Kaldor and Piketty's Facts: The Rise of Monopoly Power in the US

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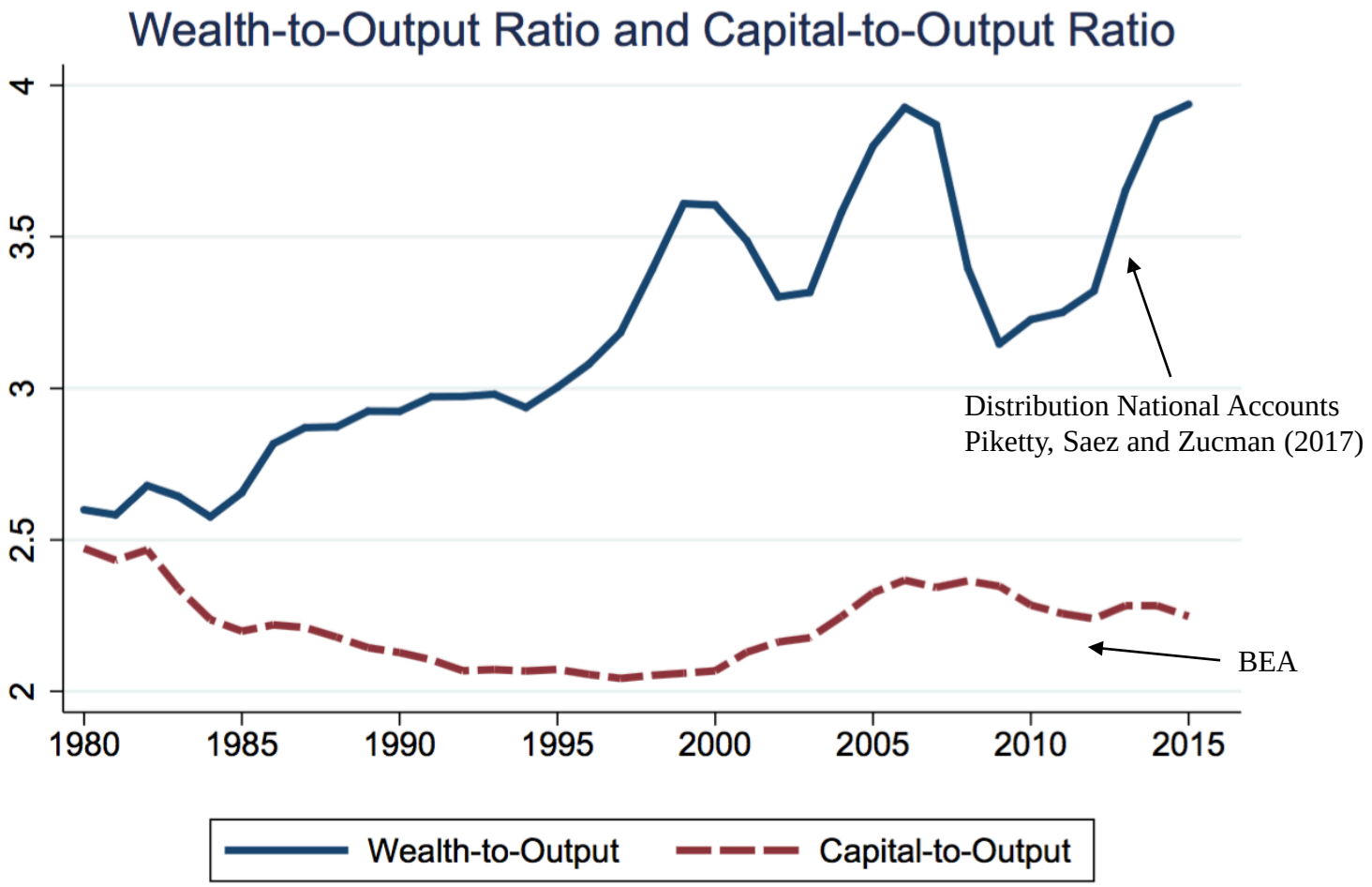
(P1) "Wealth is back"



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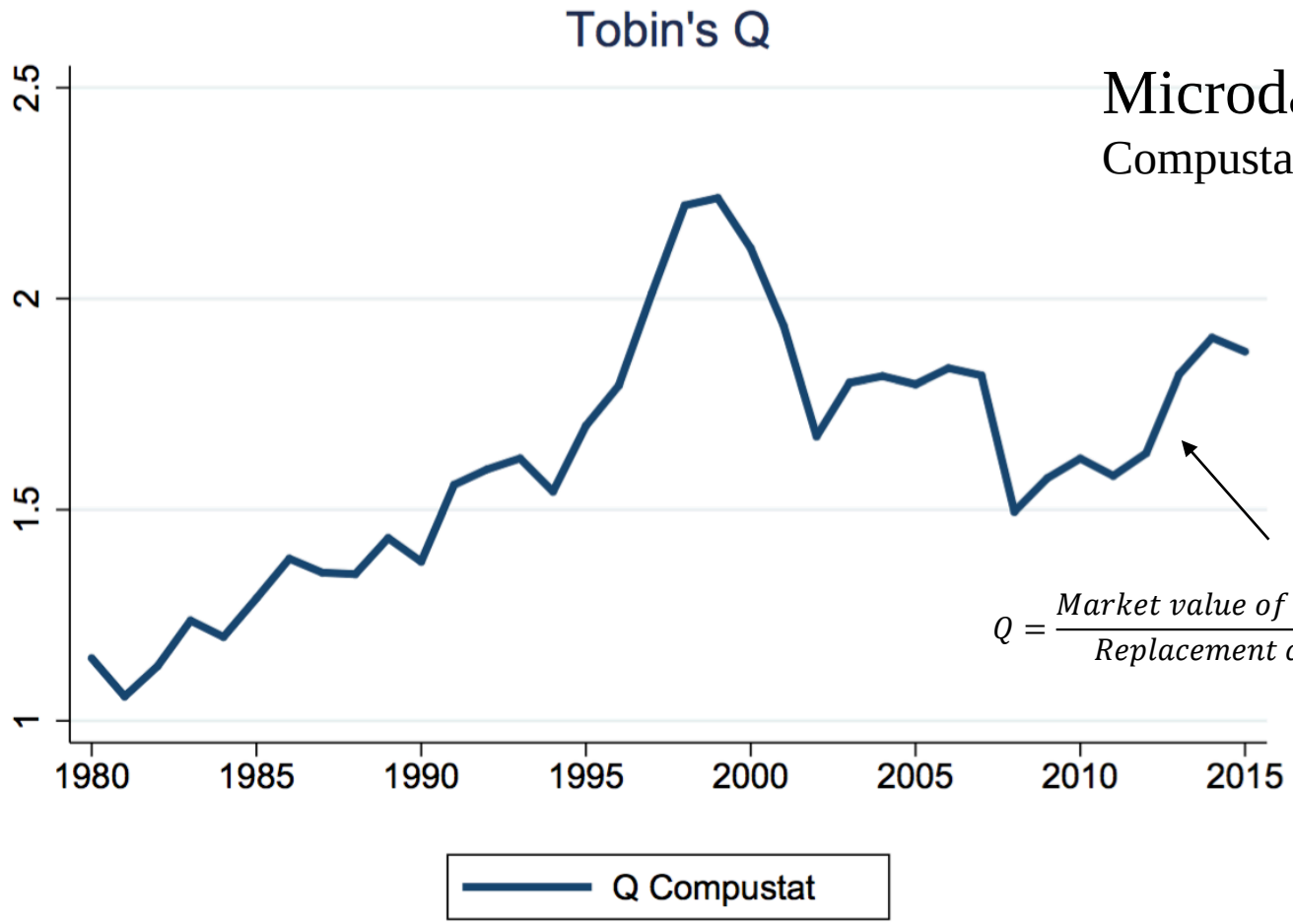
Puzzle 1: Should be same in neoclassical model

(P1) Wealth accumulation

- Wealth is not embodied in new productive capital goods. Replacement value of capital to output has stagnated.
- Instead, wealth was accumulated through ***capital gains***.
- Neoclassical model
  - ***Wealth cannot diverge from capital***
  - ***Wealth is accumulated by savings***

(P2) Tobin's Q



Microdata:
Compustat

$$Q = \frac{Market\ value\ of\ installed\ capital}{Replacement\ cost\ of\ capital}$$

Puzzle 2: Should be 1 in long run in neoclassical model

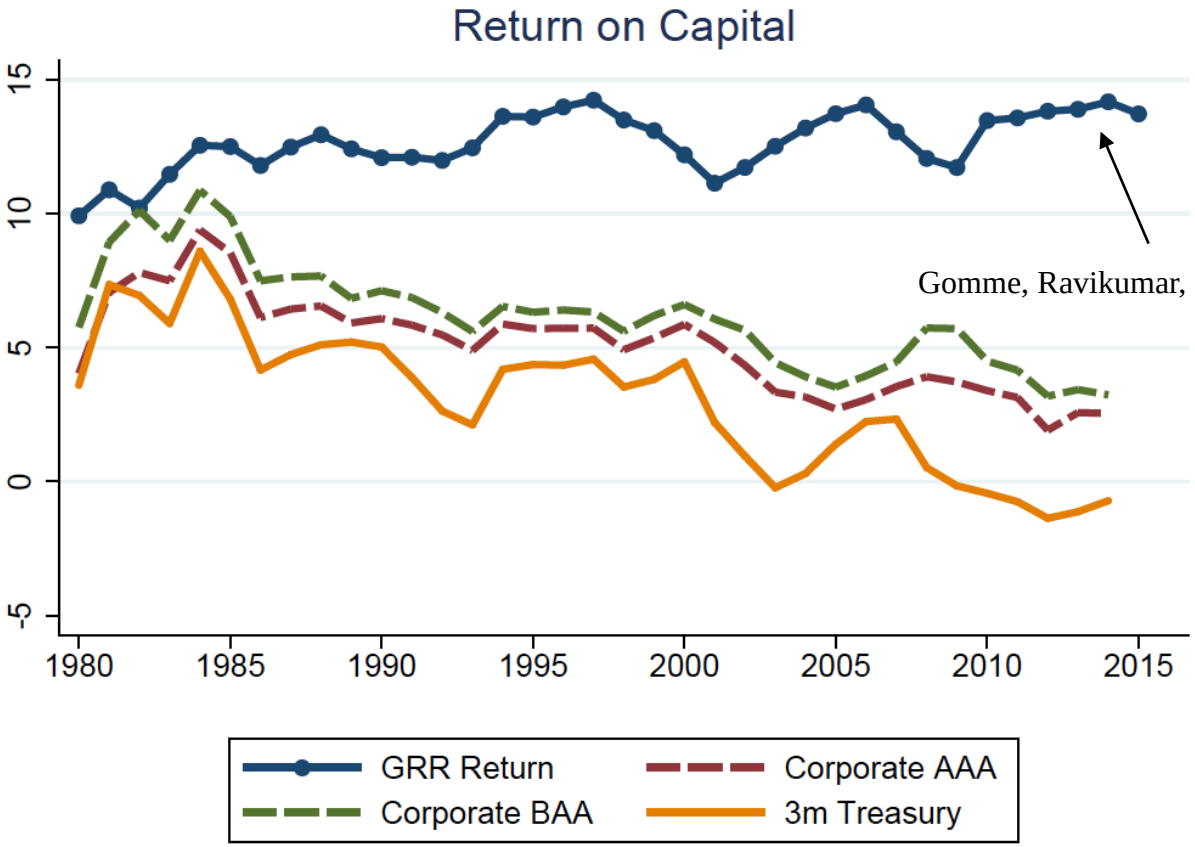
(P2) Tobin's Q

"The increase in stock brings market value into line with replacement costs, lowering the former and/or raising the latter"

Tobin and Brainhard (1976)

- Standard neoclassical models predict that the value of Tobin's Q should be 1 in long run

(P3) Decrease in real interest rate while measured return on capital constant



$$R = \frac{Y - wL - \delta K}{K}$$

Gomme, Ravikumar, and Rupert (2011), NIPA

Puzzle 3: GRR and r should be same in neoclassical model AND stable – one of Kaldor's stylized facts

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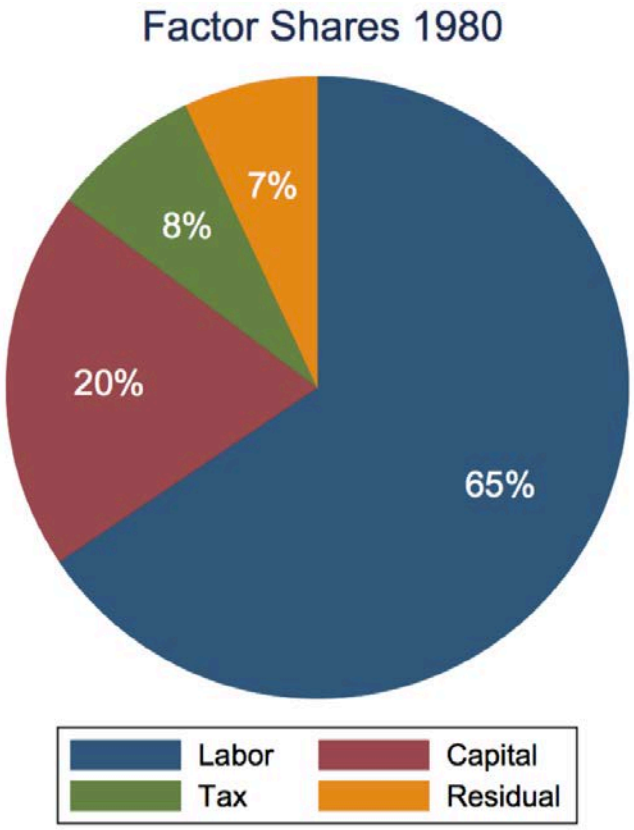
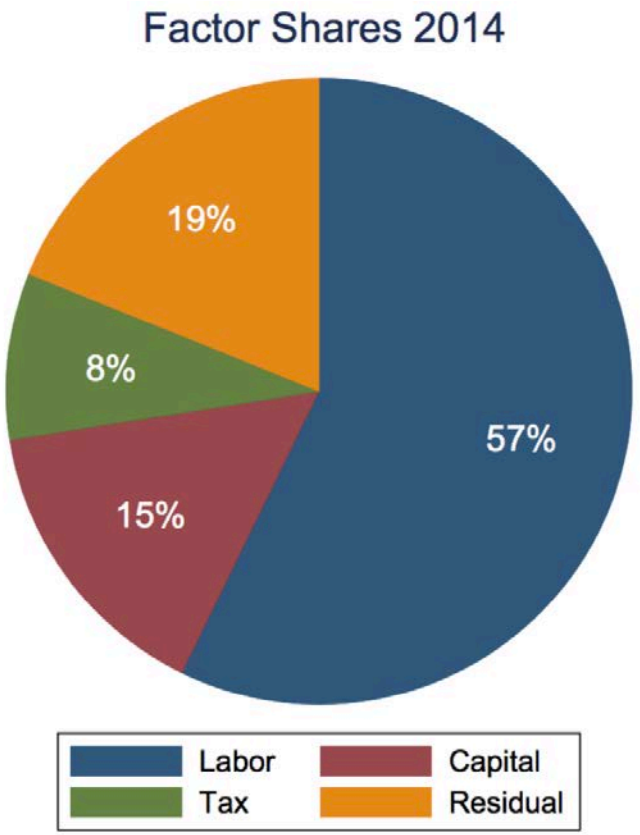
(P3) Decrease in real interest rate while measured return on capital constant

In neoclassical model the *average return is equal to the interest rate.*

(P4) A persistent decrease in labor and capital share….





