Tax Policy, Investment and Profit-Shifting[1]

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3. How costly (in terms of foregone investment) is the *battle against base erosion and profit-shifting*?

   We carry out counterfactual policy simulations to obtain the amount of real activity lost per unit of tax revenue raised.

We highlight three factors in evaluating the effects of tax reforms

1. **Unobserved heterogeneity:** The least tax-aggressive group is 18 times less responsive to tax reform measures than the most tax-aggressive group.

2. **Corner solutions:** Naive average micro-elasticity is 17 percent smaller than the average macro-elasticity estimated taking into account zero-tax MNEs.

3. **The trade-off:**
   - The introduction of a regime that makes it harder to shift profits to tax havens (e.g. CFC, global minimum tax) increases the likelihood of reporting profits to tax authorities, as well as increasing the average amount of profit reported in high tax jurisdictions.
   - Higher overall tax liability depresses investment in both high- and low-tax countries.

Literature shows considerable variation in estimates

To estimate the effect of reform, we need to know **how multinationals react to changes in the tax system**; estimates date back to Hines and Rice, 1994.

- Riedel (2018): estimates of lost corporate tax revenue from profit-shifting between 5% to 30% of total revenue.
- OECD (2015): $100 billion to $240 billion of foregone revenue, 4% to 10% of worldwide corporation tax revenue.
- Torslov, Wier and Zucman (2021): 40% of all multinational profits shifted - over $600 billion.
- A meta-study (Heckemeyer and Overesch (2017)): semi-elasticity of reported income with respect to the tax rate differential of 0.8.

What is the source of variation in existing estimates?

- Many micro-data studies assume that the cost of profit-shifting is *convex* in the amount shifted overseas. This results in a log-log specification that **drops firms that report zero profit in a jurisdiction – the worst offenders!**
- **Mismatch in micro and macro evidence**, Dharmapala (2014): estimates smaller in micro data – insufficient attention paid to **MNEs at corner solutions** and also **due to using financial accounting data**.
- **Variation in taxation that is unaffected by the outcome (profit-shifting)**: how to specify the counterfactual / control group?

How do multinationals (MNEs) shift profit to tax havens?

1. **Location of valuable (and hard-to-value) assets**
2. **Debt shifting**
3. **Mispricing of intra-firm trade**

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In practice, it is difficult to quantify the size of profit-shifting via different channels.

Our approach is agnostic about the particular channel used to *accumulate the tax avoidance asset.*

Conceptual framework: building blocks

The simplest model that captures everything that we need is that of a profit-maximizing MNE with subsidiaries in three countries, a **high tax sub**, a **low tax sub**, and a **tax haven sub**.

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1. Capital goods K_{ij} in each country j. In each country, capital is used as an input for production, and productivity may vary across different subsidiaries of the same MNE.
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At the end of the period, each subsidiary generates output $F(K_{ij})$, decides on what share of profit α_{ij} to shift to the tax haven.

Model: optimization

Each MNE i aims to maximise its beginning-of-period value:

$$V_i = -p_i Y_i - \sum_{j=1}^{N} K_{ij} + \beta \sum_{j=1}^{N} [F(K_{ij}) - \Pi_{ij} - T_{ij} - c(\alpha_{ij}, Y_i, B_{ij}) B_{ij} + (1-\delta) K_{ij}]$$

Y_i is tax avoidance asset that MNE i chooses, $Y_i \geq 0$, with relative price p_i

B_{ij} is tax base in sub j of MNE i, $B_{ij} = F(K_{ij}) - \delta K_{ij}$

α_{ij} is proportion of tax base shifted, $0 \leq \alpha_{ij} \leq 1$

T_{ij} is tax liability $T_{ij} = \tau_{ij}(1 - \alpha_{ij}) B_{ij}$

Π_{ij} is a linear shock that may bring subsidiary j to a tax loss position.

