Declining Labor Shares and the Global Rise of Corporate Saving

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Two Big Trends

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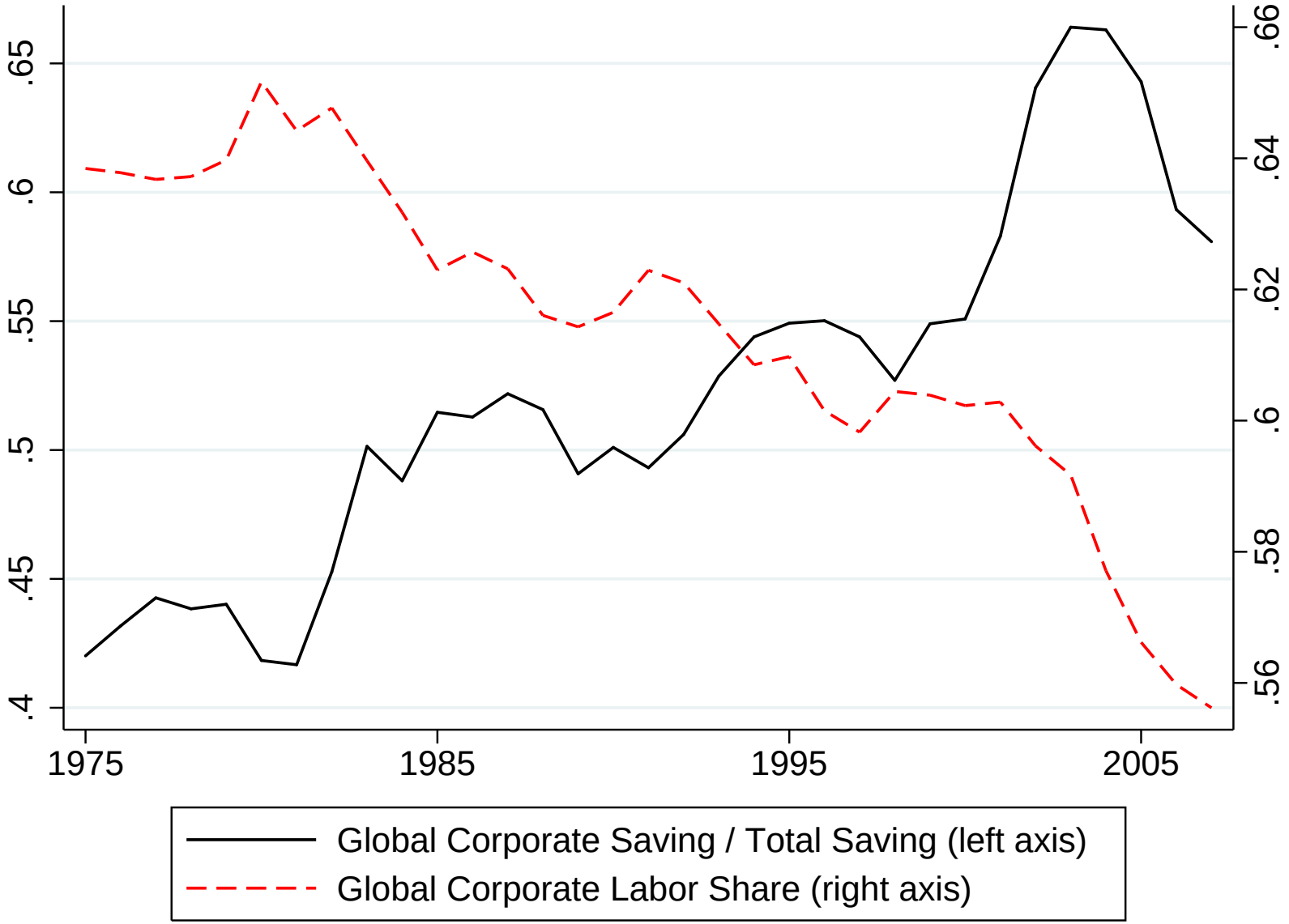


Overview

1. Empirics
   - trends in labor share and corporate saving in majority of countries
   - these trends related to trends in price of investment goods
   - two facts jointly informative about deeper shocks
2. GE Model with CES Production and Capital Market Imperfections
   - calibrate CES & imperfections to cross-country slope of labor share & corporate saving trends to price of investment trends
   - show how global decline in investment prices explains the two facts
   - show informativeness of two facts and their interaction for shocks and economy's response

Related Literature

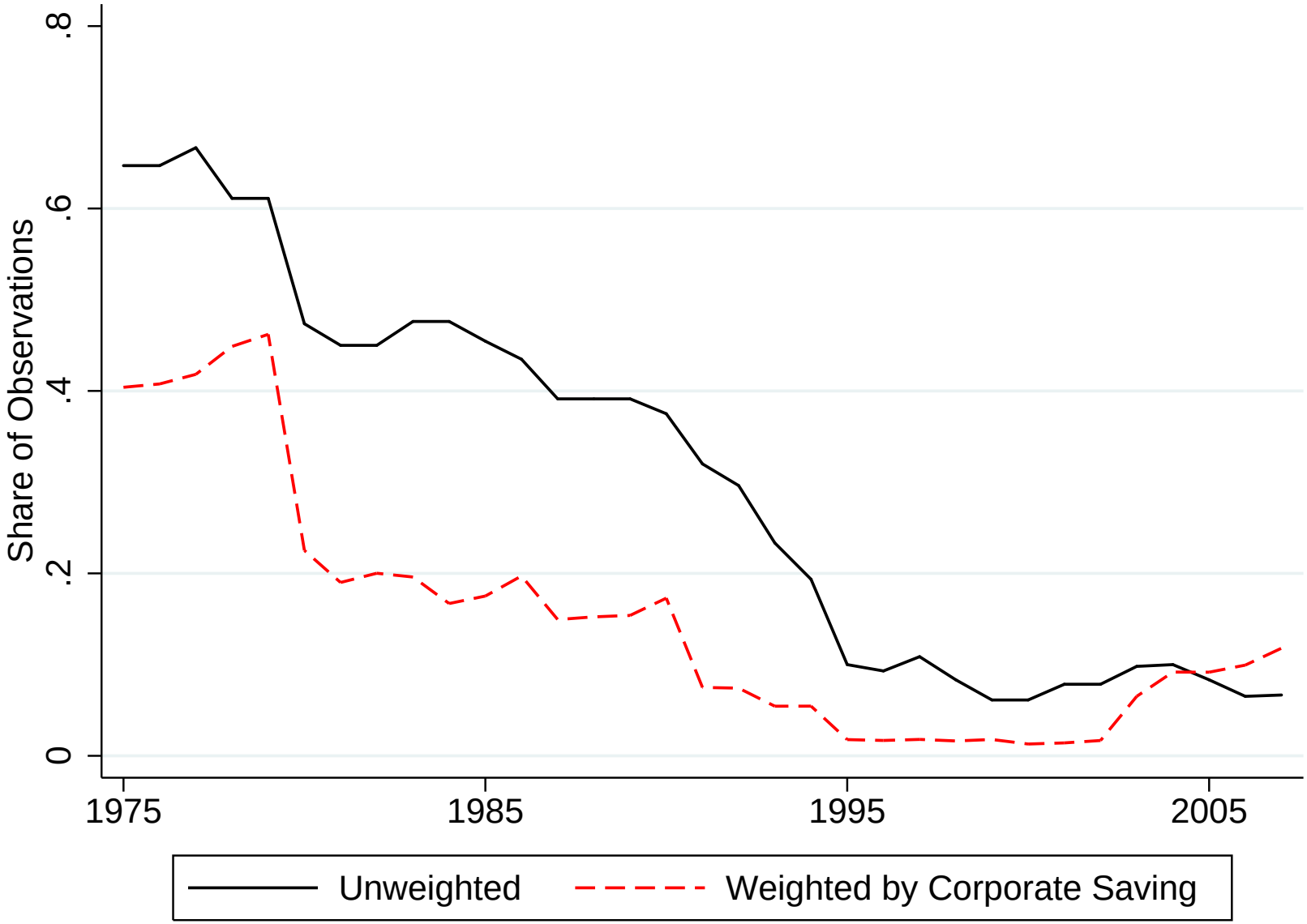
- Labor Shares (Empirical): Blanchard (1997); Gollin (2002); Harrison (2002); Jones (2003); Bentolila and Saint-Paul (2003). Go
- Corporate Saving (Empirical): United States: Poterba (1987), Auerbach and Hassett (1991), Armenter and Hnatkovska (2011); China: Bayoumi, Tong, and Wei (2010); Chile: Hsieh and Parker (2006).
- Investment-Specific Technology and Prices: Greenwood, Hercowitz, Krusell (1997); Fisher (2006); Hsieh and Klenow (2007); Justiniano, Primiceri, and Tambalotti (2011). Go
- Partial Equilibrium Corporate Finance: Poterba and Summers (1983, 1985); Gomes (2001); Hennessy and Whited (2005).
- General Equilibrium Corporate Finance: Gourio and Miao (2010, 2011); Jermann and Quadrini (2012).

1. **Empirics**
2. CES Model with Capital Market Imperfections
3. Quantitative Results
4. Conclusion

Data Sources

- System of National Accounts, "Detailed National Accounts":
  1. $C = \{$Financial Corporations, Non-Financial Corporations$\}$
  2. $H = \{$Households, Non-Profits Serving Households$\}$
  3. $G = \{$Government$\}$
- Sources combined:
  - Internet: Country-specific (preferred source)
  - Electronic databases: OECD, UN, World Bank
  - Printed materials: UN and OECD books
- We generally limit data to 1975-2007

% of Observations Not Available Digitally from UN/OECD



Key National Income Accounting Concepts

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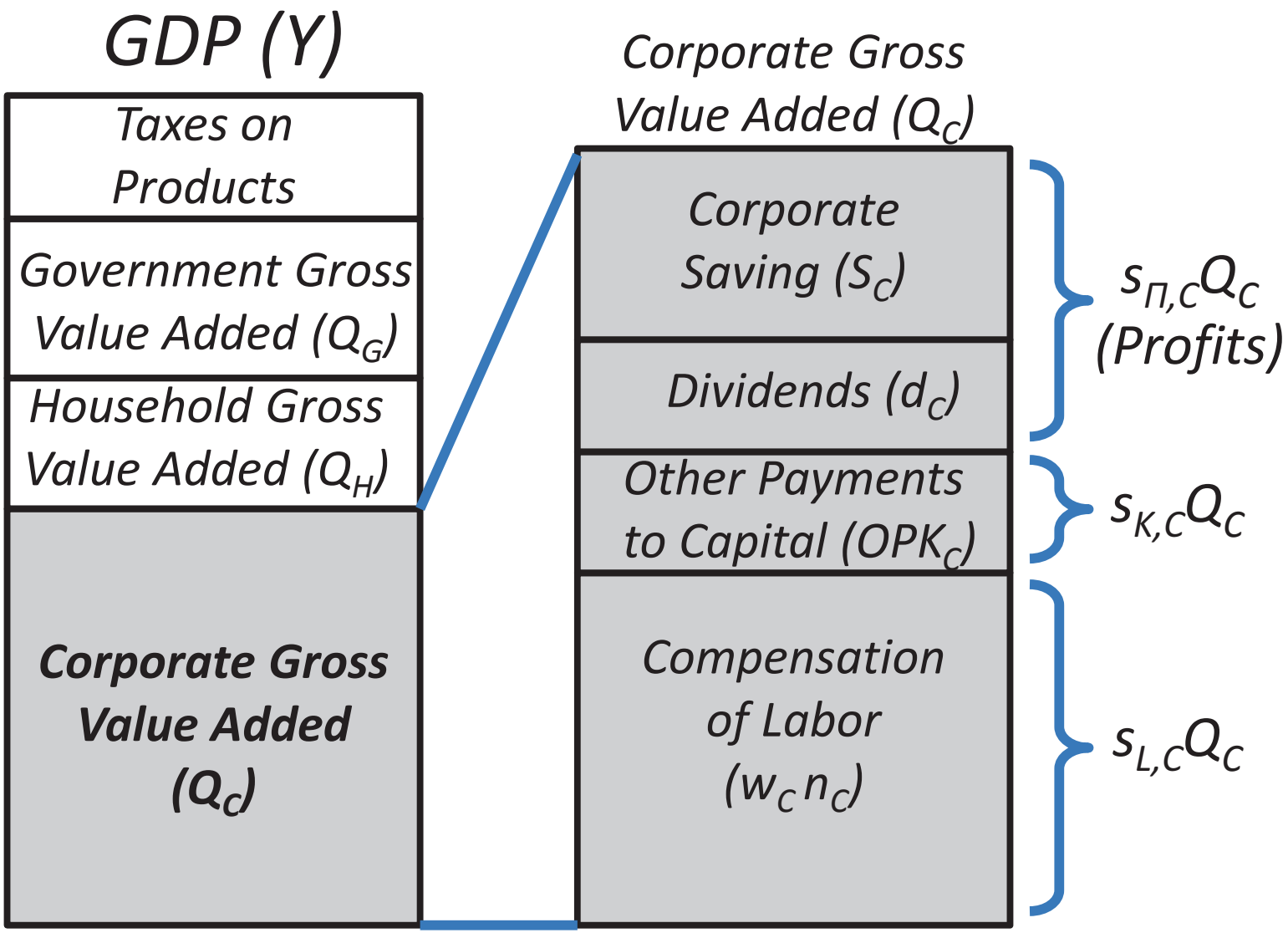
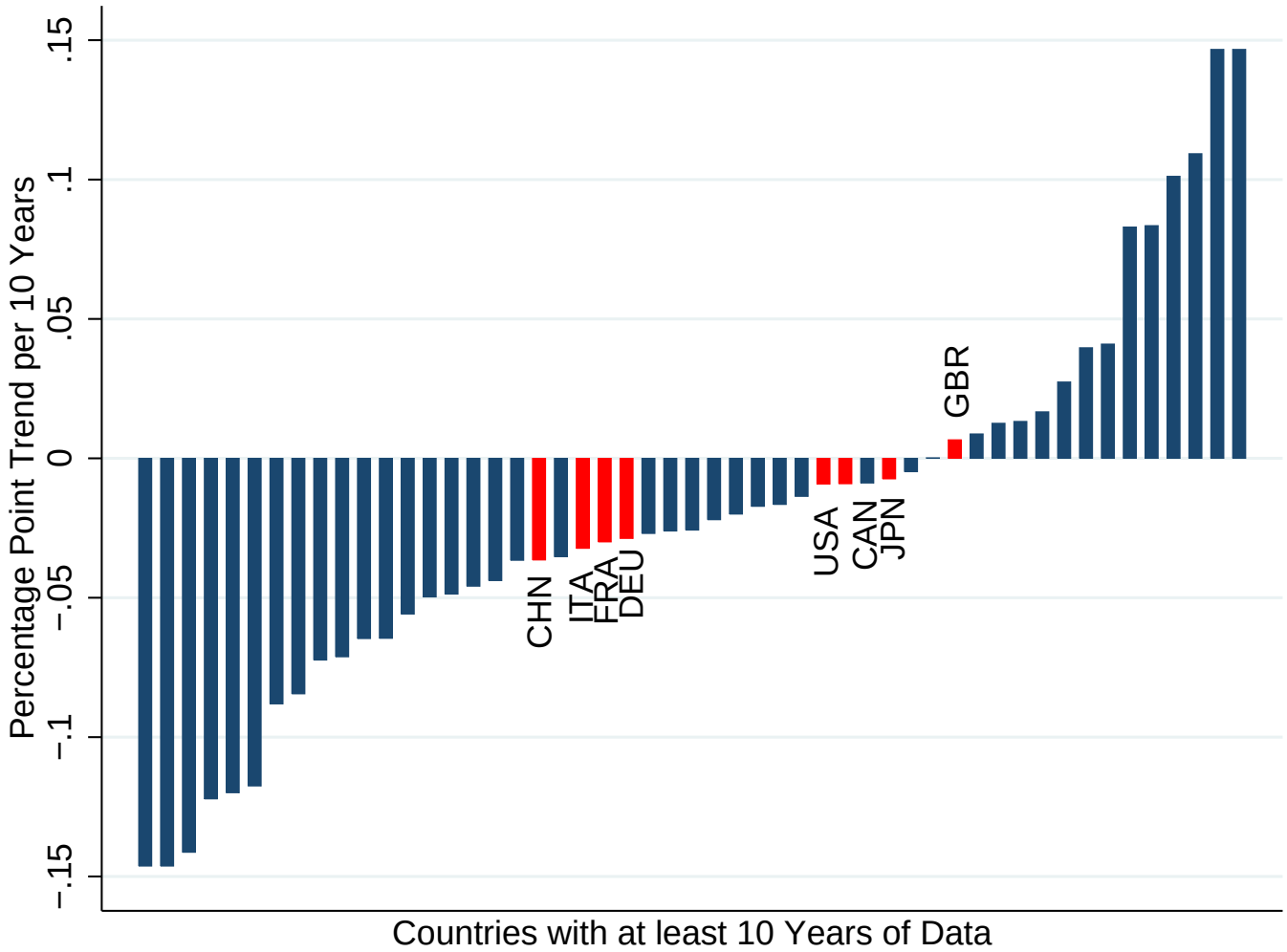


