International Economics
International Macroeconomics — Lecture 3

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Financial integration, growth and capital flows

- Capital flows and welfare gains from financial integration
  - Static and dynamic considerations
  - Discussion of the empirical evidence
- Capital flows: assessing long-run efficiency

  [not covered — discussed if time permits]

Reminder — Financial Globalisation

Using *de-jure* or *de facto* measures, financial globalization increasing since the 1980s.

Mostly among developed countries but some large emerging markets playing recently a predominant role.

Second wave of globalisation, first wave in the 19th-early 20th century before collapse in the 1930s.

Drop in capital flows after the Great Recession.

Reminder — Capital Flows and the Lucas Puzzle

Neoclassical growth model predicts:

- Capital flows to capital scarce countries (higher marginal productivity of capital $= MPK$).

- Capital flows towards fast growing countries.

Lucas Puzzle: Capital does not flow towards poorer countries. Less of a puzzle during first globalization wave than nowadays.

Allocation Puzzle: Capital does not flow towards fast growing emerging countries.

Gains from financial integration

1) Efficient allocation of capital globally

2) International risk-sharing: smoothing of country specific shocks

3) Permanent output/growth effects: risk-taking and specialization

4) The benefits in terms of domestic allocative efficiency: superior foreign technology (FDI), market discipline on domestic policies, social infrastructure, etc...

This course: focus on the first type of gains

Gains from financial integration — Efficient allocation of capital

Central question

How would (perfect) financial integration affect income across countries through its effect on the allocation of physical capital around the world?

- Static considerations: Caselli and Feyrer (2007)

- Dynamic considerations: Gourinchas and Jeanne (2006)

Gains from Financial Integration: Static Considerations

Reminder — Development Accounting

- **Step 1:** Write output per worker in country i as

$$\frac{Y_i}{L_i} = A_i \left(\frac{K_i}{L_i}\right)^{\alpha} \left(\frac{H_i}{L_i}\right)^{1-\alpha}$$

  or equivalently

$$\frac{Y_i}{L_i} = A_i^{1/(1-\alpha)} \left(\frac{K_i}{Y_i}\right)^{\alpha/(1-\alpha)} \left(\frac{H_i}{L_i}\right)$$

- **Step 2:** Take log on both sides, compute difference compared to US, and ask how much of income differences can be accounted for by observed factor differences, $\frac{K_i}{L_i}$ and $\frac{H_i}{L_i}$. Or do a variance decomposition.

Reminder — Development Accounting – Current state of the debate

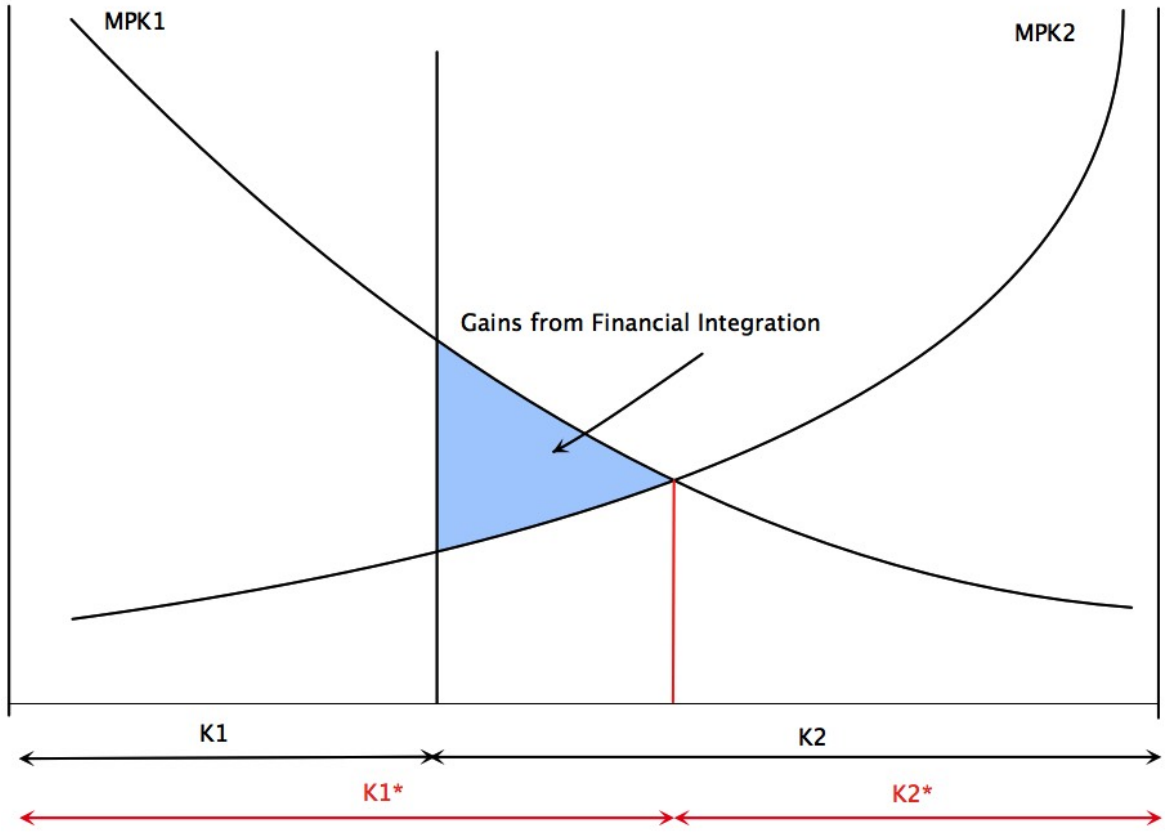
- Human capital is important: $\simeq 10 - 30\%$ of cross-country income differences
- Physical capital also matters: $\simeq 20\%$ of cross-country income differences
- Residual TFP is the biggest part of the story: $\simeq 50 - 70\%$ of cross-country income differences
- The 'convergence-gap' due to capital accumulation accounts for a small fraction of the world income inequality.

Reminder — Development Accounting – Current state of the debate

- **Open question:** What determines A?
  - Recent research suggest misallocations may be important (Banerjee and Duflo 2005, Hsieh and Klenow 2009)

- Easy to imagine in theory financial and trade integration affecting income through effects on misallocation and A (e.g. multinationals providing credit access to local subsidiaries)

- Here, focus on impact of financial integration on K/L



Static gains from financial integration

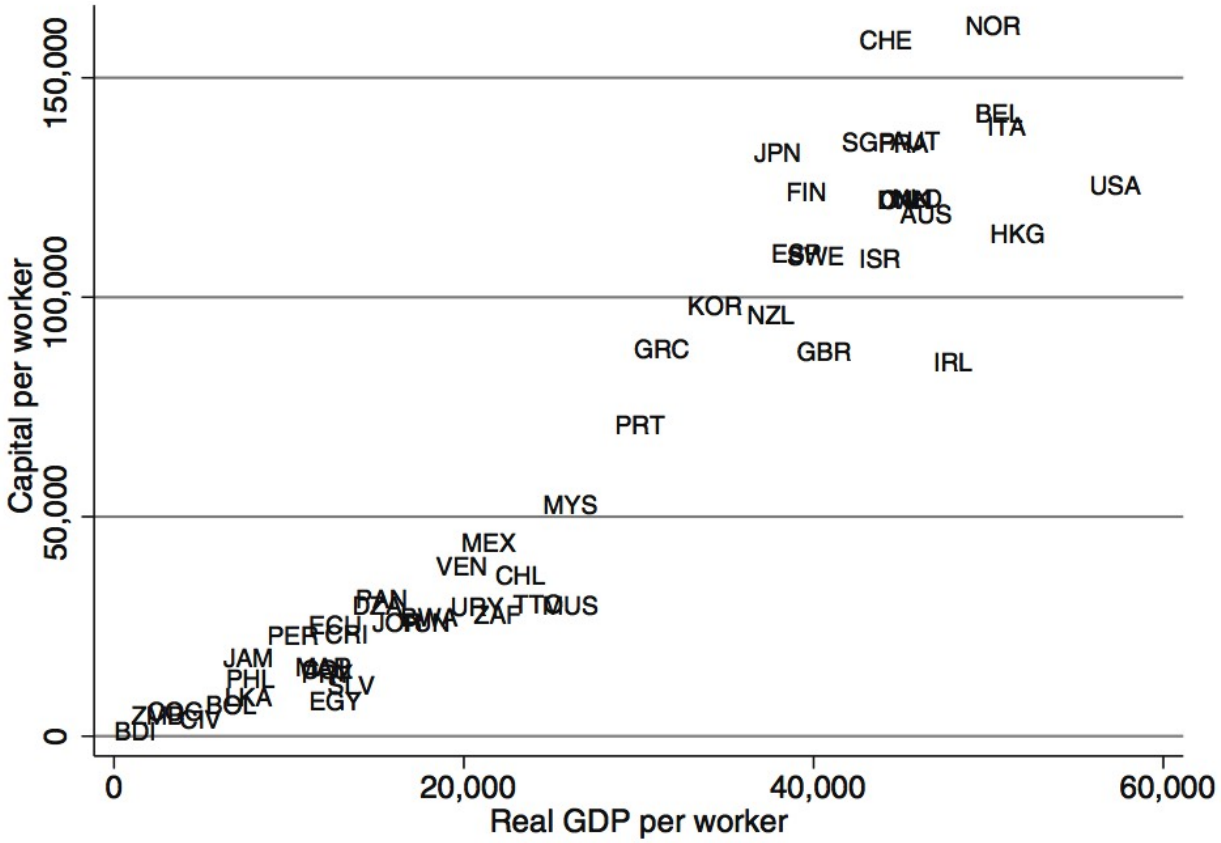


FIGURE I
Capital per Worker

Source: Penn World Tables 6.1.