Parametrization

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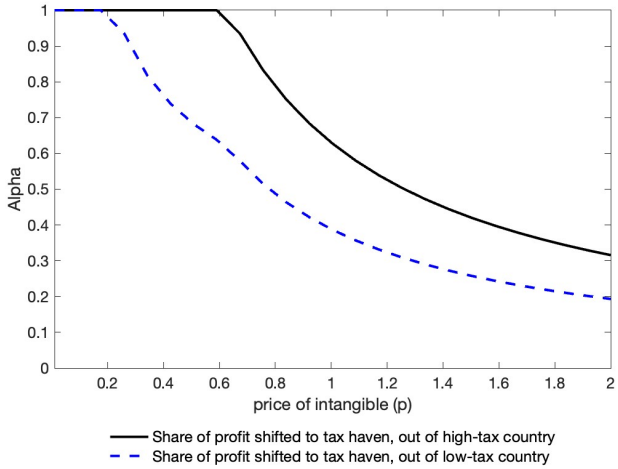
$c(\alpha_{ij}, Y_i, B_{ij}) = \frac{\gamma}{2} \left(\frac{B_{ij}}{Y_i} \right)^m \alpha_{ij}^2$ is the variable cost of shifting a share α_{ij} out of country j.

Unit price of tax avoidance intangible has a uniform distribution over: $(0, \bar{p})$.

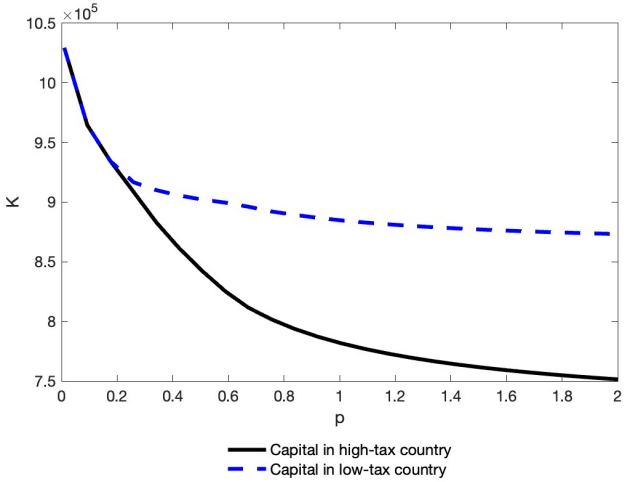
$R_i = \theta_{ij}^{1-a} K_{ij}^a$ where productivity draw $\theta_{ij} = \theta \exp(\varepsilon_{ij})$ may vary amongst subsidiaries following the process $\varepsilon_{ij} \sim \mathcal{N}(0, \sigma^2)$ and the other inputs are optimized out.

The local shock: $\ln(\Pi_{ij}) \sim \mathcal{N}(0, \sigma_\Pi^2)$

The schedule for share of profit shifted demonstrates the kinks



Costly tax avoidance asset has an adverse effect on cost of capital



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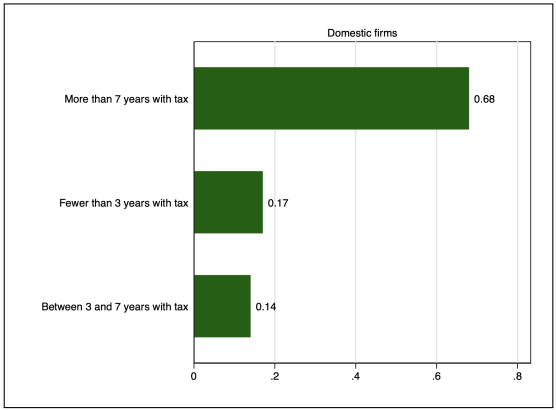
1. Extensive-margin profit-shifting effect: more firms start shifting all profit.
2. Intensive-margin profit-shifting effect: firms that shift some of their profit shift more.
3. Impact of tax reforms on capital accumulation: effect on cost of capital depends on p; for large enough p, K goes down.

