International tax competition with rising intangible capital and financial globalization

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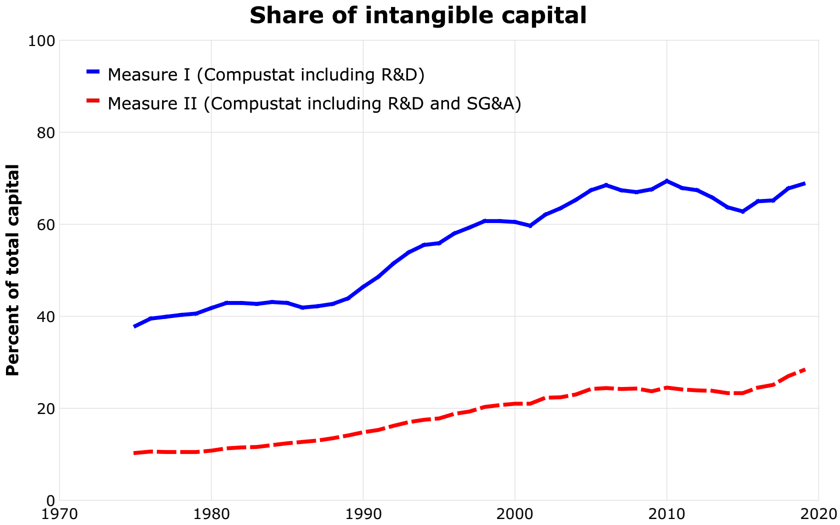
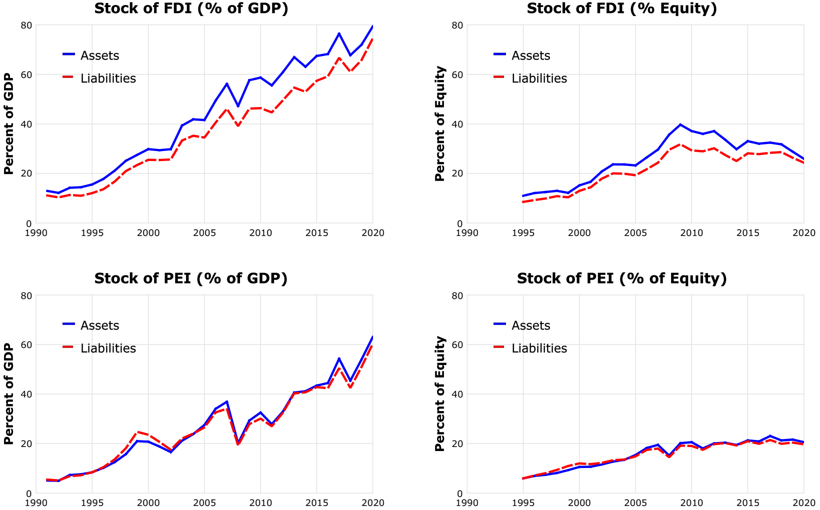
Rising share of intangible capital



Rising ‘de-facto’ globalization: Cross-Country Foreign Direct Investment & Portfolio Equity Investment



Questions

- What is the impact of the two trends on cross-country tax competition?
- What Can we say about welfare?

How we address the questions

- Two-country model with capital mobility.
- Governments fund 'exogenous' spending with two types of taxes:
  - Profit taxes (*source principle*).
  - Income taxes (*residence principle*).
- Governments choose Taxes optimally every period without commitment (*time consistent policy*) and without coordination (*non-cooperative policy choice i.e. tax competition*).

Findings

- Rising intangible capital leads to lower capital income tax rates (via lower taxation of profits) and very small increase in income tax rates.
- Rising 'de-facto' globalization leads to higher capital tax rates (via higher taxation of profits).
- The combined changes over the last three decades caused
  - A net decline in profit tax rates of 20% (30% to 24%).
  - A welfare gain of 0.55% (Obviously starting from the same initial conditions).

What is special about intangible capital?

- Non-rivalry:
  - The same capital can be use in multiple locations (countries).
- Arbitrary geographical allocation of the cost of capital:
  - Multinationals have some ability to shift profits in countries with lower taxes.

Implication

- Higher prevalence of intangible capital increases tax competition

What is special about ‘de-facto’ globalization?

- Internationalization of profits:
  - Some of the profits earned in a country belong to foreigners.
- Taxation of profits earned by foreigners:
  - Source taxes allow governments to tax profits earned by foreigners in their country.