Estimated Trends in Corporate Labor Shares



- Countries with significant trends: 29/39 countries have negative trend

Labor Shares and Investment Prices from 1950

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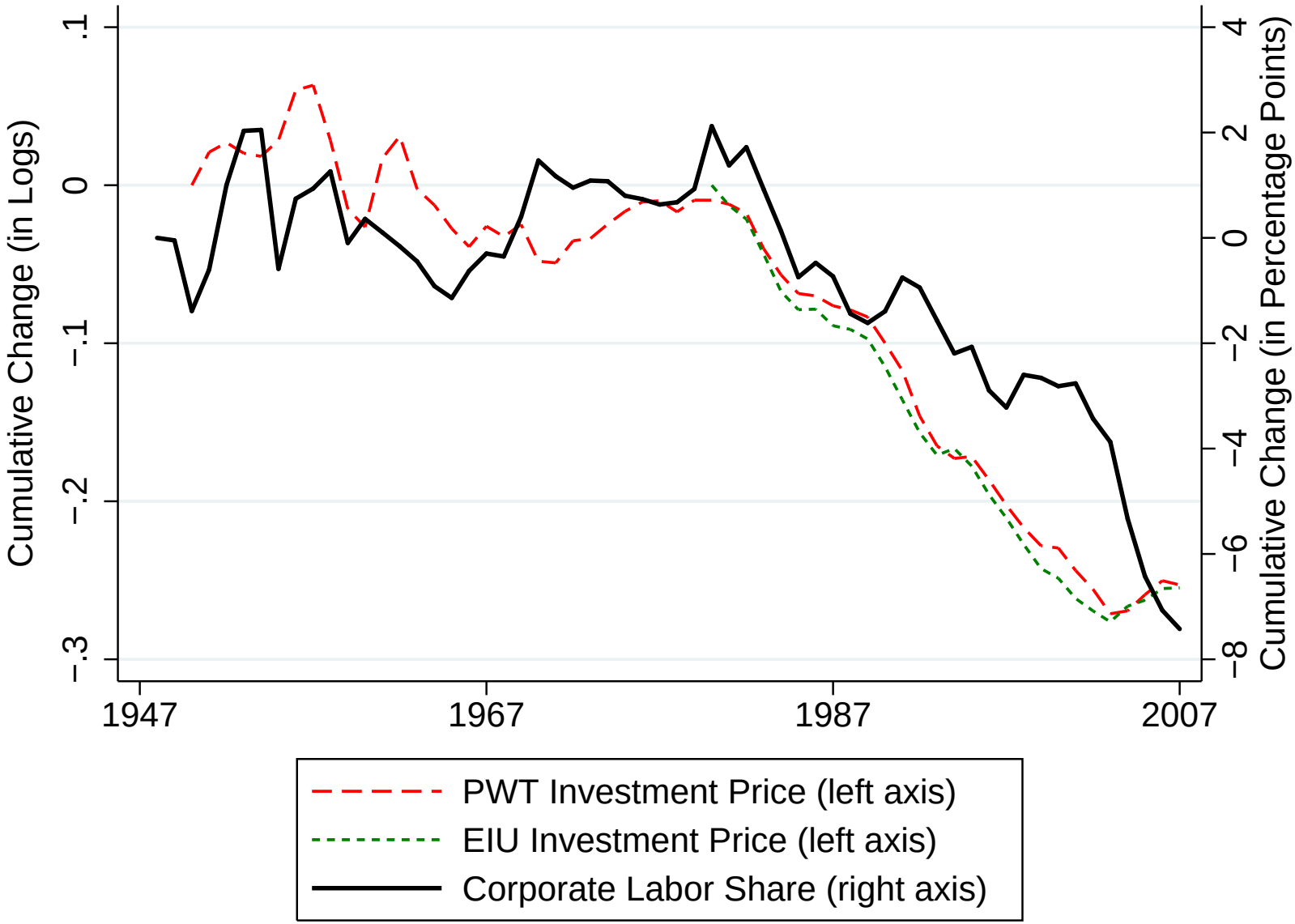

Corporate Labor Shares and Investment Prices

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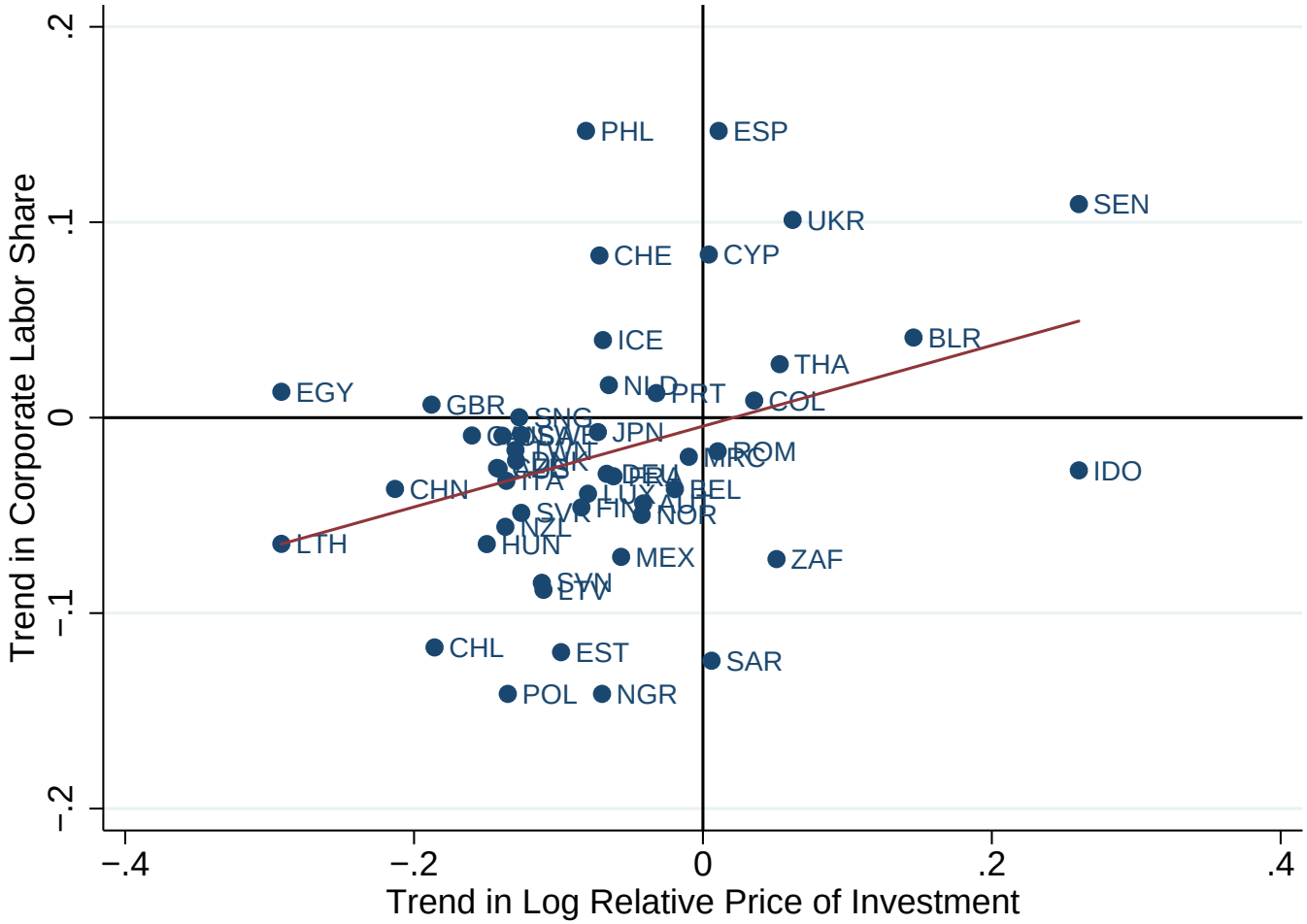
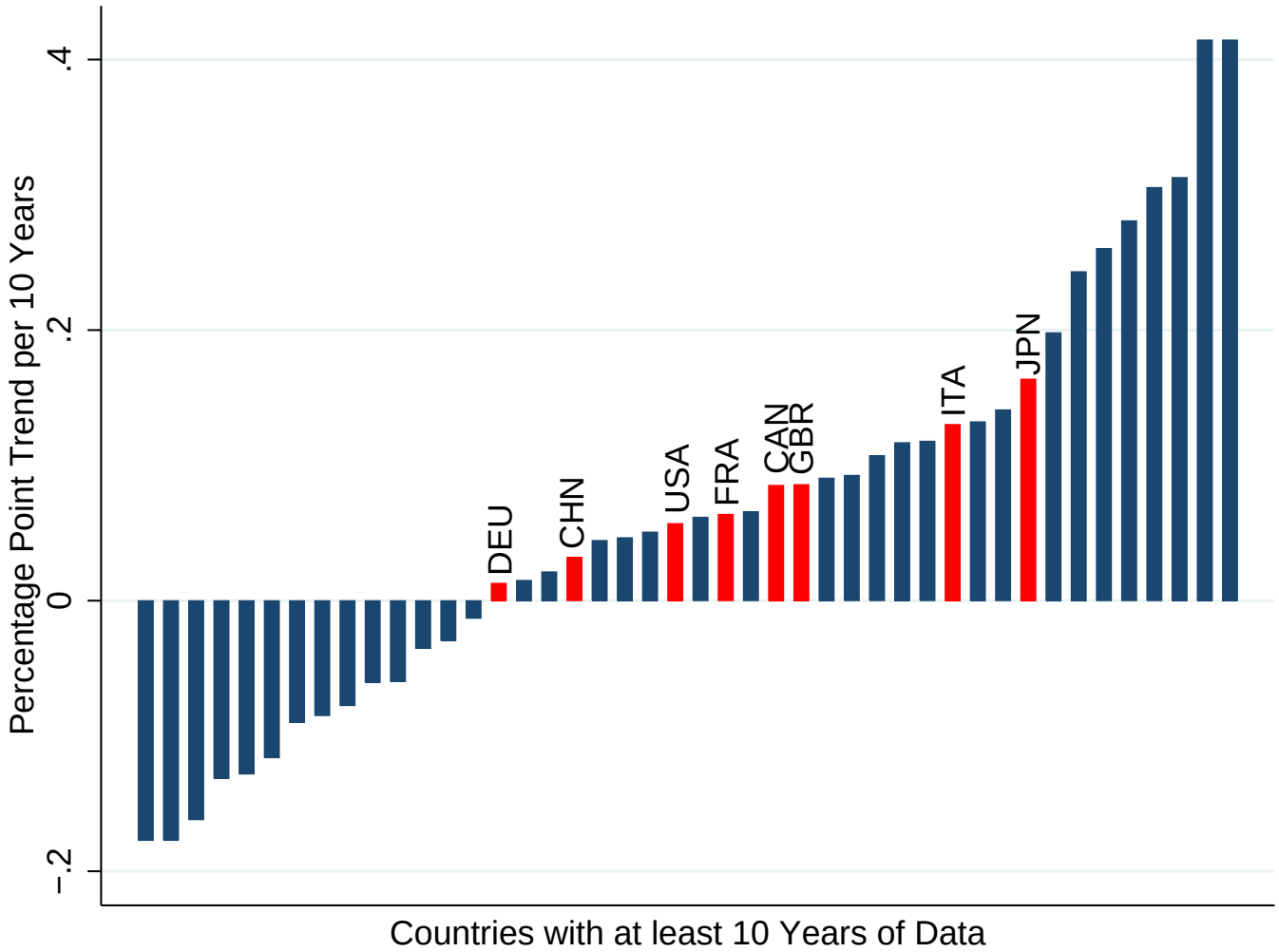


- cross-country slope 0.207 (p-value = 0.02); median within-country slope 0.26 (p-value = 0.01) Go

Estimated Trends in Corporate / Total Saving



- Countries with significant trends: 22/31 countries have positive trend

Corporate / Total Saving and Investment Prices

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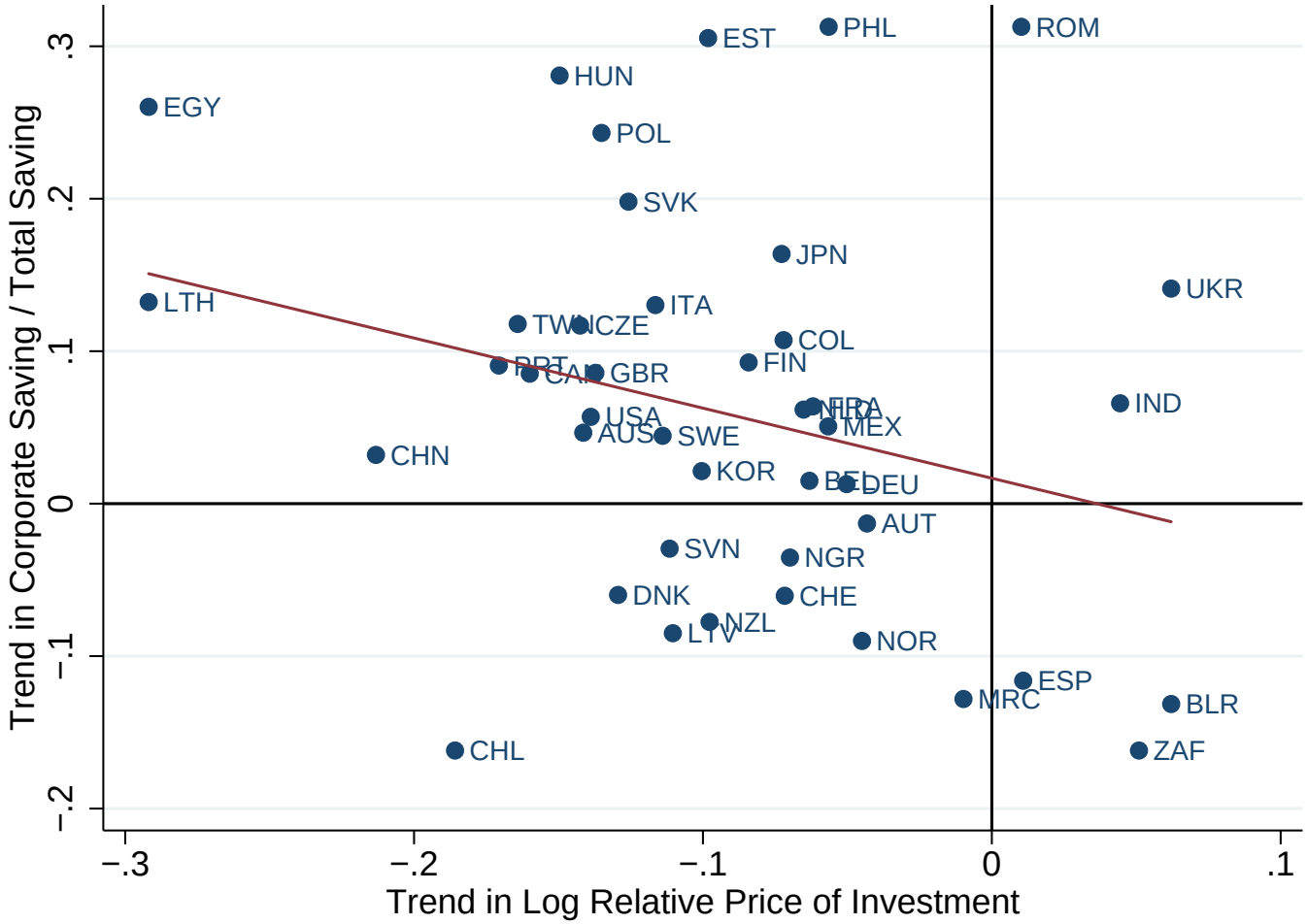
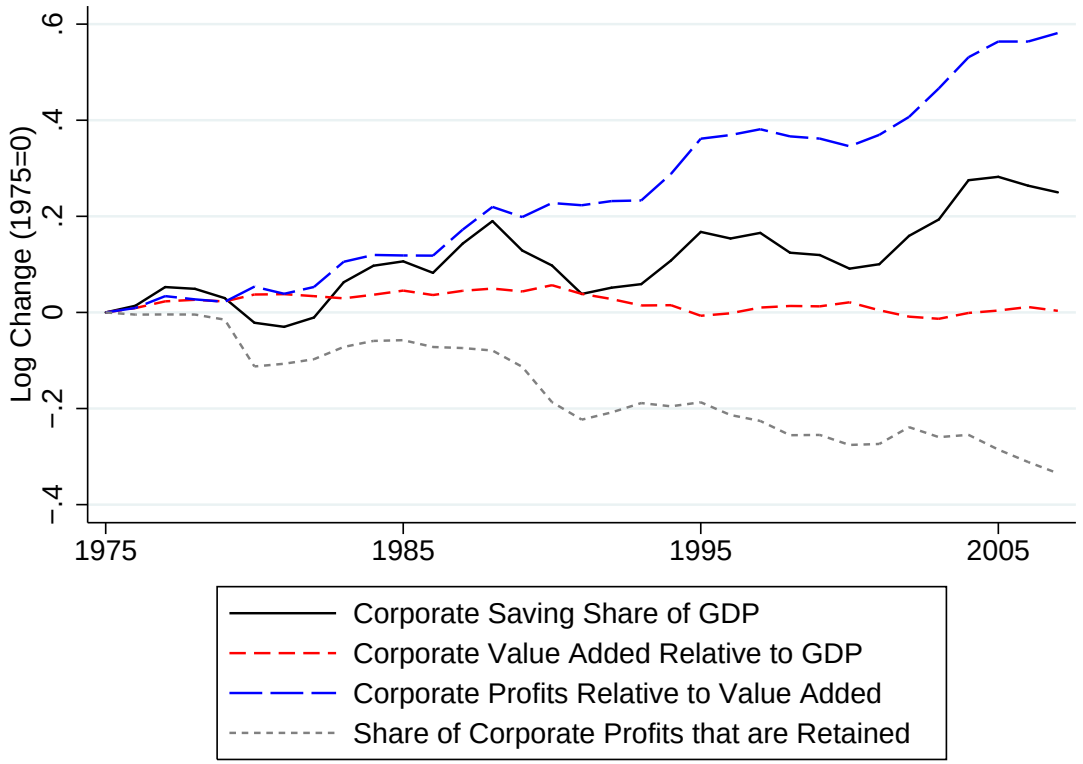


- cross-country slope -0.46 (p-value = 0.07); median within-country slope -0.49 (p-value = 0.01)

Corroboration of Investment Price Shock

$$\frac{S_C}{Y} = \frac{Q_C}{Y}\left(1 - s_{L,C} - s_{K,C}\right)\left(1 - \frac{d_C}{\Pi_C}\right)$$ Go



- Other shocks (e.g. "markups") can make $\downarrow s_L$ but $S^c/Y \downarrow$

Summary of Empirics

1. corporate labor share declined by 5 pp globally
2. corporate / total saving increased by 20 pp globally
3. across (and within) country trends in these objects covaries with trends in investment prices

Next, we use this information to build and calibrate a model and:

- Reproduce facts through a decline in investment prices
- Compare model's behavior to models that don't use this info

1. Empirics
2. **CES Model with Capital Market Imperfections**
3. Quantitative Results
4. Conclusion

Household

- Representative household owns the corporate sector ($\theta_t(z) = 1$).

- Household chooses $\{c_t, n_t, x_t^h, k_{t+1}^h, \theta_{t+1}(z)\}$ to solve:

$$\max \sum_{t=0}^{\infty} \beta^t \left(\frac{(c_t)^{1-\gamma}}{1-\gamma} - \chi \frac{(n_t)^{1+\frac{1}{\phi}}}{1+\frac{1}{\phi}} + \nu \frac{\left(k_t^h\right)^{1-\rho}}{1-\rho} \right)$$

subject to standard housing capital accumulation.