Countries exhibit large differences in K/L. Large gains?

Gains from Financial Integration: Static Considerations

- Large $\neq$ in K/L do not necessarily imply large $\neq$ in MPK (Lucas (1990))

- $\neq$ in MPK is key for size of gains from financial integration:
  - If $\neq$ in MPK are large, but "frictions" lead to small capital flows, then expect gains from (future) financial integration to be big.
  - If $\neq$ in MPK are small, because $\neq$ in K/L reflect technological differences, there may not be much left on the table.

- Caselli and Feyrer (2007) demonstrate how to use easily access macroeconomic data to compute MPKs.

Naive approach — Standard neoclassical environment

1. Constant returns to scale (CRS)

2. Perfect competition

- Under CRS and perfect competition:

$$\text{Aggregate Capital Income} \equiv MPK_n \times K$$

- Measure MPK using:

$$MPK_n \times K = \alpha_w Y \Leftrightarrow MPK_n = \frac{\alpha_w Y}{K}$$

where: $Y \equiv$ GDP; $\alpha_w \equiv 1-$Labor share in GDP; $K \equiv$ Capital stock

Measurement issues

- What's naive about the naive approach?
  - 1−labor share include payments accruing to both reproducible and non-reproducible capital (land and natural resources)
  - K, computed using the perpetual inventory method from investment flows, represents only reproducible capital stock
- Potentially important for cross-country $\neq$ in MPK. Agriculture & natural resources represent a larger share of GDP in poor countries.

Measurement issues

- The price of capital goods relative to consumption goods is also higher in poor countries (Hsieh and Klenow (2007)). Poor countries relatively more efficient at producing consumption goods

- Also important for cross-country $\neq$ in MPK:
  - For the purposes of cross-country capital flows, one wants to look at value of marginal product of capital, $\frac{\alpha P_y Y}{K}$, divided by its cost, P_k
  - If P_y/P_k is lower in poor countries, $\neq$ in physical MPK overestimate $\neq$ in returns to investment across countries

Adjustments of naive measure

- **"Land corrected" measure**:

$$MPK_l = \frac{\alpha_k Y}{K}$$

with $\alpha_k \equiv$share of reproducible capital in income

- **"Price corrected" measures:**

$$PMPK_n = \frac{\alpha_w P_y Y}{P_k K}, PMPK_l = \frac{\alpha_k P_y Y}{P_k K}$$

where $P_y/P_k \equiv$price of consumption good relative to capital goods

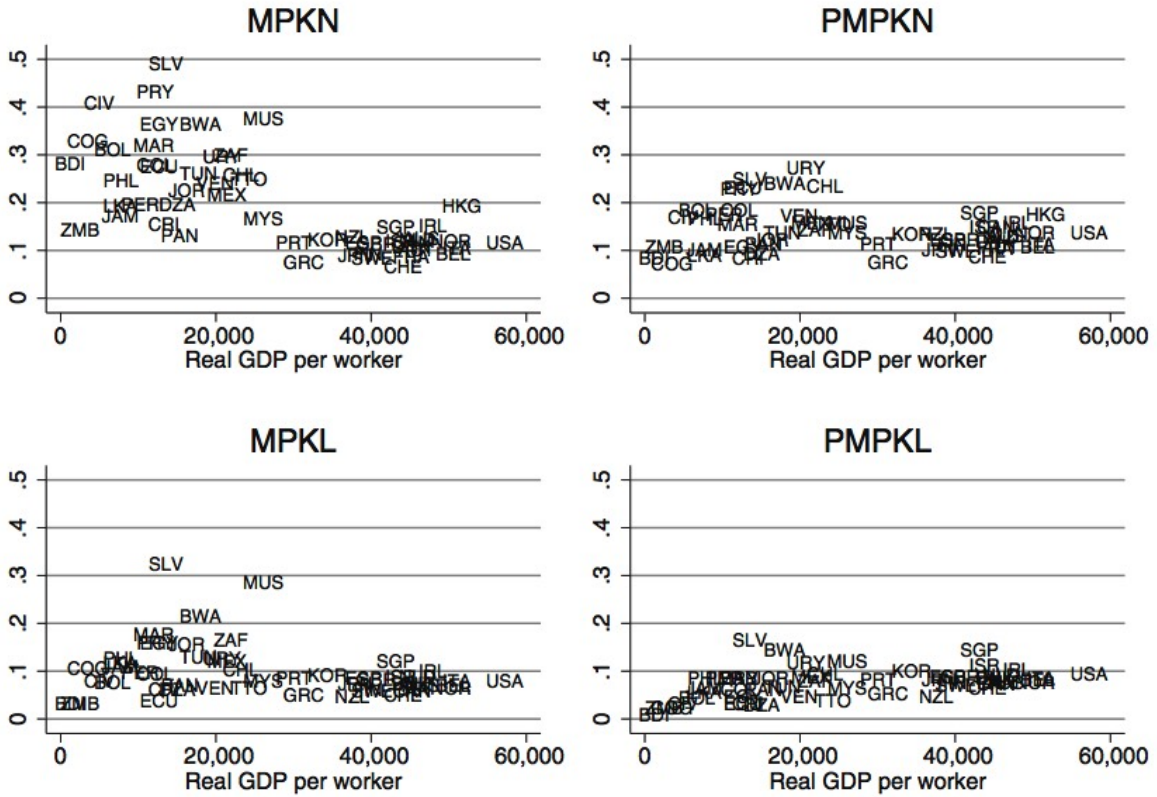


FIGURE V

The Marginal Product of Capital

MPK*N*, naive estimate; MPK*L*, after correction for natural-capital; *P*MPK*N*, after correction for price differences; *P*MPK*L*, after both corrections.

Source: Heston, Summers, and Aten [2004], Bernanke and Gurkaynak [2001], World Bank [2006], and authors' calculations.

Main results

- **Basic Message**

  Since MPK—when measured correctly—are almost equal across countries, gains from financial integration cannot be that large

- Caselli and Feyrer (2007) proceed in two steps:

  1. Compute counterfactual capital stocks such that MPKs are equalized (perfect financial integration)

  2. Compute change in output associated with new stocks (output gains from financial integration)

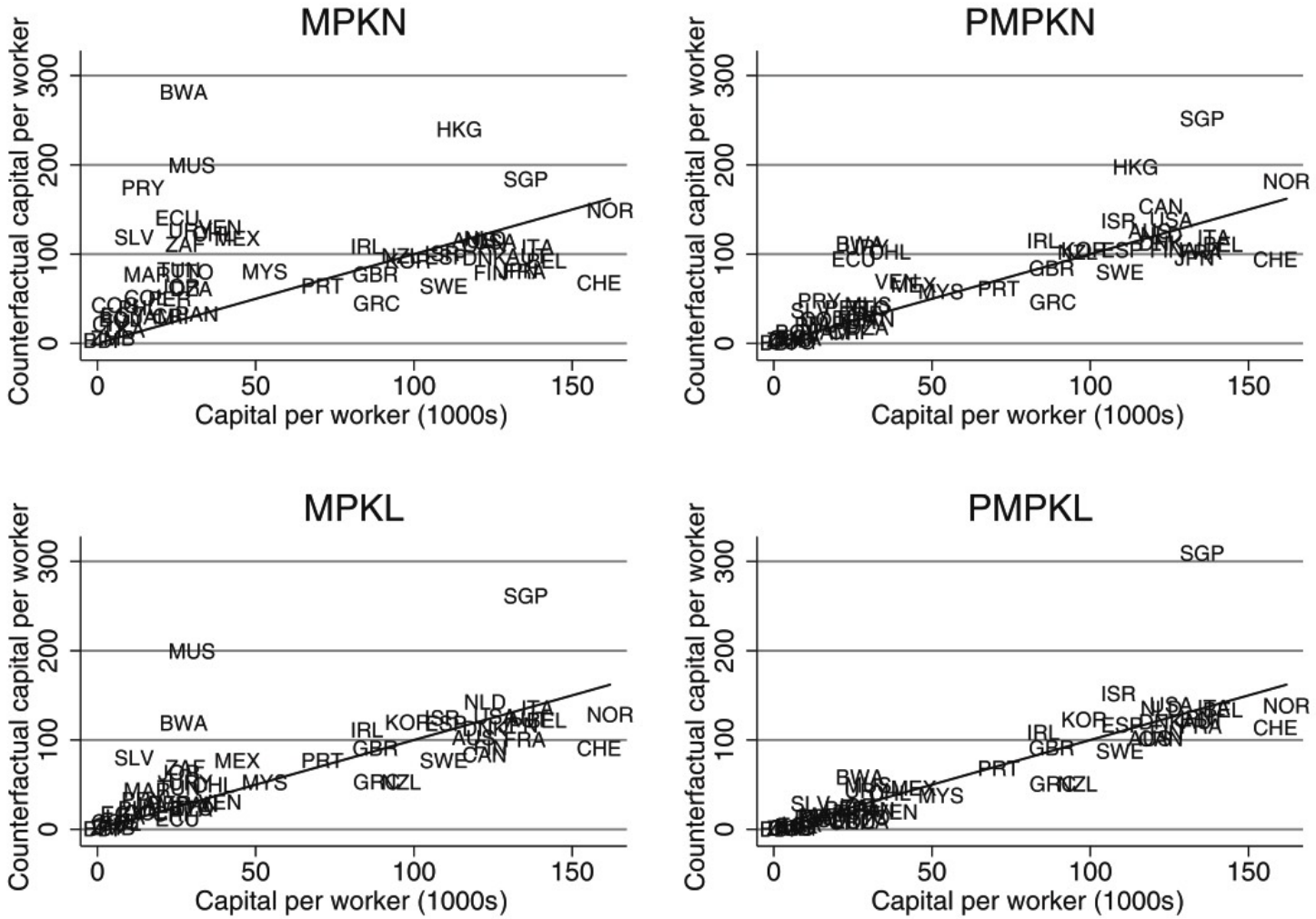


FIGURE VI
Counterfactual Capital per Worker with Equalized Returns to Capital

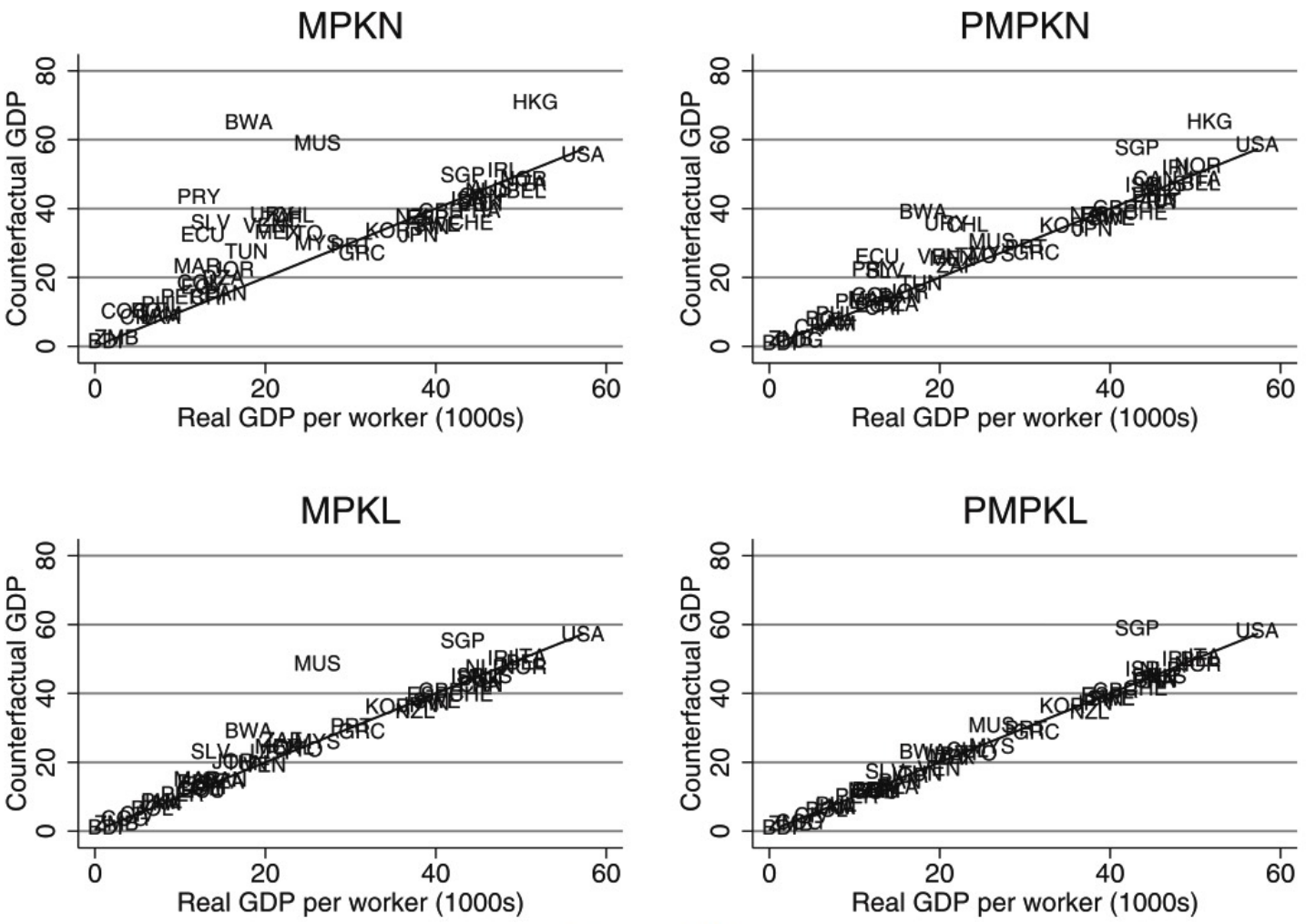


FIGURE VII
Counterfactual Output with Equalized Returns to Capital

TABLE IV

AVERAGE CHANGES IN EQUILIBRIUM CAPITAL STOCKS UNDER MPK EQUALIZATION

	Unweighted		Weighted by population	
	Rich countries	Poor countries	Rich countries	Poor countries
MPK*N*	−12.9%	274.5%	−19.3%	205.8%
MPK*L*	−6.2%	86.6%	−5.6%	59.3%
*P*MPK*N*	0.1%	71.8%	−4.9%	52.0%
*P*MPK*L*	0.6%	−10.6%	1.4%	−14.5%

MPK*N*, naive estimate; MPK*L*, after correction for natural-capital; *P*MPK*N*, after correction for price differences; *P*MPK*L*, after both corrections; Rich (Poor), GDP at least as large (smaller than) Portugal.

Source: Authors' calculations.

TABLE V

AVERAGE CHANGES IN EQUILIBRIUM OUTPUT PER WORKER UNDER MPK EQUALIZATION

	Unweighted		Weighted by population	
	Rich countries	Poor countries	Rich countries	Poor countries
MPK*N*	−3.0%	76.7%	−5.5%	58.2%
MPK*L*	−0.7%	16.8%	−1.0%	10.4%
*P*MPK*N*	1.1%	24.7%	−1.0%	17.4%
*P*MPK*L*	0.7%	0.0%	0.4%	−2.4%

MPK*N*, naive estimate; MPK*L*, after correction for natural-capital; *P*MPK*N*, after correction for price differences; *P*MPK*L*, after both corrections; Rich (Poor), GDP at least as large (smaller than) Portugal.

Standard deviations in parentheses.

Source: Authors' calculations.

Caveats

- Measurement issues far from trivial.

- Need accurate and comparable measures of:
  - quality-adjusted capital stocks
  - share of reproducible physical capital
  - quality-adjusted relative price of capital goods

Caveats

- Microdata suggest that rate of return for additional investment in some firms in poor countries may be huge (Banerjee and Duflo 2005)
  - Perhaps impossible to lend to those firms. Rate of return of additional foreign capital perhaps given by rate of return (much lower) for unconstrained firms
- Changes in output may be very different from changes in welfare
  - two country in general equilibrium (for one country, capital goes abroad and output falls, but welfare goes up)
  - dynamic considerations?

Gains from Financial Integration: Dynamic Considerations

The Elusive Gains from Financial Integration: Dynamic Considerations

Gourinchas and Jeanne (2006) proposes a new piece of evidence based on calibration of a standard neoclassical growth model

Main findings: **first class of benefits is even smaller than previously thought**

why?

- Gains are transitory. Countries would have converged anyway. Static gains are not permanent gains.

- Countries needs to be very capital-scarce or abundant to experience large gains from financial integration.

Gourinchas and Jeanne (2006)

- Look at the implications for capital account liberalization.

Focus on welfare benefits in response to capital scarcity.

- Calibrate variants of the standard (Ramsey-Koopman-Cass) model and compare transition paths towards steady state under two scenarios:

- financial autarky;

- perfect financial integration with the rest of the world (small open economy).

A simple experiment. Deterministic Ramsey-Koopman-Cass growth model under autarky and financial integration.