Puzzle 4: Should be constant in neoclassical model – one of Kaldor's stylized facts

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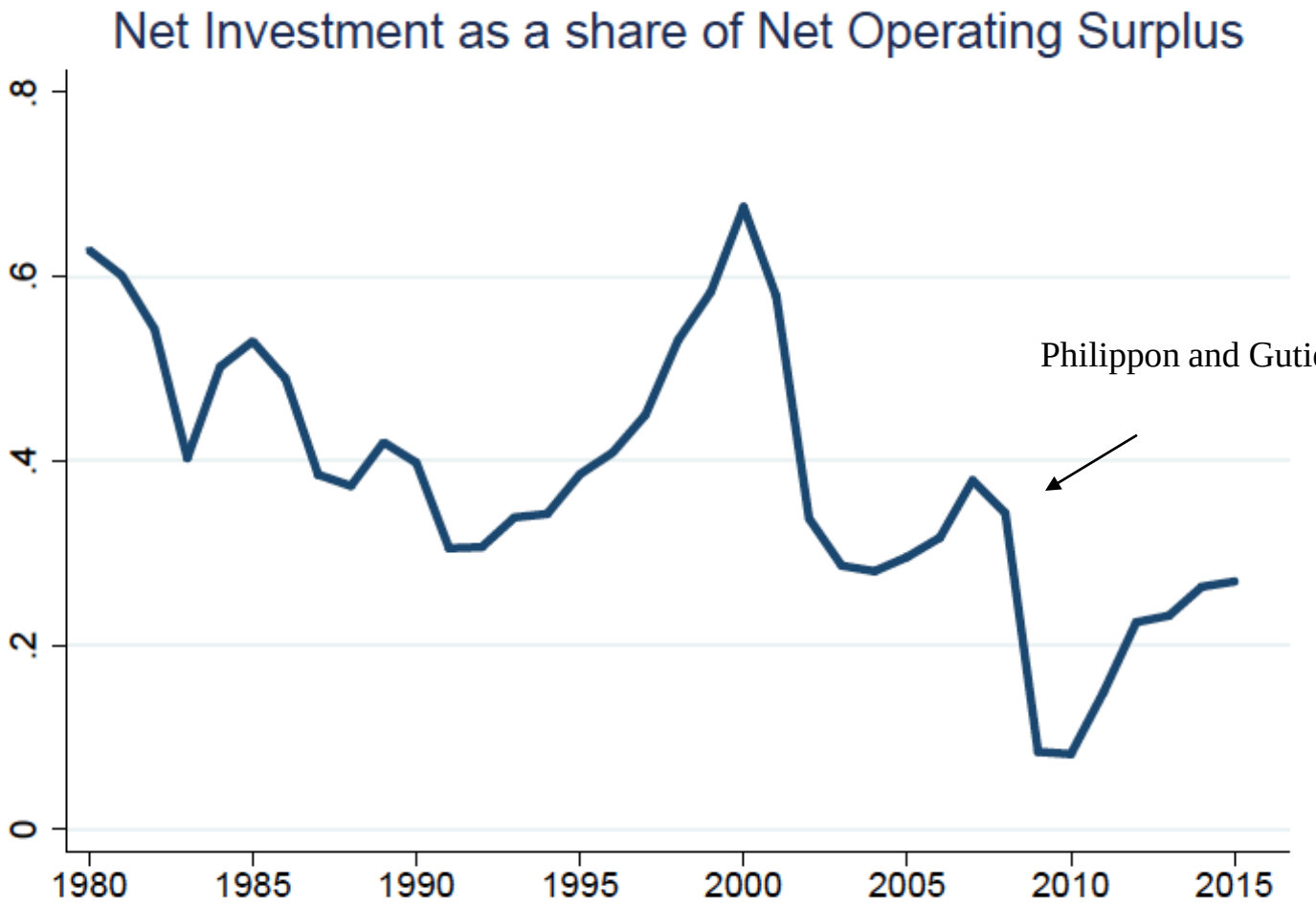
(P4) A persistent decrease in labor and capital share….

In the neoclassical model, there is no residual factor share.

(5) Decrease in investment-to-output ratio, even given low borriwng costs and high Tobin‘s Q



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Puzzle 5: Should by ***rising*** given P2 and P3

(5) Decrease in investment, despite low interest rates and high Tobinds Q

Why is investment not exploding given low interest rate?

High Q?

Summing up

(P1) W/Y>> despite low S and low K/Y.

(P2) High Tobin's Q >> 1.

(P3) A decrease in r while measured return on capital constant.

(P4) A decrease in both the *labor share* and the *capital share*.

(P5) A decrease in I/Y despite low r and a high Q.

Resolution of Puzzles

- Hypothesis: P1-P5 are being driven by two underlying trends:
  - An increase in monopoly power and markups
  - A decline in the natural rate of interest

Why them?

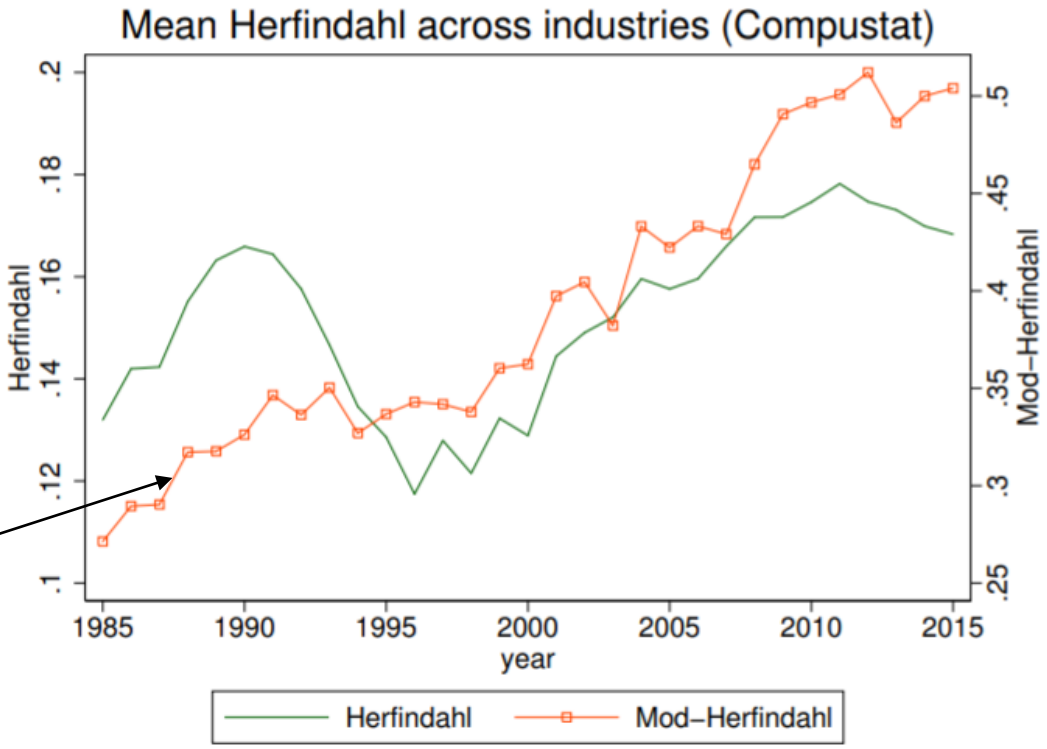
Fall in real interest rates: Fact

Market Power

- Concentration measures
- Firm entry
- Markup measures
  - Macro
  - Micro

Concentration Increasing

$$H=\sum_{i=1}^{N} s_i^2$$



Common ownership correction (Compustat, Guiterrez and Phillipon (2017)

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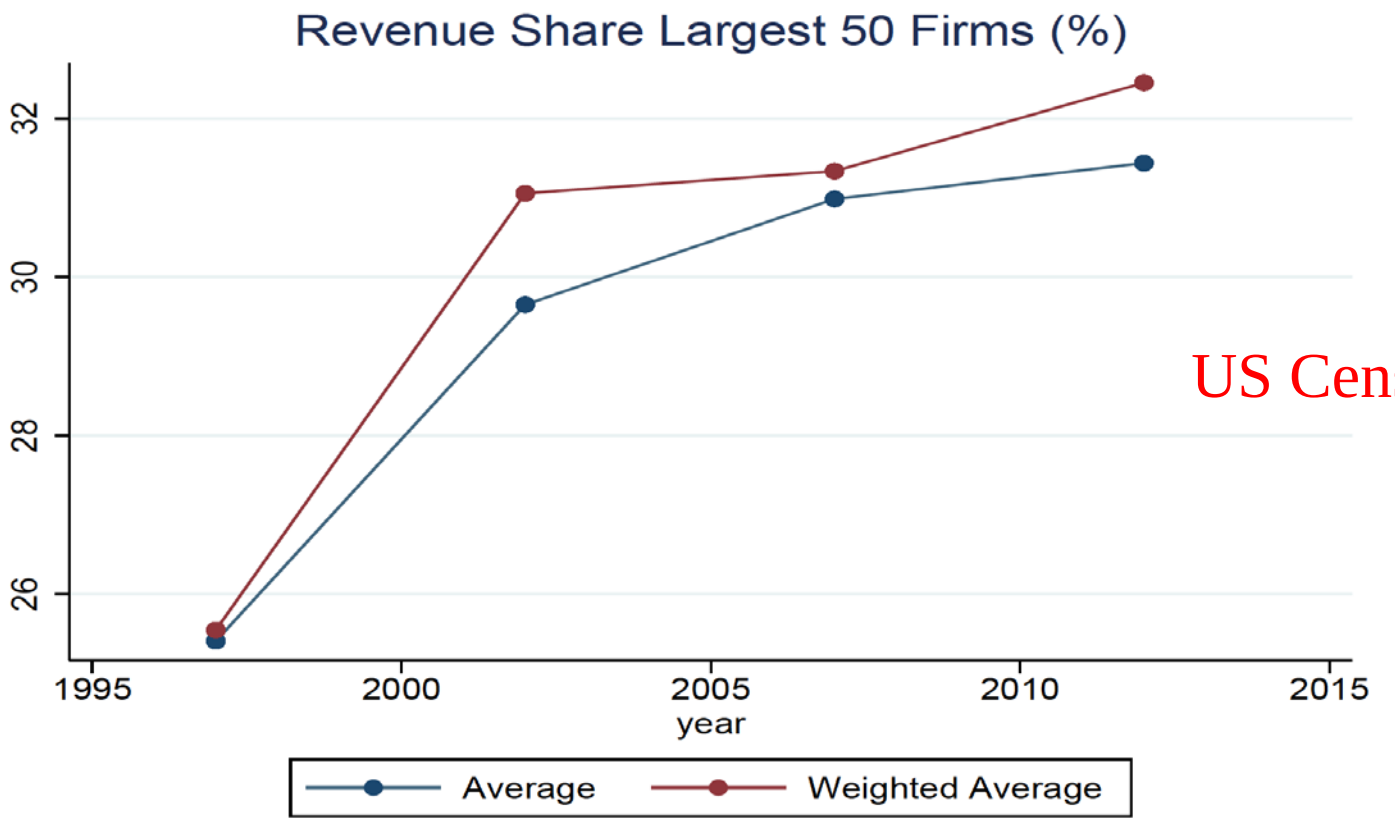
Revenue shares of largest firms increasing



US Census

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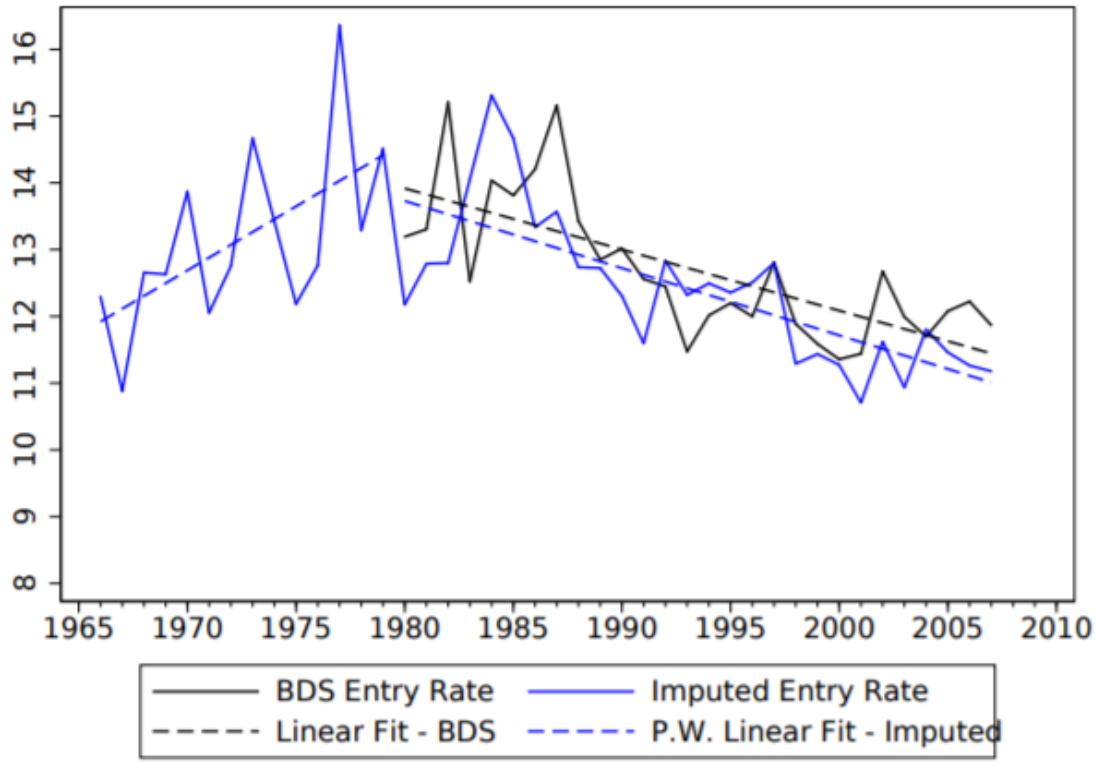
Firm Entry Rates Declining



Business Dynamics Statistics,
Karahan, Pugsley and Sahin (2018)

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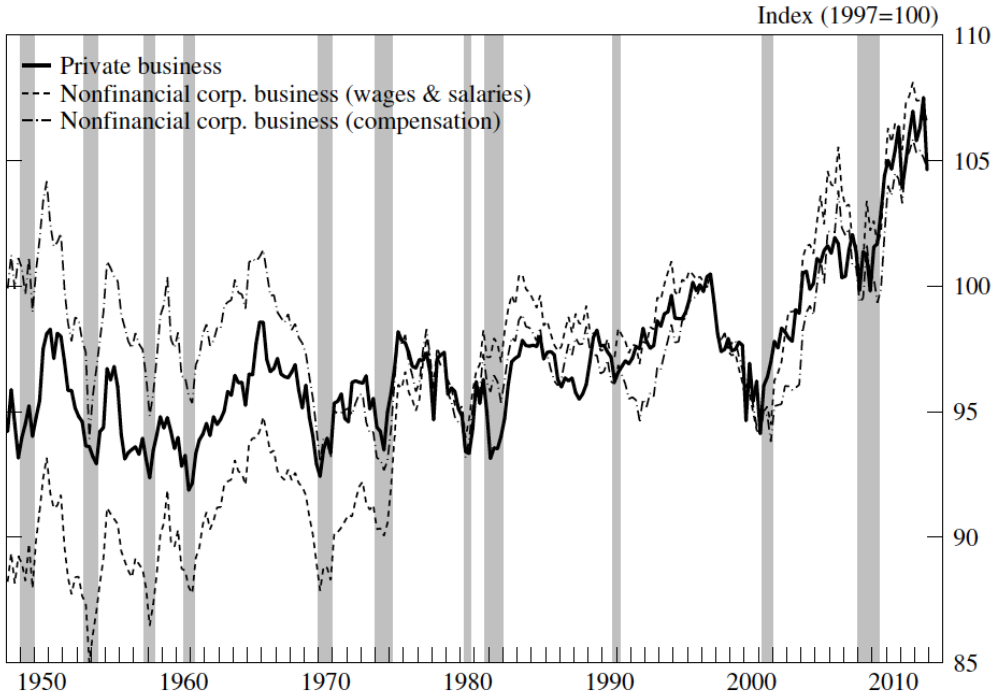
New Keynesian measures of markups

Figure 1. Aggregate Price-Cost Markup



Source: Authors' calculations using quarterly data from the BLS and BEA.

