Aggregate Tobin's Q and Inequality: The Role of Capital Taxation and Rents

Lídia Brun[1] Ignacio González[2]

[1]Université Libre de Bruxelles

[2]American University

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Outline of the presentation

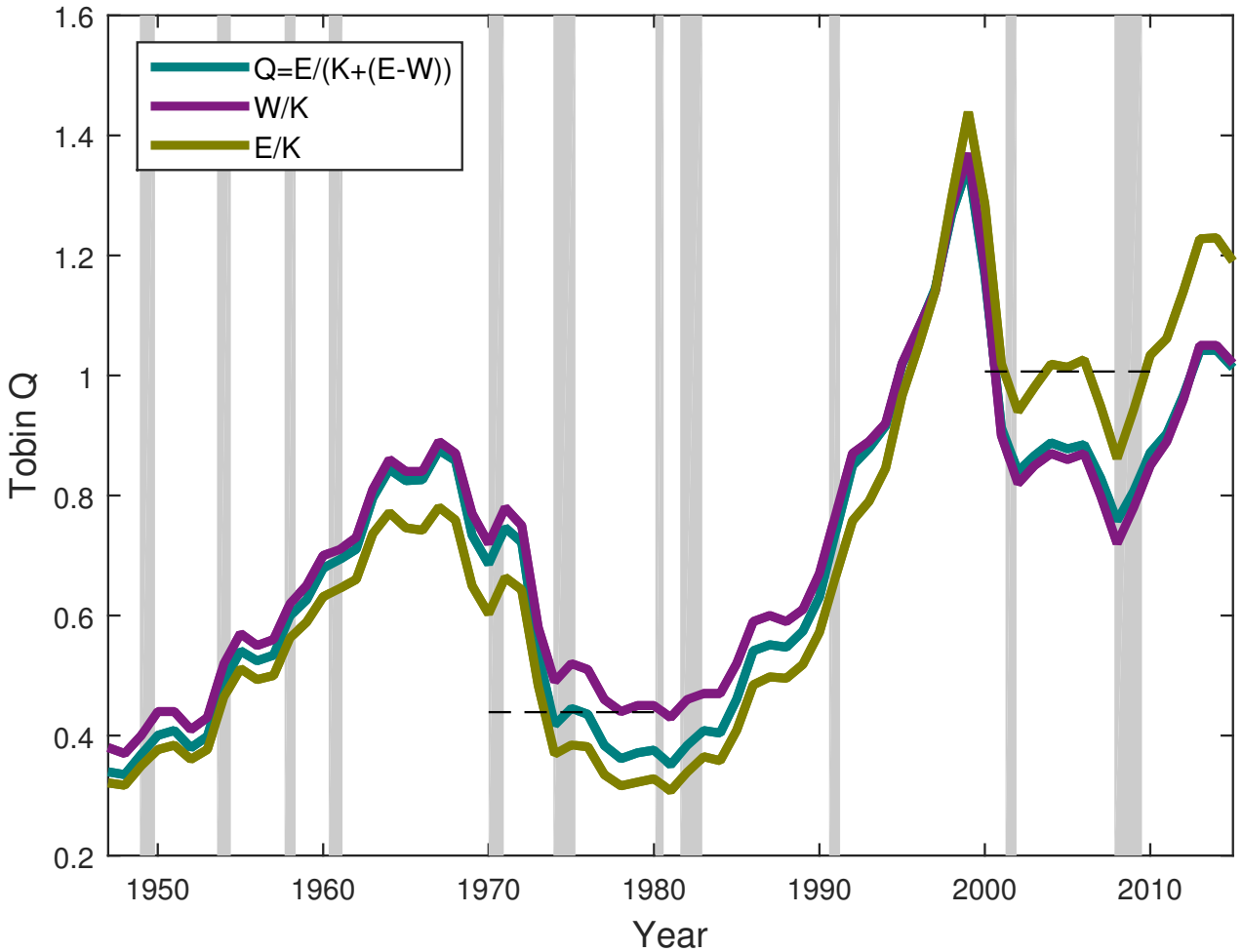
Back to 2014

- Piketty (2014)'s two empirical findings:
  - Capital Output Ratio is rising $\beta = \frac{K}{Y} \quad \uparrow$
  - Capital's Share of Output is rising: $\alpha = r\beta \quad \uparrow$
- At that time, the debate was very focused **on the value of** σ. Is $\sigma > 1$? or $\sigma < 1$?
- The evidence that wealth-income ratios were driven mostly by an asset price recovery (Piketty and Zucman 2014) received less attention.
  - other alternative theories also emphasized this: financialization literature, Rowthorn (2014), etc.