Patterns of taxable profit for firms surviving 10+ years of data



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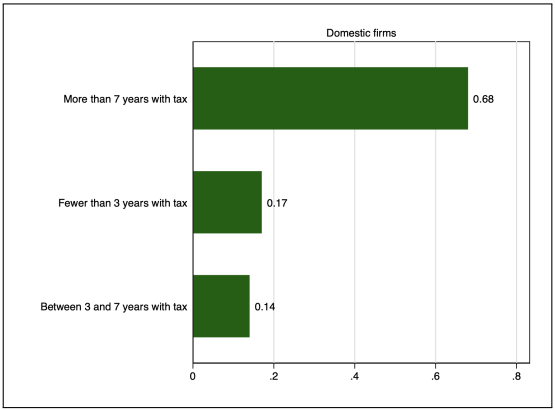
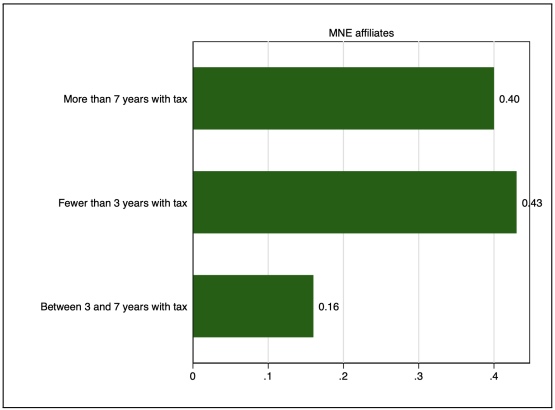
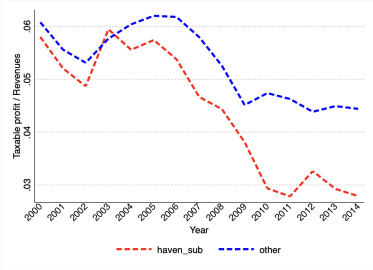
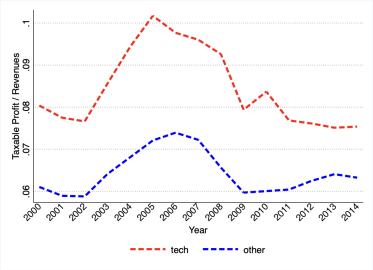
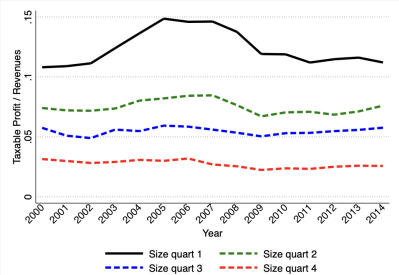


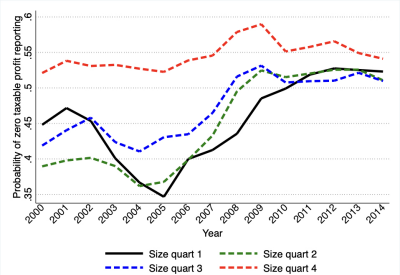


Observable characteristics do not definitively pin down tax-aggressiveness









Quasi-experimental variation from Italy in 2002 allows us to test the hypothesis that *extensive-margin profit-shifting responses* matter

According to the CFC policy change in Italy in 2002, a new tax begins to apply to income shifted to tax haven subsidiaries of Italian MNEs, relative to MNEs from other countries.

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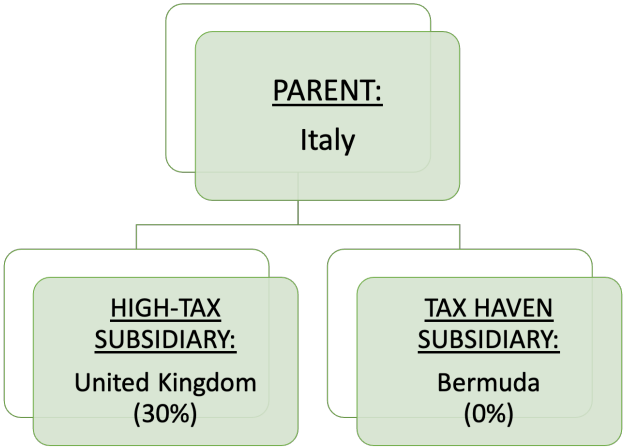
We predict that this should have two effects on the income of UK subsidiaries:

1. More UK subs start to report positive taxable profit (*the extensive-margin effect*; strong).
2. UK subs with positive profit already start to report more of it (*the intensive-margin effect*; imprecise).