Notes: The BLS markup is the inverse of labor share in private business. The markups for nonfinancial corporate business are constructed by dividing NIPA data on either total compensation or wage and salary disbursements by income without capital consumption adjustment less indirect business taxes. Shaded areas represent periods of business recession as determined by the National Bureau of Economic Research.

$$\mathcal{M}_{\mathrm{A}}^{\mathrm{CD}} = \frac{P}{W_{\mathrm{A}} / \left[\alpha \left(Y/hN\right)\right]} = \frac{\alpha}{s}$$

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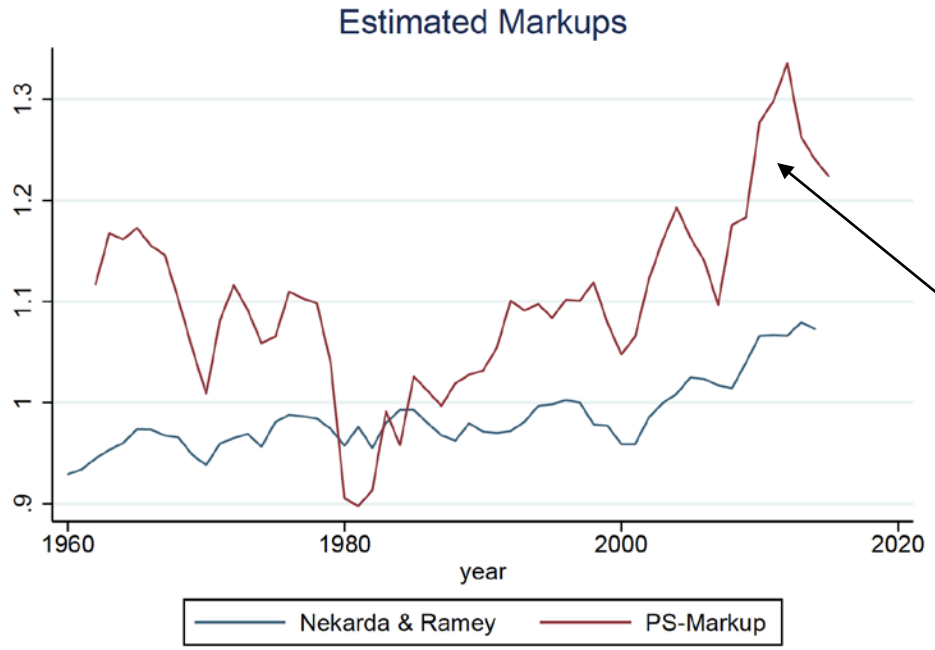
Using profit share



$$PS = \frac{\mu - 1}{\mu} \implies \mu = \frac{1}{1 - PS}$$

Barkai (2016),
Neiman and Karabarboulis (2018)

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Estimates from Loecker and Eechout (2017)

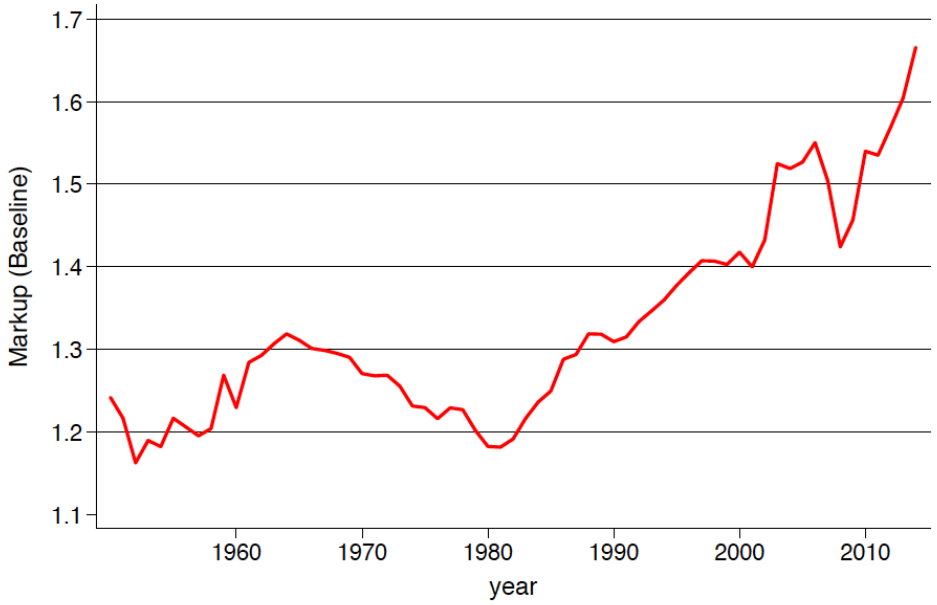

Figure 1: The Evolution of Average Markups (1960 - 2014). Average Markup is weighted by marketshare of sales in the sample.

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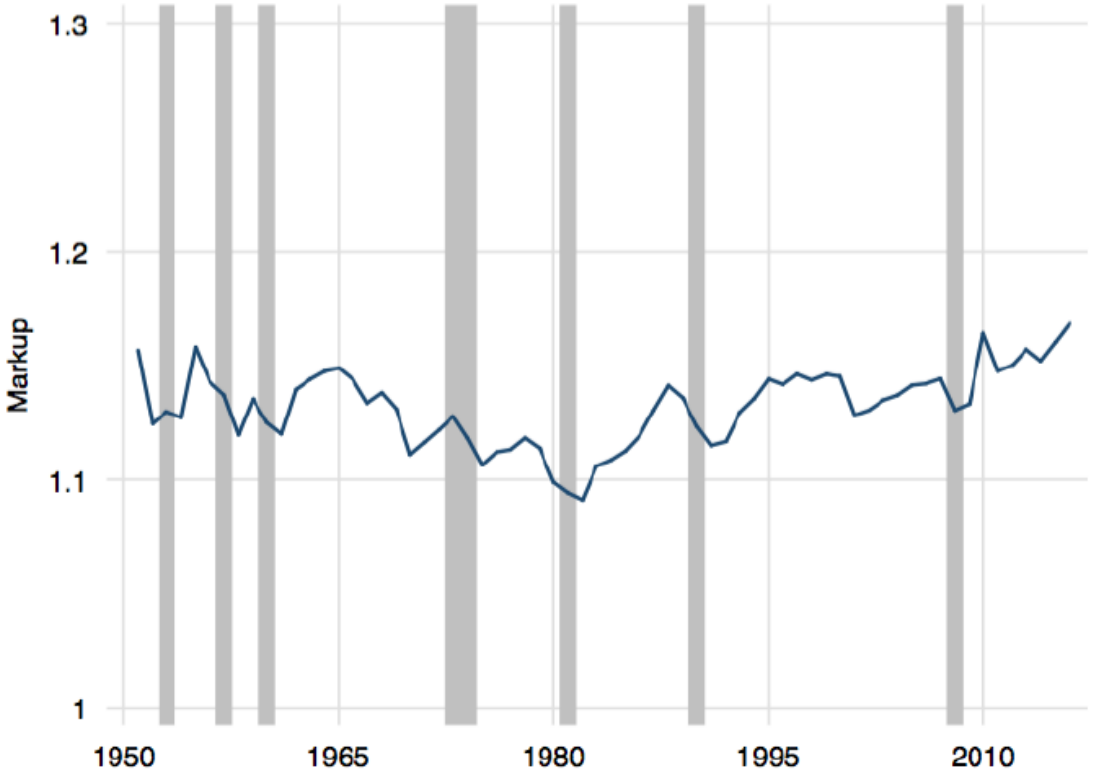
Compustat

Traina (2018)

Figure 1: Aggregate Market Power in Compustat



Main difference:
Takes into account
marketing and managerial costs

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Select lit review

Standing on sholders of….

Build on large literature. About 70 references already and counting

P1: Piketty, Saez and Zucman (2018), Stiglitz (2016) …

P2 : Philippon and Gutierrez (2016) …

P3: Caballero, Farhi, Gourinchas (2017), Gomme, Ravikumar and Rupert (2015), Elsby, Hobijin and Sahin (2013) …

P4: Barkai (2016), Caballero, Farhi, Gourinchas (2017), Karbarabounis and Neiman (2014)…

P5: Phillipon and Gutierres (2016), Barkai (2016) …

Markups: Autor et al (2017), De Loecker and Eechout (2017), Hall (2018), Traina (2018) ….

Falling Real Rates: Del Negro et al (2017), Eggertsson, Mehrotra and Robbins (2017), Gagnon, Johannsen, Lopez-Salido (2016) ….

Outline

1. Five puzzles - “stylized facts” and why neoclassical model does not account for them.
   → Key hypothesis for resolution
      i. Increase in monopoly power
      ii. Secular reduction in real interest rates
2. A minimalistic modification of the canonical neoclassical model
3. Qualitative Resolution in model
4. Quantitative Resolution in model
      i. Estimation of driving forces
      ii. Calibration exercise
5. Extension

Household preferences

- Unit mass of individuals with Epstein-Zin utility:

$$V_t = \left[(1-\beta) \left(c_t^{\nu} (A_{t-1}(1-L_t))^{1-\nu} \right)^{\frac{1-\gamma}{\theta}} + \beta D_t \left(E_t V_{t+1}^{1-\gamma} \right)^{\frac{1}{\theta}} \right]^{\frac{\theta}{1-\gamma}}$$

$$c_t + X_t^i S_{t+1}^i + X_t^f S_{t+1}^f = w_t L_t + d_t^i S_t^i + d_t^f S_t^f + \Delta_{t+1} X_t^f + (1-\Delta_t) X_t^f S_t^f + X_t^i S_t^i.$$

Model – focus on production

- Final good composite

$$Y_t = \left[\int_0^1 y_t^f(i)^{\frac{\Lambda_t - 1}{\Lambda_t}} di \right]^{\frac{\Lambda_t}{\Lambda_t - 1}}$$

Demand of final good *i*

$$y_t^f(i) = Y_t \left(\frac{p_t(i)}{P_t} \right)^{-\Lambda_t}$$

Production function of final firm *i*

$$y_t^f = y_t^m$$

Final goods firms

- Final goods charge optimal markup

$$\mu_t = \frac{\Lambda_t}{\Lambda_t - 1}$$

- Markups follow AR(1) process

$$ln(\mu_t) = (1 - \rho_\mu) ln(\bar{\mu}) + \rho_\mu ln(\mu_{t-1}) + \epsilon_t^\mu$$

- Barriers to entry generate pure profits

$$\Pi_t = \frac{\mu_t - 1}{\mu_t} Y_t$$

Firm dynamics

- Although barriers, not “permanent”
- Firm exit a la Melitz (2003). Each period, a final goods firm *i* has a probability Δ of exiting
- Entry is also exogenous – each period, mass Δ of new final goods firms enters.

Asset pricing

- There are security markets in which the rights to the future profits of final goods firms are bought and sold
- Securities S_{t+1} are traded at time t with price X_t^f.

$$X_t^f = E_t \sum_{j=1}^{\infty} (1-\Delta)^{j-1} m_{t+j} d_{t+j}^f$$

- For entering firms, shares distributed to individuals as 'IPO Securities'

Intermediate goods firms

- Representative firm

$$Y_t^m = \left(\alpha K_t^{\frac{\sigma-1}{\sigma}} + (1-\alpha)(A_t L_t)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

- Adjustment costs as in Jermann (1998)

$$K_{t+1} = \Phi(I_t/K_t)K_t + (1-\delta)K_t$$

$$\Phi(I_t/K_t) = \frac{a_1}{1-\xi}\left(\frac{I_t}{K_t}\right)^{1-\xi} + a_2$$

Long run risk

- Long-run productivity risk enters our model as in Bansal and Yaron (2004) and Croce (2014)
- Will allow us to match equity premium

$$\Delta a_{t+1} = \zeta + x_t + \sigma_a \epsilon_{a,t+1}$$

$$x_t = \rho x_{t-1} + \sigma_x \epsilon_{x,t}$$

$$\begin{bmatrix} \epsilon_{a,t+1} \\ \epsilon_{x,t+1} \end{bmatrix} \sim iid\ N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho_{xa} \\ \rho_{xa} & 1 \end{bmatrix} \right)$$

Wealth and Tobin's Q

- Define aggregate wealth as the total market value of physical capital and securities

$$W_t = X_t^f + X_t^i = X_t^f + q_t \ K_t$$

- Empirical Tobin's Q is defined as

$$Q_t = \frac{W_t}{K_t} = \frac{X_t^f + q_t \ K_t}{K_t}$$

- Note that the existence of securitized pure profits allows there to be a wedge between wealth and capital, and allows Tobin's Q to be permanently above one

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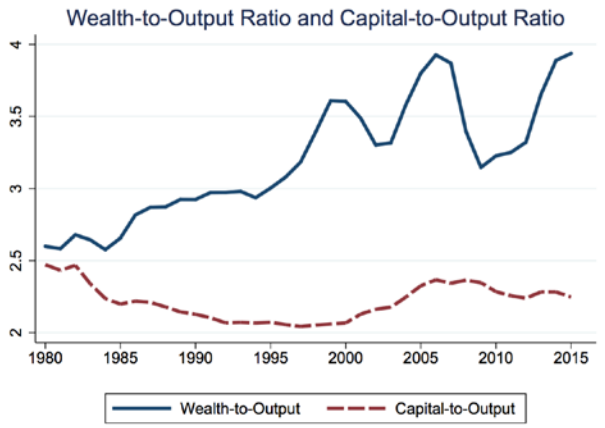
Qualitative Resolution

- Consider first steady state of the model as a constant solution without uncertainty
- Can solve for P1-P5 qualitatively.
- But will not be able to speak to evolution of some financial variables like average returns that include *risk premia* precluding a serious quantitative evaluation.