- We focus here on equity **Tobin's Q=W/K** and the divergence between stock aggregates: $\frac{W}{Y} \uparrow$ and $\frac{K}{Y} \downarrow$

Our contribution

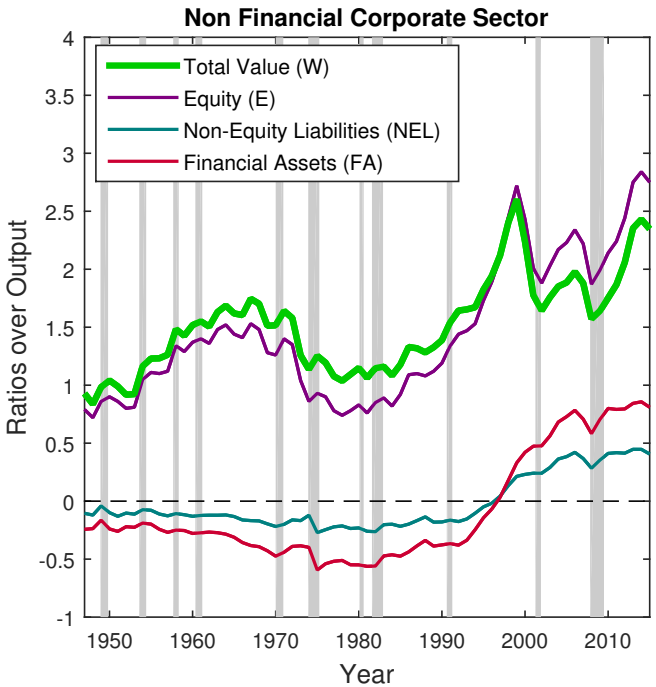
- Tobin's Q has increased during the period in which inequality has rocketed and investment has slow down.
  - We can't simply assume that $q = 1$ and use $F = (W, L) = F(qK, L)$.
  - In fact, and perhaps more interestingly, changes in the valuation q have crowded out capital formation K
- Aggregate Tobin's Q reflects the **role of pro-capital policies** that have **real effects on aggregate outcomes** .
  - Potential candidates: **capital taxation and rents.**
- Heterogeneous agents framework to explain evolution of Tobin's Q and its macro effects on equity wealth, investment, equity returns, impact on inequality/welfare.

