.24	-0.25	-0.01	-0.16
Europe	-73.08	3.06	-0.14	-0.02	-0.96
Rest of world	-80.33	1.49	-0.14	-0.03	-0.60
Low tax	-45.34	5.47	-0.47	-1.11	1.13
(b) No spillovers					
USA	0.06	-0.20	0.00	-0.00	0.06
Europe	-73.08	3.17	0.02	0.00	-0.80
Rest of world	-80.33	1.55	0.01	-0.01	-0.45
Low tax	-45.32	5.61	-0.25	-1.10	1.38

GMT decreases capital investment, thus having negative effects on GDP

GMT: All regions except US

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
			(% chg.)		
(a) Baseline model					
USA	0.06	-0.24	-0.25	-0.01	-0.16
Europe	-73.08	3.06	-0.14	-0.02	-0.96
Rest of world	-80.33	1.49	-0.14	-0.03	-0.60
Low tax	-45.34	5.47	-0.47	-1.11	1.13
(b) No spillovers					
USA	0.06	-0.20	0.00	-0.00	0.06
Europe	-73.08	3.17	0.02	0.00	-0.80
Rest of world	-80.33	1.55	0.01	-0.01	-0.45
Low tax	-45.32	5.61	-0.25	-1.10	1.38

The spillovers effect is important in generating the ripple effect of GMT

GMT: All regions including US

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
			(% chg.)		
(a) Baseline model					
USA	-36.82	0.35	-0.33	-0.02	-0.45
Europe	-73.08	3.02	-0.24	-0.03	-0.99
Rest of world	-80.33	1.47	-0.28	-0.04	-0.66
Low tax	-48.92	4.74	-0.57	-1.17	1.15
(b) No spillovers					
USA	-36.82	0.42	-0.05	-0.00	-0.23
Europe	-73.08	3.16	-0.04	0.00	-0.79
Rest of world	-80.33	1.55	-0.05	-0.01	-0.45
Low tax	-48.90	4.92	-0.32	-1.16	1.42

GMT: All regions including US

Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
			(% chg.)		
(a) Baseline model					
USA	-36.82	0.35	-0.33	-0.02	-0.45
Europe	-73.08	3.02	-0.24	-0.03	-0.99
Rest of world	-80.33	1.47	-0.28	-0.04	-0.66
Low tax	-48.92	4.74	-0.57	-1.17	1.15
(b) No spillovers					
USA	-36.82	0.42	-0.05	-0.00	-0.23
Europe	-73.08	3.16	-0.04	0.00	-0.79
Rest of world	-80.33	1.55	-0.05	-0.01	-0.45
Low tax	-48.90	4.92	-0.32	-1.16	1.42

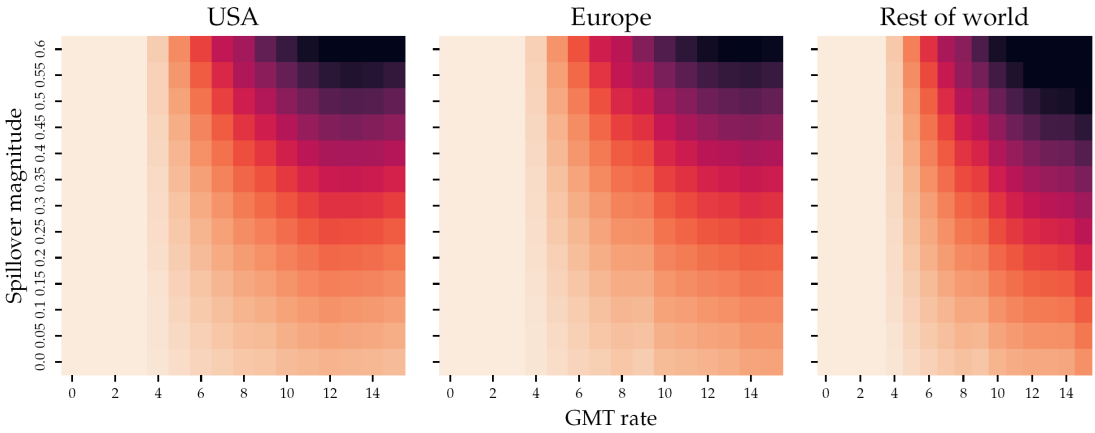
If US joins GMT, the effects on lost profits and CIT are limited with GILTI in place.