Output

$$\begin{aligned} Y_t &= K_t^{\alpha}(A_t L_t)^{1-\alpha} \\ y_t &= A_t k_t^{\alpha}, \quad y_t = Y_t/L_t; k_t = K_t/\left(A_t L_t\right) \end{aligned}$$

Constant productivity $A_t = 1$ and population $L_t = 1$ (do $g_{t+1} = \frac{A_{t+1}}{A_t} = g^*$ and demographic growth as an exercise).

Intertemporal utility

$$U_0 = \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\gamma}}{1-\gamma}$$

Autarky. Capital stock converges

$$\lim_{t\to\infty} k_t = k^* = \left(\frac{\alpha}{R^* + \delta - 1}\right)^{1/(1-\alpha)}$$

with $R^* = 1/\beta$; $\delta =$ depreciation rate

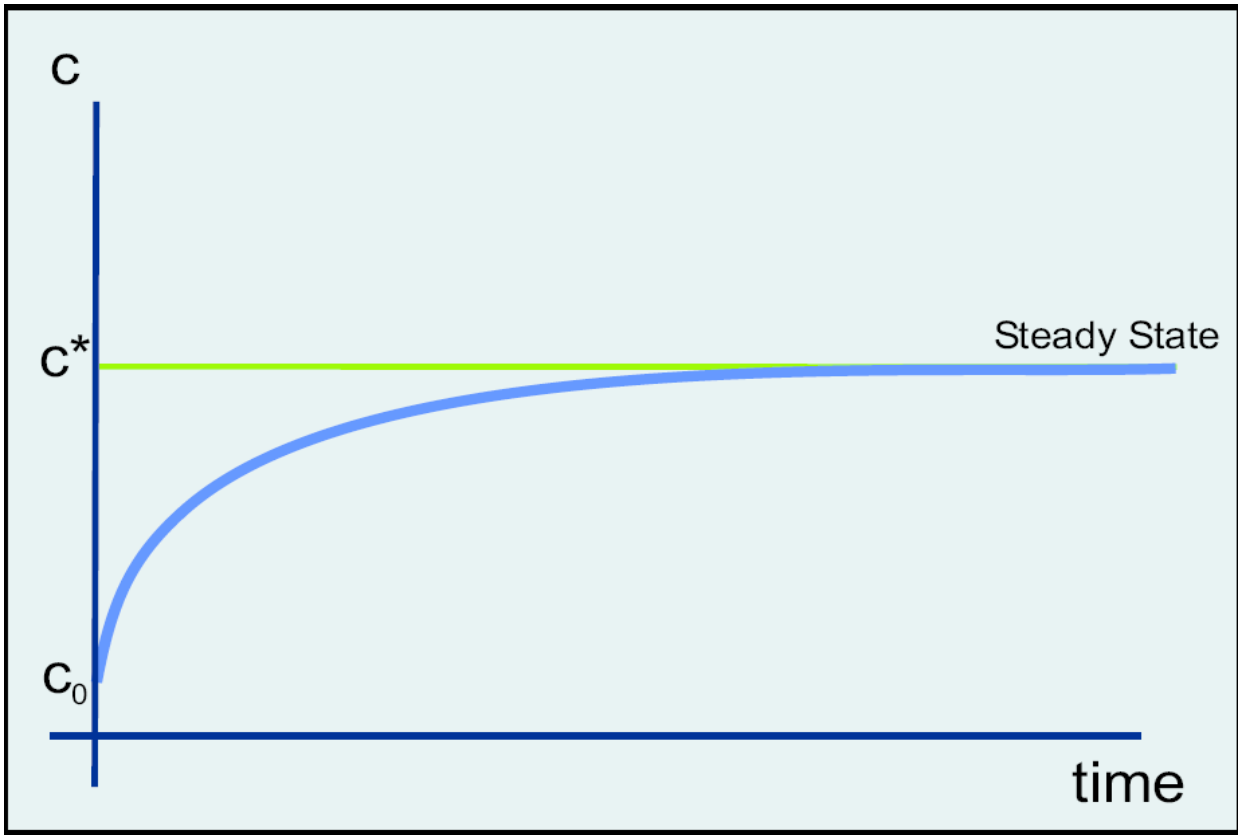
Transition path. Euler equation

$$c_t^{-\gamma} = c_{t+1}^{-\gamma}(\beta R_{t+1}) = c_{t+1}^{-\gamma}\beta(1 - \delta + \alpha k_{t+1}^{\alpha-1})$$

Market clearing

$$y_t = k_t^{\alpha} = c_t + k_{t+1} - (1 - \delta)k_t$$

Slow accumulation of capital as relying on domestic saving.



Dynamic of consumption: autarky

Financial integration. Constant world interest rate $R^* = 1/\beta$

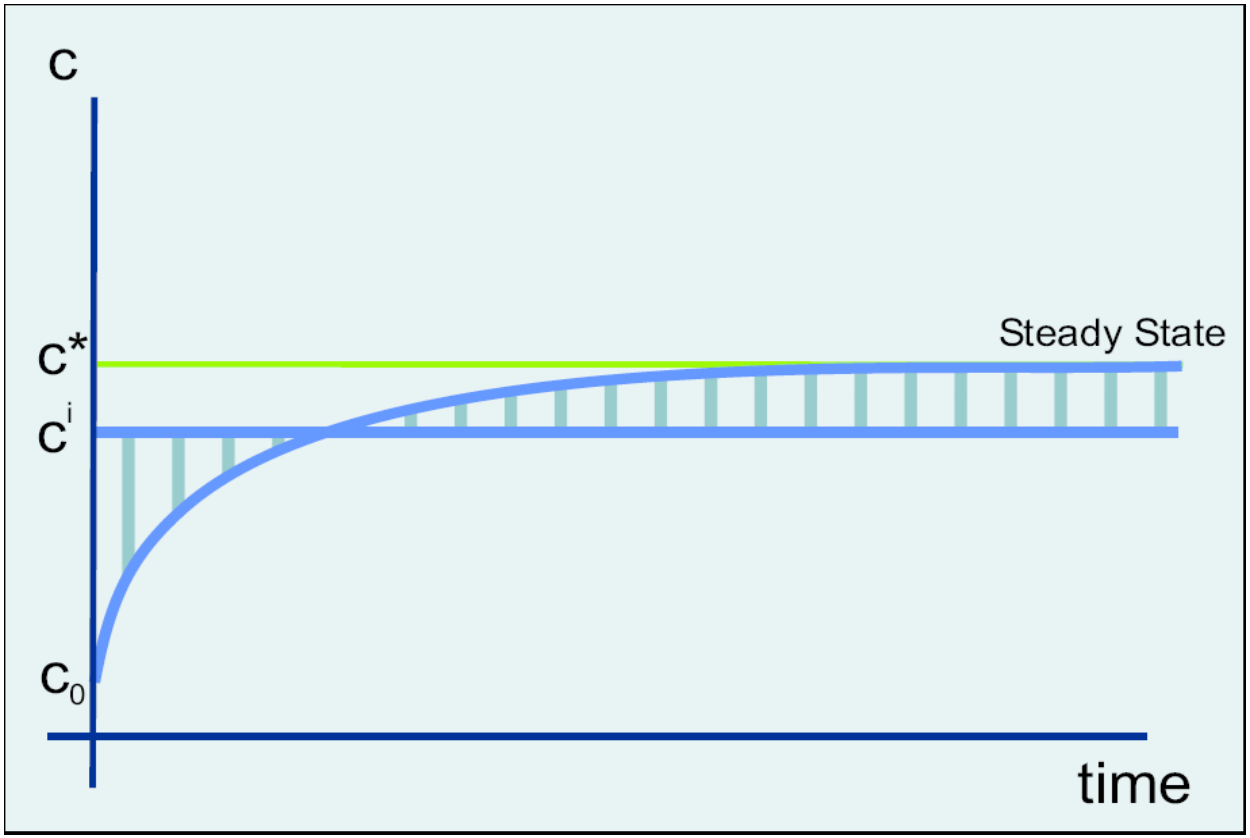
Consumption contant with $c = c_I$ implied by intertemporal budget constraint.

Euler equation $c_t^{-\gamma} = c_{t+1}^{-\gamma}(\beta R^*)$

Capital stock **jumps** to its steady-state.

If country capital scarce initially. Check: $c_I < \lim_{t\to\infty} c_t^{autarky} = c^*$.

Intuition?



Dynamic of consumption: autarky versus integration

Welfare gains

Calculate equivalent variation μ defined as the % (permanent) increase in consumption that brings domestic welfare under autarky up to its level under integration.