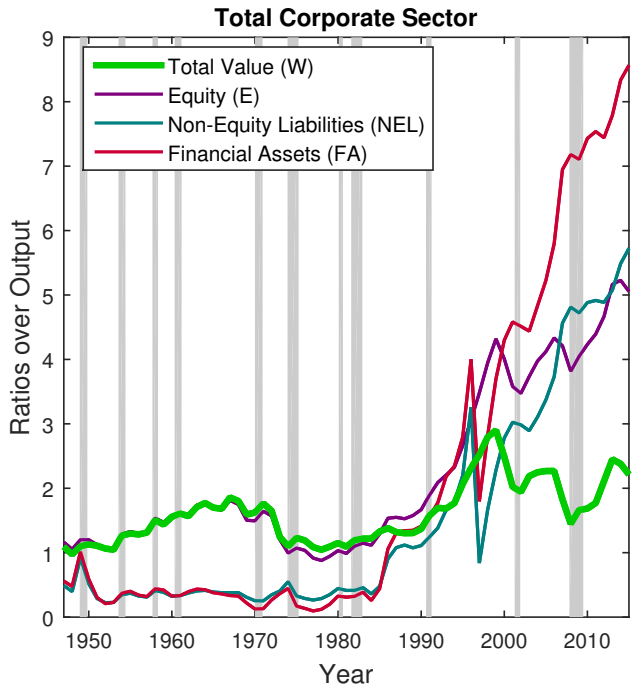
Equity Tobin's Q



▸ decomposition

Figure: Financial Wealth decomposition. $Q = \frac{E}{K+FA-NEL}$

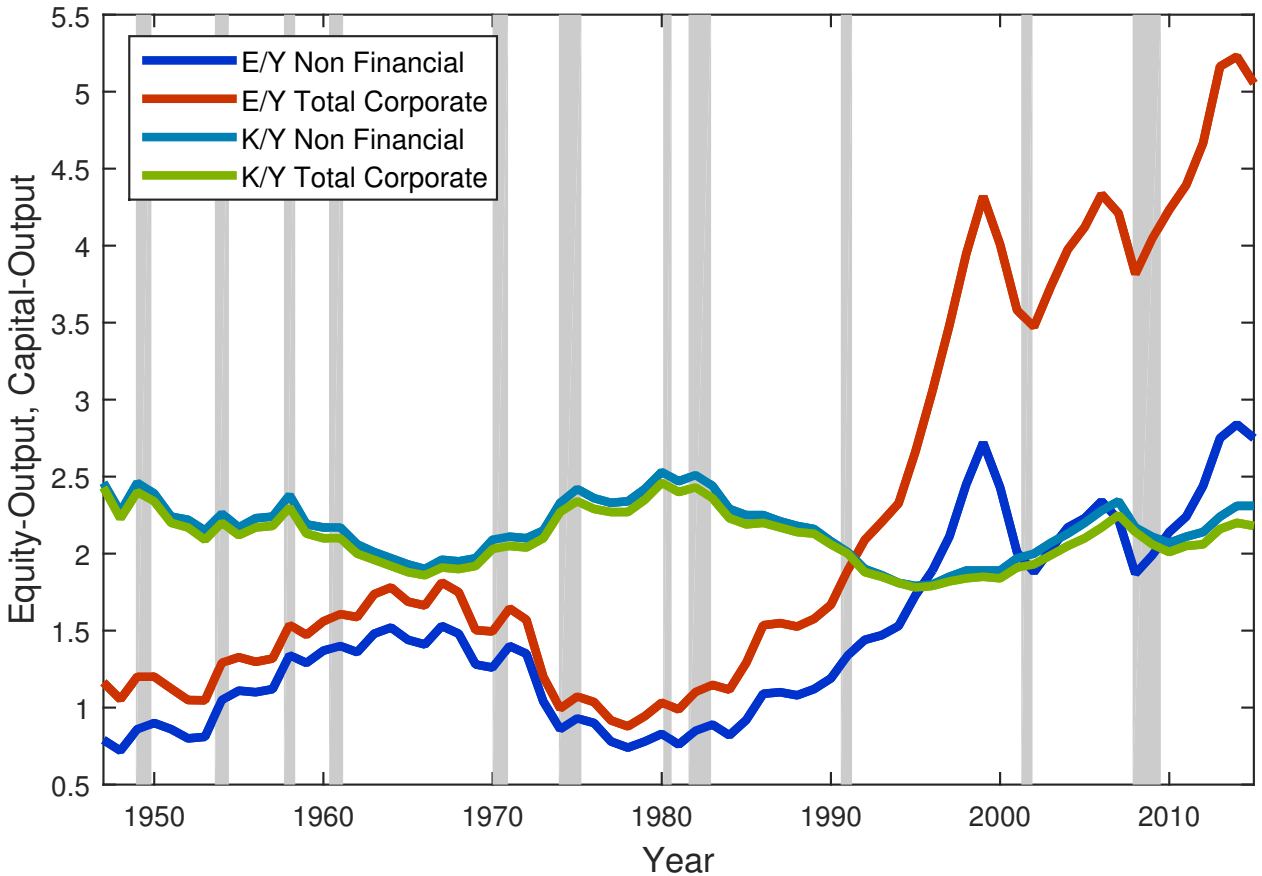