P1



$$\frac{W}{Y} = \frac{X^f + X^i}{Y} = \frac{X^f}{Y} + \frac{K}{Y}$$

$$\frac{\frac{\mu - 1}{\mu}}{1 + r - (1 - \Delta)e^{\xi}}$$

$$\frac{\frac{\alpha}{\mu}}{r + \delta}$$

$\mu \uparrow X/Y \uparrow, r \downarrow X/Y \uparrow$

$\mu \uparrow K/Y \downarrow, r \downarrow K/Y \uparrow$

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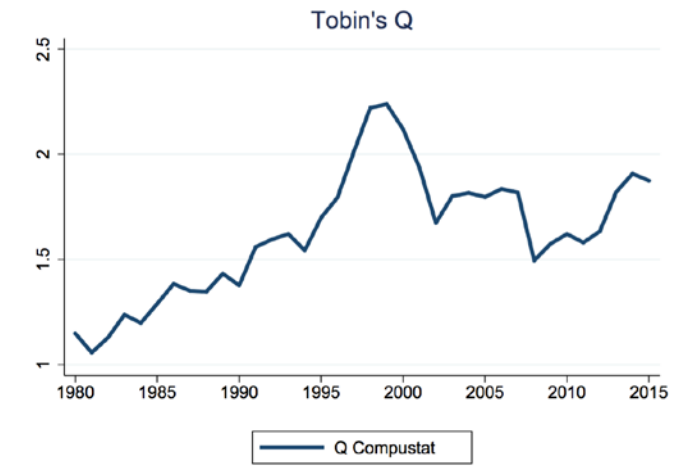
P2



$$Q = \frac{W}{K} = \frac{X^f + X^i}{K} = \frac{X^f}{K} * \frac{K}{Y} + 1$$

$$\frac{(\mu - 1)\alpha^{-1}(r + \delta)}{1 + r - (1 - \Delta)e^{\xi}}$$

$$\mu \uparrow Q \uparrow, r \downarrow Q?$$

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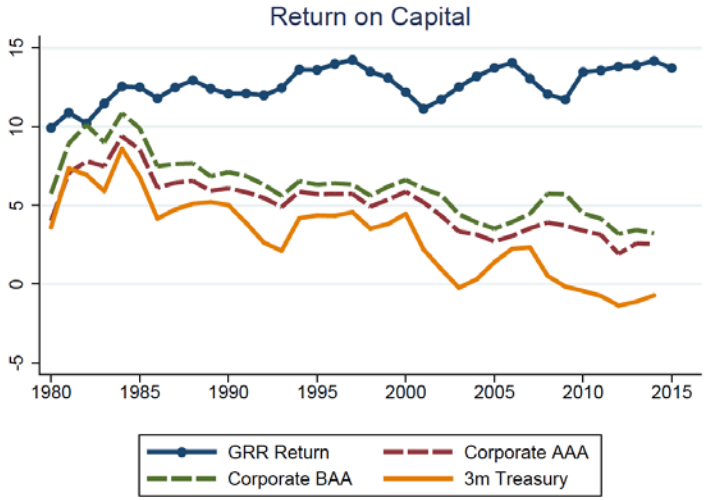
P3



$$AR = \frac{Y - wL - \delta K}{K} = r + \frac{\frac{\mu - 1}{\mu}}{K/Y} = r + \frac{\mu - 1}{\alpha}(r + \delta)$$

$$\mu \uparrow AR \uparrow, r \downarrow AR \downarrow$$

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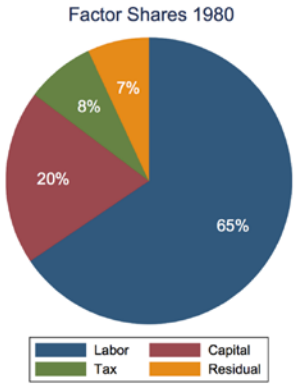
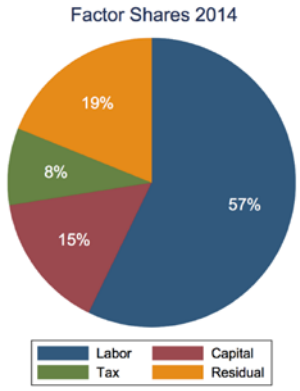
P4





$$\frac{r+\delta}{K} = \frac{1}{\mu}(1-\alpha)$$

$$\frac{wL}{L} = \frac{1}{\mu}\alpha$$

$$\mu \uparrow \frac{r+\delta}{K} \downarrow \frac{wL}{L} \downarrow$$

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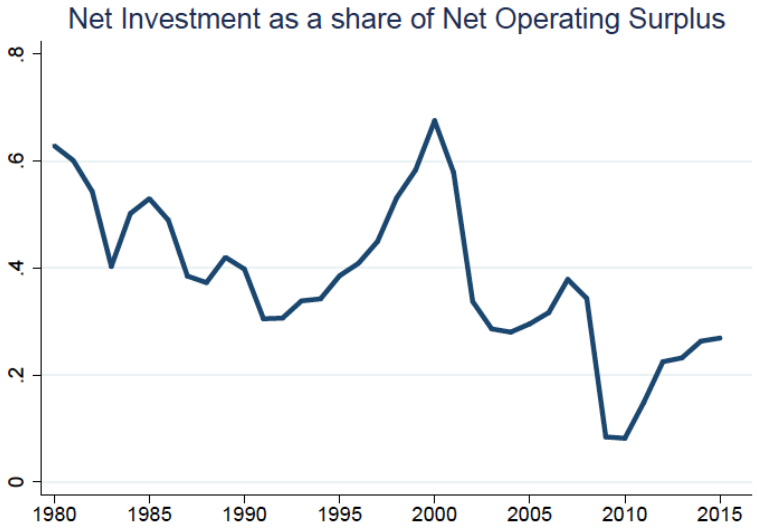
P5



$$\frac{I}{Y} = \frac{\alpha(\delta + \epsilon^{\zeta} - 1)}{\mu(r + \delta)}\alpha$$

$$\mu \uparrow \frac{I}{Y} \downarrow, r \downarrow \frac{I}{Y} \downarrow$$

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Table 2: Effect of an increase in markups

Model statistic	*Symbol*	*Effect*
Capital-to-output (**P1**)	K_t/Y_t	$\downarrow$
Tobin's Q (**P2**)	Q_t	$\uparrow$
Average return (**P3**)	AR_t	$\uparrow$
Profit share (**P4**)	PS_t	$\uparrow$
Labor share (**P4**)	LS_t	$\downarrow$ if $\sigma \leq 1$
Investment-to-output (**P5**)	I_t/Y_t	$\downarrow$

Can we match puzzles?-- simple model

$\delta = 0.06$ $\alpha = 0.23$ $\boldsymbol{\Delta = 0.21}$ $\Delta, \delta, \alpha, \mu, \mathrm{r}, e^{\xi}$

$$\max_{\alpha,\delta,\Delta}(-\lambda_1(\tfrac{W}{Y}-\tfrac{W}{Y}^{1970})^2-\lambda_2(\tfrac{wL}{Y}-\tfrac{wL}{Y}^{1970})^2-\lambda_3(\tfrac{I}{Y}-\tfrac{I}{Y}^{1970})^2+\sum \log f(\psi))$$

$\frac{W}{Y}$	$\frac{wL}{Y}$	$\frac{I}{Y}$	AR	Q
2.6 (2.54)	0.7 (0.71)	0.18 (0.17)	0.07 (0.12)	1.18 (1.14)
r=3% ⟶ r=1%		μ=1.1 ⟶ μ=1.22		
3.39 (3.63)	0.63 (0.64)	0.17 (0.16)	0.08 (0.13)	1.32 (1.74)

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Quantitative Analysis

- We've seen how an increase in monopoly power combined with a decrease in *r* can potentially account for the five facts

- But are these effects quantitatively important?

Quantitative experiment

- Do a second order approximation of the model.
- Calibrate the model to 1970.
- Then “plug in”
  - → Change in markups from 1970 level to 2015 level
  - → Changes in interest rates from 1970 to 2015 level
- Compare *changes* in model moments to *changes* in data moments, see if we can match the puzzles

Quantitative Exercise

3 categories categories of parameters and shocks

1. Levels of markups and interest rates
2. Parameters from data and literature
3. Parameters chosen to match 1970 data moments, through minimization of objective function

(1) Markups

Table A.11: Markup Estimates

Estimate		μ *2015*
De Loecker & Eeckhout (2017)	1.18	1.67
Nakarda & Ramey (2013)	1.01	1.11
Hall (2018)	1.12	1.27
Barkai (2017)	1.025	1.21

Our estimate: Using methods similar to Barkai, find increase from 1.11 to 1.22 from 1970-2015

(1) Changes in the natural rate

Table A.12: Natural Rate Estimates

Estimate		*2015*
Holston, Laubach, and Williams (2017)	3.91	.43
Del Negro et. al. (2017)	2.5	1.5
5-Year MA Real Federal Funds	2.25	−1.55

Our estimate: Decline of 2%, from 3% in 1970 to 1% in 2015

(2) Parameters taken from the literature

Table 4: Parameters taken from the data and related literature

Panel A: Data	*Symbol*	*Value*	*Source*
Productivity growth (/yr)	ζ	2.02%	Fernald (2012)
Panel B: Related literature			
Long run risk persistence	ρ	.98	Croce (2014)
Long run risk std. dev.	σ_x	.0010	Croce (2014)
Short run risk std. dev.	σ_a	.01	Croce (2014)
Depreciation rate (/yr)	δ	6%	Jorgensen (1996)
Adjustment costs	ξ	.12	Croce (2014)

(3) Parameters calibrated to 1970 moments

Table 6: 1970 calibration results

Targets	*Model*	*Data*	*Source*
Real interest rate	2.99%	3.00%	Federal Reserve
Wealth-to-output ratio	2.66	2.66	Financial Accounts
Investment-to-output ratio	15.27%	16.15%	NIPA
Labor share	71.82%	72.40%	Elsby (2013)
Equity premium	4.60%	4.71%	Croce (2014)
Labor supply	0.18%	0.18%	Croce (2014)

(3) Parameters calibrated to 1970 moments

Table 5: Calibrated parameter results

Parameters chosen to match targets	*Symbol*	*Value*
Capital production elasticity	α	0.26
Production elasticity	σ	0.93
Firm exit rate	Δ	0.0043
Rate of time preference	β	0.9958
Risk Aversion	γ	7.67
Hours supplied	ν	0.21

Calibration

- Note that we are choosing parameters *to match only 1970 moments*
- In particular, we *do not* choose any parameters to match 2015 moments, or to try and match any change in the moments from 1970 to 2015
- The success or failure of the exercise will be comparing *changes* in our model moments to *change* in the data moments

Results – Markups & Interest Rates

Moments	Δ *Model*	Δ *Data*
Wealth-to-output ratio (**P1**)	0.90	0.95
Capital-to-output ratio (**P1**)	0.23	0.31
Tobin's Q (**P2**)	0.15	0.40
Real interest rate (**P3**)	$-2.00\ pp$	$-2.00\ pp$
Average return (**P3**)	0.60	0.64
Profit share (**P4**)	$8.25\ pp$	$8.25\ pp$
Labor share (**P4**)	$-6.40\ pp$	$-6.41\ pp$
Capital share (**P4**)	$-1.85\ pp$	$-2.30\ pp$
Investment-to-output (**P5**)	$-1.14\ pp$	$-0.19\ pp$
Equity Premium	$2.05\ pp$	$0 - 2\ pp$

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Results

- Overall the markups and drop in real interest rate can “quantitatively account” for ***P1-P5***

Results – markup only

Table 8: Quantitative results: changes in markups only

Moments	Δ *Model*	Δ *Data*
Wealth-to-output ratio (**P1**)	0.50	0.95
Capital-to-output ratio (**P1**)	-0.16	0.31
Tobin's Q (**P2**)	0.33	0.40
Real interest rate (**P3**)	0.00 *pp*	-2.00 *pp*
Average return (**P3**)	4.78	0.64
Profit share (**P4**)	8.25 *pp*	8.25 *pp*
Labor share (**P4**)	-6.69 *pp*	-6.41 *pp*
Capital share (**P4**)	-1.56 *pp*	-2.30 *pp*
Investment-to-output (**P5**)	-1.26 *pp*	-0.19 *pp*
Equity Premium	2.17 *pp*	$0-2$ *pp*

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Results – interest rate only

Table 9: Quantitative results: changes in D only

Moments	Δ *Model*	Δ *Data*
Wealth-to-output ratio (**P1**)	0.25	0.95
Capital-to-output ratio (**P1**)	0.22	0.31
Tobin's Q (**P2**)	-0.06	0.40
Real interest rate (**P3**)	-1.18 *pp*	-2.00 *pp*
Average return (**P3**)	-1.92	0.64
Profit share (**P4**)	0.00 *pp*	8.25 *pp*
Labor share (**P4**)	0.18 *pp*	-6.41 *pp*
Capital share (**P4**)	-0.18 *pp*	-2.30 *pp*
Investment-to-output (**P5**)	1.72 *pp*	-0.19 *pp*
Equity Premium	0.28 *pp*	$0 - 2$ *pp*

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Other estimate of markups

- Using Nakarda-Ramey yields very similar results
- De Loecker and Eeckout (2017)

Table A.10: De Loecker quantitative results: changes in markups, productivity growth rates, interest rates

Moments	Δ *Model*	Δ *Data*
Wealth-to-output ratio (**P1**)	1.72	0.95
Capital-to-output ratio (**P1**)	−0.48	0.31
Tobin's Q (**P2**)	1.35	0.40
Real interest rate (**P3**)	−2.03%	−2.00%
Average return (**P3**)	17.27%	0.64%
Profit share (**P4**)	30.18%	8.25%
Labor share (**P4**)	−22.47%	−6.41%
Capital share (**P4**)	−7.71%	−2.30%
Investment-to-output ratio (**P5**)	−5.79%	−0.19%
Equity Premium	2.51%	0 − 2%

Other stories, extensions

- Housing to be added
- Fall in relative price of investment to be added.
- Implausible implications for other shocks?
- Other candidates
  - Rise in risk-premia
  - in our case it is endogenous
  - Intangible capital
- What about pre-1970?
- Endogenous rise in markups