Calibration:

ADDITIONAL ASSUMPTIONS

β	γ	α	δ_k	g^*	n
0.96	1	0.3	0.06	1.012	1.0074

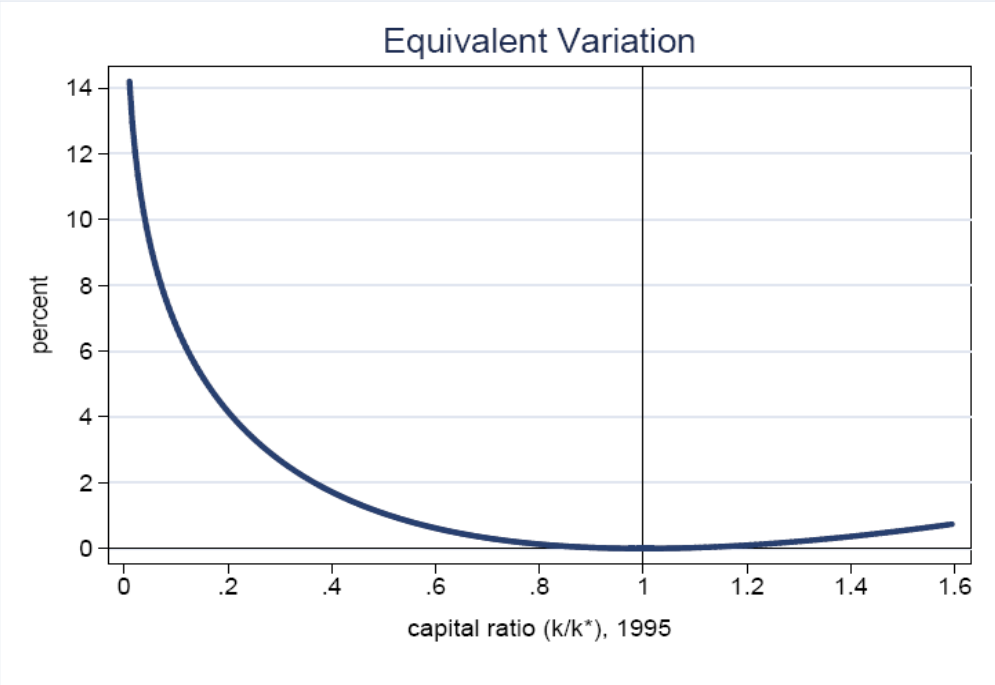


Figure 1: International Financial Integration, benchmark case. The solid line corresponds to the theoretical gains from international financial integration as a function of the capital ratio k/k^* for a country with the same parameters as the U.S.

Large gains require very large capital deficit (or surpluses): need $k/k* < 1/3$ for $\mu > 2\%$

Transitory gains

Small gains despite (temporary) gains in growth (consistent with empirical literature detailed below: after equity market liberalization, GDP growth increases by 1% over the next 5 years)

Basic intuition: the distorsion from financial autarky is transitory in nature (the distorsion disappears anyway)

- either speed of convergence is fast (Ramsey) and not much gain from going fast to SS

- or the problem is not convergence but the level of the SS level of capital & consumption.

Limits and potential extensions to the neoclassical model

Deterministic view: risk affects the steady state level of capital stock (precautionary savings). Financial integration by providing risk sharing opportunities modifies the steady state. (Coeurdacier, Rey and Winant (2018)).

Partial equilibrium: adverse interest rate changes would reduce gains even more.

Absence of financial frictions: capital scarcity can be due to credit constraints. If financial integration alleviates credit constraints, can generate permanent welfare gains.

Possibility of non-convexities (poverty traps).

Gains from financial integration — Discussion of empirical evidence

Gains from financial integration — Empirical evidence

- Cross country regressions using IMF-based measures look at the impact of financial integration on growth. Results range from no effect (Rodrik (1998)), to (small) significant effects (Quinn (1997,2008), Edwards (2001), ...). Interpretation?

- 'Policy experiments': financial liberalization (stock market opening) increases equity prices capital accumulation and growth (Henry (2007), Bekaert et al (2005))

- Not obvious how to translate a given increase in growth in terms of welfare: how permanent is the effect on growth? Does it change output levels in steady state? What share goes to foreigners?

Empirical evidence of financial liberalization on growth

- Evidence based on event study in Henry (2007) for a sample of emerging markets

- Tests predictions of standard neoclassical model:

(i) financial integration boosts growth and investment.

(ii) reduces the cost of capital (or increases asset prices).

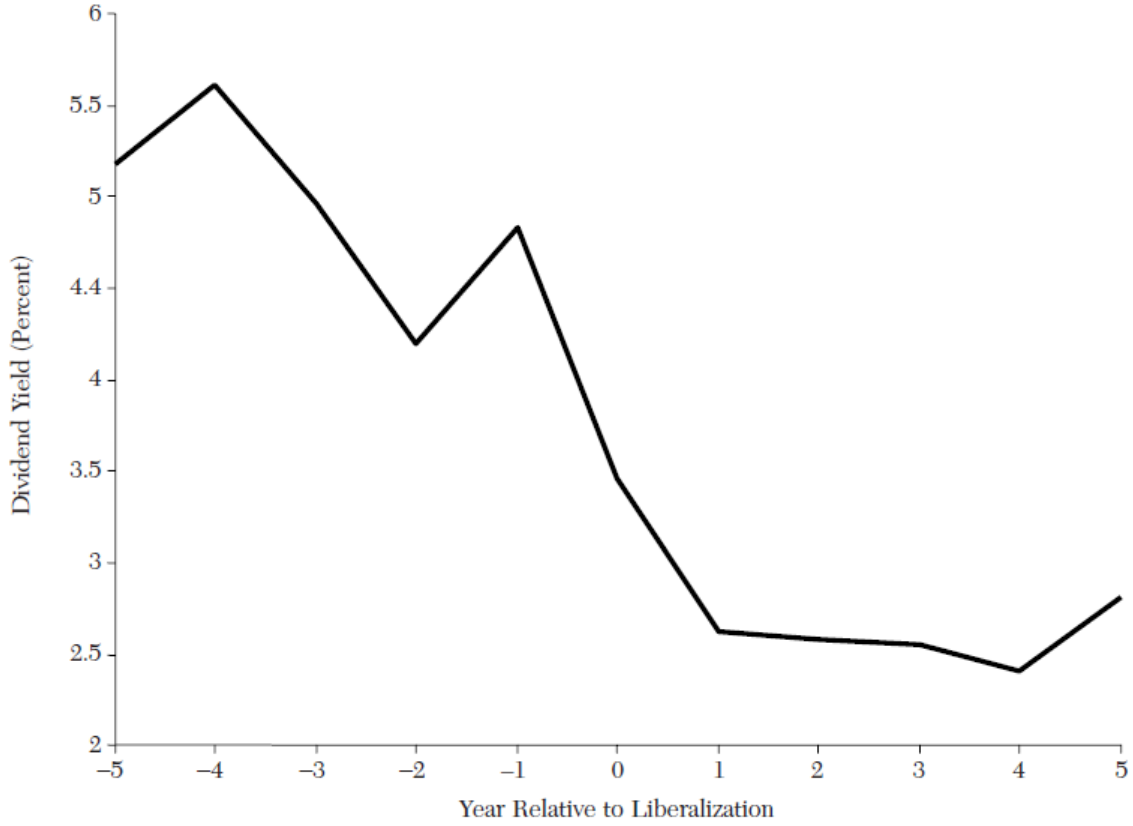


Figure 3. The Cost of Capital Falls When Countries Liberalize the Capital Account