Household Budget Constraint

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Household funds come from the following sources:

1. labor income
2. transfers minus taxes
3. dividends
4. previously purchased equity (capital gains and buybacks)

Household funds go to the following uses:

1. consumption
2. housing investment
3. new equity

Corporation's Technology

- Firm uses its own capital and labor to produce the final good:

$$Q_t = A_t z \left(\alpha_k^{\frac{\sigma-1}{\kappa\sigma}} \left(k_t^c\right)^{\frac{\sigma-1}{\sigma}} + \alpha_n^{\frac{\sigma-1}{\kappa\sigma}} \left(n_t\right)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\kappa\sigma}{\sigma-1}}$$

- Calibrate (σ, α_k) to match s_L and $\mathrm{d}s_L/\mathrm{d}\log\xi^c$ in the cross section
- Corporate capital accumulation:

$$k_{t+1}^c = (1-\delta^c)k_t^c + \frac{x_t^c}{\xi_t^c}$$

- Lower ξ^c represents decline in relative price of investment

Corporate Saving is Interesting: Feldstein-Horioka

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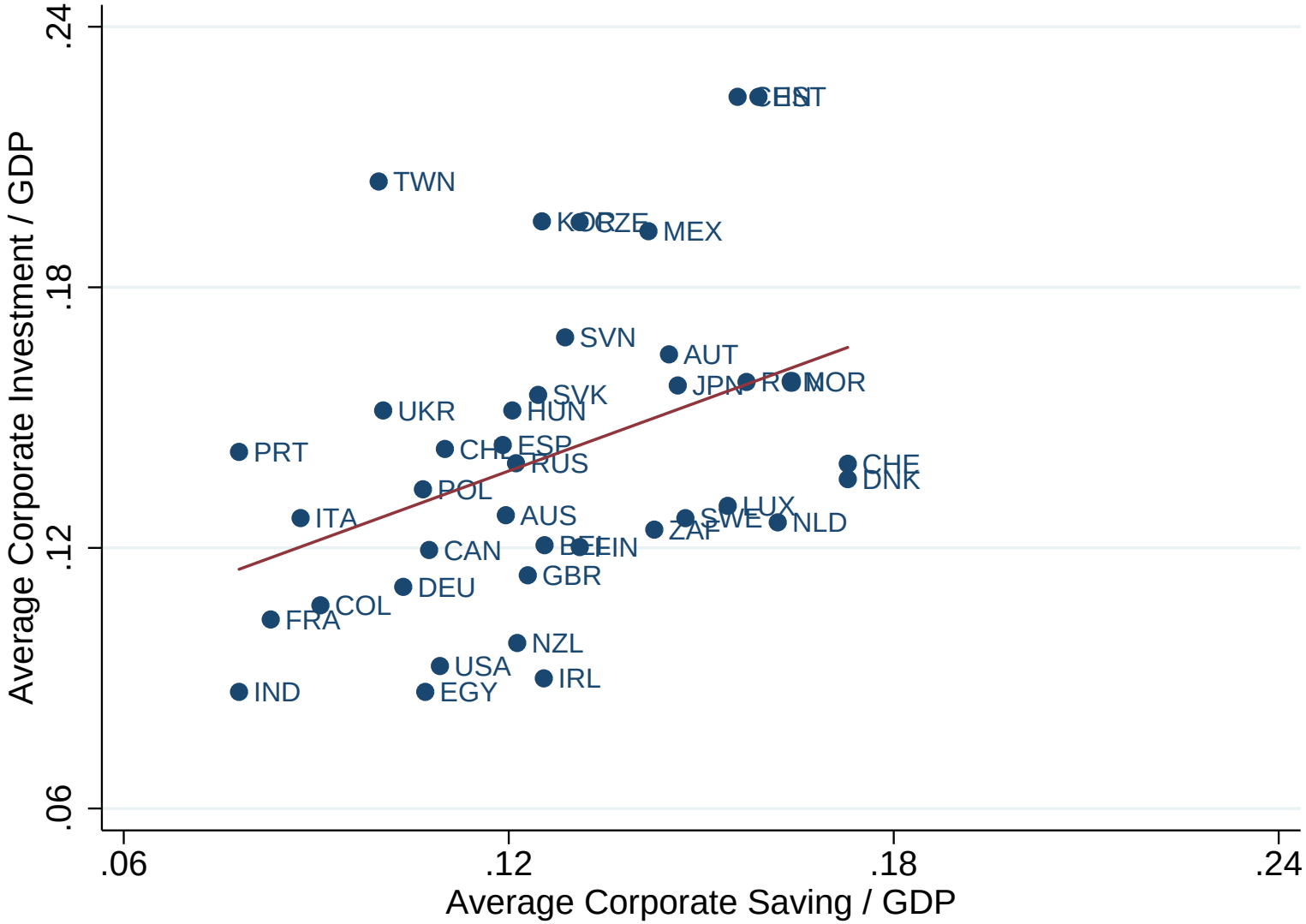

Corporation's Problem

- Corporation chooses $\{n_t, x_t^c, k_{t+1}^c, d_t, e_t\}$ to maximize:

$$V_t = \max \sum_{s=t}^{\infty} \beta_s^c \left(\left(\frac{1-\tau_s^d}{1-\tau_s^g} \right) d_s - e_s \right)$$

subject to constraints:

$$x_t^c = (\Pi_t(\lambda) - d_t) + e_t = S_t^c + e_t \Longrightarrow S_t^c = x_t^c + (-e_t)$$

$$d_t \geq 0$$

$$e_t \geq -\left(e^0 + e^1 k_t^c\right)$$

- Calibrate (e^0, e^1) to match S^c/S and $\mathrm{d}(S^c/S)/\mathrm{d}\log\xi^c$ in the cross section

Simplified Corporate Policies: A Pecking Order

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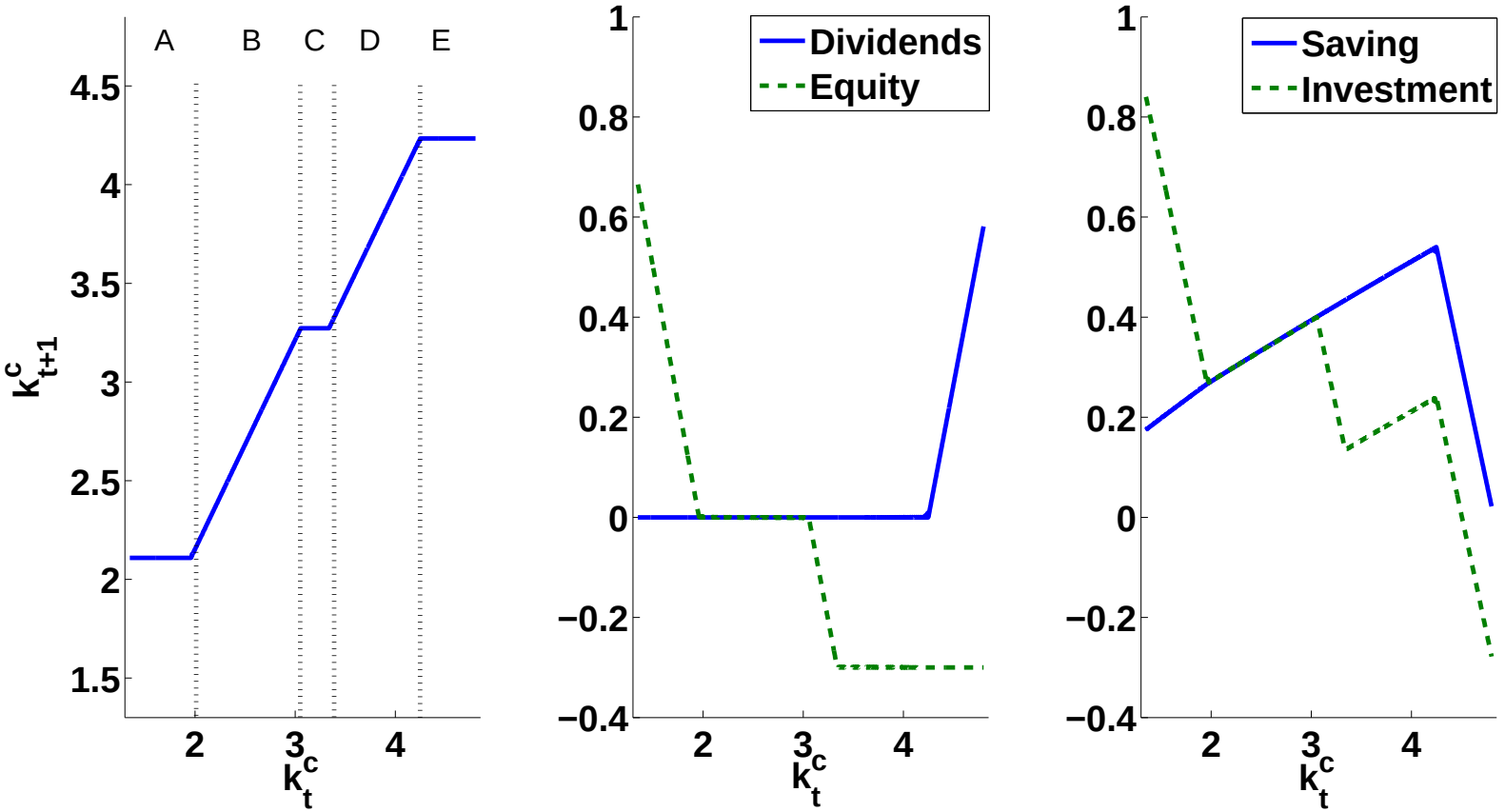

$$Q_{k,t+1} = (1 + r_{t+1}) \left(\frac{1 - \tau^d + \mu^d_t}{1 - \tau^d + \mu^d_{t+1}} \right) - (1 - \delta^c)$$

Summary: Capital Market Imperfections

- Corporate investment funded internally (corporate saving) or externally (debt and equity).
- Corporate saving preferred because of **equity flotation costs** and **debt collateral constraints**.
- Corporate saving (profits minus dividends) cannot increase without limits due to **minimum-dividend constraints**.
- Equity buybacks preferred to dividends because of higher dividend taxes. But there are **equity buyback constraints**.
- Capital market imperfections imply "composition non-neutrality of saving."

Perfect Capital Markets

- Household budget constraint:

$$c_t + x_t^h = \text{labor income} + \text{net transfers} + R,$$

- Corporate flow of funds:

$$x_t^c = \text{output} - \text{net taxes} - R.$$

- Corporate saving in benchmark neoclassical economy is indeterminate. Such a model ignores $\mathrm{d}(S^c/S)/\mathrm{d}\log\xi^c$.

- Our model exhibits composition non-neutrality of saving iff its user cost (and hence allocations) differ from those in the perfect capital markets model Go

1. Empirics
2. CES Model with Capital Market Imperfections
3. **Quantitative Results**
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Calibration of CES Model with Imperfect Capital Markets

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Key parameters to calibrate:

- Production function: α_k and σ
- Capital market imperfections: e^0 and e^1

Moments to match:

1. corporate labor share
   - Level $s_L = 0.614$
   - Slope $\mathrm{d}s_L/\mathrm{d}\log\xi^c = 0.207$
2. corporate saving / total saving
   - Level $d/\Pi = 0.279$ (given s_L, this almost pins down S^c/S)
   - Slope $\mathrm{d}(S^c/S)/\mathrm{d}\log\xi^c = -0.460$

Steady State Results

	Statistic	Steady State Value	Relative to Benchmark
(i)	Total Saving / GDP	0.230	0.872
(ii)	Corporate Investment / Total Investment	0.660	0.921
(iii)	Corporate Saving / Total Saving	0.798	–
(iv)	Dividends / Profits	0.279	–
(v)	Corporate Labor Share	0.614	1.038
(vi)	Household Capital / Corporate Capital	0.516	1.302
(vii)	User Cost of Capital	0.072	1.166

Response to a Negative Investment Price (ξ^c) Shock

- We shock ξ^c from 1 to 0.79 as in PWT and study steady state to steady state changes Go
- Capital market imperfections matter more in states of high desired investment
- Increase of desired investment depends on elasticity of substitution between k and n
- The higher the elasticity of substitution, the more desired investment increases, and the more capital market imperfections should matter
- To quantify this interaction we compare
  - Difference between perfect and imperfect capital markets under CD
  - Difference between perfect and imperfect capital markets under CES

Negative ξ^c Shock: Results

	Production: / **Capital Markets Imperfections:**	**CD** / **No**	**CD** / **Yes**	**CES** / **No**	**CES** / **Yes**
(i)	Δ Corporate Labor Share	0.000	0.000	-0.058	-0.053
(ii)	Δ Corporate / Total Saving	-	0.072	-	0.118
(iii)	Δ Corporate Saving / GDP	-	0.031	-	0.064
(iv)	Δ Corporate / Total Investment	0.031	0.029	0.065	0.066
(v)	Δ Corporate Investment / GDP	0.023	0.018	0.058	0.044
(vi)	Δ log GDP	0.202	0.194	0.317	0.272
(vii)	Δ log c	0.174	0.173	0.242	0.219
(viii)	Welfare Equivalent Consumption	0.204	0.205	0.321	0.290

▸ Go

Can Model Reproduce Empirical Patterns?

- Increase in saving / GDP is counterfactual (**Model A**) Go
- Want to highlight role of change in *composition* of saving
- **Model B**: ξ^c shock and stabilize S/GDP by $\downarrow \delta^h$
- **Model C**: ξ^c shock and stabilize S/GDP by $\downarrow \beta$
  - we also $\downarrow \tau^k$ to keep the real interest rate r constant
- **Model E**: introduce more shocks from the data
  - except for ξ^c, also feed τ^c, τ^d, and τ^g decreases from data
  - stabilize S/GDP and r by $\downarrow \beta$ and $\downarrow \tau^k$

Reproducing Empirical Patterns: Results

	ξ^c	ξ^c, δ^h	ξ^c, β	ξ^c, τ^c, τ^d, τ^g, β	
Δ Variable	**A**	**B**	**C**	**E**	**Data**
Corporate Labor Share	-0.053	-0.053	-0.033	-0.044	-0.081
Corporate / Total Saving	0.118	0.238	0.114	0.215	0.161
Corporate Saving / GDP	0.064	0.055	0.026	0.050	0.039
Corporate / Total Investment	0.066	0.161	0.062	0.146	0.091
Corporate Investment / GDP	0.044	0.037	0.014	0.034	0.025
Total Saving / GDP	0.040	0.000	0.000	0.000	≈ 0

20% Positive A Shock (Unexpected and Permanent)

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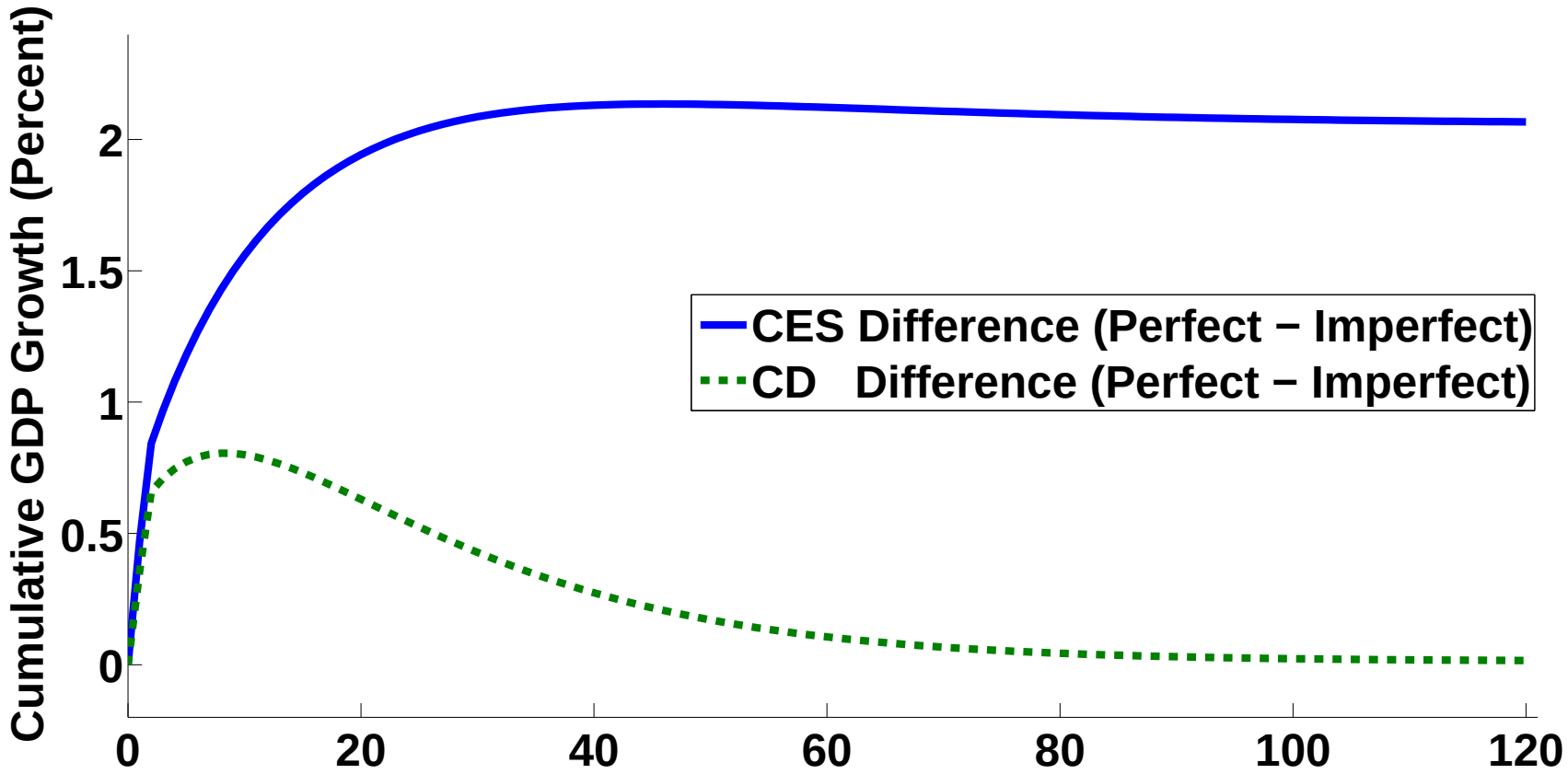

Intuition I

- Define ratio of user costs (imperfect/perfect capital markets):

$$u_R = \frac{u_I}{u_P} > 1$$

- The differential growth of the capital-labor ratio is:

$$D = \mathrm{d}\left(k_I^c/n_I\right)/\left(k_I^c/n_I\right) \Big/ \mathrm{d}\left(k_P^c/n_P\right)/\left(k_P^c/n_P\right) =$$

$$\left(1 - \frac{\left(u_R^{\sigma-1} - 1\right)\left(1 - s_{L,I}\right)}{s_{L,I}}\right)\left[1 - \left(\frac{1}{s_{L,P}}\right)\left(\frac{\sigma\left(\mathrm{d}u_R/u_R\right)}{\mathrm{d}\left(k_P^c/n_P\right)/\left(k_P^c/n_P\right)}\right)\right]$$

- Examples: A, ξ^c, β Go

Intuition II

$$D = \left(1 - \frac{\left(u_R^{\sigma-1} - 1\right)\left(1 - s_{L,I}\right)}{s_{L,I}}\right)\left[1 - \left(\frac{1}{s_{L,P}}\right)\left(\frac{\sigma\left(\mathrm{d}u_R/u_R\right)}{\mathrm{d}\left(k_P^c/n_P\right)/\left(k_P^c/n_P\right)}\right)\right]$$

1. Shocks that do not change ratio of user costs $\mathrm{d}u_R = 0$ (e.g. higher A)
   - $D = 1$ in Cobb-Douglas: knife-edge case in which growth of k^c/n same between I model and P model.
   - $D < 1$ in CES with $\sigma > 1$: the higher σ, the more a given *level* of capital market imperfections restricts the growth of capital.
2. Shocks that change ratio of user costs $\mathrm{d}u_R \neq 0$ (e.g. lower ξ^c)
   - When $\mathrm{d}u_R > 0$, growth in P model expected to be higher as the user cost falls by more.
   - Higher σ implies that firms desire to substitute more toward k^c, so the difference between P and I becomes even larger.