GMT: All regions including US

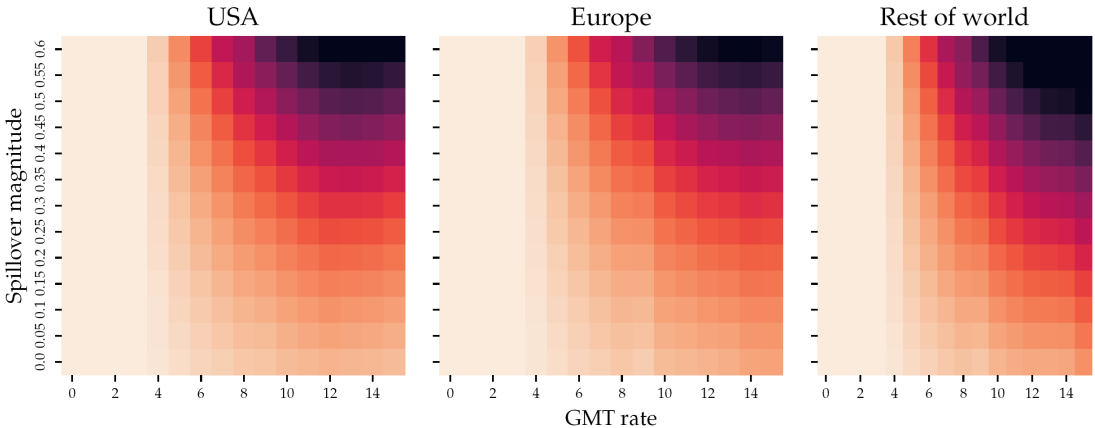
Region	Lost profits	CIT rev.	GDP	Tangible capital	Intangible capital
			(% chg.)		
(a) Baseline model					
USA	-36.82	0.35	-0.33	-0.02	-0.45
Europe	-73.08	3.02	-0.24	-0.03	-0.99
Rest of world	-80.33	1.47	-0.28	-0.04	-0.66
Low tax	-48.92	4.74	-0.57	-1.17	1.15
(b) No spillovers					
USA	-36.82	0.42	-0.05	-0.00	-0.23
Europe	-73.08	3.16	-0.04	0.00	-0.79
Rest of world	-80.33	1.55	-0.05	-0.01	-0.45
Low tax	-48.90	4.92	-0.32	-1.16	1.42

However, it further dampens capital investment and thus GDP.

Real GDP Change: All regions including US introduce GMT



Real GDP Change: All regions including US introduce GMT



Spillovers amplify the effects of the GMT across the world.

Conclusions

1. **Global Reach:** Tax reforms in economies with nonrival intangibles create spillovers that affect even non-adopting countries. Outsized importance of US MNEs in global economy makes them particularly susceptible.

2. **Inaction:** US abstention from GMT doesn't shield it from negative effects, and fails to raise revenue or reduce profit shifting.

3. **GILTI vs. GMT:** GILTI reduces shifting and boosts investment. GMT curbs shifting but cuts both intangible and tangible capital, amplifying global losses.

Additional Slides

GMT: All regions except US

Region	Tangible capital				Intangible capital		
	Total (% chg.)	Non MNEs (% chg.)	Domestic MNEs (% chg.)	Foreign MNEs (% chg.)	Total (% chg.)	Non MNEs (% chg.)	Domestic MNEs (% chg.)
(a) Baseline model							
USA	-0.01	-0.00	0.01	-0.17	-0.16	-0.26	-0.15
Europe	-0.02	0.12	-0.17	0.02	-0.96	-0.03	-1.05
Rest of world	-0.03	0.08	-0.09	-0.16	-0.60	-0.04	-0.65
Low tax	-1.11	0.95	-3.03	-2.23	1.13	1.62	1.07
(b) No spillovers							
USA	-0.00	0.00	0.02	-0.09	0.06	0.01	0.07
Europe	0.00	0.12	-0.16	0.11	-0.80	0.16	-0.89
Rest of world	-0.01	0.09	-0.08	-0.03	-0.45	0.13	-0.50
Low tax	-1.10	0.91	-3.04	-2.15	1.38	1.91	1.31