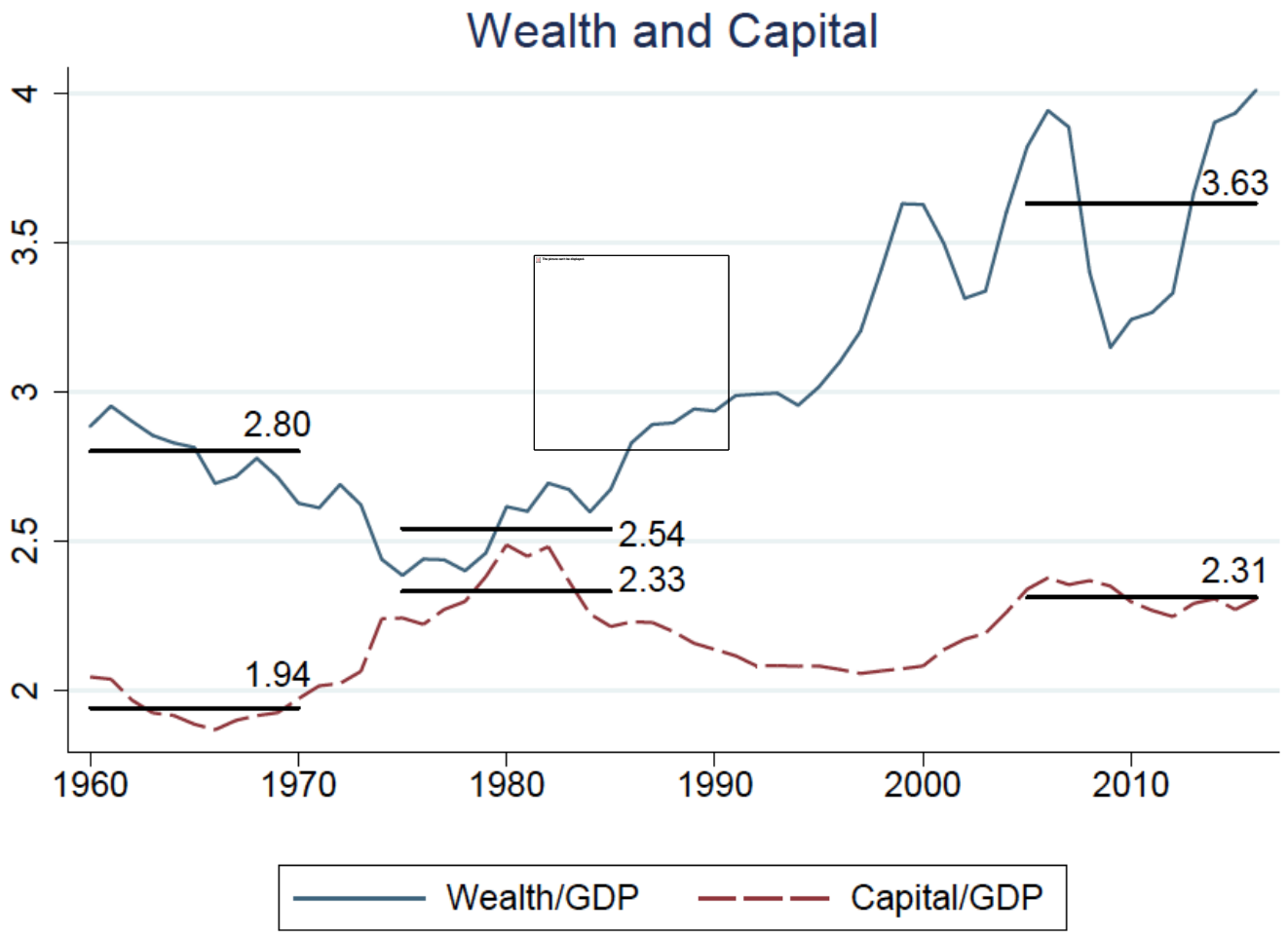
Intangible capital story

- Another story --- there is a still a large stock of unmeasured intangible capital
- This would lead to a high measured Q, average return, and W/Y…..

However…

- Last two revisions to NIPAs have included massive revisions of intangible capital
- Most expenditures on R&D, software, training, etc are now counted as investment
- What potential intangible investment is missing? **Advertising, marketing** (Traina 2018), etc.
  - But is this investment? ”creates” market power

Story 1960-1980: P1



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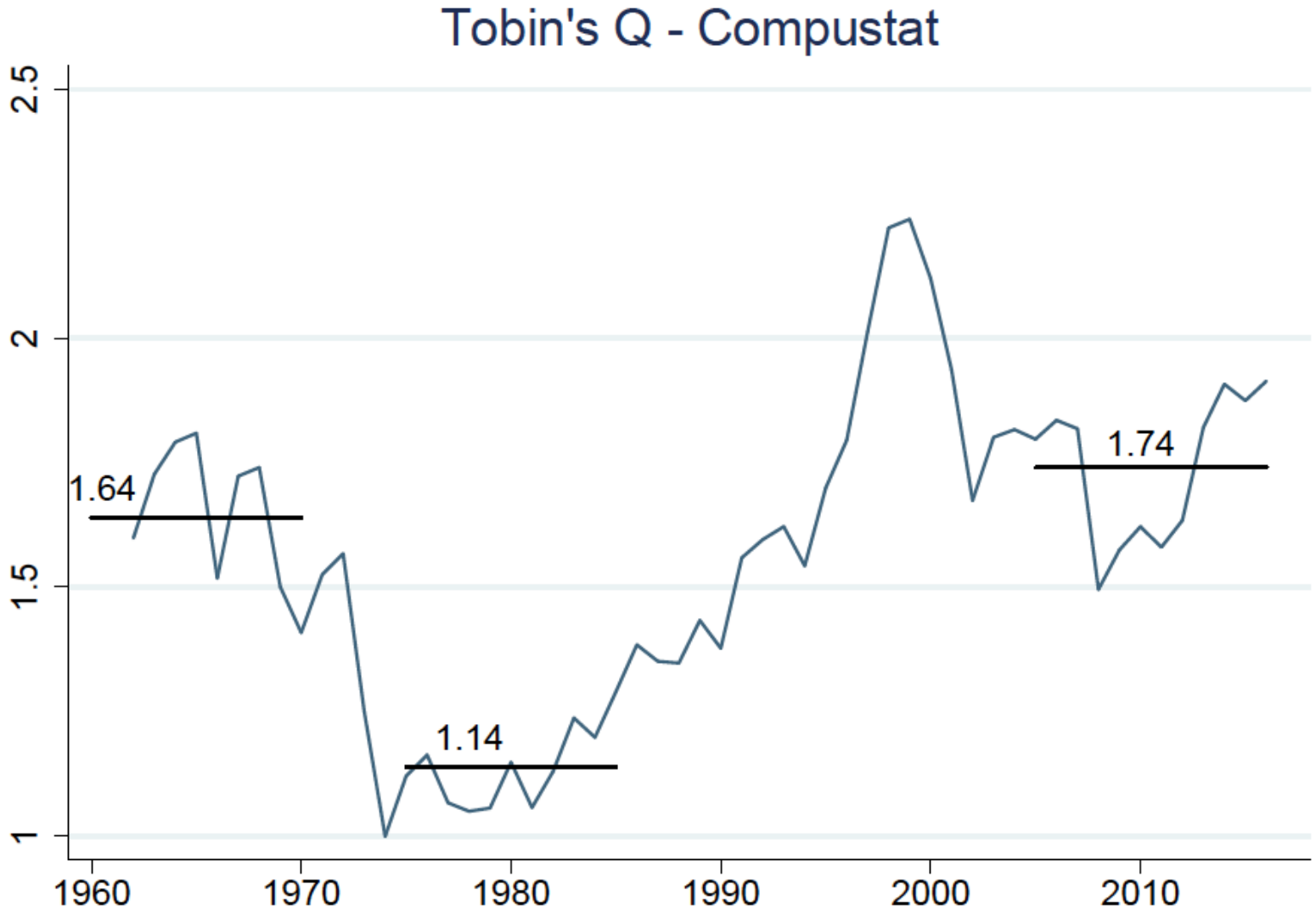
Story 1960-1980: P2



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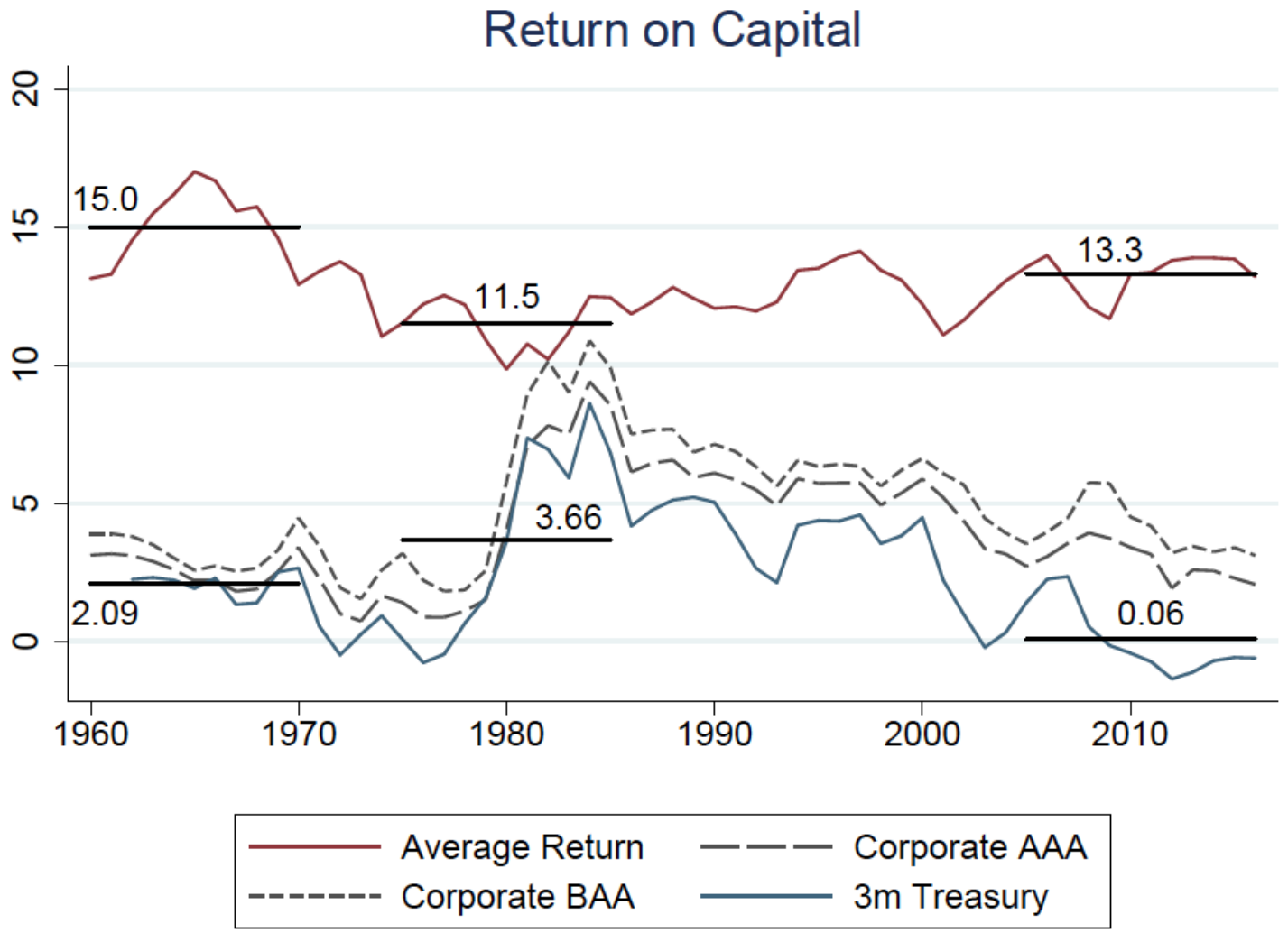
Story 1960-1980: P3