Implication

- Higher ‘de-facto’ globalization increases the incentive to tax profits.

MODEL

Model features

- There are two symmetric countries: ‘Home’ and ‘Foreign’
- In each country there is
  - Continuum of representative households;
  - Continuum of multinational firms headquartered there;
  - A government that taxes profits (source) and income (residence).

Households

- Standard Preferences

$$\sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\sigma}}{1-\sigma}.$$

- Supply one unit of labor inelastically.
- Hold a share θ of domestic multinationals and a share $1-\theta$ of foreign multinationals.
- Lend or borrow internationally with a one-period bond.

Multinational firms

- Produce intermediate inputs domestically and abroad

$$\begin{aligned} m_t &= z \left(x_t^{\alpha} k_t^{1-\alpha} \right)^{\nu} \ell_t^{1-\nu} \\ \widehat{m}_t &= \widehat{z} \left(x_t^{\alpha} \widehat{k}_t^{1-\alpha} \right)^{\nu} \widehat{\ell}_t^{1-\nu} \end{aligned}$$

z, $\widehat{z}$ = Productivity at home and abroad (today $z = \widehat{z}$)

x = Intangible capital

k, $\widehat{k}$ = Tangible capital at home and abroad

ℓ, $\widehat{\ell}$ = Labor at home and abroad

- Capital (intangible and tangible) depreciates at rate δ.

Final production and intermediate prices

- Final production with inputs produced by home and foreign multinationals

$$y_t = m_t^{\lambda} \left(\widehat{m}_t^*\right)^{1-\lambda}$$

- Intermediate prices are marginal productivities in final sector

$$\begin{aligned} q_t &= \frac{\partial \left[m_t^{\lambda} \left(\widehat{m}_t^*\right)^{1-\lambda}\right]}{\partial m_t}, \\ \widehat{q}_t^* &= \frac{\partial \left[m_t^{\lambda} \left(\widehat{m}_t^*\right)^{1-\lambda}\right]}{\partial \widehat{m}_t^*} \end{aligned}$$

Cross-country allocation of costs

- Recall that Intangible capital depreciates at rate δ.

- However, multinationals have discretion in choosing country-specific depreciation—ζ_t at home and $\widehat{\zeta}_t$ abroad—provided that

$$\zeta_t + \widehat{\zeta}_t = \delta$$

- There is a cost though

$$\chi \cdot \left(\zeta_t - \lambda\delta\right)^2 \cdot x_t$$
$$\chi \cdot \left(\widehat{\zeta}_t - (1-\lambda)\delta\right)^2 \cdot x_t$$

Profits of Home Firms

$$\pi_t = q_t F(x_t, k_t, l_t) - w_t l_t - \delta k_t - \zeta_t x_t - \chi \cdot \left(\zeta_t - \lambda\delta\right)^2 x_t$$

$$\widehat{\pi}_t = \widehat{q}_t \widehat{F}(x_t, \widehat{k}_t, \widehat{l}_t) - w_t^* \widehat{l}_t - \delta \widehat{k}_t - (\delta - \zeta_t) x_t - \chi \cdot \left(\lambda\delta - \zeta_t\right)^2 x_t$$

Government

- Fund exogenous spending $G + T$ with
  - Profit taxes at source, τ_t
  - Income taxes based on residency, ϕ_t
- Budget constraint

$$
\begin{aligned}
G_t + T_t \quad = \quad & \tau_t\left(\pi_t + \widehat{\pi}_t^*\right) + \phi_t\Big[\theta(1-\tau_t)\pi_t + \theta(1-\tau_t^*)\widehat{\pi}_t + \\
& (1-\theta)(1-\tau_t)\widehat{\pi}_t^* + (1-\theta)(1-\tau_t^*)\pi_t^* + w_t\Big]
\end{aligned}
$$