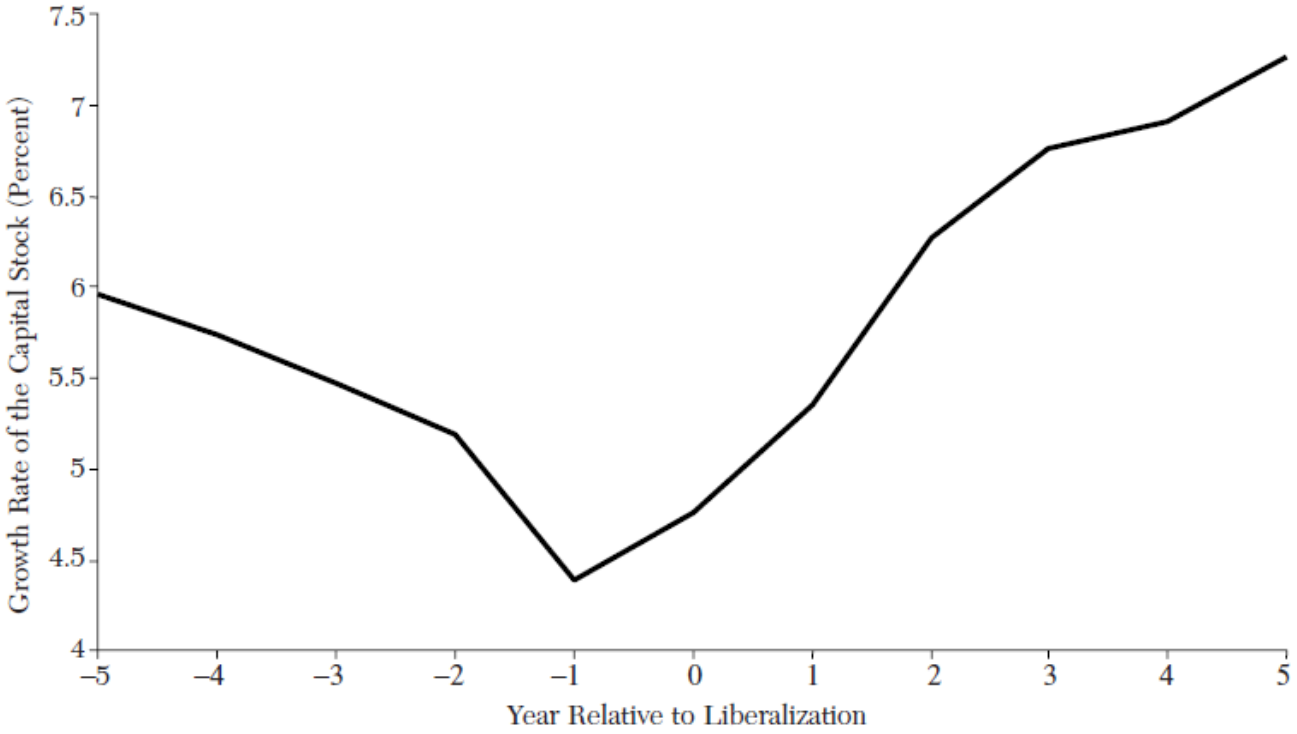


Figure 4. Investment Booms When Countries Liberalize the Capital Account

Empirical evidence of financial liberalization on growth

Bekaert et al. (2005) investigates the opening of stock markets to foreign investors in a sample of 95 emerging markets. Pick up equity market liberalization dates ($\neq$ capital account liberalization where effects are found to be smaller/less robust)

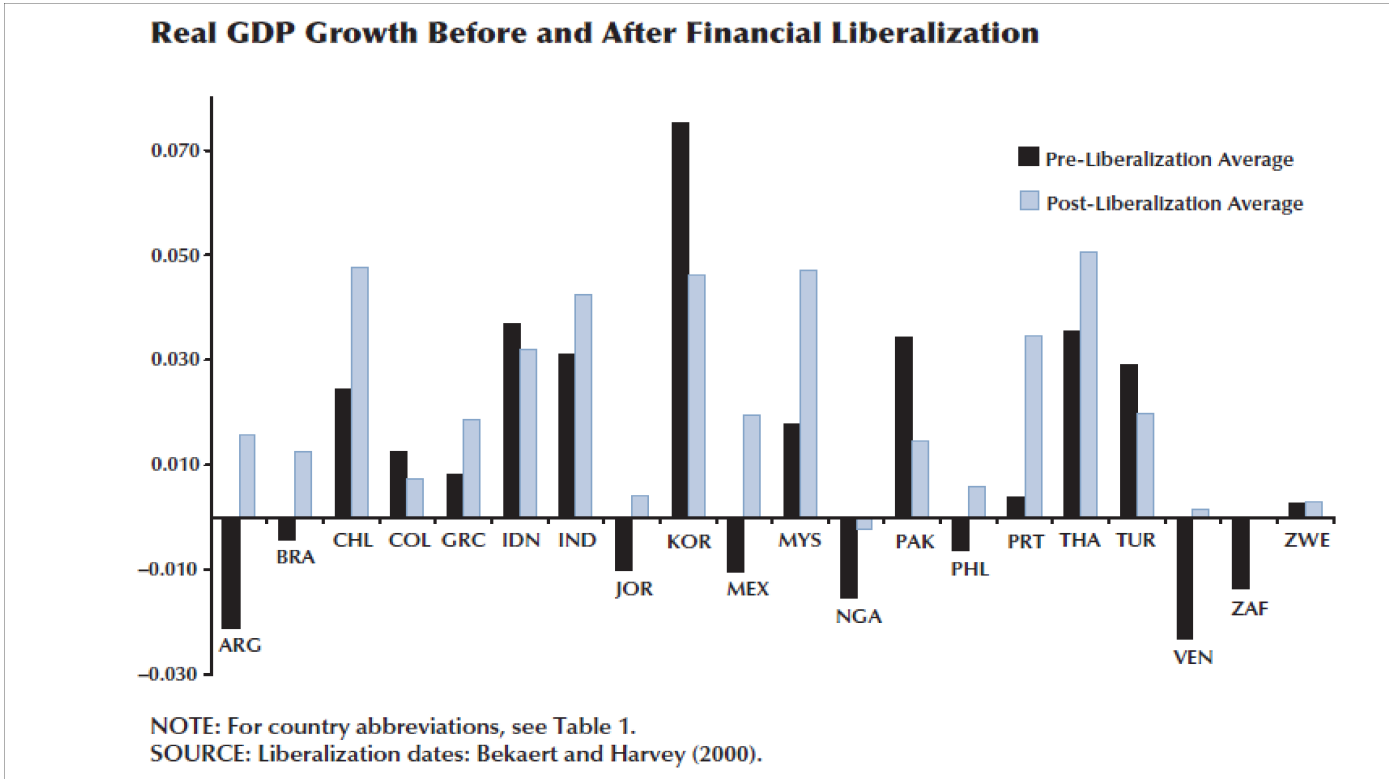
Find roughly 1% increase in real GDP growth after stock market liberalization. Mostly through capital accumulation but also TFP growth.

-Temporary effect?

- Is the date exogenous? Is it financial integration of stock markets or just financial development?

- Upper bound of the effect?

Financial integration and real GDP growth



Source: Bekaert et al. (2003)

Classic Growth Regression and the Impact of Liberalization

	Sample I	II	III	IV
Constant	-0.2281	-0.2374	-0.1493	-0.2018
Std. error	*0.0179*	*0.0214*	*0.0286*	*0.0658*
Log(GDP)	-0.0094	-0.0088	-0.0115	-0.0158
Std. error	*0.0007*	*0.0007*	*0.0008*	*0.0011*
Govt/GDP	-0.0039	-0.0178	-0.0187	-0.0301
Std. error	*0.0087*	*0.0098*	*0.0105*	*0.0165*
Enrollment	0.0305	0.0112	0.0243	0.0566
Std. error	*0.0077*	*0.0097*	*0.0116*	*0.0171*
Population Growth	-0.5594	-0.5731	-0.8159	-1.1013
Std. error	*0.0621*	*0.0691*	*0.0835*	*0.1151*
Log(Life Expectancy)	0.0755	0.0781	0.0627	0.0838
Std. error	*0.0049*	*0.0056*	*0.0076*	*0.0167*
Official Liberalization Indicator	**0.0095**	**0.0083**	**0.0113**	**0.0130**
Std. error	***0.0016***	***0.0017***	***0.0020***	***0.0036***

Source: Bekaert et al. (2003)

Capital flows: assessing long-run international efficiency

[if time permits]

Capital flows: Failures of the intertemporal approach

Capital flows look 'inefficient' for some fast growing emerging economies — particularly so for China.

General pattern?

How do we assess international efficiency?

Starting point to develop new rationale for international capital flows beyond the intertemporal approach.

International capital flows: assessing long-run international efficiency

Heathcote and Perri (2013) and Gourinchas and Jeanne (2013).

Three basic steps:

- Take your favorite multi-country model (frictionless or with some already embedded frictions).

- Calibrate it using observables and estimated structural parameters.

- Compare observed outcomes (e.g international capital flows) to model predicted outcomes.

International capital flows: assessing long-run international efficiency

If observed outcomes match model predicted outcomes. Fine.

Otherwise 'puzzle'.

If not, be careful two conclusions can be drawn.

Markets are not frictionless if no frictions (or frictions missing). Next step is to add relevant frictions (trade frictions, financial frictions...).

Or model is misspecified (missing ingredients, poor estimation of structural parameters, wrong hypothesis on the utility function, wrong statistical properties of stochastic shocks...).

Application: Gourinchas and Jeanne (2013) — 'The allocation puzzle'.

Remark I: The growth consensus

(Hall & Jones (1999), Parente & Prescott (1994), Caselli (2005)...)

- A large share of the differences in development outcomes can be attributed to productivity.

Explains levels of development. Explains growth miracles and growth disasters (Korea vs Madagascar)

- Gourinchas and Jeanne (2013)

Implications of that consensus for capital flows. Find a robust puzzle in the allocation of capital flows across developing countries. Capital flowing less to fast growing emerging economies

Remark II: Allocation Puzzle and Lucas Puzzle are different

- Lucas Puzzle

About the small size of capital flows from rich to poor countries. Consistent with data, given the lack of productivity catch-up and capital market distortions in developing countries.

- Allocation Puzzle

Allocation of capital flows across developing countries, not their level. Empirically, the predicted flows are negatively correlated with observed flows: capital flows 'upstream'

Rule of the game

Take a small open economy Ramsey model

Calibrate structural parameters

Feed initial capital stocks (in 1980) and observed productivity growth over the last 20 years

Back-out predicted capital flows and compare to data.