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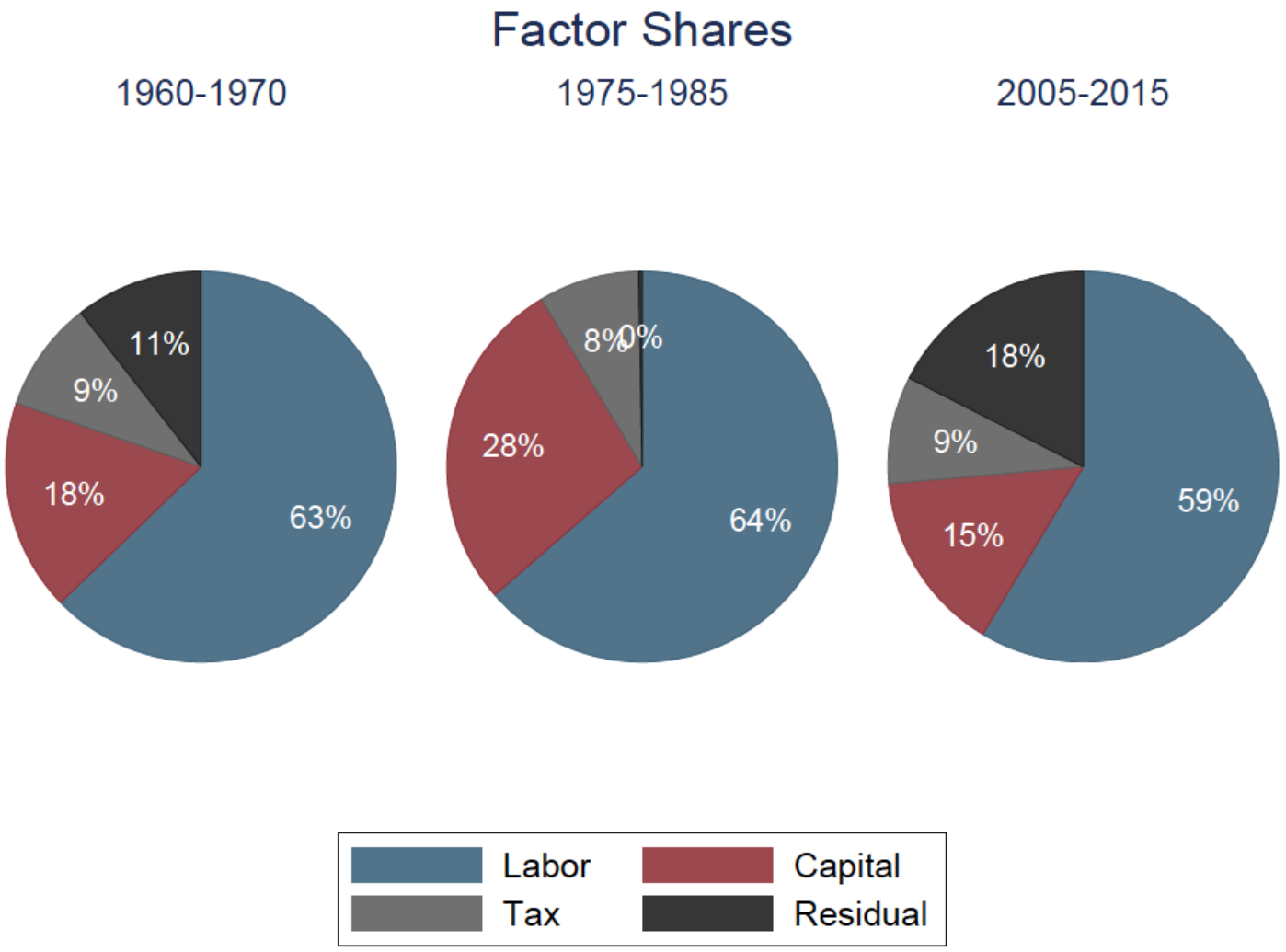
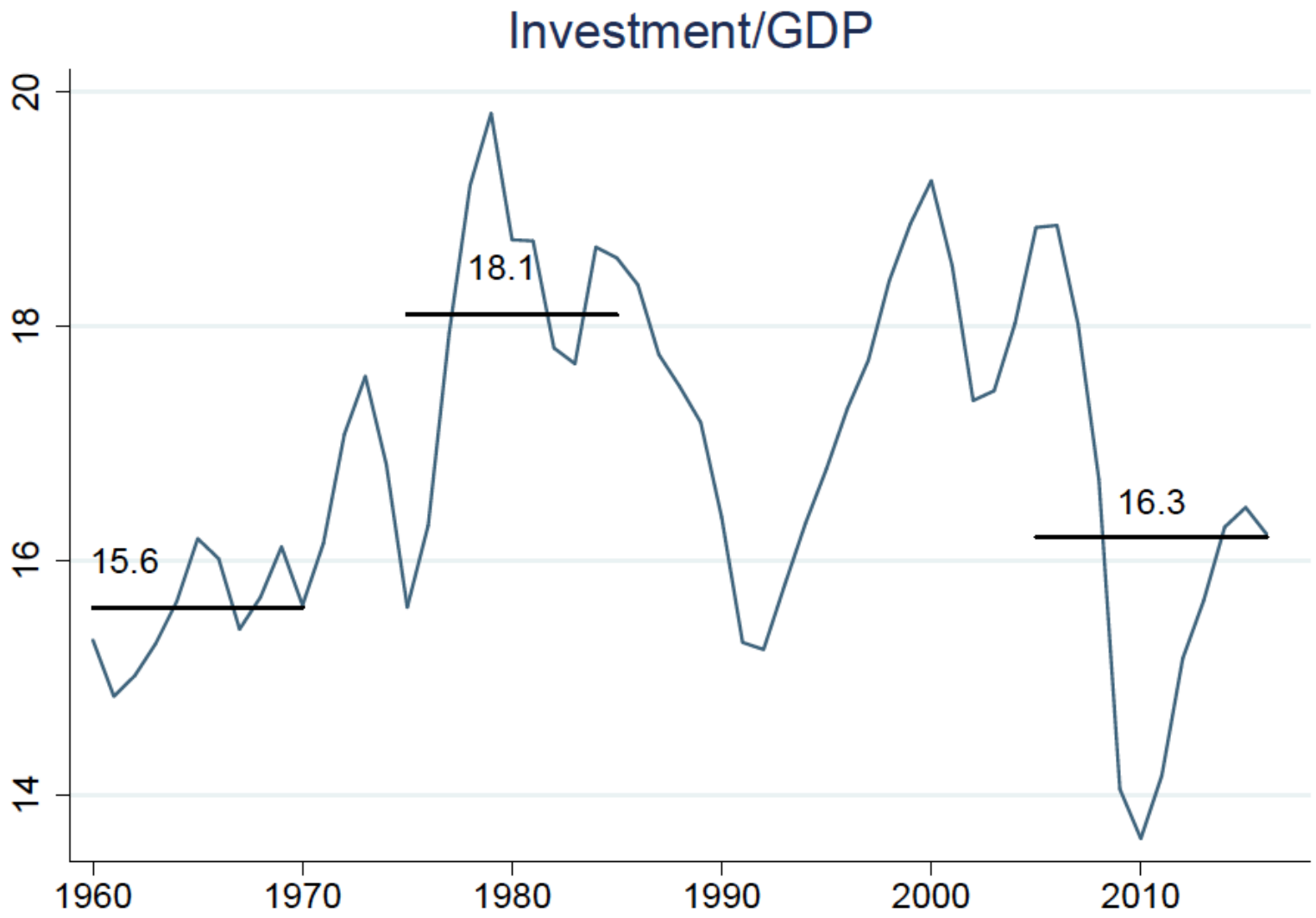
Story 1950-1980: P4



Story 1960-1980: P5



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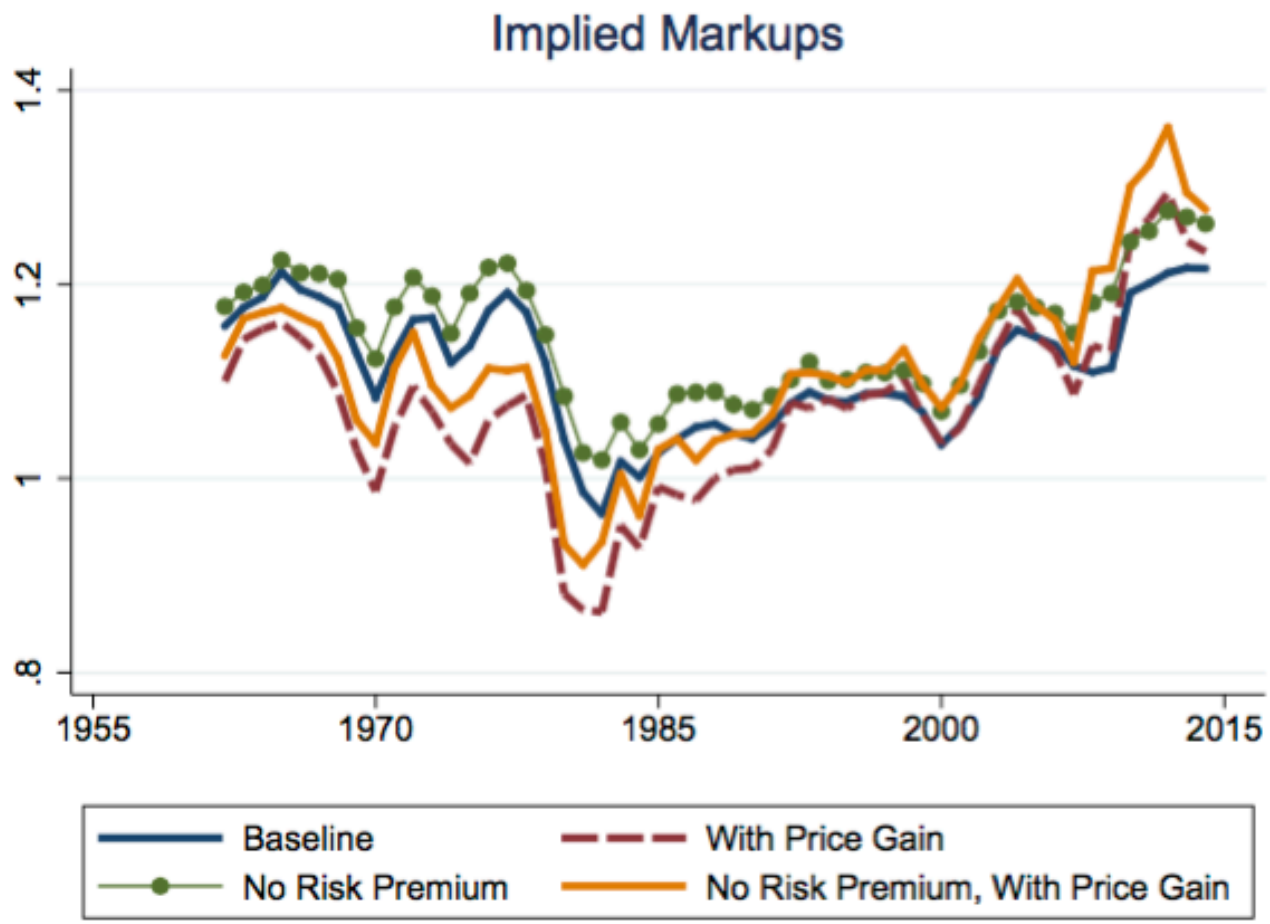
Story 1950-1980: Markups



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Can we match puzzles?-- simple model

$\delta = 0.06$ $\alpha = 0.23$ $\boldsymbol{\Delta = 0.21}$ $\Delta, \delta, \alpha, \mu, \mathrm{r}, e^{\xi}$

$$\max_{\alpha,\delta,\Delta}(-\lambda_1(\tfrac{W}{Y}-\tfrac{W}{Y}^{1970})^2-\lambda_2(\tfrac{wL}{Y}-\tfrac{wL}{Y}^{1970})^2-\lambda_3(\tfrac{I}{Y}-\tfrac{I}{Y}^{1970})^2+\sum \log f(\psi))$$

$\frac{W}{Y}$	$\frac{wL}{Y}$	$\frac{I}{Y}$	AR	Q
2.6 (2.54)	0.7 (0.71)	0.18 (0.17)	0.07 (0.12)	1.18 (1.14)
r=3% ⟶ r=2%		μ=1.1 ⟶ μ=1.15		
3 (2.8)	0.66 (0.63)	0.19(0.16)	0.08 (0.15)	1.28(1.64)

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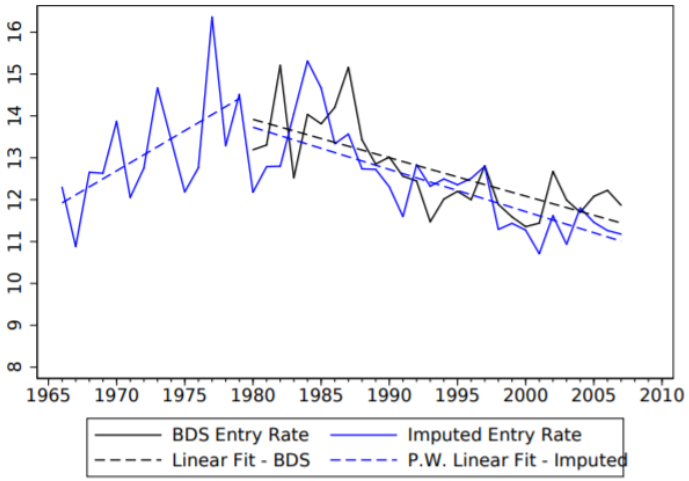
Pre 1980 Story

- Overall story consistent with a moderate level of markups in 1960, followed by a decline until 1980, followed by a significant increase

Firm Entry Rates Declining: Endogenous markups



Atkeson-Burstein (2008)
Jaimovich and Floetotto (2008)

- Countinum of industries on measure 0 to 1.
- Finite number of firms in industry
- Berntrand competition.

Simples case: Elasticity across industries 1, then

$$\mu = \frac{\theta N_t + \theta - 1}{(\theta - 1)(N_t - 1)}$$

N down by 20%
μ from 1.4 to 1.5

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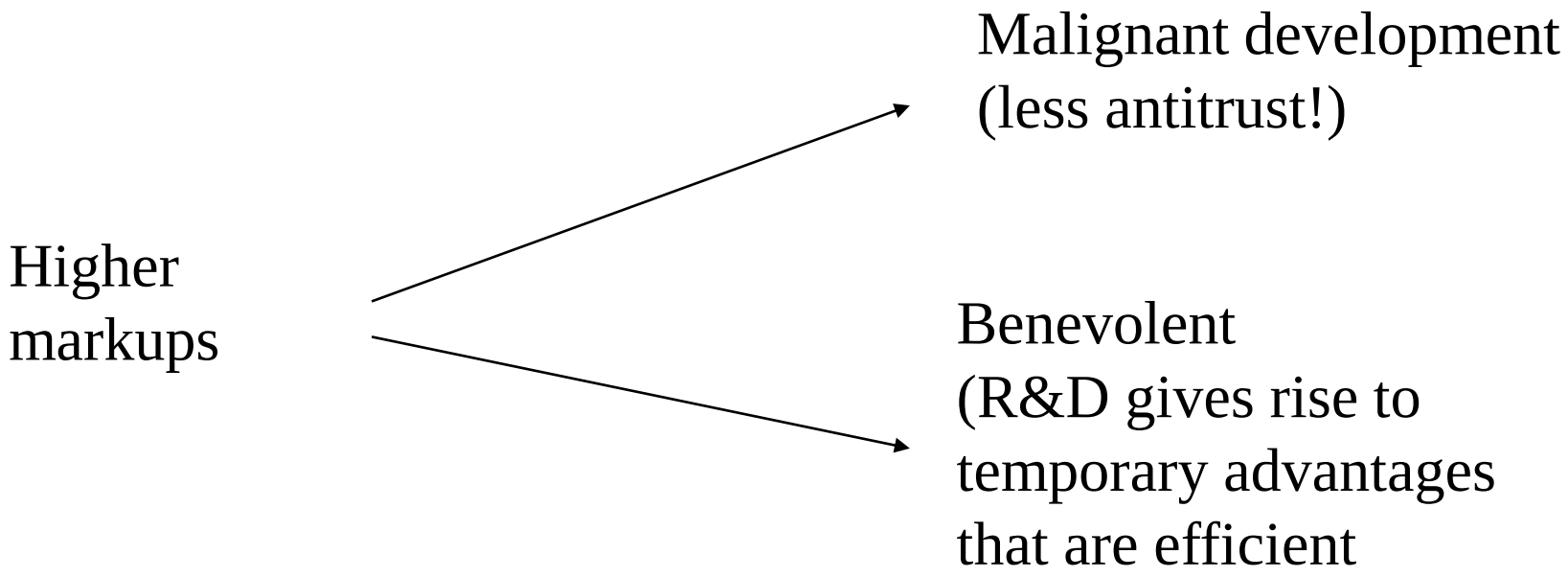
Conclusion

P1-P5 → circumstantial evidence for higher markups

To early to draw policy conclusions



– Needed: Explicit model where the monopoly "wedge" is explicitly modeled.

Conclusion

- Analysis relies heavily on estimates of markups, which are difficult to measure. Having said that, an increase in markups should lead to…
  - Negative impact on GDP growth
  - Increase in income inequality and wealth inequality
  - Important implications for capital taxation?