Write the Problem Recursively

- Aggregate State is

$$\mathbf{s} = \{X, K, \widehat{K}, X^*, K^*, \widehat{K}^*, B\}$$

- Individual States.
  - Home Firms

$$\{\mathbf{s}, x, k, \widehat{k}, \}$$

  - Foreign Firms

$$\{\mathbf{s}, x^*, k^*, \widehat{k}^*\}$$

  - Home Households

$$\{\mathbf{s}, b\}$$

  - Foreign Households

$$\{\mathbf{s}, b^*\}$$

Home Firm Problem Given Policy Ψ: I Static Part

$$\max_{\zeta,\widehat{\zeta},\ell,\widehat{\ell}} \quad \Big\{(1-\tau)\pi + (1-\tau^*)\widehat{\pi}\Big\},$$

$$\text{s.t.} \quad \zeta + \widehat{\zeta} = \delta.$$

With FOC

$$\Big[1 + \varphi_\zeta(\zeta)\Big](1-\tau) = \Big[1 + \widehat{\varphi}_\zeta(\widehat{\zeta})\Big](1-\tau^*),$$

$$q \; F_\ell(k, x, \ell) = w,$$

$$\widehat{q} \; \widehat{F}_\ell(\widehat{k}, x, \widehat{\ell}) = w^*,$$

Home Firm Problem Given Policy Ψ: II Dynamics

- Solves

$$\begin{aligned}
V(\mathbf{s},x,k,\widehat{k};\Psi) &= \max_{n,i,\widehat{i}} \left\{ d + \widetilde{R}^{-1}(\mathbf{s})\ V\left(\mathbf{s}';x',k',\widehat{k}';\Psi\right) \right\} \\
\text{s.t.} \qquad d &= (1-\bar{\phi})\Big[(1-\tau)\pi + (1-\widehat{\tau})\widehat{\pi}\Big] - n - i - \widehat{i}, \\
x' &= x+n, \qquad k' = k+i, \qquad \widehat{k}' = \widehat{k}+\widehat{i}, \\
(\tau,\tau^*,\phi,\phi^*) &= \Psi(\mathbf{s}), \qquad \mathbf{s}' = \Upsilon(\mathbf{s};\Psi) \qquad \text{Equil object}
\end{aligned}$$

$\bar{\phi} = \theta\phi + (1-\theta)\phi^*$, d (Firms pay income taxes of its shareholders).

- FOC

$$R^{-1}(\mathbf{s})\left[1 + (1-\bar{\phi}')\left[(1-\tau')\frac{\partial \pi'}{\partial x'} + (1-\tau^{*\prime})\frac{\partial \widehat{\pi}'}{\partial x'} - \varphi(\zeta')\right]\right] = 1,$$

$$R^{-1}(\mathbf{s})\left[1 + (1-\bar{\phi}')(1-\tau')\frac{\partial \pi'}{\partial k'}\right] = 1,$$

$$R^{-1}(\mathbf{s})\left[1 + (1-\bar{\phi}')(1-\tau^{*\prime})\frac{\partial \widehat{\pi}'}{\partial \widehat{k}'}\right] = 1.$$

Household Problem Given Policy Ψ

- Solves

$$\begin{aligned} \Omega(\mathbf{s}, b; \Psi) &= \max_{c, b'} \left\{ u(c) + \beta\Omega\left(\mathbf{s}', b'; \Psi\right) \right\} \\ \text{s.t.} \qquad c &= (1-\phi)w + \theta d + (1-\theta)d^* + T + b - pb', \\ \phi &= \Psi_\phi(\mathbf{s}), \\ \mathbf{s}' &= \Upsilon(\mathbf{s}; \Psi). \end{aligned}$$

- FOC

$$u_c(c)\ p = \beta\ u_c(c'),$$

- This FOC Yields the discount factor for firm $R^{-1}(\mathbf{s})$

Equilibrium given Ψ

- It is just that decision rules of agents satisfy
  - Representative Agent Conditions
  - Consistency with $\mathbf{s}' = \Upsilon(\mathbf{s}; \Psi)$

Also Have to Consider deviations from Ψ

- Governments have to **consider** alternative taxation so
- A home firm would solve

$$
\begin{aligned}
\widetilde{V}\left(\mathbf{s}, x, k, \widehat{k}, \tau, \tau^*; \Psi\right) &= \max_{\zeta, l, \widehat{\ell}, n, i, \widehat{i}} \left\{ d + pV\left(\mathbf{s}', x', k', \widehat{k}'; \Psi\right) \right\} \textbf{s.t.} \\
d &= (1-\bar{\phi})\left[(1-\tau)\pi + (1-\tau^*)\widehat{\pi}\right] - n - i - \widehat{i}, \\
x' &= x + n, \\
k' &= k + i, \\
\widehat{k}' &= \widehat{k} + \widehat{i}, \\
(\phi, \phi^*) &= \widetilde{\mathcal{B}}(\mathbf{s}; \tau, \tau^*) \\
\bar{\phi} &= \theta\phi + (1-\theta)\phi^* \\
\mathbf{s}' &= \widetilde{\Upsilon}(\mathbf{s}, \tau, \tau^*; \Psi).
\end{aligned}
$$