GMT: All regions including US

Region	Tangible capital				Intangible capital		
	Total (% chg.)	Non MNEs (% chg.)	Domestic MNEs (% chg.)	Foreign MNEs (% chg.)	Total (% chg.)	Non MNEs (% chg.)	Domestic MNEs (% chg.)
(a) Baseline model							
USA	-0.02	0.04	-0.03	-0.17	-0.45	-0.22	-0.47
Europe	-0.03	0.12	-0.17	-0.02	-0.99	-0.07	-1.08
Rest of world	-0.04	0.07	-0.09	-0.19	-0.66	-0.12	-0.71
Low tax	-1.17	0.99	-3.00	-2.51	1.15	1.64	1.09
(b) No spillovers							
USA	-0.00	0.04	-0.03	-0.06	-0.23	0.07	-0.25
Europe	0.00	0.12	-0.16	0.09	-0.79	0.17	-0.89
Rest of world	-0.01	0.09	-0.08	-0.06	-0.45	0.13	-0.50
Low tax	-1.16	0.95	-3.01	-2.41	1.42	1.97	1.36

Taxable profits: foreign subsidiaries, LT and TH

- Foreign subsidiary j:

$$\pi_{i,j} = \pi^F_{ij}(a,z) - \underbrace{\vartheta_{ij}(z)z}_{\text{Licensing fee}}.$$

- Low Tax (LT) region:

$$\pi_{i,LT} = \pi^F_{i,LT}(a,z) - \underbrace{\varphi_{iLT}\lambda_{LT}\nu_i(z)z}_{\text{Cost of buying } z} + \overbrace{\sum_{j\in J_F\cup\{i\}\setminus\{LT\}} \lambda_{LT}\vartheta_{ij}(z)z}^{\text{Licensing fee receipts}} - \underbrace{(1-\lambda_{LT})\vartheta_{iLT}(z)z}_{\text{Licensing fee payment}}$$

- Tax Haven (TH) :

$$\pi_{i,TH} = \underbrace{\sum_{j\in J_F\cup\{i\}} \lambda_{TH}\vartheta_{ij}(z)z}_{\text{Licensing fee receipts}} - \underbrace{\varphi_{iTH}\lambda_{TH}\nu_i(z)z}_{\text{Cost of buying } z}.$$

Foreign Derived Intangible Income (FDII)

- Deemed Intangible Income:

$$\pi_{ii}^{DII} = \pi_{ii} - \underbrace{\chi^{QBAI} \times P_i k_i}_{\substack{\text{exemption for domestic} \\ \text{tangible assets base with} \\ \chi^{QBAI} = 10\%}}$$

- FDII deduction:

$$D^{FDII} = \underbrace{\chi^{FDII}}_{\substack{\text{FDII deduction rate} \\ \chi^{FDII} = 37.5\%}} \times \underbrace{FDR}_{\substack{\text{Foreign Derive Ratio (FDR) i.e.} \\ \text{share of foreign derived income (exports)}}} \times \pi_{ii}^{DII}$$

▸ GILTI and FDII

Base Erosion and Anti-Abuse Tax (BEAT)

- Base Erosion Payments: licensing fees paid by USP to LT and TH subsidiaries

$$BEP = (\lambda_{LT} + \lambda_{TH}) \times \vartheta_{ii}(z_i) \times z_i$$

- Modified Taxable Income:

$$\pi_{ii}^{MTI} = \pi_{ii} + BEP$$

- The BEAT liability becomes:

$$T^{BEAT} = \max\left(0, \underbrace{\left(\chi^{BEAT} \times \pi_{ii}^{MTI} - \tau_{US} \times \pi_{ii}^{TI}\right)}_{\substack{\text{excess of licensing-fees-adjusted tax liability} \\ \text{with } \chi^{BEAT} = 10\% \text{ over regular tax liability}}}\right)$$