▸ tobin's q

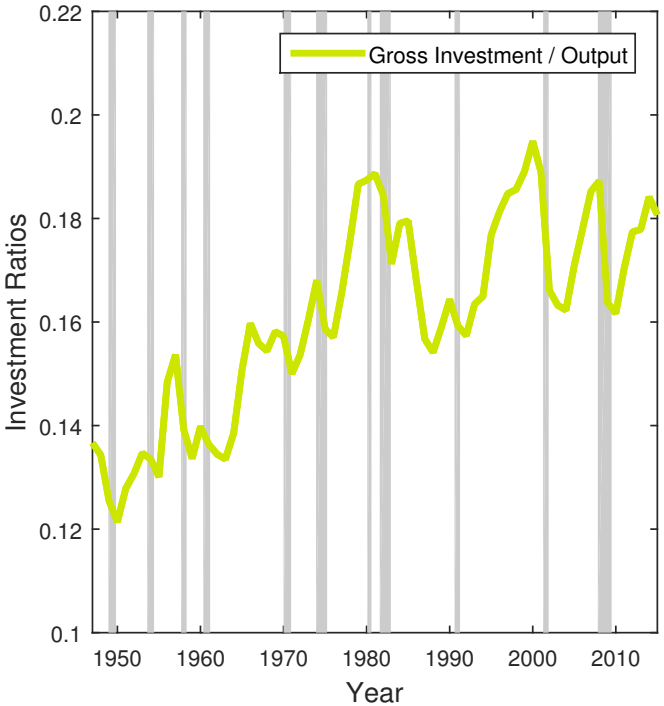
Wealth and Capital Ratios

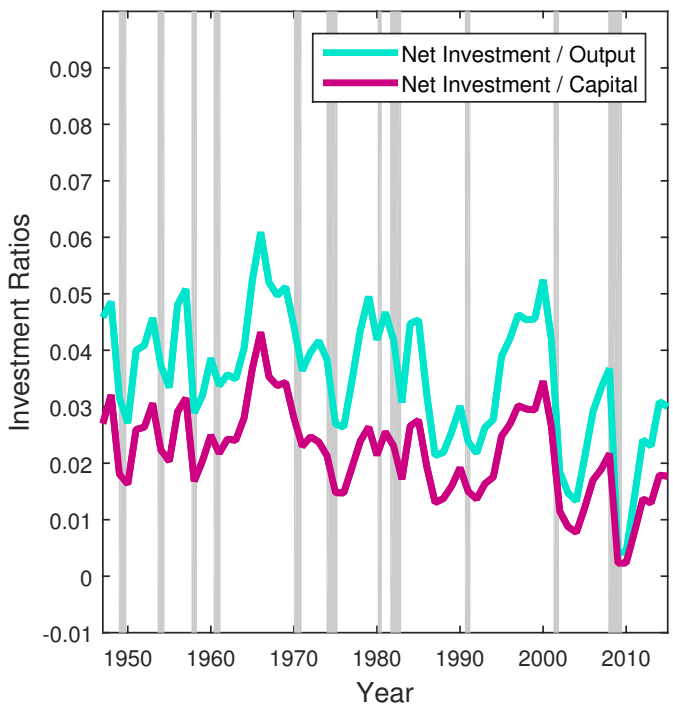
Figure: Equity-Wealth-Output and Corporate-Capital-Output ratios