Example of a (very simple) corporate structure in *treatment group*



Difference-in-difference analysis

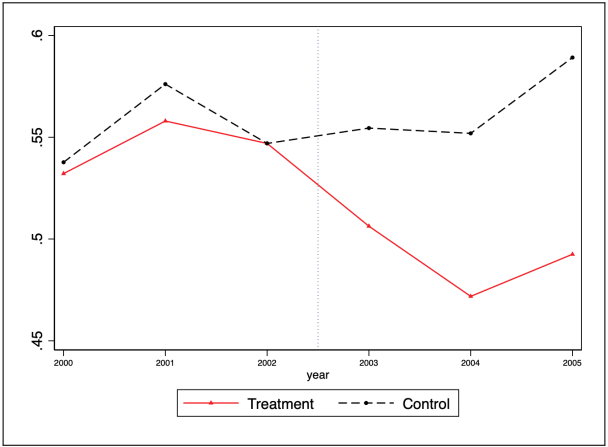
Treatment group: Italian MNEs reporting in the UK.

Control group: Spanish MNEs reporting in the UK.

Dependent variables of interest:

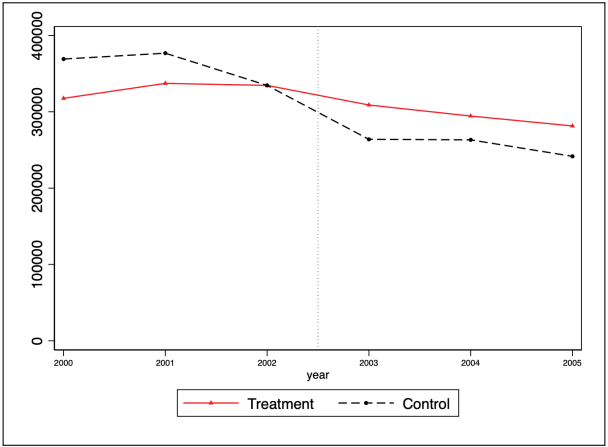
1. dummy equal to one when a firm reports zero taxable profits.
2. log or level of taxable income.

Average probability to report zero taxable profit *(extensive margin)*



Reform effect: a significant negative effect of 6.5 percent

Average reported taxable profit *(intensive margin)*



Reform effect: an insignificant positive effect of 7 percent.

Structural approach

- Estimate static production function parameters a and θ using standard linear panel regression approach.

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- Estimate static production function parameters a and θ using standard linear panel regression approach.
- Calibrate the depreciation rate δ and discount factor β based on the literature (10% and 95% respectively).
- Estimate the profit-shifting parameters $\bar{p}$ and γ using method of simulated moments, minimizing the weighted distance between simulated and empirical moments.

  Recall the role of γ: $c(\alpha_{ij}, Y_i, B_{ij}) = \frac{\gamma}{2}\left(\frac{B_{ij}}{Y_i}\right)^m \alpha_{ij}^2$ is the variable cost of shifting a share α_{ij} out of country j.

Structural parameters: identification

Policy Parameters

τ_H:	High tax country stat. rate	30%
τ_L:	Low tax country stat. rate	19%

Parameters to be estimated	Description	Moments to identify the parameter
γ:	Variable cost multiplier	**average taxable income**
p:	Rel. price of intangible, drawn from a uniform dist. over $(0, \bar{p})$	**proportion of full shifters**
Both		**Cond'l on taxable profit position:** **- avg investment** **- avg trading profit/loss** **- dispersion of trading profit/loss**

Method of simulated moments estimation

	Assumed and Estimated Parameters		Method
δ:	Depreciation Rate, assumed	0.1	Assumed
β:	Discount Factor, assumed	0.95	Assumed
$\hat{\bar{p}}$:	Upper bound, cost of intangible	2.100***	MSM
		(0.095)	
$\hat{\gamma}$:	Convex cost of shifting	0.114***	MSM
		(0.003)	
$\hat{\theta}$:	Total factor productivity (in log)	4.430***	Regression
		(0.046)	
$\hat{a}$:	Output elasticity wrt K	0.675***	Regression
		(0.003)	
$\hat{\sigma}$	Std.dev of productivity draw	1.446	Post-estimation residuals
No of obs		354,992	

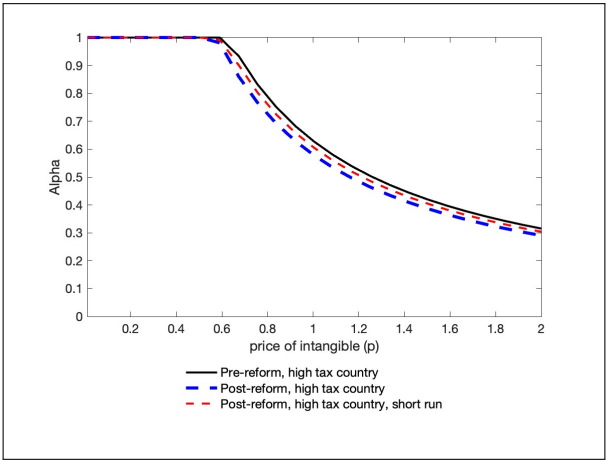
How do we interpret these findings?