Back

The Interaction between GILTI and FDII

- Tax reductions in IRS Form 8992 if $\pi_{ii}^{GILTI} + \pi_{ii}^{FDII} - \pi_{ii} > 0$, specifically

$$R^{FDII} = \begin{cases} 0 & \text{if } \pi_{ii}^{GILTI} + \pi_{ii}^{FDII} - \pi_{ii} \leq 0 \\ \frac{\pi_{ii}^{FDII}}{\pi_{ii}^{GILTI} + \pi_{ii}^{FDII}} \times \left(\pi_{ii}^{GILTI} + \pi_{ii}^{FDII} - \pi_{ii}\right) & \text{if } \pi_{ii}^{GILTI} + \pi_{ii}^{FDII} - \pi_{ii} > 0 \end{cases}$$

and

$$R^{GILTI} = \begin{cases} 0 & \text{if } \pi_{ii}^{GILTI} + \pi_{ii}^{FDII} - \pi_{ii} \leq 0 \\ \frac{\pi_{ii}^{GILTI}}{\pi_{ii}^{GILTI} + \pi_{ii}^{FDII}} \times \left(\pi_{ii}^{GILTI} + \pi_{ii}^{FDII} - \pi_{ii}\right) & \text{if } \pi_{ii}^{GILTI} + \pi_{ii}^{FDII} - \pi_{ii} > 0 \end{cases}$$

- Then

$$D^{FDII} = \chi^{FDII} \times \left(\pi_{ii}^{FDII} - R^{FDII}\right)$$

and

$$D^{GILTI} = \chi^{GILTI} \times \left(\pi_{ii}^{GILTI} - R^{GILTI}\right)$$

Return

Households: preferences and budgets

- In each region i representative household solves:

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

  where C_{it} is consumption, L_{it} is labor supply.

- Budget constraint:

$$P_{it}[C_{it} + X_{it}] + P_{bt}B_{it+1} = W_{it}L_{it} + R_{it}K_{it} + B_{it} + D_{it} + T_{it},$$

  where X_{it} is tangible investment and B_{it+1} are internationally-traded bonds, D_{it} dividends of MNEs headquartered in i, and T_{it} are lump sum transfers.

  The law of motion for tangible capital:

$$K_{it+1} = (1 - \delta)K_{it} + X_{it},$$

Final Goods Producers

In each region i representative final-good producer that combines domestic and foreign products into a nontradable aggregate:

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

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).

The aggregate price index is:

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

Aggregation and accounting measures: GDP and Goods trade

- Gross domestic product:

$$GDP_i = \sum_{j=1}^{I} \int_{\omega \in \Omega_j, i \in J_F(\omega)} p_{ji}(\omega) y_{ji}(\omega)\, d\omega.$$

- Goods trade:

$$EX_i^G = \sum_{j \neq i} \int_{\Omega_i} p_{ij}^X(\omega)\,(1+\xi_{ij})\, q_{ij}^X(\omega)\, d\omega,$$

$$IM_i^G = \sum_{j \neq i} \int_{\Omega_j} p_{ji}^X(\omega)\,(1+\xi_{ji})\, q_{ji}^X(\omega)\, d\omega.$$

Aggregation and accounting measures: Services trade

- High-tax regions' services:

$$EX_i^S = \sum_{j \neq i} \int_{\Omega_i} \left[1 - \lambda_{LT}(\omega) - \lambda_{TH}(\omega))\right] \vartheta_{ij}(\omega) z(\omega)\, d\omega + \int_{\Omega_i} \varphi_i(\lambda_{LT}(\omega) + \lambda_{TH}(\omega)) \nu_i(\omega) z(\omega)\, d\omega$$

$$IM_i^S = \sum_{j \neq i} \int_{\Omega_i} \left[\lambda_{LT}(\omega) + \lambda_{TH}(\omega)\right] \vartheta_{ij}(\omega) z(\omega)\, d\omega + \sum_{j \neq i} \int_{\Omega_j} \vartheta_{ji}(\omega) z(\omega)\, d\omega.$$

- The low-tax region's services:

$$EX_{LT}^S = \sum_{j \neq i} \int_{\Omega_i} \left[1 - \lambda_{TH}(\omega)\right] \vartheta_{ij}(\omega) z(\omega)\, d\omega + \sum_{j \neq i} \int_{\Omega_j} \lambda_{LT} \vartheta_{ji}(\omega) z(\omega)\, d\omega,$$

$$IM_{LT}^S = \sum_{j \neq i} \int_{\Omega_i} \lambda_{TH}(\omega) \vartheta_{ij}(\omega) z(\omega)\, d\omega + \sum_{j \neq i} \int_{\Omega_j} \left[1 - \lambda_{LT}(\omega)\right] \vartheta_{ji}(\omega) z(\omega)\, d\omega +$$
$$\sum_{j \neq i} \int_{\Omega_j} \varphi_j \lambda_{LT}(\omega) \nu_j(\omega) z(\omega)\, d\omega.$$