- Same for other agents

Government objective and time-consistent policy

- Maximize welfare of residents by choosing $\{\tau, \phi\}$, taking as given
  - $\{\tau^*, \phi^*\}$ = Tax rate chosen by the other country
  - $\Psi(\mathbf{s})$ = Policy rule determining future taxes
  - Equilibrium response from optimal decisions of households and firms

$$\max_{\tau} \ \widetilde{\Omega}\Big(\mathbf{s}, \tau, \tau^*; \Psi\Big)$$

- A **Nash one-step equilibrium** is a policy function

$$(\tau, \tau^*) = \psi(\mathbf{s}; \Psi)$$

that satisfies

$$\tau = h(\mathbf{s}, \tau^*; \Psi), \qquad \text{and} \qquad \tau^* = h^*(\mathbf{s}, \tau; \Psi).$$

- A **Time-consistent policy rule** satisfies

$$\Psi(\mathbf{s}) = \psi(\mathbf{s}; \Psi).$$

QUANTITATIVE ANALYSIS

Steps in the quantitative excercise

The goal is to quantify the impact of changes in intangible capital and 'de-facto' globalization during the last three decades. So

- We calibrate the model to early 1990s.
- We then changes the parameters α, λ, θ so that the model replicates the share of intangible capital and globalization in 2020,
- We also Change TFP to ensure that same output is implied
- We quantify the macroeconomic and welfare implications.

Calibration

Steady state values

	Targets 1990	Implications 2020
Profit tax rate	0.30	**0.24**
Income tax rate	0.35	**0.35**
Share Intangible Capital	0.30	**0.70**
Stock of FDI	0.15	**0.50**
Share of PEI	0.05	**1.03**
Public purchases-output ratio	0.20	**0.19**
Public transfers-output ratio	0.15	**0.14**
Stock of capital	2.29	**2.49**
Output	1.00	**1.03**

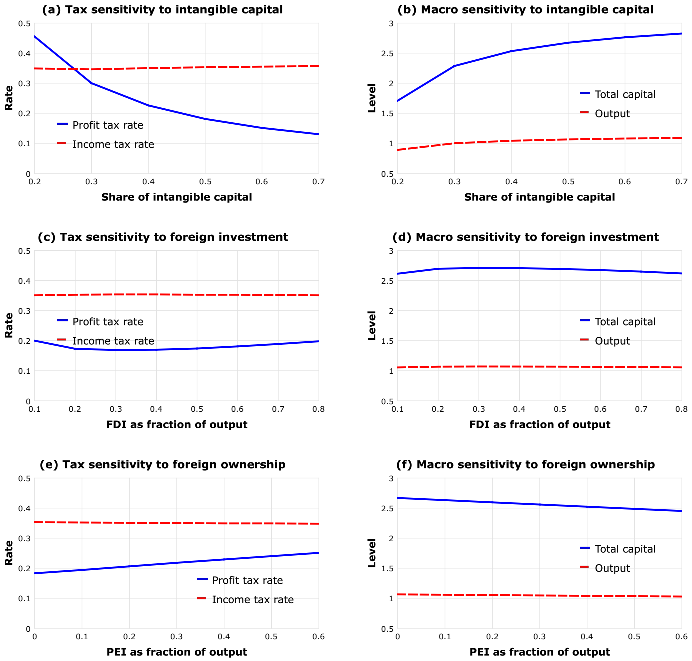
Parameter values.

		1990	*2020*
Discount factor	β	0.95	
Utility curvature	σ	2.00	
Productivity	$\bar{z}$	0.72	
Capital income share	ν	0.40	
Share intangible capital	α	0.30	**0.50**
Share domestic production inputs	λ	0.93	**0.69**
Share domestic ownership of multinationals	θ	0.98	**0.78**
Cost of tax shifting	χ	0.81	
Government purchases	G	0.20	
Government transfers	T	0.15	

Summary

- A net decline in profit tax rates of 20% (30% to 24%).
- Income Tax Rates barely Change (.346 to .349)

Sensitivities



What About Welfare?