A Small Open Economy Ramsey Model

CRRA Preferences: $U_t = \sum_{s=0}^{\infty} \beta^s N_{t+s} c_{t+s}^{1-\gamma}/(1-\gamma)$

Exogenous population growth: $N_t = N_0 n^t$

Technology: $Y_t = K_t^{\alpha} (A_t N_t)^{1-\alpha}$

Long-run productivity growth: $A_{t+1}/A_t = g_{t+1} \to g^*$

Budget constraint ($x = X/N$, $w =$ wage, $d =$ net foreign debt)

$$n(k_{t+1} - d_{t+1}) = R_t k_t - R^* d_t + w_t - c_t$$

Equilibrium under financial integration

Returns: $R_t = R^* = (g^*)^\gamma / \beta$ (efficiency/arbitrage condition)

Steady-state capital stock (per efficiency units $\widetilde{x} = X/(AN)$)

$$\widetilde{k_{t+1}} = \widetilde{k^*} = \left(\frac{\alpha}{R^* + \delta - 1} \right)^{1/(1-\alpha)}$$

Consumption decisions (Euler)

$$c_t^{-\gamma} = \beta R^* c_{t+1}^{-\gamma} \text{ and } c_{t+1} = g^* c_t$$

Initial consumption

$$c_0 = (R^* - ng^*)(k_0 - d_0) + \left[1 - \frac{ng^*}{R^*} \right] \sum_{s=0}^{\infty} \left(\frac{n}{R^*} \right)^s w_s$$

Productivity catch-up

Define $\pi_t = A_t/(A_0\,(g^*)^t) - 1$, relative productivity

$\pi_0 = 0$

$\lim_{t\to\infty} \pi_t = \pi$: long-run productivity catch-up

› $\pi = A_0^*/A_0 - 1$: full productivity catch-up

› $\pi = 0$: no productivity change w.r.t technology frontier

› $\pi < 0$: long-run productivity divergence

› $\pi_t = \pi$ for $t \geq T$: no productivity catch-up after T [case assumed from now on]

Net capital flows accounting

Natural measure of capital flows is:

$$\frac{\Delta D_T}{Y_0} = \frac{D_T - D_0}{Y_0}$$

Given initial debt $\widetilde{d_0}$, capital stock $\widetilde{k_0}$, relative productivity process $\{\pi_t\}_{t\geq 0}$ and steady-state capital $\widetilde{k^*}$, the ratio of cumulated capital flows is:

$$\begin{aligned}\frac{\Delta D_T}{Y_0} &= \left[(ng^*)^T - 1\right]\frac{\widetilde{d_0}}{\widetilde{y_0}} + (ng^*)^T\left(\frac{\widetilde{k^*} - \widetilde{k_0}}{\widetilde{y_0}}\right) \\ &\quad + \pi\left[\widetilde{k^*} + \left(\frac{\widetilde{w}}{R^*}\right)\sum_{t=0}^{T}(\frac{ng^*}{R^*})^t(1-\pi_t/\pi)\right]\frac{(ng^*)^T}{\widetilde{y_0}}\end{aligned}$$

Interpretation

Initial debt: $\left[(ng^*)^T - 1\right] \widetilde{d_0}/\widetilde{y_0}$

Capital scarcity: $(ng^*)^T \left(\widetilde{k^*} - \widetilde{k_0}\right)/\widetilde{y_0}$

Investment: $\pi\widetilde{k^*}/\widetilde{y_0}(ng^*)^T$

Saving: $\pi \left(\frac{\widetilde{w}}{R^*\widetilde{y_0}}\right) \sum_{t=0}^{T} (\frac{ng^*}{R^*})^t (1 - \pi_t/\pi)(ng^*)^T$

Capital flows proportional to π ($\pi_t \leq \pi$)

Technical steps towards solution

$$\frac{D_T - D_0}{Y_0} = \frac{\widetilde{d_T}(g^* n)^T(1+\pi) - \widetilde{d_0}}{\widetilde{y_0}}$$

Show (with $\widetilde{w} = (1-\alpha)\widetilde{k^*}^{\alpha}$):

$$\widetilde{c_t} + ng_{t+1}(\widetilde{k^*} - \widetilde{d_{t+1}}) = R^*(\widetilde{k^*} - \widetilde{d_t}) + \widetilde{w}$$

After T, balanced growth path at g^* so $\widetilde{d_t} = \widetilde{d_T}$ and $\widetilde{c_t} = \widetilde{c_T}$

$$\widetilde{d_T} = \widetilde{k^*} + \frac{\widetilde{w} - \widetilde{c_T}}{R^* - ng^*} \quad ; \quad \widetilde{c_T} = \frac{c_T}{A_T} = \frac{c_0 \left(g^*\right)^T}{(1+\pi) A_0 \left(g^*\right)^T} = \frac{\widetilde{c_0}}{1+\pi}$$

Then use optimal c_0 to get $\widetilde{c_0}$

Capital flows across developing countries

Consider a country without initial capital scarcity or initial debt. Then the country receives a positive level of capital inflows $\Delta D > 0$ if and only if its productivity catches up relative to the world technology frontier, $\pi > 0$.

Consider two countries A and B, identical except for their long-run productivity catch-up: $\pi_A < \pi_B$. Then, country A receives strictly less capital inflows than country B:

$$\frac{\Delta D^A}{Y_0} < \frac{\Delta D^B}{Y_0}$$

Bringing the model to the data

Common parameters: log preferences, $\beta = 0.96$, $g^* = 1.017$, $\alpha = 0.3$, $\delta = 0.06$

Implies $R^* = 1.0594$.

Y, K from PWT (perpetual inventory method);

Technology from: $A_t^{1-\alpha} = y/k^{\alpha}$

Period 1980-2000. 68 non-OECD countries.

$\ln(\pi) = (\ln(A_{2000}) - \ln(A_{1980})) - 20 \ln(g^*)$

HP filter to avoid BC fluctuations

$n =$ growth rate of working age population

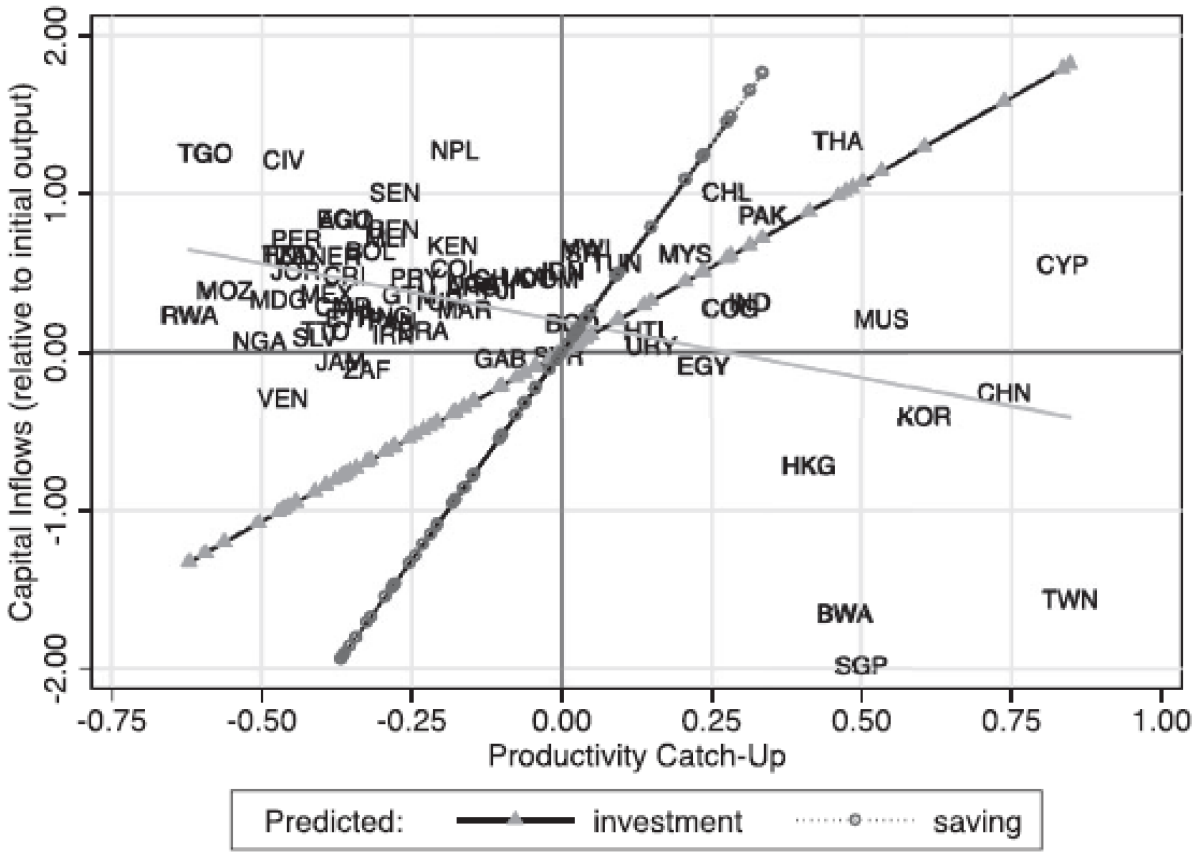


FIGURE 2

Productivity catch-up (π) and change in external debt ($\Delta D/Y_0$) together with predicted investment $\left(\Delta D^I/Y_0\right)$ and predicted saving $\left(\Delta D^S/Y_0\right)$ terms. 1980–2000. 68 non-OECD countries

Allocation puzzle

Model predicts $cov(g, s) < 0$ and $cov(g, i) > 0$, so we expect $cov(g, s-i) < 0$

Empirically, robust $cov(g, s - i) > 0$

Potential explanations of the puzzle among others?