Market clearings

- Labor market:

$$L_i = \overbrace{\sum_{j=1}^{I} \int_{\Omega_j} \ell_{ji}(\omega)\, d\omega}^{\text{goods production}} + \overbrace{\int_{\Omega_i} l_i^z\, d\omega}^{z \text{ production}} + \overbrace{\int_{\Omega_i} \left(\sum_{j \in J_X(\omega)} \kappa_i^X + \sum_{j \in J_F(\omega)} \kappa_i^F + 1_{\{\lambda_{TH}(\omega) > 0\}} \kappa_i^{TH} \right) d\omega}^{\text{fixed costs}}$$
$$+ \underbrace{\int_{\Omega_i} \mathcal{C}_i(\lambda_{LT}, \lambda_{TH}) \nu(\omega) z(\omega)\, d\omega}_{\text{costs of shifting } z}.$$

- Capital market:

$$K_i = \sum_{j=1}^{I} \int_{\Omega_j} k_{ji}(\omega)\, d\omega$$

- Government budget constraint:

$$T_i = \tau_i \sum_{j=1}^{I} \int_{\Omega_j} \pi_{ji}(\omega)\, d\omega.$$

Market clearings

- Balance of payments:

$$EX_i^G + EX_i^S - IM_i^G - IM_i^S + NFR_i - NFP_i = 0.$$

where:

$$NFR_i = \sum_{j \neq i} \int_{\Omega_i} (1 - \tau_j) \pi_{ij}(\omega) \, d\omega,$$

$$NFP_i = \sum_{j \neq i} \int_{\Omega_j} (1 - \tau_i) \pi_{ji}(\omega) \, d\omega.$$

are net factor receipts from (payments to) foreigners.

Taking the Model to the Data

Calibration

Taking the Model to the Data

Aggregate countries into 5 regions:

- High-tax regions: United States (US), Europe (EU), Rest of the World (RW)
- Profit-shifting destinations identified by Tørsløv et al. (2022) split into
  - Low tax (LT): Belgium, Switzerland, Netherlands, Ireland etc.
  - Tax haven (TH): Antigua, Aruba, the Bahamas, Barbados etc.
  - US, EU, and RW firms can shift profits to LT and/or TH (after paying fixed FDI costs)

Discipline for key parameters:

- TFP (A_i) and prod. dispersion (σ_a): GDP and firm size dist.
- Intangible share (ϕ): Foreign MNEs' intangible share
- Trade costs (κ^X, ξ): Num. exporters, trade flows
- FDI costs (κ^F, σ): Num. MNEs, foreign MNEs' VA shares
- Corporate tax rates (τ): taken from Tørsløv et al. (2022)
- Markdowns (φ_i): Lost profit estimates from Tørsløv et al. (2022)
  - Lost profits/GDP: 0.6% for US, 1.4% for EU, 0.7% for RoW.

Calibration: Region-specific target moments

Taking the Model to the Data

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	–
Corporate tax rate (%)	21.0	17.3	11.4	17.4	3.3
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	0.76	1.19	0.24	–
Prod. dispersion (η_i)	4.74	4.75	5.23	4.59	–
Utility weight on leisure (ψ_i)	1.41	1.43	1.43	1.42	–
Fixed export cost (κ_i^X)	3.8e-3	7.5e-3	2.0e-3	3.1e-2	–
Variable FDI cost (σ_i)	0.44	0.54	0.51	0.54	–
Fixed FDI cost (κ_i^F)	2.33	3.02	0.91	16.0	–
Cost of shifting profits to LT (ψ_{iLT})	2.59	0.43	–	3.29	–
Cost of shifting profits to TH (ψ_{iTH})	2.17	1.39	–	2.42	–

Measuring profit shifting in the model

Taking the Model to the Data

- The profits shifted out of region j by firm ω is

$$ps_{ij}(\omega) = \tilde{\pi}_{ij}(\omega) - \pi_{ij}(\omega).$$

  where $\tilde{\pi}_{ij}$ are the profits a firm would have reported in region j if it did not shift profits.

- Aggregating firm-level shifted profits yields the total profits shifted out of region j:

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

- $\tilde{\pi}_{ijt}(\omega)$ can be computed in PE (calibration) or in GE (experiments).