1. There is vast heterogeneity in elasticities of taxable profit across the unobserved dimensions of productivity and access to the tax avoidance intangible.

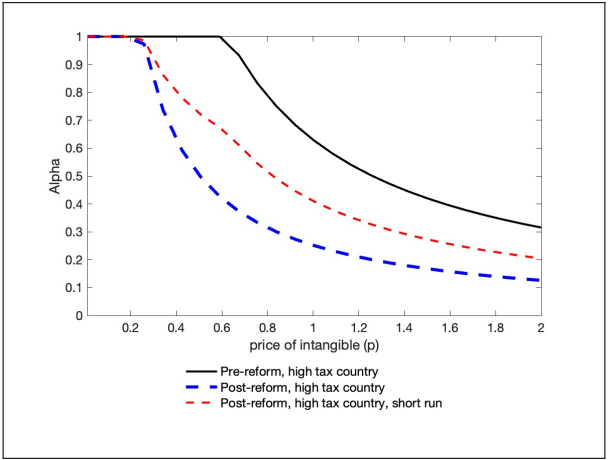
2. The elasticity of profit-shifting for the most aggressive firms is up to 18 times higher than that for the least aggressive shifters.

3. On average, we reconcile the discrepancy in the micro vs macro literature on profit-shifting: our model predicts that the aggregate profit-shifting elasticity is around 17% higher than the *naive* reduced-form micro elasticity.

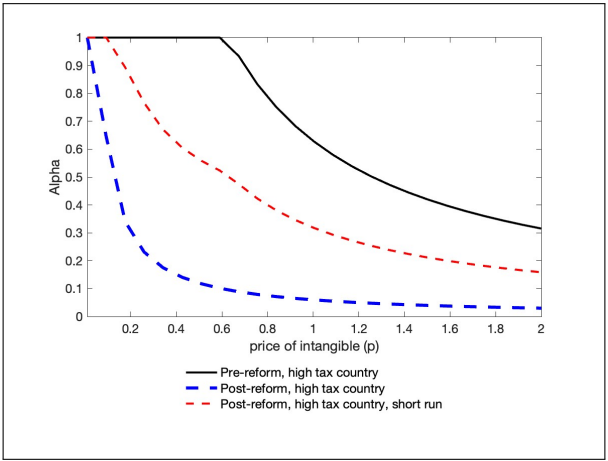
What happens after a 1 percentage point rate reduction? Profit-shifting responses in a country with 30% tax rate



What happens after a 10 percentage point rate reduction? Profit-shifting responses in a country with 30% tax rate



What happens after the introduction of a GMT at 15%? Profit-shifting responses in a country with 30% tax rate



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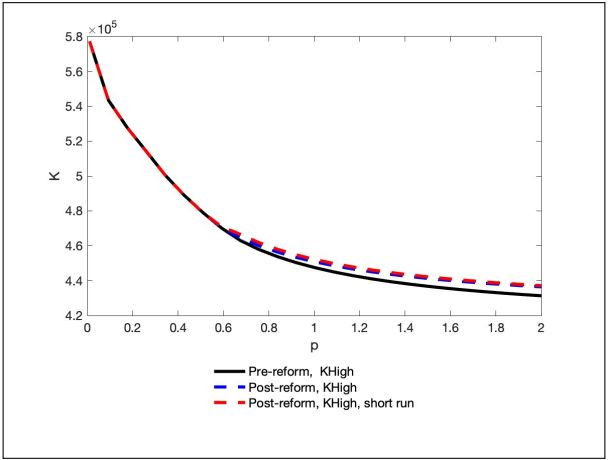