- Steady State Comparisons say **nothing** about welfare.
- Need to Compute Transition
  - Starting from the initial steady state
  - An MIT permanent Shock that Changes the three parameters (increasing intangible capital, globalization in terms of shares of goods and foreign ownership).
  - Compute the utilities of both and find proportional increase in Steady States that equate them.
  - Still, it is a conservative (in the sense of right wing) statement that ignores inequaility.

Welfare implications

- Indifference between transition with 2020 new parameters and 1990 steady state where consumption is raised by g:

$$(1+g)^{1-\sigma}\Omega\left(\mathbf{s}_0;\alpha_{90},\lambda_{90},\theta_{90}\right) = \Omega\left(\mathbf{s}_0;\alpha_{20},\lambda_{20},\theta_{20}\right).$$

- Welfare gain is 0.55% ($g = 0.0055$).

Extension to a bit of Heterogeneity

- Two types (one hand to mouth). Predictable findings: Poor gain but not a lot relative to loses of rich.
- Political Bias in favor of the poor (more of the same)
- Some Myopia: Even worse disaster
- The answers are all charged as taxing profits is a huge disincentive to capital accumulation and no role of public expenditures.

CONCLUSION

- The growing importance of intangible capital and financial globalization alter tax competition in different directions.
- We find that the growth of intangible has dominated financial globalization with consequent reduction in capital taxes.
- The welfare consequences are positive (because of ther Rep Agent Assumption) because the lower taxation of capital increases investment .

HETEROGENEITY

Extended model

- Two types of households
  - Type I: Same as before, μ.
  - Type II: Hand-to-mouth households with labor income only, $1 - \mu$.
- $1 - \mu$ is an index of inequality.

Inequality and taxes

$$\max_{\tau} \left\{ \mu \widetilde{\Omega}\Big(\mathbf{s}, \tau, \tau^*; \Psi\Big) + (1-\mu)\widetilde{U}\Big(\mathbf{s}, \tau, \tau^*; \Psi\Big) \right\},$$

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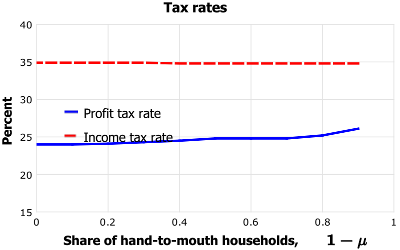
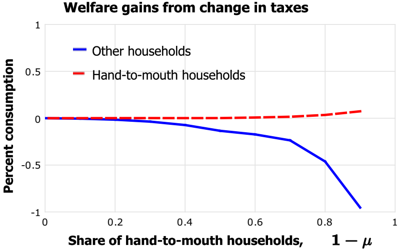
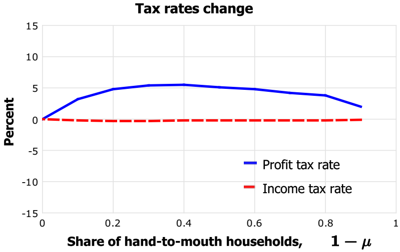


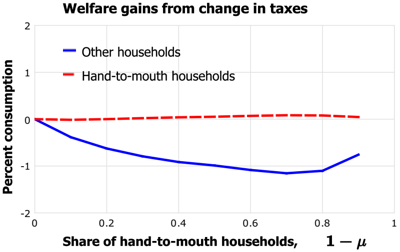


Political bias

$$\max_{\tau} \left\{ \rho \cdot \mu \cdot \widetilde{\Omega}\Big(\mathbf{s}, \tau, \tau^*; \Psi\Big) + (2 - \rho) \cdot (1 - \mu) \cdot \widetilde{U}\Big(\mathbf{s}, \tau, \tau^*; \Psi\Big) \right\}$$

$$\rho = \mathbf{0.5}$$





Political myopia

$$\max_{\tau} \left\{ \mu \cdot \left[u\Big(\tilde{c}(\mathbf{s},\tau,\tau^*;\Psi)\Big) + \gamma\beta\Omega(\mathbf{s};\Psi) \right] + (1-\mu)\cdot \left[u\Big(\tilde{c}^{hm}(\mathbf{s},\tau,\tau^*;\Psi)\Big) + \gamma\beta U(\mathbf{s};\Psi) \right] \right\},$$

i

$$\gamma = \mathbf{0.5}$$