Validation

Taking the Model to the Data

Simulate at the model generated data the following

$$\log \pi_i^k(\omega) = \beta_0 + \beta_\ell \log \ell_i^k(\omega) + \beta_z \log z^k(\omega) - \beta_\tau \hat{\tau}_i^k + \epsilon_i^k(\omega)$$

- $\hat{\tau}_i^k$: tax differential between an MNE's home region and LT or TH.
- β_τ: percentage change in reported profit in response to a one-percentage-point change in the tax differential between the home country and a tax haven
- k: the index of the counterfactual economy

Validation cont.

Study	**Data source**	β_τ
Johansson et al., 2017	ORBIS, 2000-2010	1.11
Heckemeyer and Overesch, 2017	Meta: 27 studies, 203 estimates	0.79
Beer et al., 2020	Meta: 38 studies, 402 estimates	0.98
This paper	Simulated model data	0.87

Additional Validation

Taking the Model to the Data

1. Share of corporate income taxes paid by foreign MNEs

Source	NA	EU	LT	RW
Data	16.65	41.58	72.40	16.32
Model	24.40	40.56	73.30	18.54

2. Global MNE spending on profit-shifting employees
   - → Tørsløv et al. (2020): $25 billion
   - → Model: $75 billion

GMT Rules Summary

Feature	QDMTT	IIR	UTPR
Full Name	Qualified Domestic Minimum Top-Up Tax	Income Inclusion Rule	Undertaxed Profits Rule
Who Applies It?	Source country (where profits are earned)	Parent country (MNE HQ)	Countries where MNE has operations (if parent doesn't apply IIR)
What It Taxes	Low-taxed profits of domestic subsidiaries	Low-taxed profits of foreign subsidiaries	Low-taxed profits of MNEs from non-GMT countries
Trigger Condition	Local ETR < 15%	Foreign affiliate's ETR < 15%	No IIR applied & ETR < 15%
Priority in Application	**First**	**Second** (after QDMTT)	**Third** (after QDMTT and IIR)
Purpose	Keep top-up tax in source country	Prevent HQ-based income shifting	Prevent free-riding by non-GMT HQs
Tax Revenue Collected By	Local tax authority	HQ country's tax authority	GMT countries, allocated by substance
Relies on Substance Test?	No	No	**Yes** (employees and tangible assets)
Blocks Other Rules?	**Yes** (preempts IIR and UTPR)	No	No

Global Minimum Tax (GMT)

- **Qualified Domestic Minimum Top-Up Tax (QDMTT)**: a domestic top-up tax in a source country j':

$$T_{ij'}^{\text{QDMTT}} = \mathbf{1}\left\{j' \in \text{QDMTT}\right\} \cdot \mathbf{1}\left\{\tau_{ij'}^{\text{eff}} < \tau^{\text{GMT}}\right\} \cdot \left(\tau^{\text{GMT}} - \tau_{ij'}^{\text{eff}}\right) \cdot \pi_{ij'}$$

- **Income Inclusion Rule**: top-up tax in a parent country i:

$$T_{i}^{\text{IIR}} = \sum_{j \in J_F} \mathbf{1}\left\{j \notin \text{QDMTT}\right\} \cdot \mathbf{1}\left\{i \in \text{GMT}\right\} \cdot \mathbf{1}\left\{\tau_{ij}^{\text{eff}} < \tau^{\text{GMT}}\right\} \cdot \left(\tau^{\text{GMT}} - \tau_{ij}^{\text{eff}}\right) \cdot \pi_{ij}$$

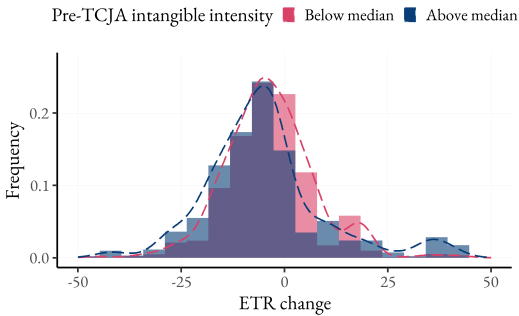
- **Undertaxed Profits Rule** (UTPR): top-up tax in third-party country j:

$$T_{ij}^{\text{UTPR}} = \mathbf{1}\left\{j' \notin \text{QDMTT}\right\} \cdot \mathbf{1}\left\{i \notin \text{GMT}\right\} \cdot \mathbf{1}\left\{j \in \text{GMT}\right\} \cdot \mathbf{1}\left\{\tau_{ij}^{\text{eff}} < \tau^{\text{GMT}}\right\} \cdot s_{ij} \cdot \left(\tau^{\text{GMT}} - \tau_{ij}^{\text{eff}}\right) \cdot \pi_{ij}$$