1. Empirics
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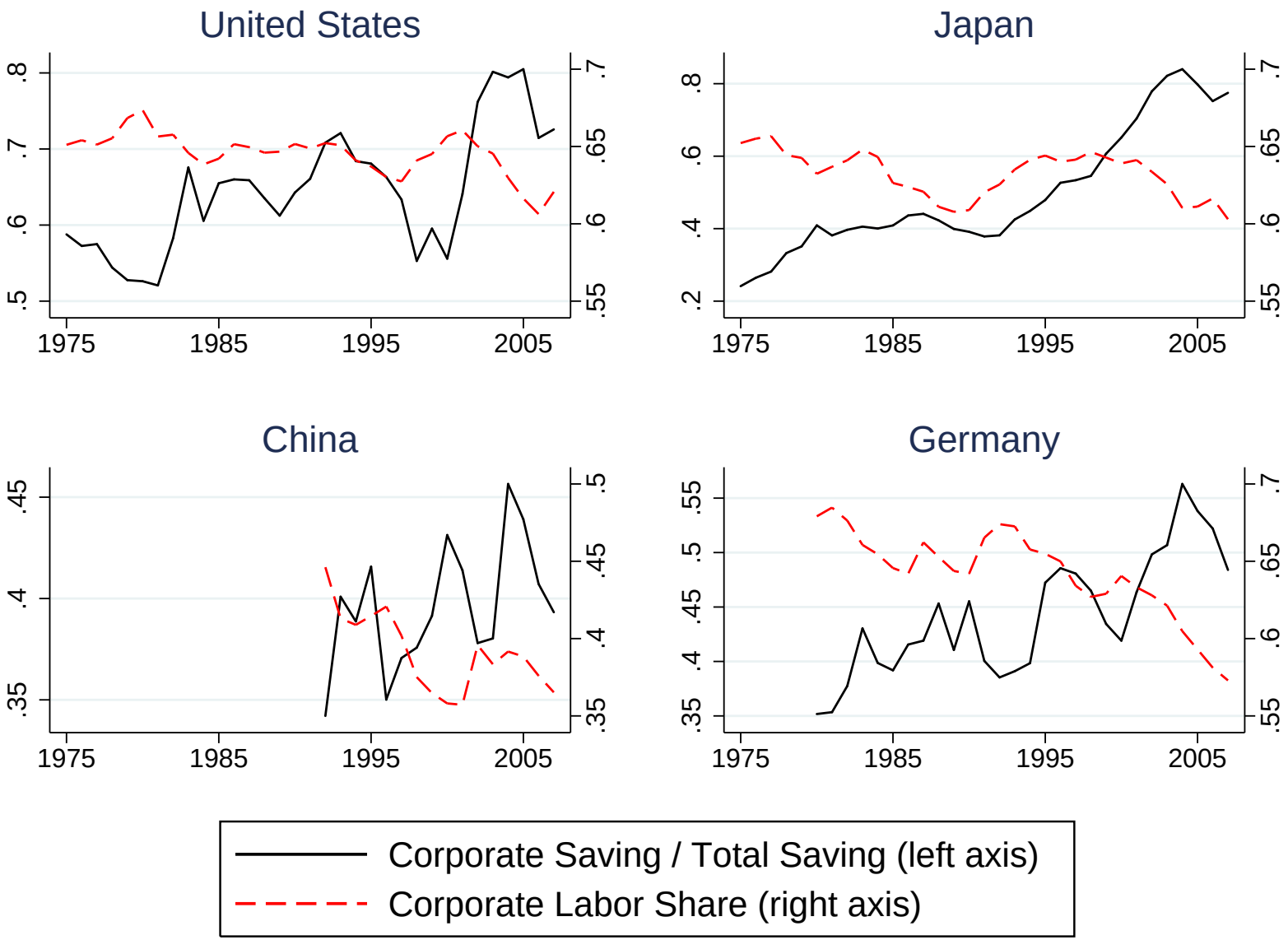
Conclusion and Next Steps

- Striking global trends from mid 70s: labor share down, corporate saving up.
- Trends driven in part by decline in cost of capital. Model calibrated to cross-section, matches a large portion of global time-series.
- Two facts informative for response of economy of various shocks.
- Related projects / Next Steps
  1. Joint Determination of Sectoral Saving and Current Account Imbalances
  2. Declining Labor's Share and the Global Rise in Inequality

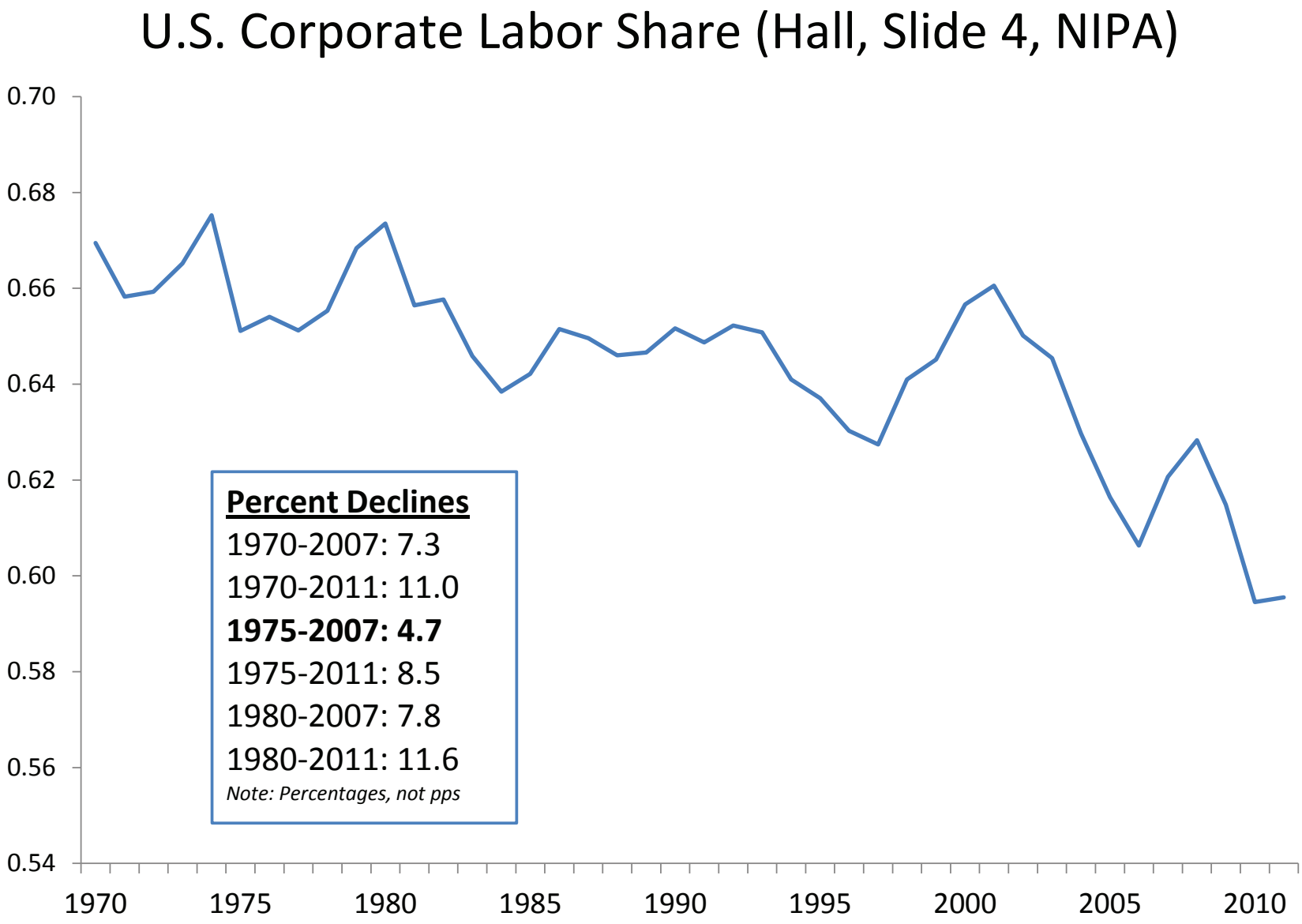
EXTRA SLIDES

Corporate Labor Shares and Saving: 4 Largest Economies

Back



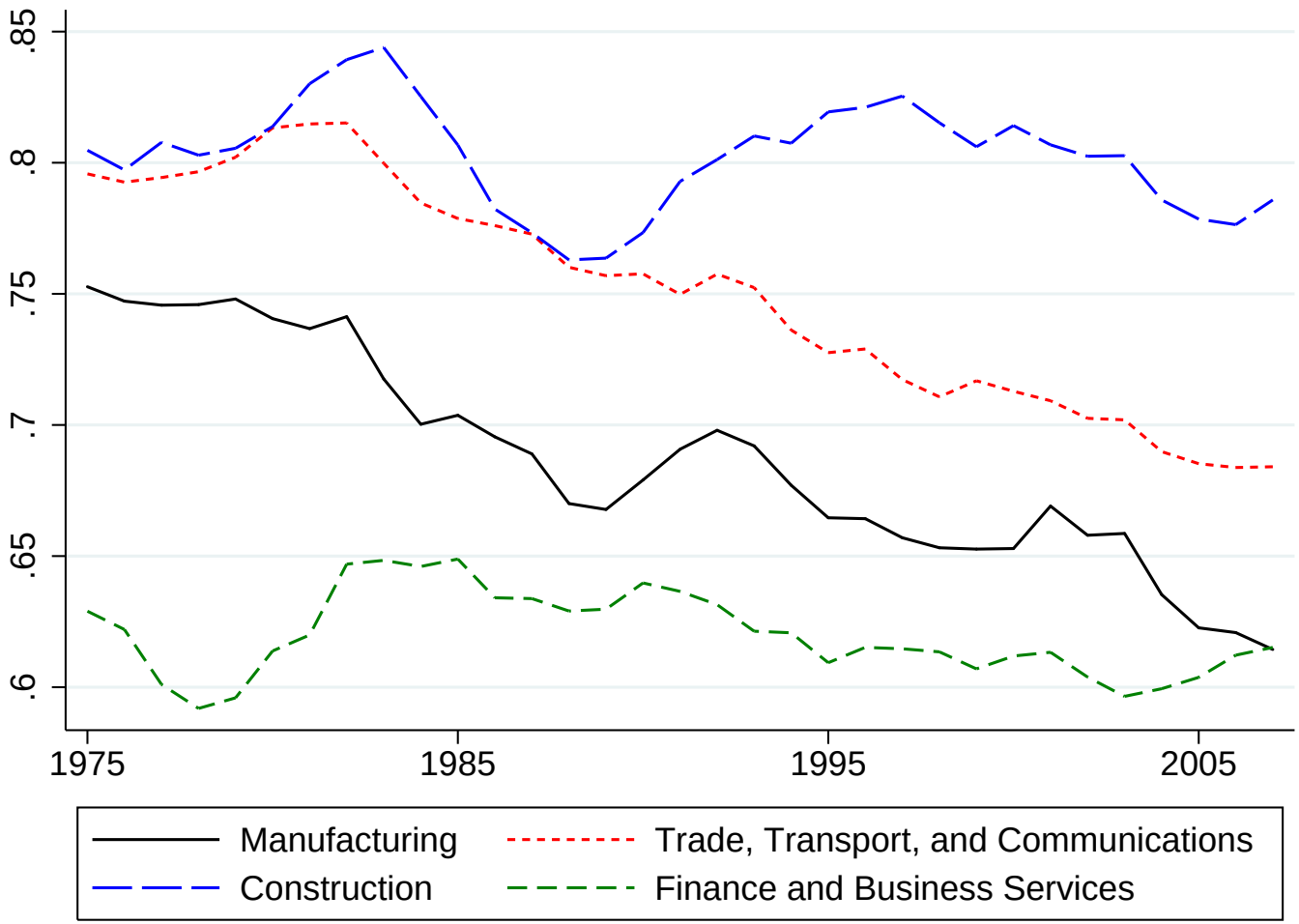
U.S. Labor Share



U.S. Labor Share Decline: Implications

- Take our very conservative estimate of roughly 3.5 pp decline.
- Suppose the U.S. faced the global representative shock of 21% decline in the price of investment goods.
- The elasticity of substitution necessary to rationalize this decline is $\sigma \approx 1.3$ (with $\sigma = 1.4$ we get a 5 pp decline in labor share).
- Does $\sigma = 1.3$ vs. $\sigma = 1$ make a difference for welfare in response to the *same shock*?
- Yes. For example, $\Delta \log \text{GDP}$ is 0.20 under $\sigma = 1$ but roughly 0.27 under $\sigma = 1.3$.

Labor Share Trends by Sector



- covers total economy other than agriculture, mining, utilities, real-estate, and government

Corporate vs. Overall Labor Share

Implications of CES for Balanced Growth

Back

- balanced growth with non-zero factor shares under labor augmenting tech growth under any production function (including CES)
  - our shock increases real wages by 20%
  - the rest could be labor-augmenting growth which does not move the labor share
- balanced growth path under any technology (including capital augmenting) under CD
  - Jones (2003) production function with time varying elasticities
- Our $\sigma = 1.4$ is reasonable. Example:
  - Taiwan 7.1% annual growth in k/n over 25 years (1966-1990)
  - CRS and Hicks-neutral tech growth: 10pp decline in s_L
  - big but not unusual relative to other countries in our dataset

Implications for Levels (Hsieh and Klenow, 2007)

Back

- Their argument is that the high relative price of investment goods in less developed countries reflects their low price of consumption and not their high price of investment goods.
- Balassa-Samuelson effect: investment goods (more) tradeable and consumption goods (more) non-tradeable, so low price of consumption reflects low technology of producing investment goods.
- Our model with $\sigma > 1$ implies that labor share s_L is lower where relative price of investment goods ξ^c is lower.
- We prefer calibrating our model from the cross sectional variation in trends (instead of levels), to avoid biases stemming from fixed effects (e.g. different industrial composition).
- We do find a positive relationship between s_L and ξ^c in levels.

Compensation of Employees

Back

- wages and salaries in cash (including overtime, housing allowances, holidays, sickness, bonuses, commissions, tips etc.; does not include unfunded benefits such as maternity leave, medical services not related to work etc.)
- wages and salaries in kind (meals, housing services, transportation to and from work, parking, etc.)
- employers' social contributions for sickness, accidents, and retirement (to social security funds, insurance enterprises, and other institutional units)
- most developed countries try to account for the value of stock options granted to employees as part of labor compensation (though the treatment of these gains is subject to data availability and is not uniform across countries)