investment real

Figure: Corporate Investment

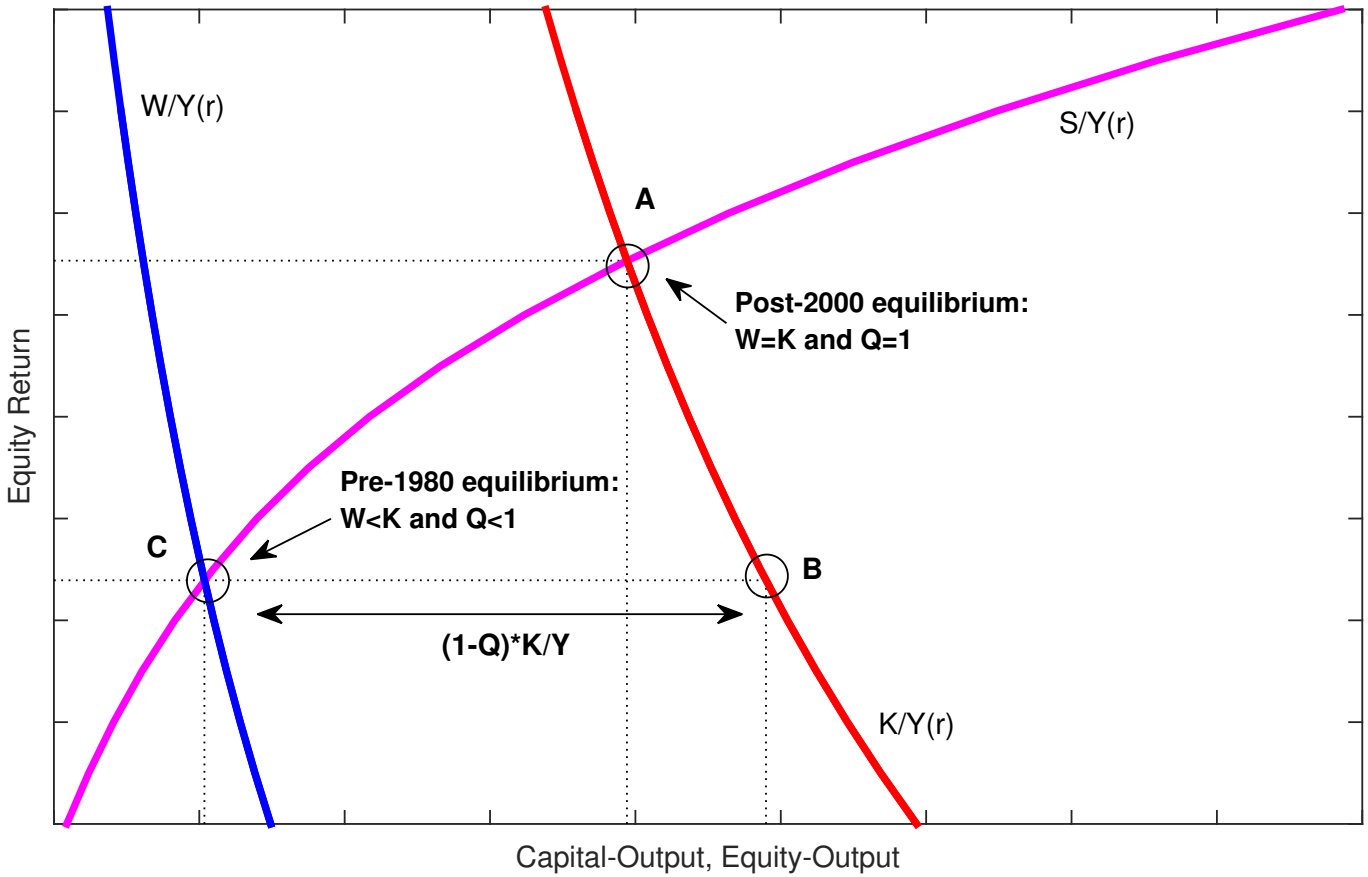




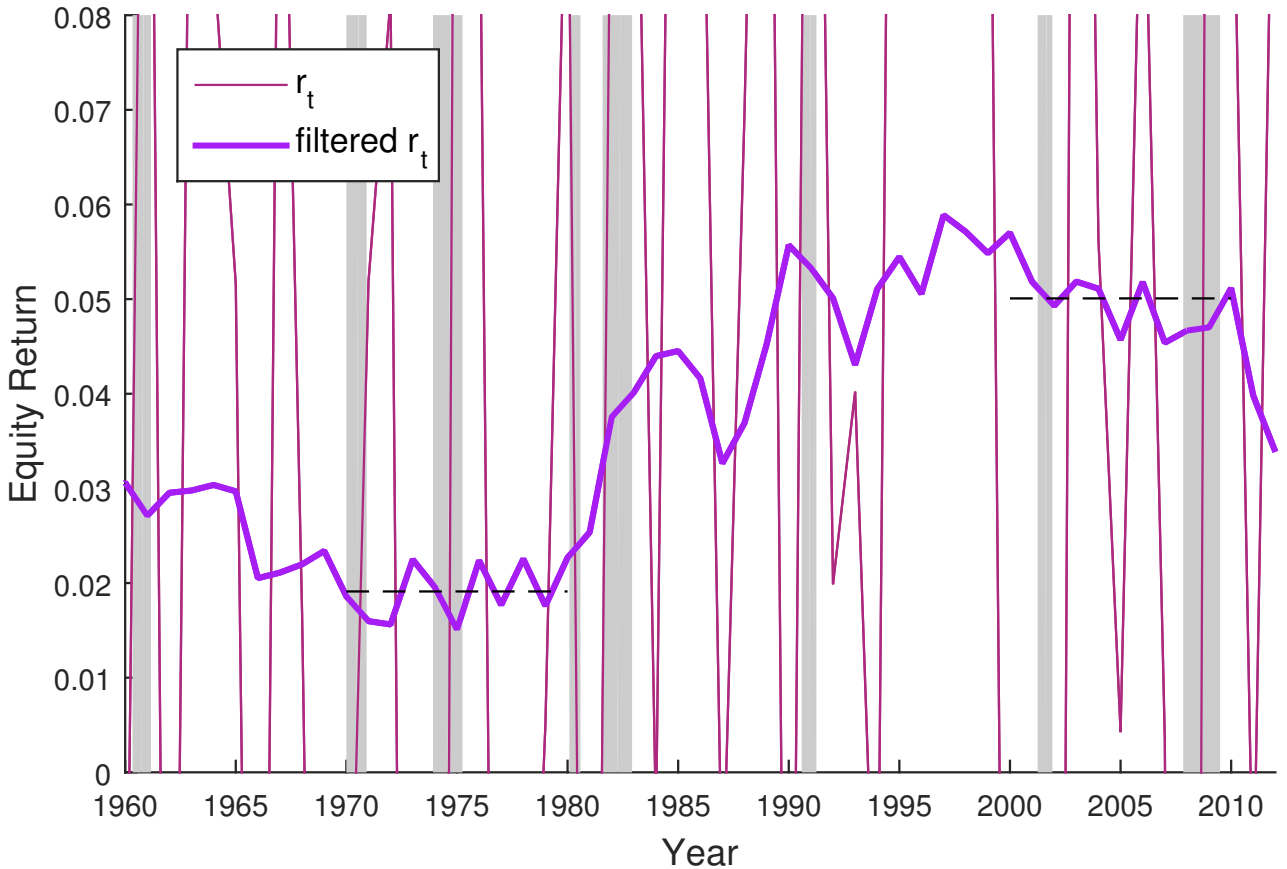
▸ stocks

Secular Aggregate Movements: A Hypothesis

Figure: Capital Market



Equity Returns adjusted for Inflation, Taxes and Portfolio Costs. 1960-2012



▸ profits ▸ gross returns

Tobin's Q and Inequality

- We build a model where changes in asset prices can occur at the expense of corporate investment.
  - Asset prices and Tobin's Q drivers:
    - Capital Taxation
    - Monopoly Rents
  - Investment is low due to high Tobin's Q, not despite high Tobin's Q (conceptual difference with respect to traditional Q theory and recent papers like Gutierrez and Philippon (2017))
- We believe that there are good reasons to study monopoly power in an heterogeneous agents setting.

Literature

- On asset prices and capital taxation:
  - Sialm (2009): negative relation between taxes on equity and aggregate stock valuations
  - McGrattan and Prescott (2005): secular movement in corporate equity value relative to GDP due to capital income taxation. Representative agent/complete markets. Completely elastic supply of capital. No inequality/growth implications.
- On the desired level of capital in an incomplete markets economy.
  - Davila et al. (2012).The U.S. economy has too little capital because a large proportion of the population relies mainly on labor income
- Monopoly power and its implications.
  - Barkai (2016)
  - De Loecker and Eeckhout (2017)

The Model

Environment

- A financial economy with **one tradable asset** (stocks) that capitalizes conventional and pure profits.
    - No distinction between "capital share" vs "pure profit share". We believe this is important for realistic tax policy

Households:

- Make consumption/savings decisions under uncertain income
- Save in stocks (actually, a composite of stocks, i.e., a portfolio).
- Pay taxes on dividends and capital gains

Firms

- Monopolistic Competition
- Own physical capital, invest using retained earnings and distribute dividends
- Make investment decisions to maximize shareholder value
- Pay corporate taxes