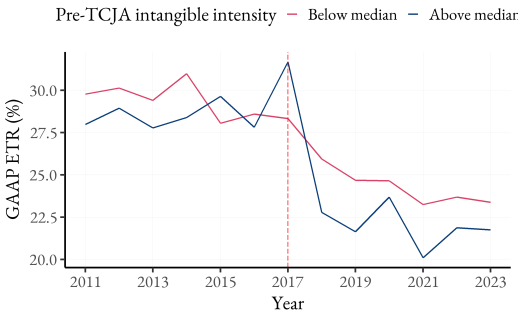
where the substance-based weight is $s_{ij} = \frac{W_j \cdot \ell_{ij} + P_j \cdot k_{ij}}{\sum_{r \in J_F^{\text{GMT}}} (W_r \cdot \ell_{ir} + P_r \cdot k_{ir})}$.

Empirical evidence

Firm-Level Effects of the TCJA: The Role of Intangible Intensity



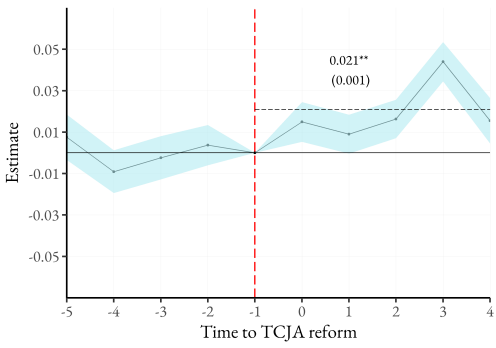
(c) Histogram of ETR Changes



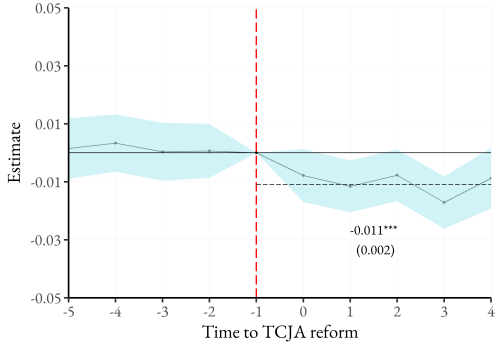
(d) Time Series of ETR

Greater decreases in ETR for high-intangible firms: (1) more mobile tax base, (2) receive greater FDII tax credits.

Regression Analysis



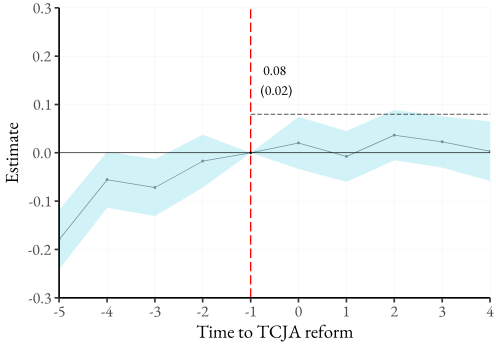
(e) Tangible capital



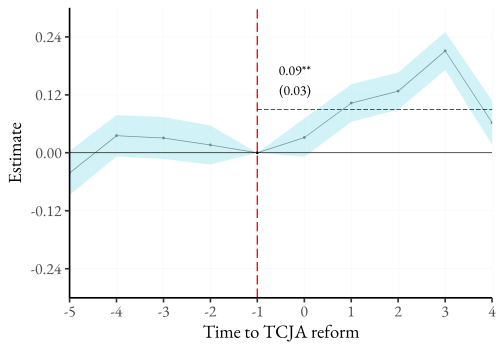
(f) Intangible capital

Suggests that TCJA has a positive effect on the tangible investment rate and a negative effect on tangible investment rate for MNEs

Event study results – Foreign & domestic income



(g) Domestic income



(h) Foreign income

Suggests that TCJA has a positive effect on foreign income