Back to fact 1

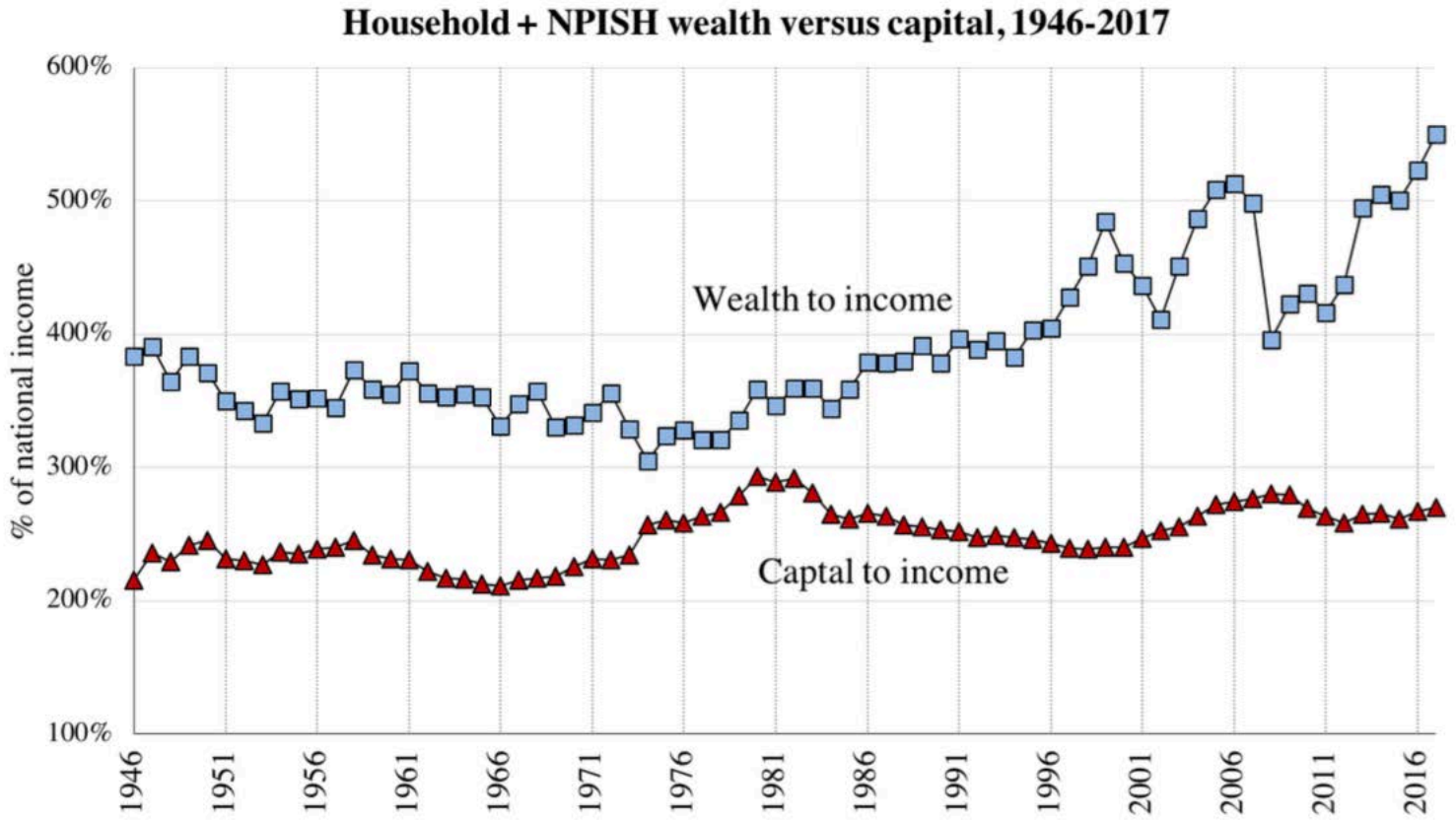


Figure 1: Trends in wealth and capital, 1946-2017

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Gross national capital gain

Definition: A pure capital gain is the aggregate increase in the market value of household wealth beyond what is saved.

$$GNKG_t = W_t - W_{t-1} - S_t = \Delta W_t - S_t.$$

Gross National Capital Gains

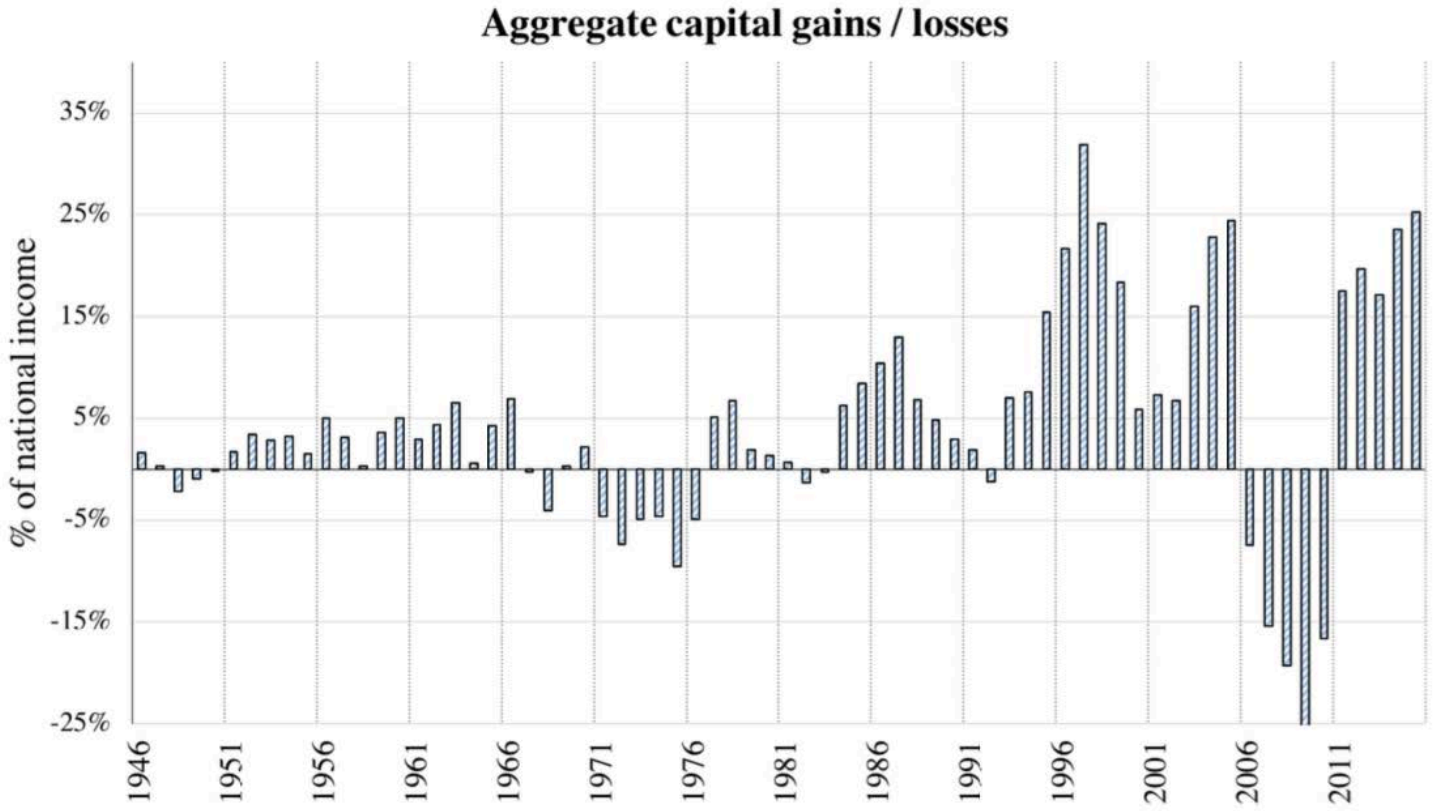


Figure 3: Aggregate capital gains, 1946-2014

$$GNKG_t = W_t - W_{t-1} - S_t = \Delta W_t - S_t.$$

Gross National Capital Gains

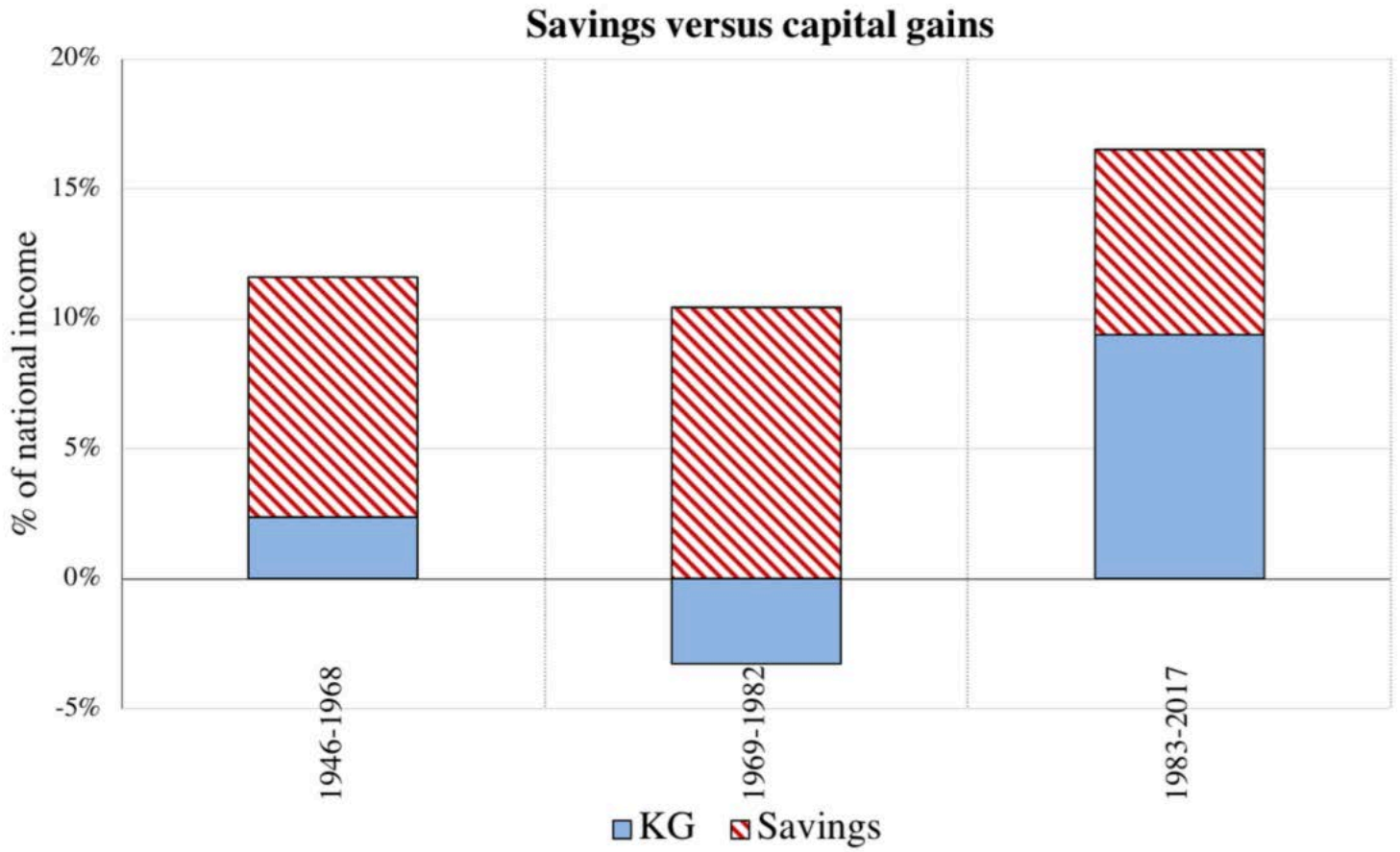
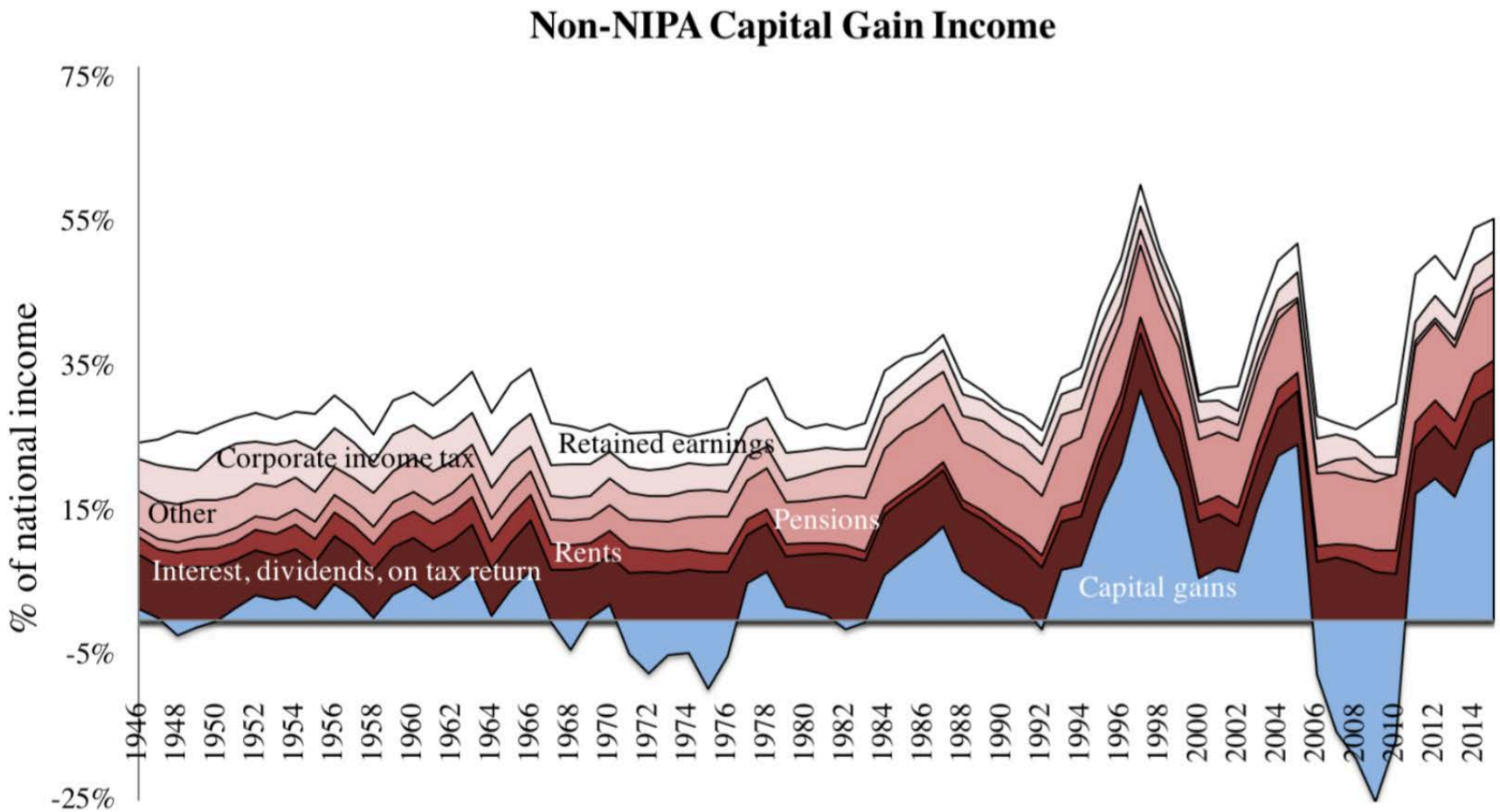