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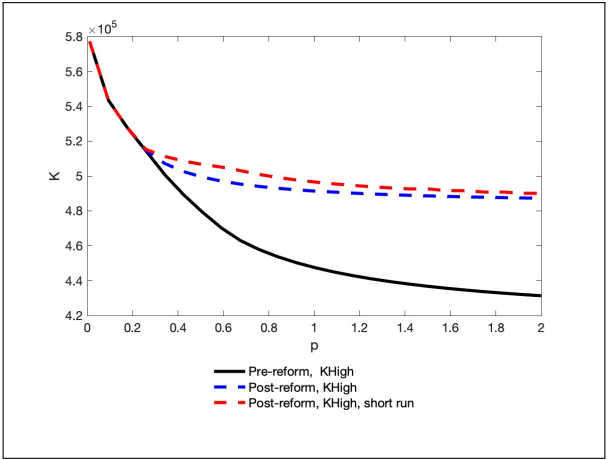

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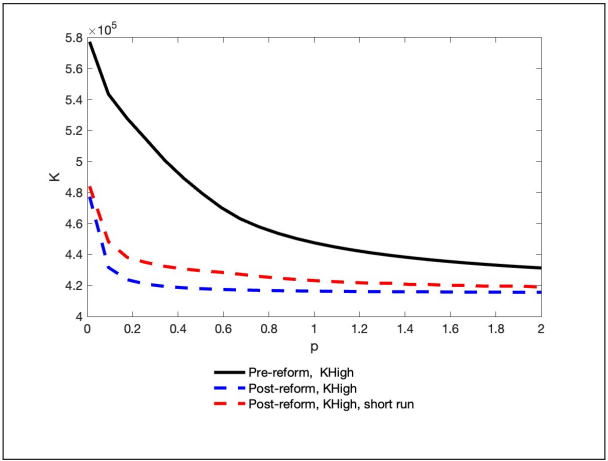
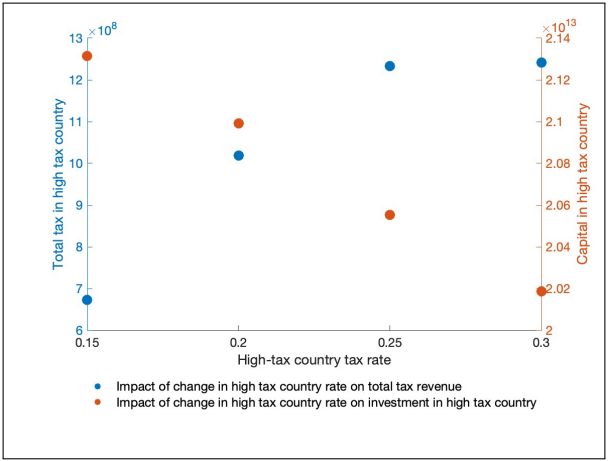
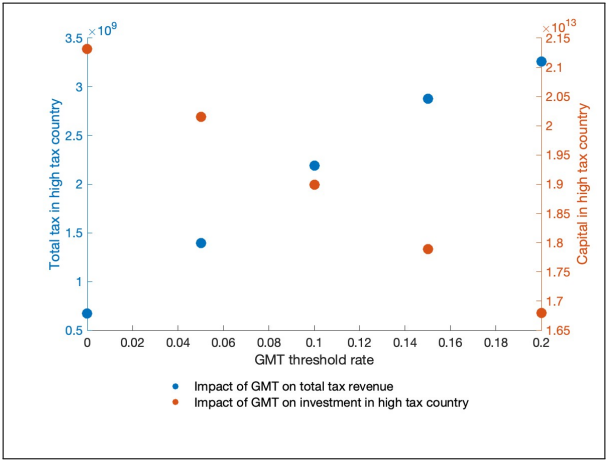


The tax revenue-investment tradeoff: reducing the home tax rate



The tax revenue-investment tradeoff: introducing GMT at 15%



Conclusion

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Applying our model to data, we make three contributions:

1. **Revenue-investment trade-off:** Using our framework, it is possible to obtain quantifiable measures of the revenue-investment trade-off in tax policy.
2. **Unobserved heterogeneity:** Highest elasticity group is 18 times more responsive to tax reform measures than the least tax-aggressive group.
3. **Corner solutions:** Naive average micro-elasticity 17 percent smaller than the average macro-elasticity estimated taking into account zero-tax MNEs.