Related Trends in Investment

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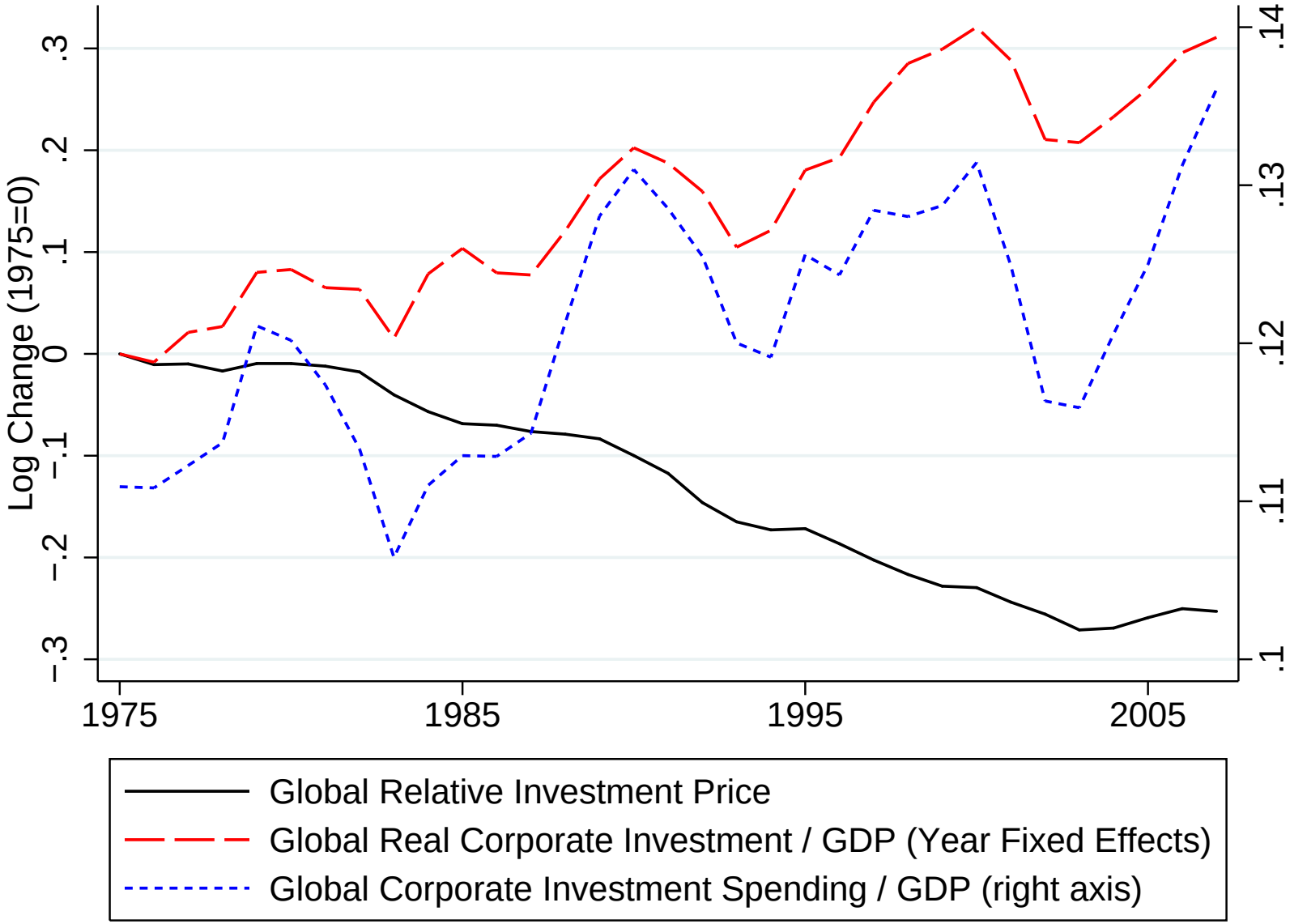
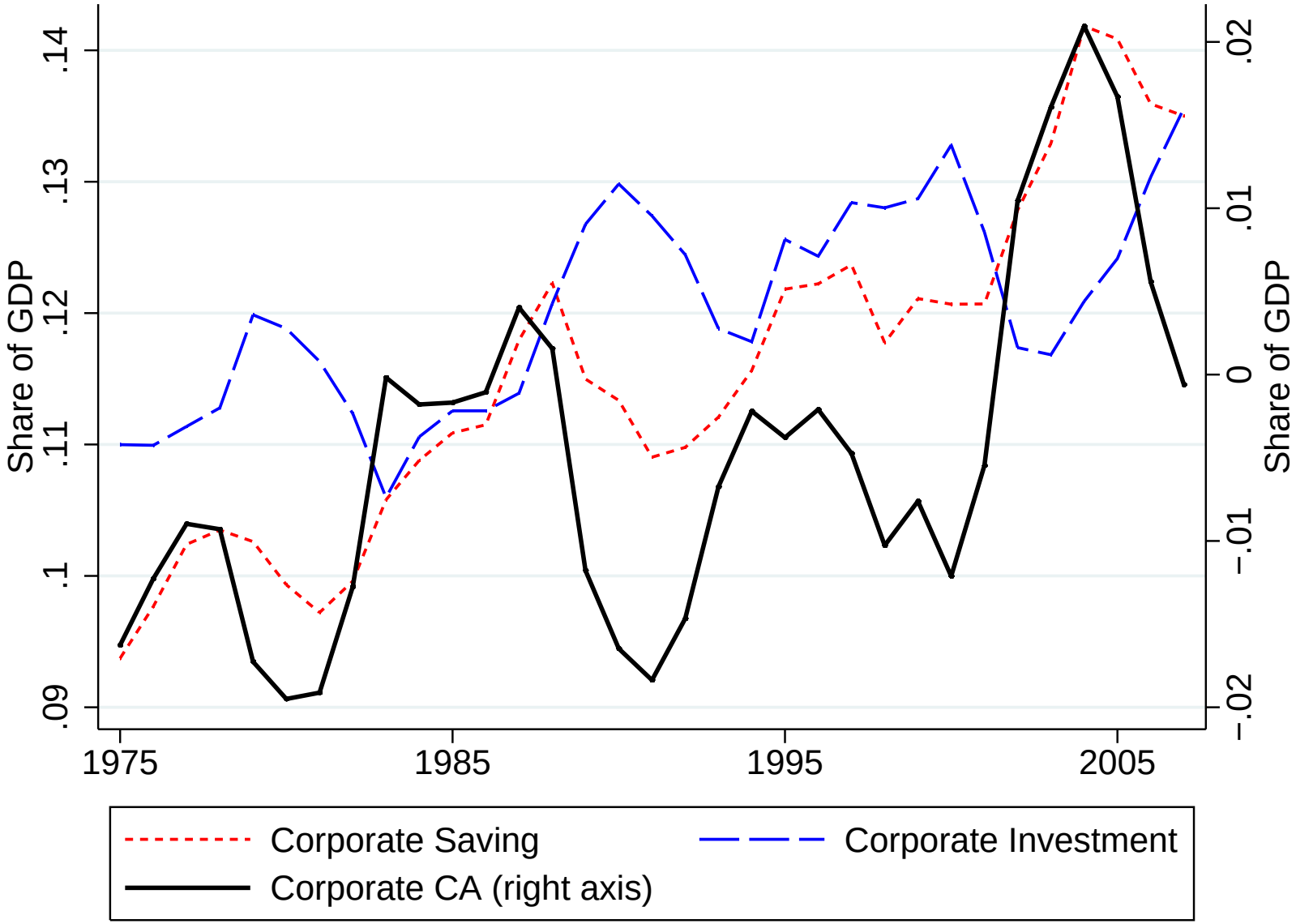


Implications for Investment

- In response to the investment price shock, our model implies an increase of the real capital stock over GDP k^c/GDP.
- Real corporate investment as a share of GDP, (x^c/ξ)/GDP, grows both in our model and the data.
- Nominal corporate investment as a share of global GDP, x^c/GDP, is relatively constant in the data but increases in the model.
    1. Stable x^c/GDP is not incompatible with declining labor share (e.g. introduce ξ^c and β shocks together).
    2. Our model has more robust predictions about the sectoral shares of total savings/investment (instead of shares of GDP).
    3. In the data we have not measured intangibles which have grown considerably for all major economies.

Corporate Saving, Investment, and CA



Investment Prices

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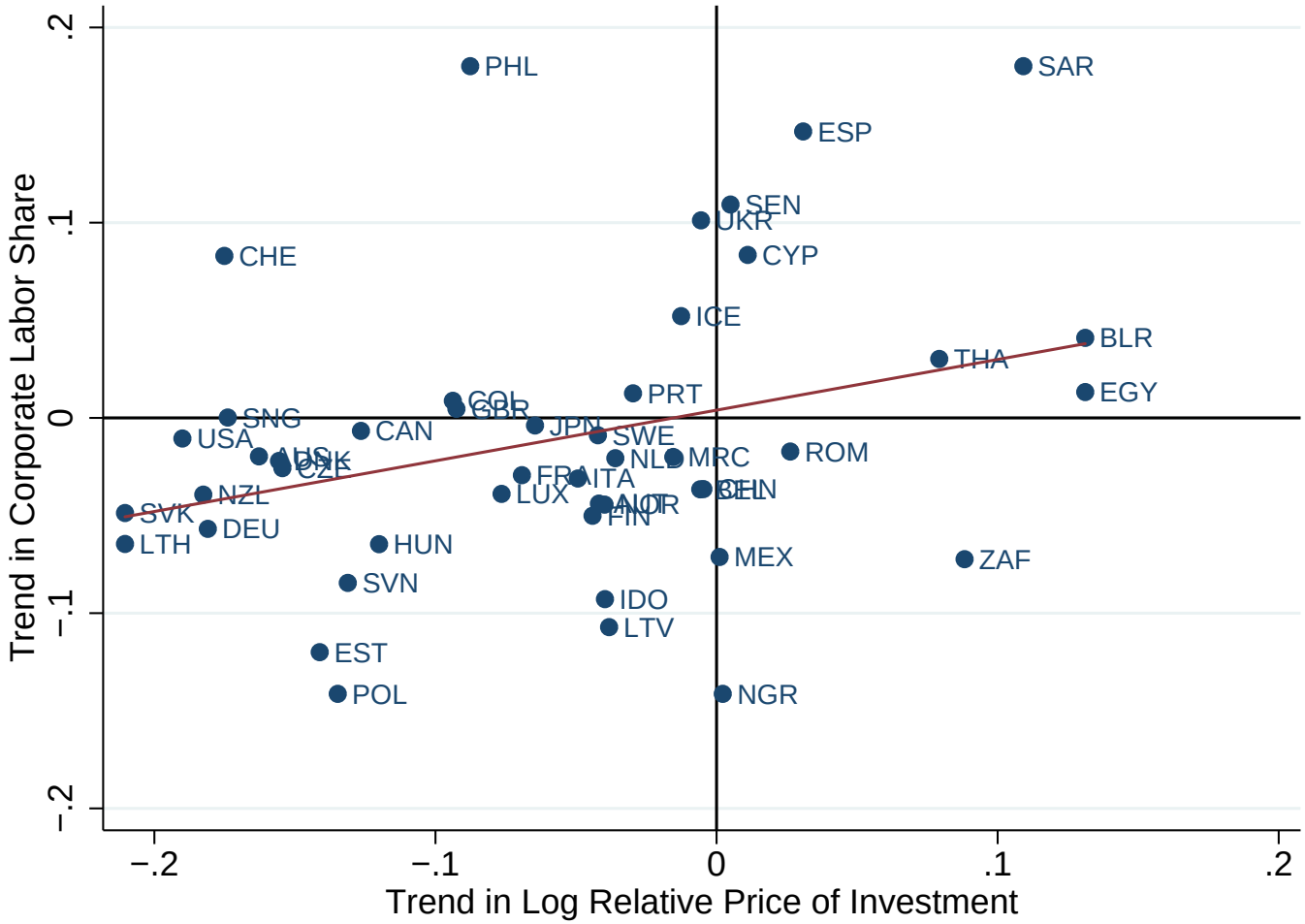
$$\xi_i^c = \left(\frac{P_{I,i}^{\text{PPP,Int}} / P_{C,i}^{\text{PPP,Int}}}{P_{I,US}^{\text{PPP,Int}} / P_{C,US}^{\text{PPP,Int}}} \right) \left(\frac{P_{I,US}^{\text{BEA}}}{P_{C,US}^{\text{BEA}}} \right)$$

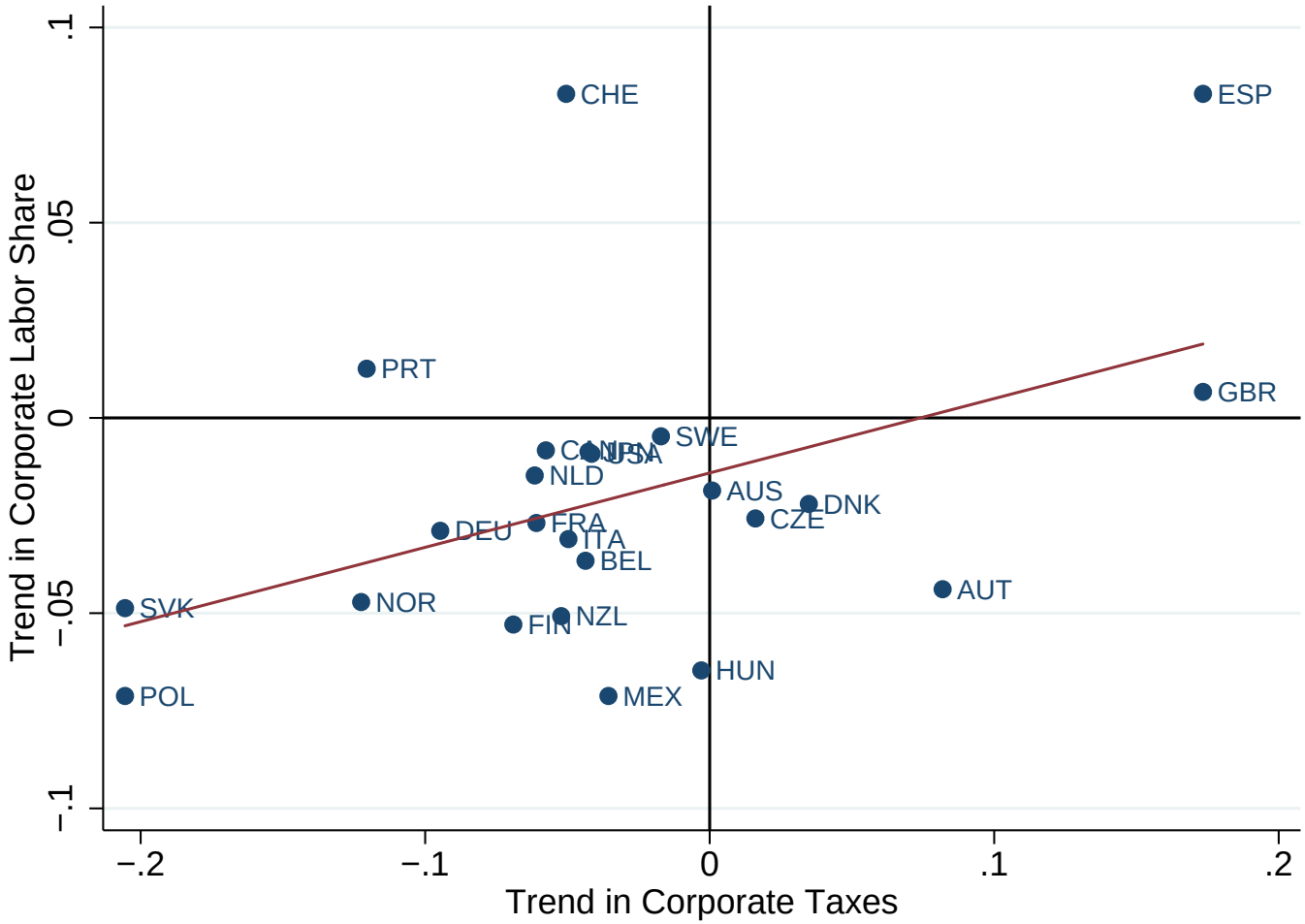
- PWT: typically no hedonic estimates ("most price comparisons have used national average prices, matching identical items as much as possible"). So, cross sectional heterogeneity is not driven by lack of consistency in hedonics estimates. All domestic relative prices of investment reflect the same hedonic adjustment made by the BLS/BEA.
- EIU: collects directly domestic investment prices, so there may be lack of consistency in hedonics estimates.
- We do find similar effects when we correlate other components of the user cost such as corporate income taxes.

Corporate Labor Shares and EIU Investment Prices



- cross-country slope 0.26; median within-country slope 0.31

Corporate Labor Shares and OECD Corporate Taxes



- cross-country slope XXX; median within-country slope XXX

Capital-Augmenting Technology

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- Differences between labor-augmenting and capital-augmenting technological progress could bias our results if correlated with trends in the price of investment goods.
- Antras (2004) shows that in the U.S., labor-augmenting technology grew faster than capital-augmenting technology.
- If countries in which price of investment goods fell the most, also experienced greater labor-augmenting relative to capital-augmenting technological progress, then our results are biased towards Cobb-Douglas (i.e. true σ even higher).