Savings and Growth, Trade/Financial Frictions, Official flows and governments decisions.

Provide insights based on a saving and investment wedge analysis.

Wedge analysis

Introduce a country-specific capital wedge $= \tau_k$ and saving wedge $\tau_s =$ tax on domestic and foreign capital income:

$$c_t + n[k_{t+1} - d_{t+1}] = (1 - \tau_s)[(1 - \tau_k)R_t k_t - R^* d_t] + w_t + z_t$$

$z_t =$ lump-sum tax rebate

Can rewrite accumulated capital flows as:

$$\frac{\Delta D_T}{Y_0} = D(\tau_k; \tau_s)$$

Calibrate τ_k to match aggregate investment rate and τ_s to match aggregate saving. Match perfectly capital flows.

Wedge analysis

Capital wedges τ_k not correlated with productivity catch-up π.

Saving wedges τ_s are very correlated with productivity catch-up π.

The allocation puzzle is a saving puzzle

Countries catching up invest a lot, as expected, but tend save even more.

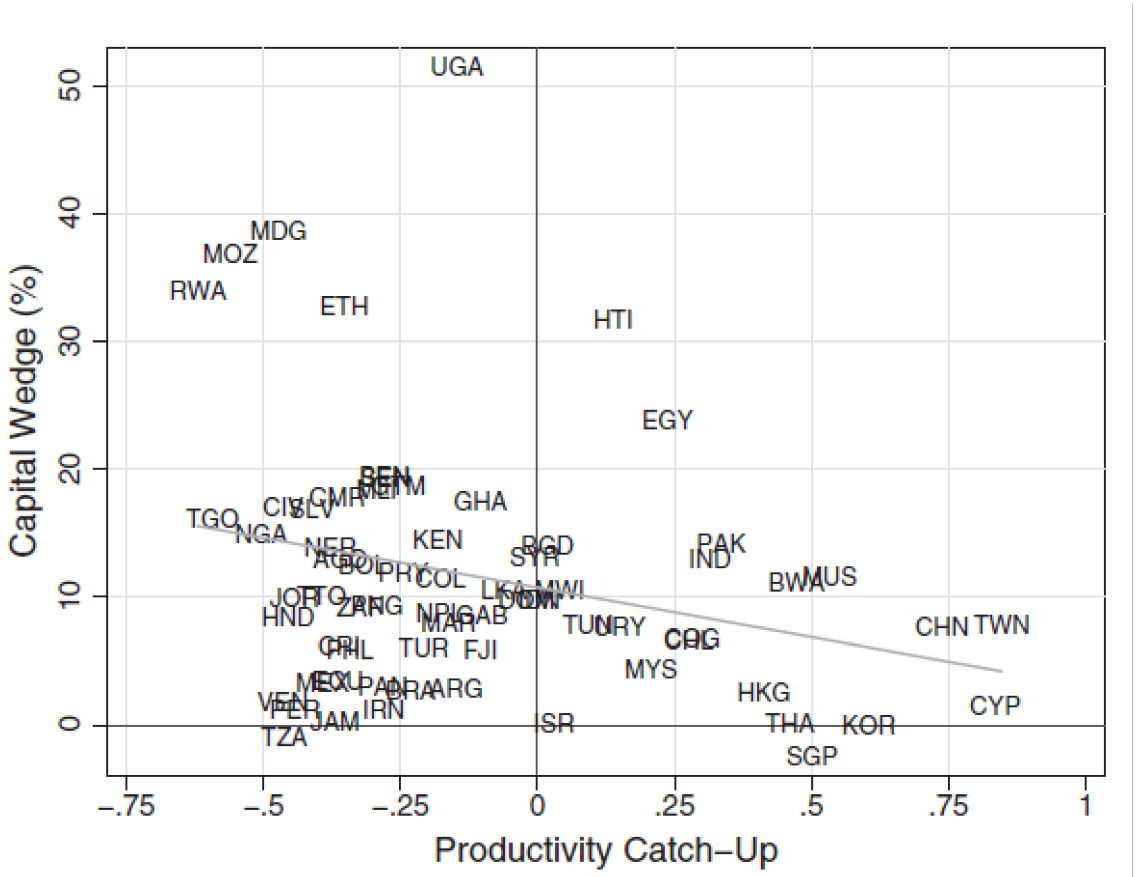


FIGURE 3

Productivity catch-up (π) and capital wedge (τ_k). 1980–2000. 68 non-OECD countries

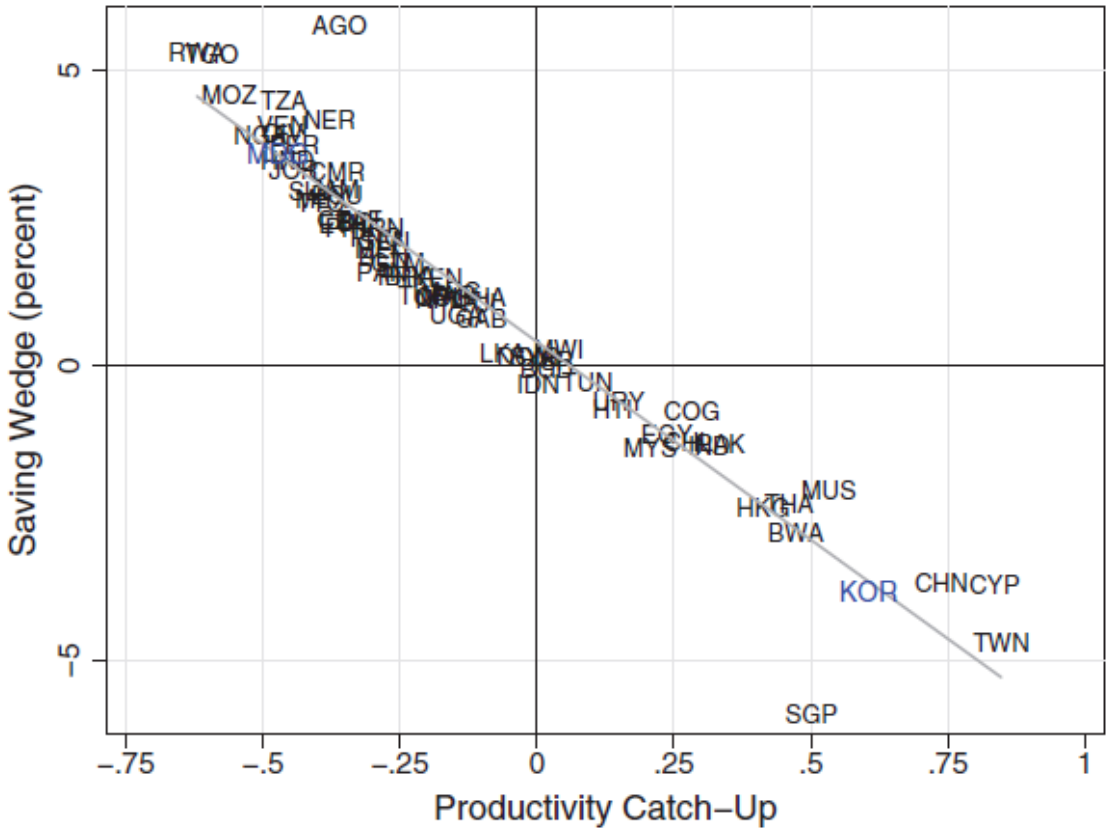


FIGURE 6

Productivity catch-up (π) and saving wedges (τ_s). 1980–2000. 68 non-OECD countries

Caveats and Discussion

- Measurement issues
  - Private versus official flows.
  - Results robust dropping official flows although weakens significantly the puzzle.
  - Note that puzzle would remain with Ricardian equivalence.
  - Alfaro, Kalemli-Ozcan and Volosovych, 2014.

Caveats and Discussion

- Missing ingredients
  - Moving away from Ricardian equivalence and incorporating public saving.
  - Trade and/or financial frictions.
  - Differences in risk across countries (country-specific aggregate risk or idiosyncratic risk).
  - Other factors potentially correlated with productivity catch-up affecting saving decisions and capital flows (e.g demographics).