Figure 6: Capital gains: three eras

Distribution of capital gains



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Effect on top income shares

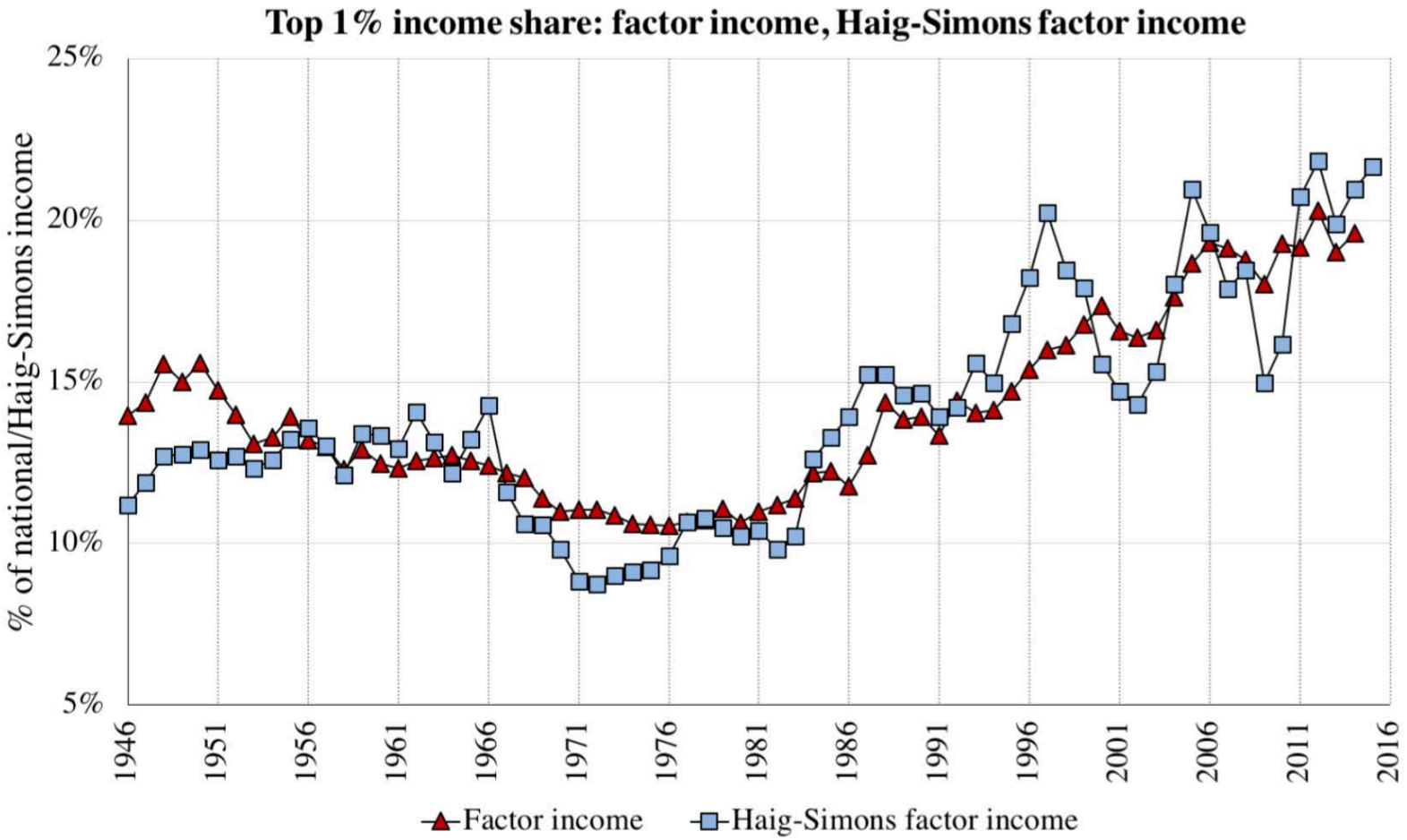

Figure 11: The top 1% share of income

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Effect on top income shares

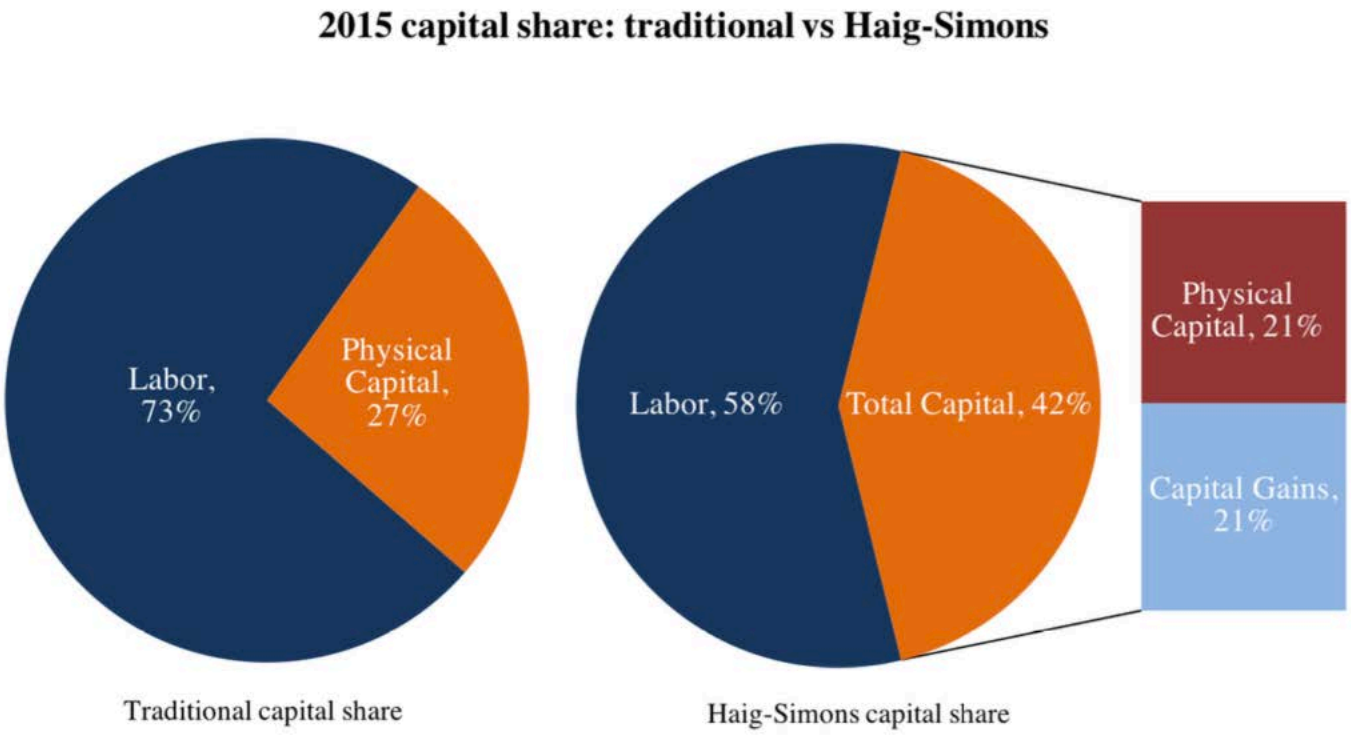
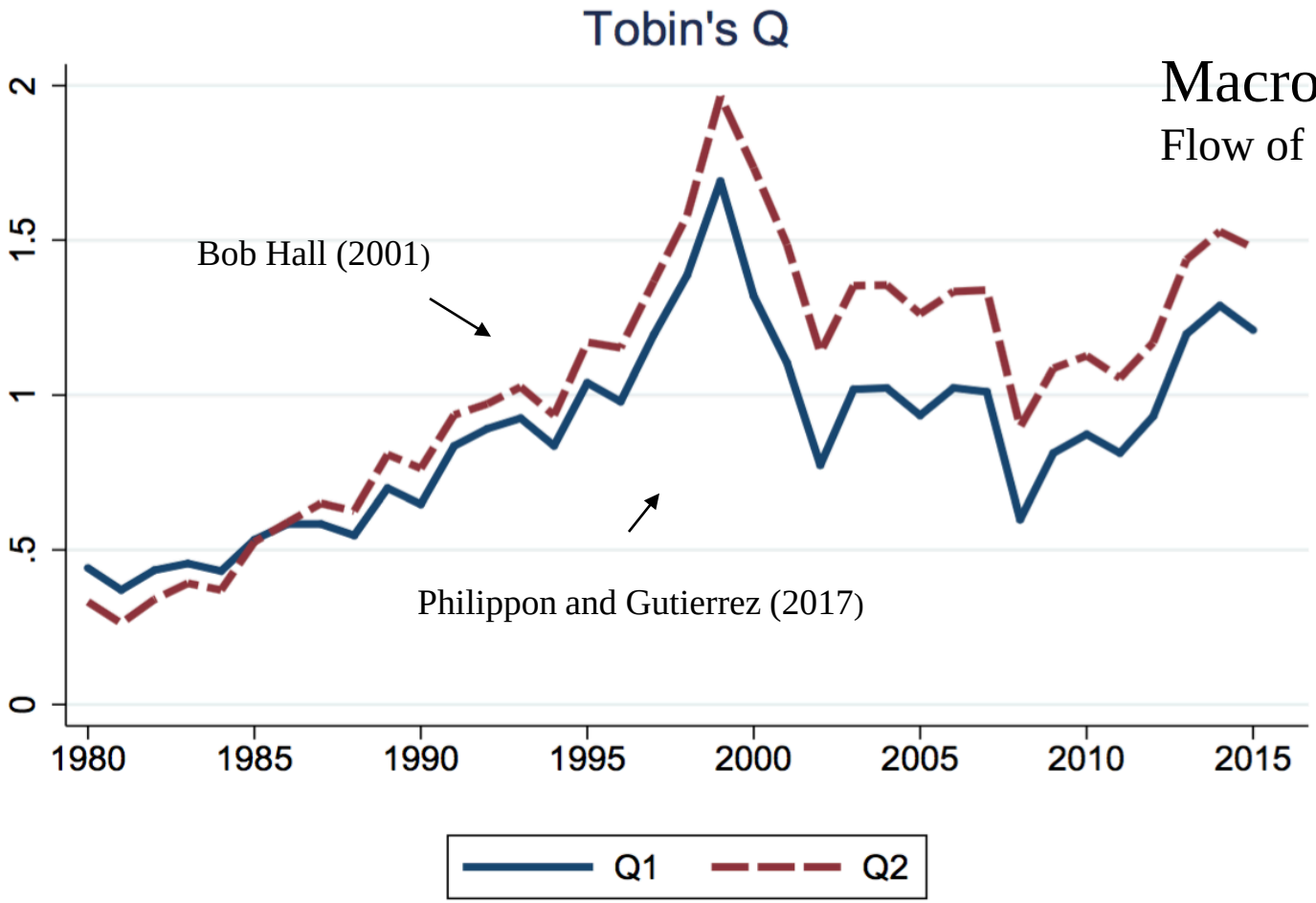


Figure 8: Capital share 2015, without capital gains

(P2) Macro Tobin's Q



Macrodata:
Flow of Funds by Fed

$$Q = \frac{Market\ value\ of\ installed\ capital}{Replacement\ cost\ of\ capital}$$

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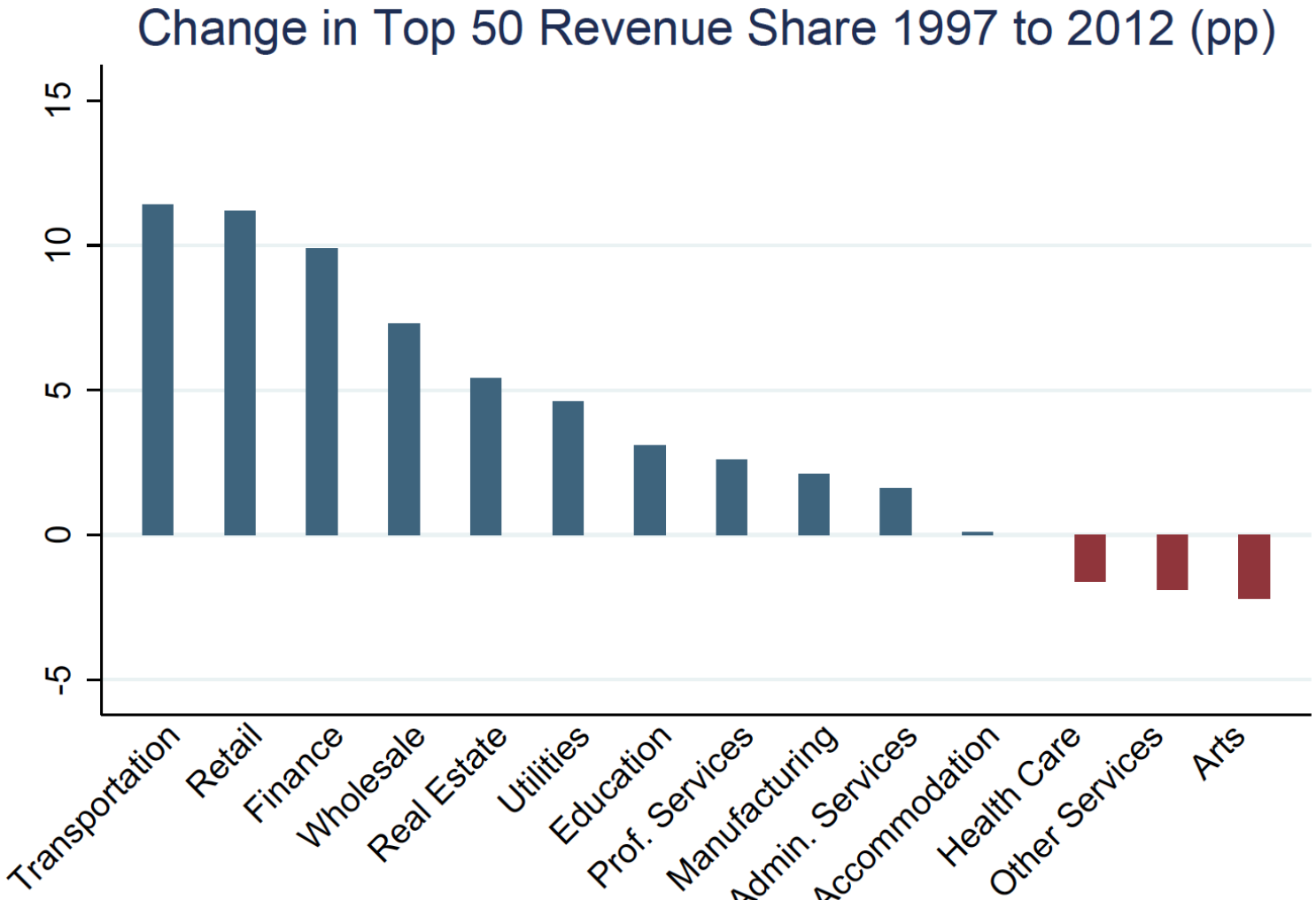
Change in Revenue Share



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