Corporate Saving Shares and EIU Investment Prices

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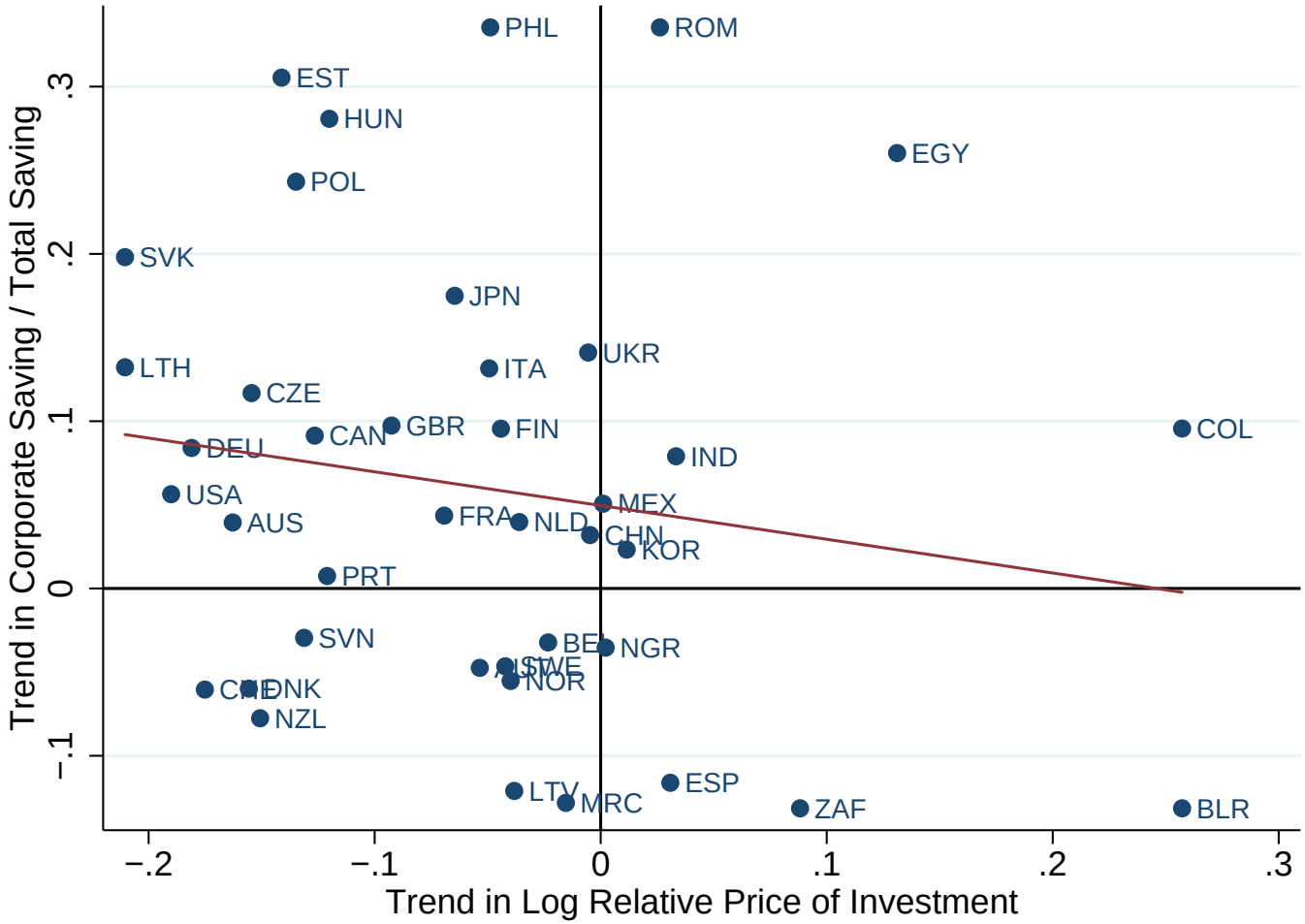
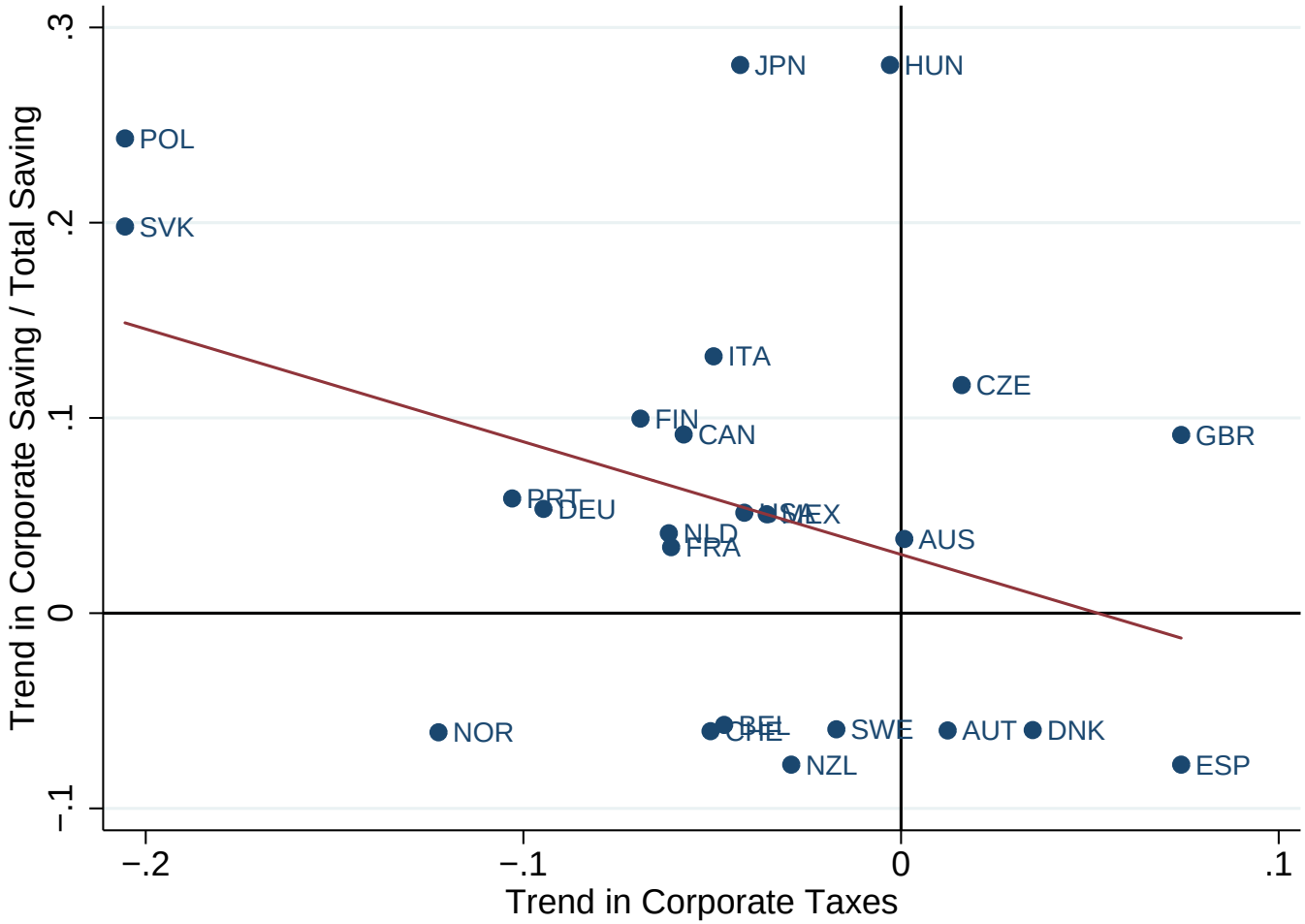


- cross-country slope -0.20; median within-country slope -0.49

Corporate Saving Shares and OECD Corporate Taxes



- cross-country slope XXX; median within-country slope XXX

Corporate Saving and Labor Share, Country by Country

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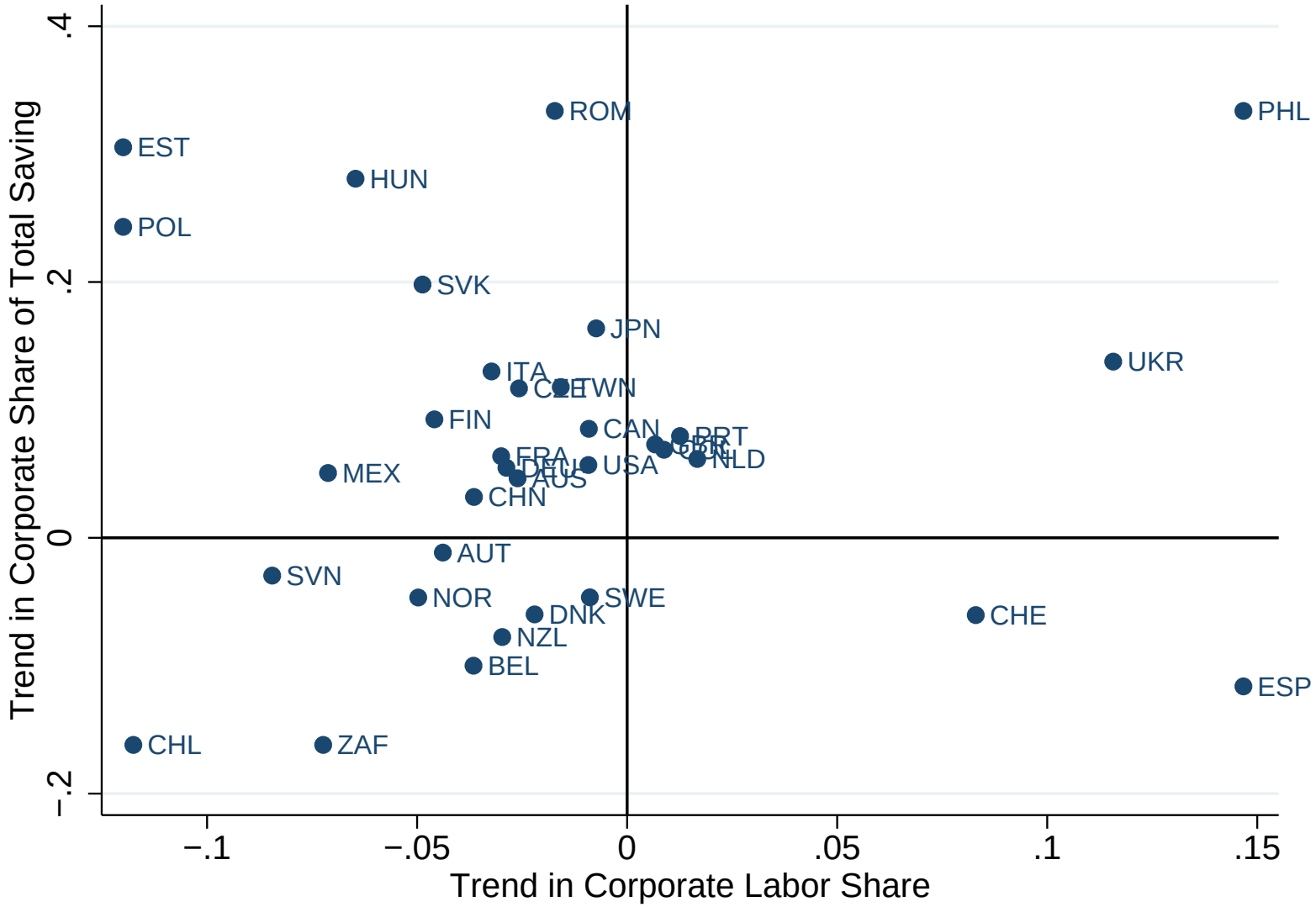
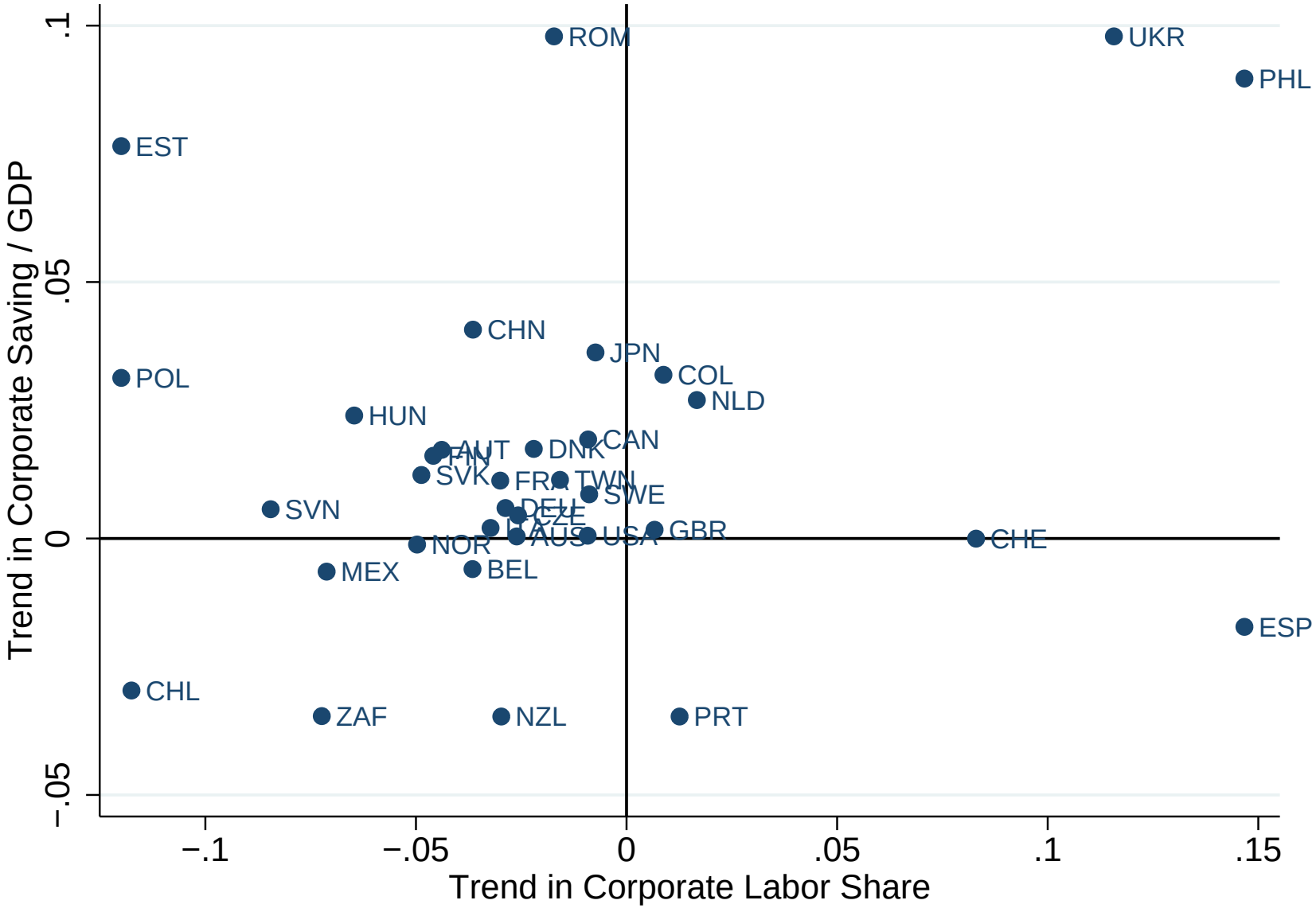


Corporate Saving and Labor Share, Country by Country



Household Budget Constraint

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$$
\begin{aligned}
c_t \quad + \quad & x_t^h + \int \theta_{t+1}(z) p_t(z) \pi(z) dz + \int b_{t+1}^c(z) \pi(z) dz = \\
& w_t n_t (1 - \tau_t^n) + T_t + \tau_t^k \delta^h k_t^h \\
& + \int \theta_t(z) d_t(z) (1 - \tau_t^d) \pi(z) dz \\
& + \int \theta_t(z) (p_t(z) - e_t(z)) \pi(z) dz \\
& - \int \theta_t(z) \tau_t^g \left(p_t(z) - p_{t-1}(z) - e_t(z) \right) \pi(z) dz \\
& + \int b_t^c(z) (1 + r_t (1 - \tau_t^k)) \pi(z) dz.
\end{aligned}
$$

Feldstein-Horioka on Shares

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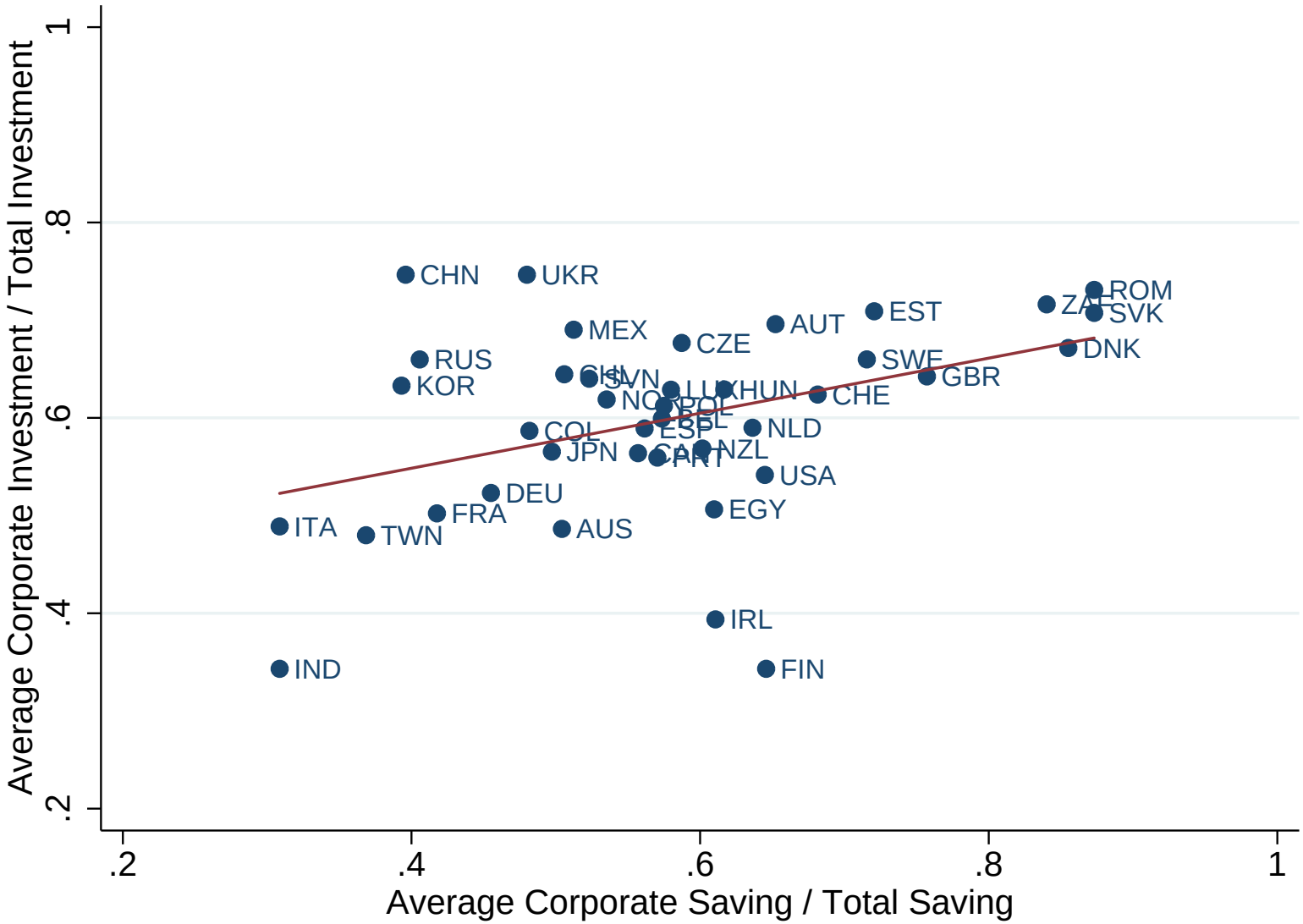

Simplifications in Describing Corporate Policies

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1. Partial equilibrium
2. Flotation costs of 2%
3. No debt
4. No adjustment costs
5. $e_t \geq -0.3$ (does not depend on capital)
6. price of investment always equal to 1
7. all other exogenous variables expected to remain constant for ever with probability 1

Perfect vs. Imperfect Markets Formally

Back

- Allocations in our model differ from allocations in benchmark neoclassical model if and only if user costs differ:

$$u_{t+1}^{\mathsf{P}} = \xi_t^c \left(1 + \left(1 - \tau^k\right) r_{t+1}\right) \left(1 + \Psi_{1,t}^c\right)$$
$$- \xi_{t+1}^c \left(1 - \left(1 - \frac{\tau^c}{\xi_{t+1}^c}\right) \delta^c - \Psi_{2,t+1}^c\right)$$

$$u_{t+1}^{\mathsf{I}} = \xi_t^c \left(1 + \left(\frac{1-\tau^k}{1-\tau^g}\right) r_{t+1}\right) \left(\frac{\frac{1-\tau^d}{1-\tau^g} + \mu_t^d}{\frac{1-\tau^d}{1-\tau^g} + \mu_{t+1}^d}\right) \left(1 + \Psi_{1,t}^c - \eta \mu_t^b\right)$$
$$- \xi_{t+1}^c \left(1 - \left(1 - \frac{\tau^c}{\xi_{t+1}^c}\right) \delta^c - \Psi_{2,t+1}^c\right) - \frac{\mu_{t+1}^e e^1}{\frac{1-\tau^d}{1-\tau^g} + \mu_{t+1}^d}$$

Traditional vs. New View ($e_1 = 0$ and $\eta = 0$)

- Traditional view: the marginal source of funds is new equity, so $\mu^e = 0$ and $\mu^d = 1/E'(e) - (1 - \tau^d)/(1 - \tau^g) > 0$. Postulates negative effect of dividend taxation on capital accumulation.
- New view: the marginal source of funds is retained earnings, so $\mu^d = 0$ and $\mu^e = 1 - (1 - \tau^d)/(1 - \tau^g) > 0$. Postulates no effect of dividend taxation on capital accumulation.
- Across steady-states, changes in τ^d do not affect user cost and capital stock.
  - with firm heterogeneity, this is not true if firms move across financial regimes (Gourio and Miao).
- Temporary dividend tax cut, $\tau^d_{t+1} < \tau^d_t$:
  - firms with $\mu^d_t = \mu^d_{t+1} = 0$: lower u_{t+1}, more investment in t
  - firms with $\mu^e_t = \mu^e_{t+1} = 0$: not affected

Calibration (Other Parameters)

Back

- Preferences: log consumption, log housing, and unitary Frisch elasticity
- Discount factor $\beta = 0.9723$ to match $r = 4.5\%$
- Tax rates are GDP-weighted from OECD
- Decreasing returns to scale $\kappa = 0.961$ and adjustment costs from Gourio and Miao (2010)
- Heterogeneity: $\{z_H = 1.09, \pi_H = 0.2\}$ and $\{z_L = 0.98, \pi_L = 0.8\}$ to match cdf of market shares
- Housing preference ν to match steady state hh investment / consumption
- Depreciation $\delta^h = \delta^c = 0.06$ to match saving/GDP equal to 22.5%
- Flotation costs $\lambda = 0.972$ from Gomes (2001) and collateral parameter $\eta = 0.2548$ to match debt/investment ratio in the US

A: ξ^c shock

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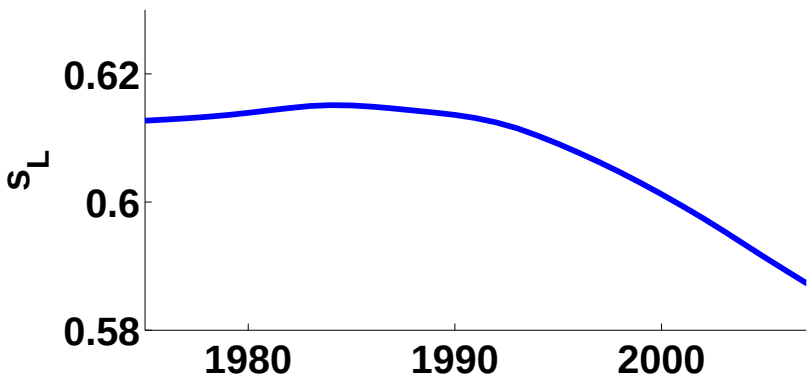
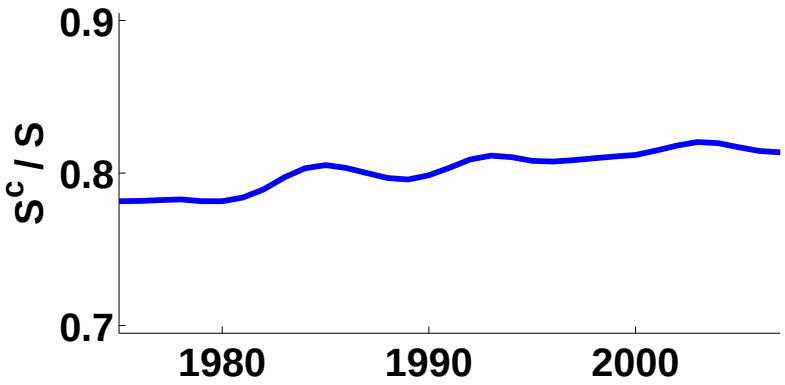
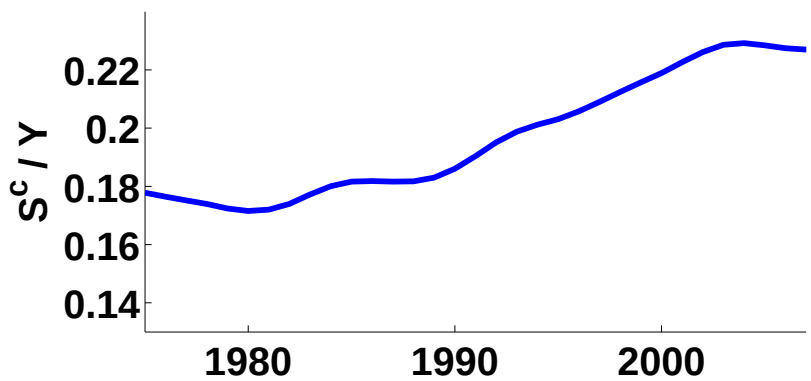
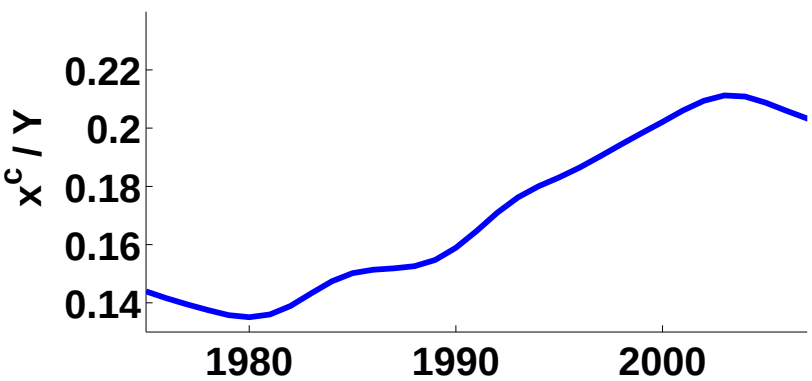
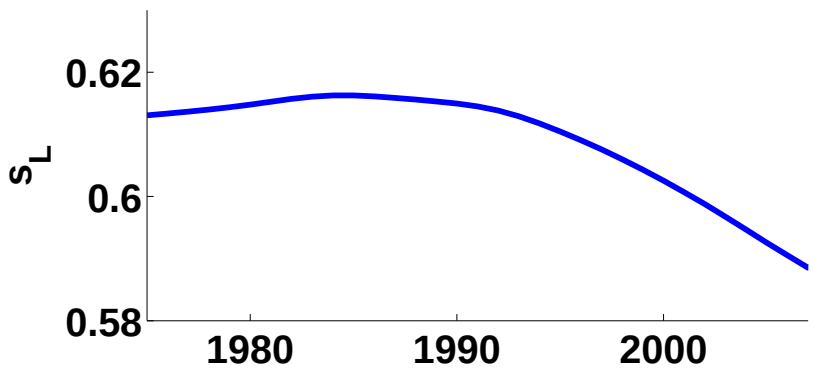


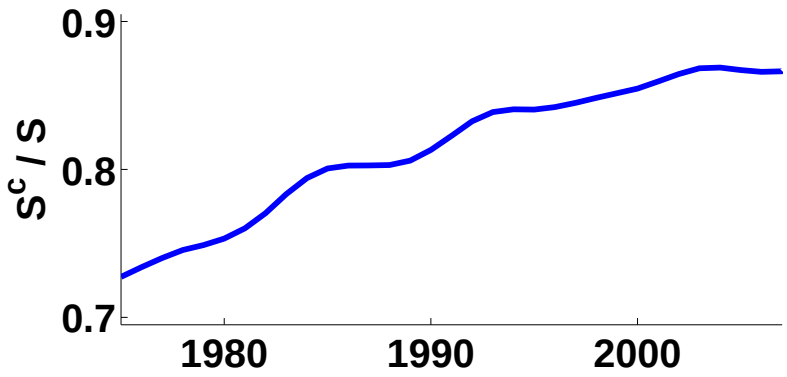


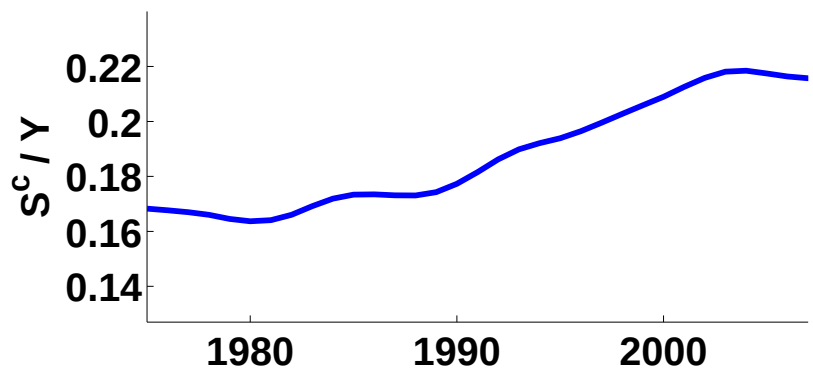


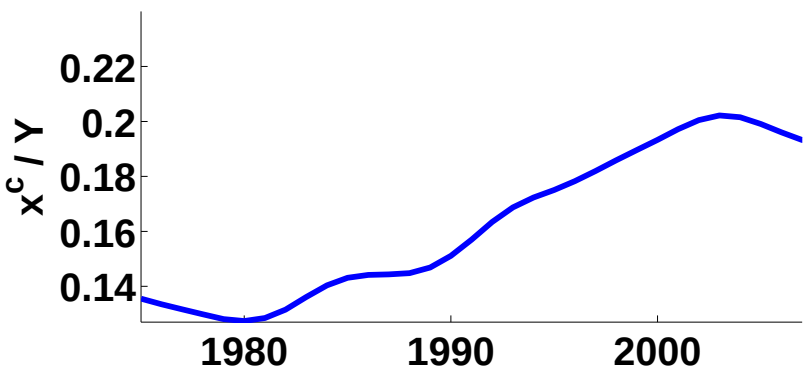


B: (ξ^c) and (δ^h) shocks

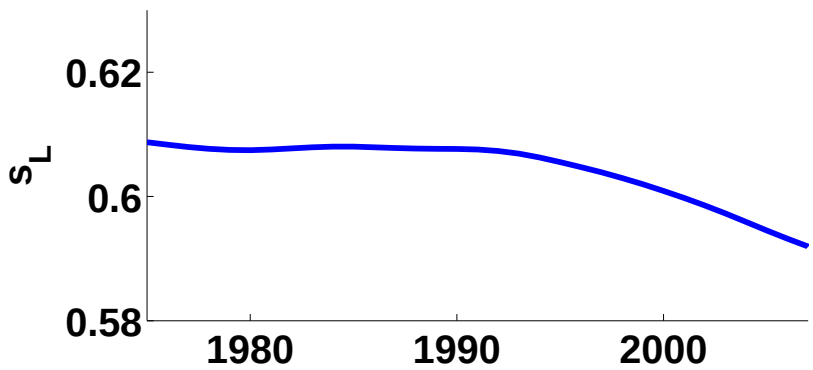


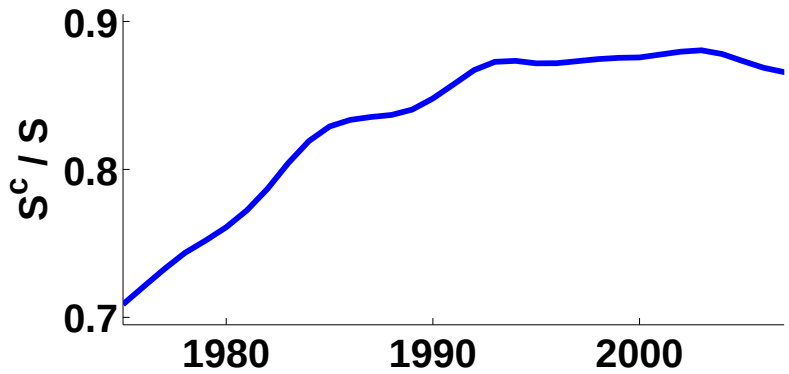


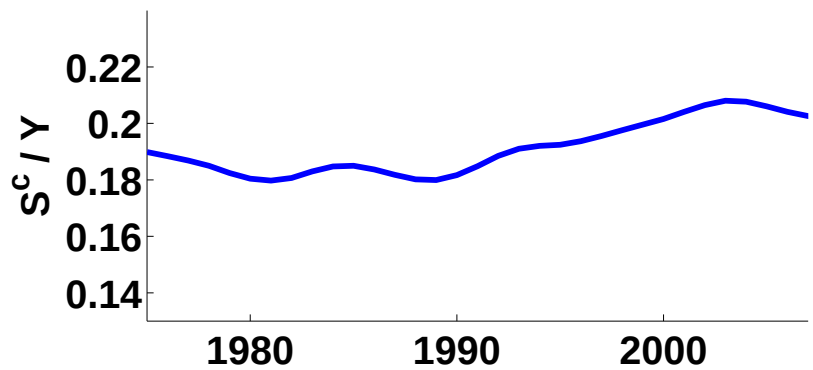


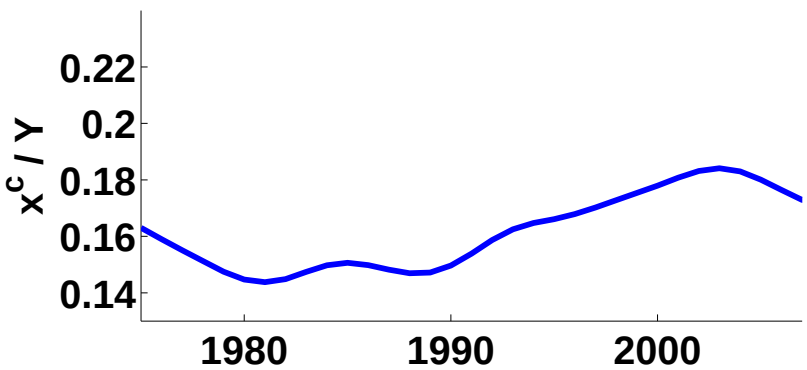


C: (ξ^c) and (β, τ^k) shocks

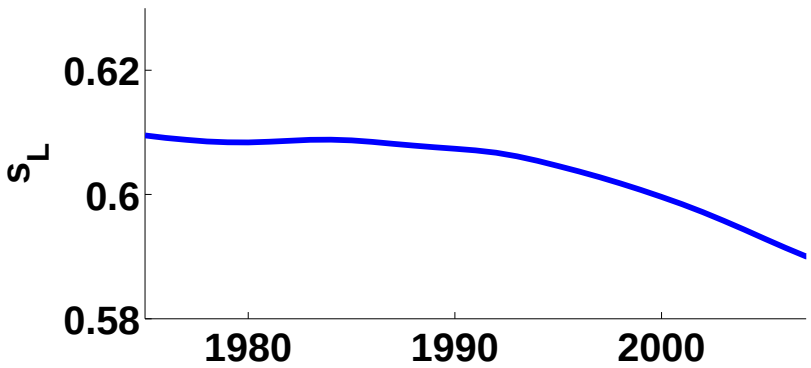


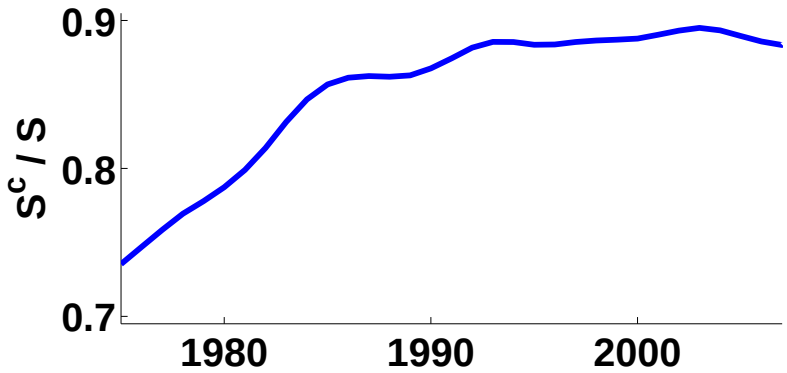


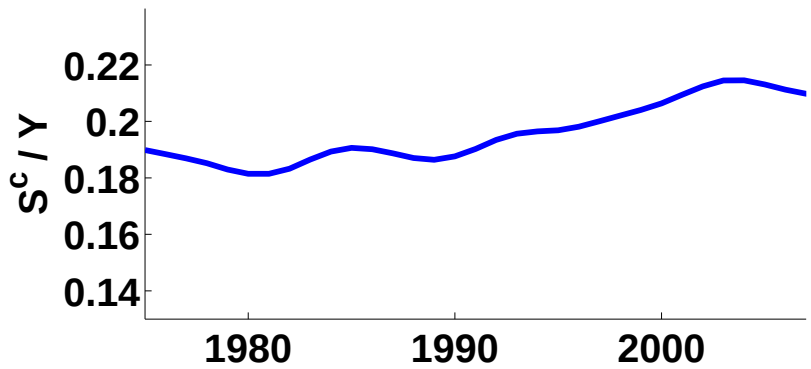


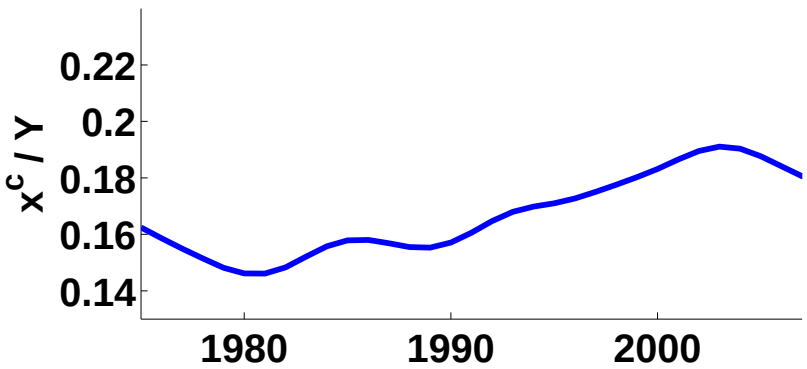


D: (ξ^c, τ^c) and (β, τ^k) shocks

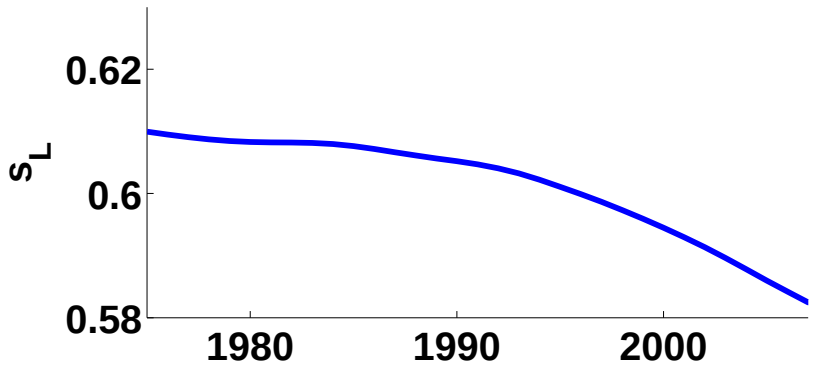


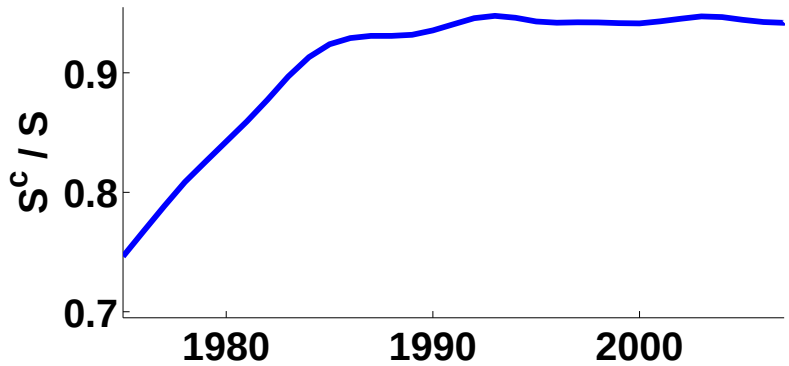


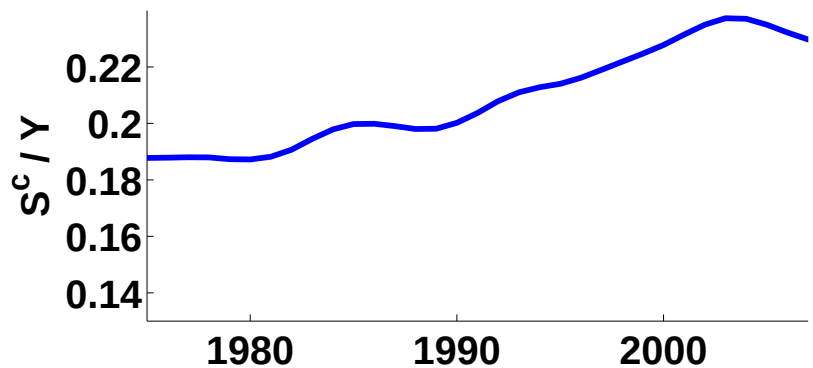


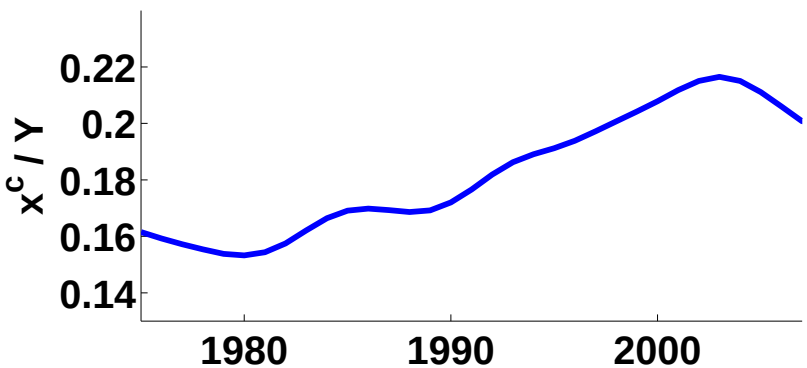


E: $(\xi^c, \tau^c, \tau^d, \tau^g)$ and (β, τ^k) shocks

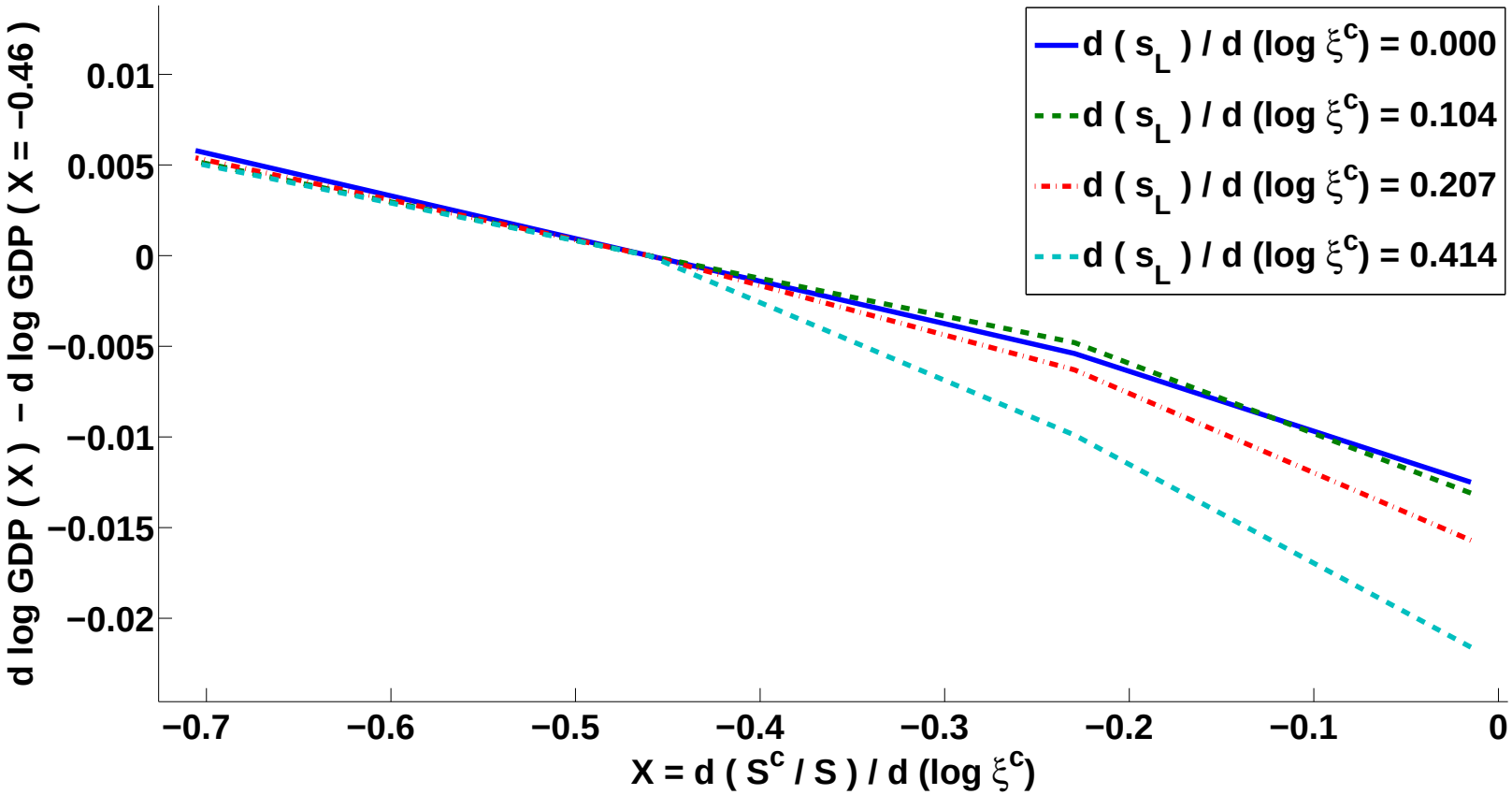








Informativeness of Labor Shares and Corporate Saving



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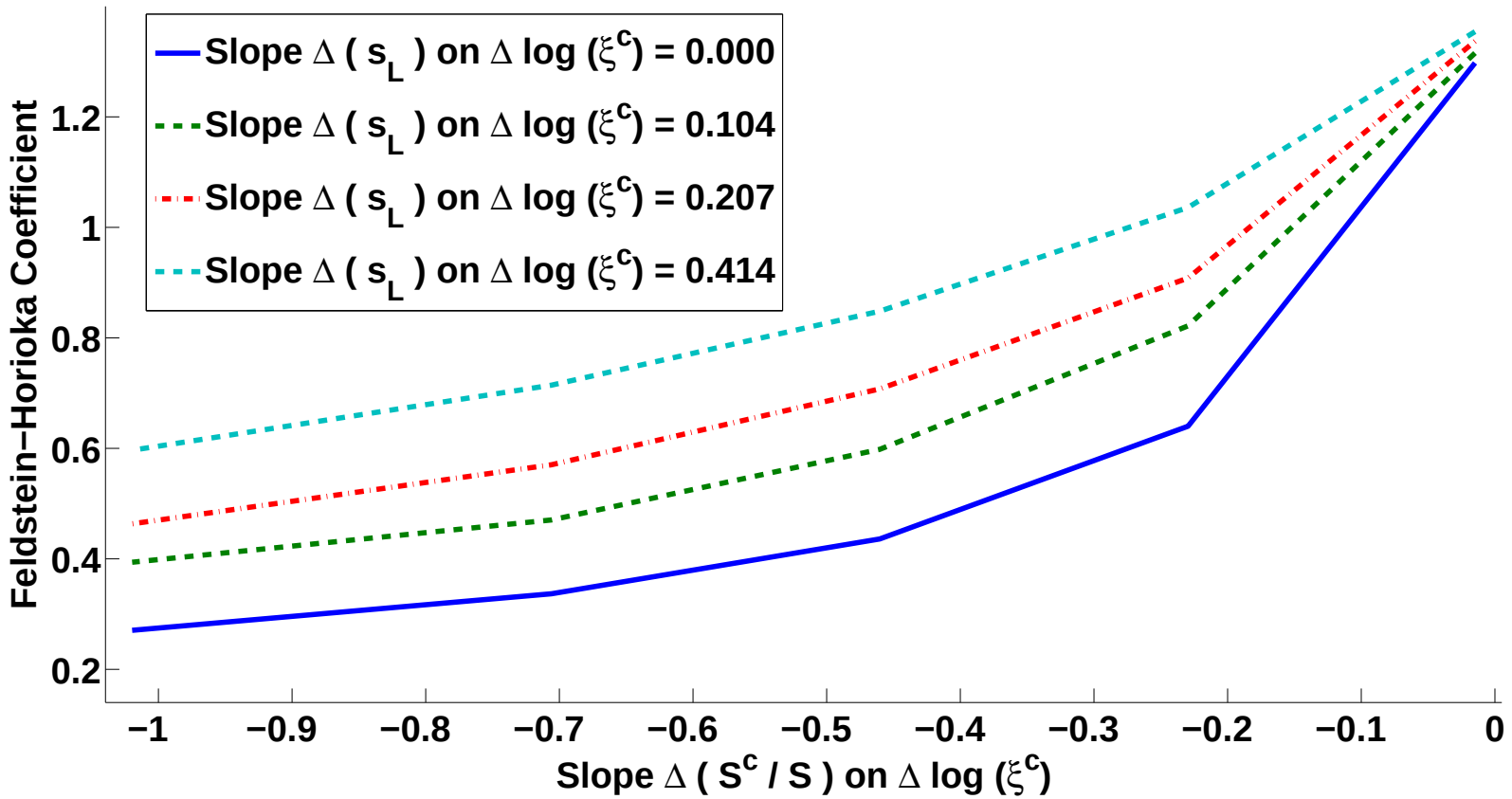
Capital Market Imperfections, Labor Shares, and FH Puzzle



Global Sectoral Saving Relative to GDP

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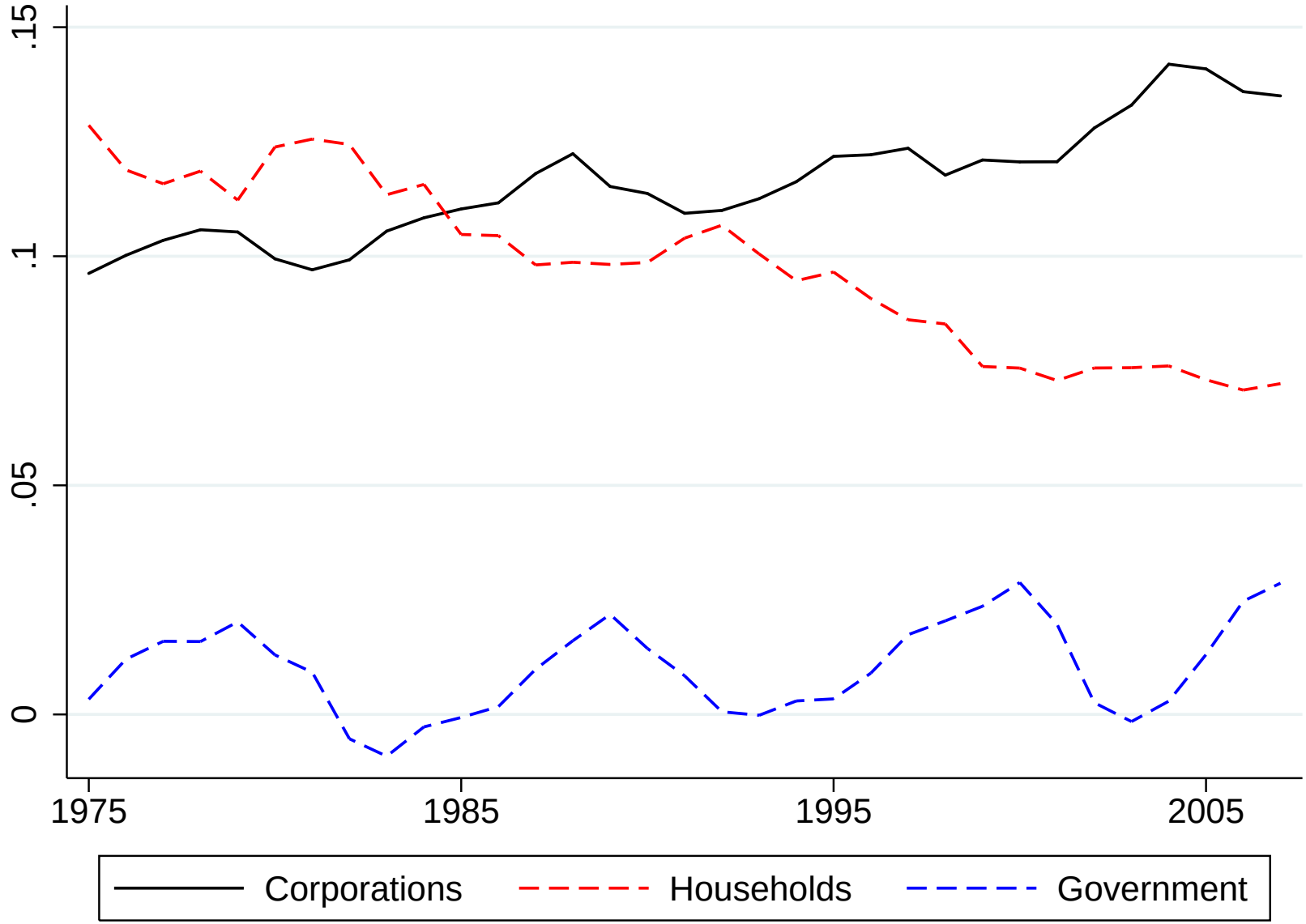

20% Negative A Shock (Unexpected and Permanent)

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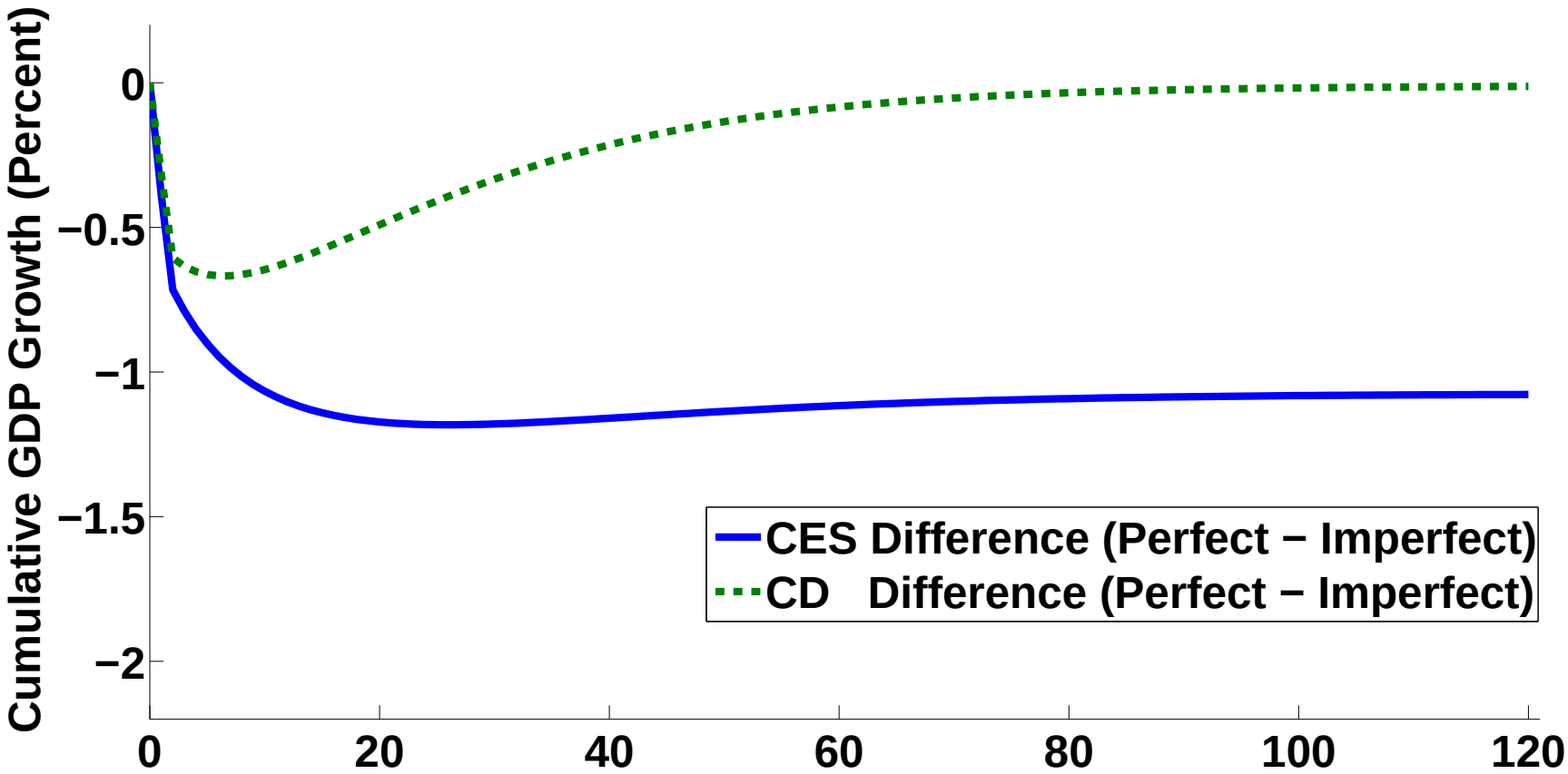

1 PP Negative β Shock (Unexpected and Permanent)

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