Taxes and monopoly rents

- create a wedge between the market value of firms and the replacement cost of physical capital (Tobin's $Q \neq 1$)

The Household Problem

Preferences

$$\max U(c_i) = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u(c_{it}) \quad \textit{where} \quad c_{it} = \left(\sum_{j=1}^{n} (c_{jit})^{\frac{\xi-1}{\xi}} \right)^{\frac{\xi}{\xi-1}}$$

Budget Constraint

$$\sum_{j=1}^{n} p_{jt} c_{jit} + \sum_{j=1}^{n} v_{jt} s_{jit+1} = w_t \epsilon_{it} + \frac{\sum_{j=1}^{n} \left(v_{jt} + (1-\tau_d) d_{jt} - \tau_g \left(v_{jt} - \frac{P_t}{P_{t-1}} v_{jt-1} \right) \right) s_{jit}}{(1+\kappa)}$$

Euler Equation

$$\frac{u'(c_{it})}{\mathbb{E}_t[\beta u'(c_{it+1})]} = \frac{v_{jt+1} + (1-\tau_d) d_{jt+1} - \tau_g \left(v_{jt+1} - \frac{P_{t+1}}{P_t} v_{jt} \right)}{v_{jt}} \frac{P_t}{P_{t+1}} \frac{1}{1+\kappa} = 1 + r_{jt+1}$$

Imposing no bubble condition, the real price of firm's j is:

$$\frac{v_{jt}}{P_t} = \frac{1-\tau_d}{1-\tau_g} \sum_{k=1}^{\infty} \frac{d_{jt+k}}{P_{t+k} \prod_{l=1}^{k} (1+\tilde{r}_{t+l})} \quad \text{where} \quad \tilde{r} \approx \frac{r+\kappa}{1-\tau_g}$$

The Firm's problem

Capital is accumulated according to the standard equation:

$$K_{jt+1} = (1-\delta)K_{jt} + i_{jt} \quad where \quad i_{jt} = \left(\int_0^1 i_{jht}^{\frac{\xi-1}{\xi}} dh \right)^{\frac{\xi}{\xi-1}}$$

Total demand for product j is the sum of the consumption demand and the investment demand for that product:

$$y_j = \int_0^1 c_{ijt} d\Phi_{t-1}(s,e) + \int_0^1 i_{hjt} dh = \left(\frac{p_{jt}}{P_t} \right)^{-\xi} (C_t + I_t) = \left(\frac{p_{jt}}{P_t} \right)^{-\xi} F(K_t, L_t)$$

The firm's financing constraint:

$$d_{jt} + P_t i_{jt} + w_t L_{jt} - \tau_c (p_{jt} F(K_{jt}, L_{jt}) - w_t L_{jt} - \delta K_{jt}) = p_{jt} F(K_{jt}, L_{jt})$$

Firm's Capital

Using constant returns to scale assumption and the "no-bubble condition":

$$K_{jt+1} = \sum_{k=1}^{\infty} \left(\frac{d_{jt+k}}{P_{t+k} \prod_{l=1}^{k} (1 + \tilde{r}_{t+l})} - \frac{1}{\xi} \frac{(1 - \tau_c) p_{jt+k} F(K_{jt+k}, L_{jt+k})}{P_{t+k} \prod_{l=1}^{k} (1 + \tilde{r}_{t+l})} \right)$$

Tobin's Q

The Tobin's Q is the ratio between the financial valuation of the firm $\frac{v_{jt}}{P_t}$ and the value of its capital stock K_{jt+1}:

$$Q_{jt} = \frac{v_{jt}}{P_t K_{jt+1}} = \frac{1-\tau_d}{1-\tau_g}\left(1 + \frac{1}{\xi}\frac{1-\tau_c}{K_{jt+1}}\sum_{k=1}^{\infty}\frac{p_{jt+k}F(K_{jt+k}, L_{jt+k})}{P_{t+k}\prod_{l=1}^{k}(1+\tilde{r}_{t+l})}\right)$$

In the steady state with symmetric equilibrium: $K_j = K$; $p_j = P$; $v_j = v$; $d_j = d$.), Tobin's Q is:

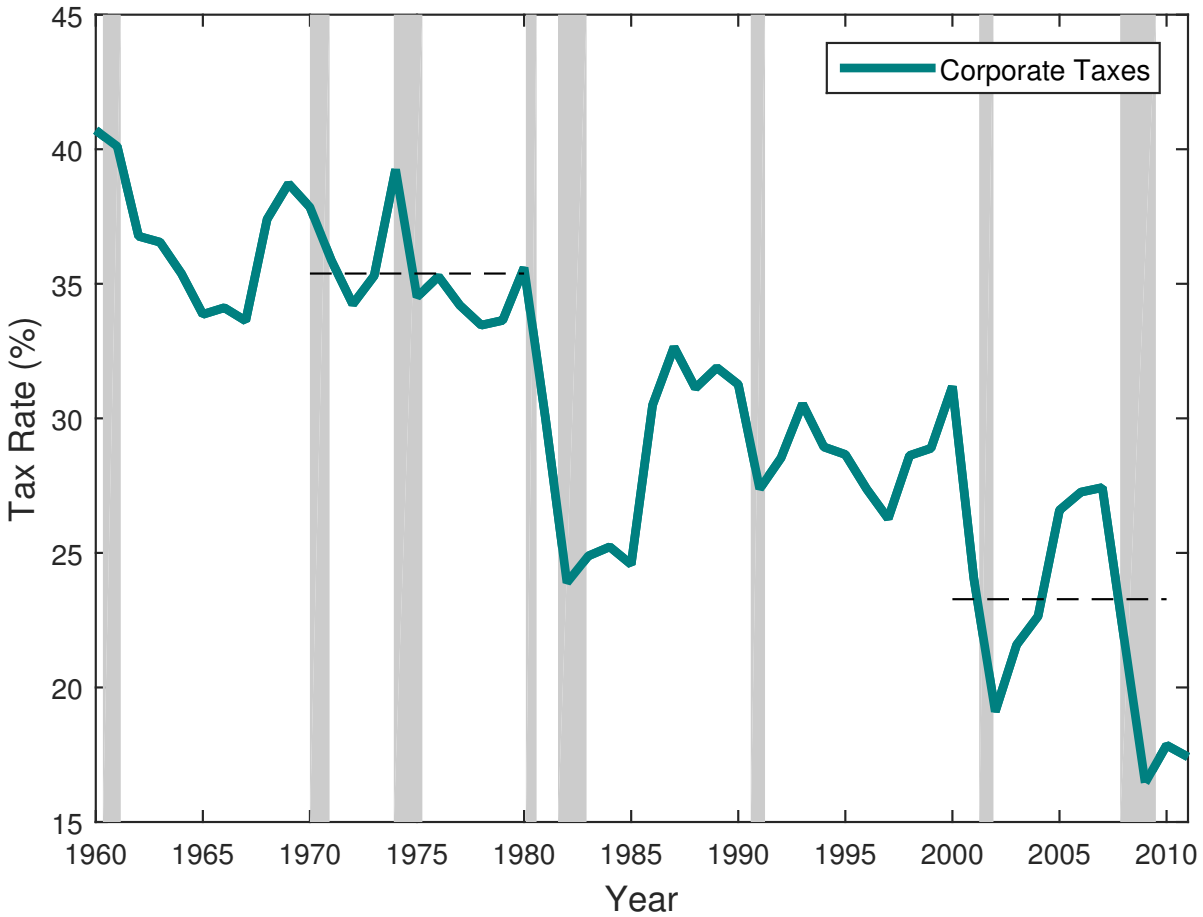
$$\mathbf{Q(r,K)} = \frac{1-\tau_d}{1-\tau_g}\left(1 + \frac{1}{\xi}\frac{1-\tau_c}{\mathbf{K}}F(\mathbf{K}, L)\left(\frac{1-\tau_g}{\mathbf{r}+\kappa}\right)\right)$$

Comparative Statics

- A decrease in τ_d increases Q ▸ graph
- A decrease in τ_g decreases Q ▸ graph
- A decrease in ξ (increase in markup) increases Q ▸ graph
- If markets are competitive (i.e. $\xi = \infty$) neither τ_c nor κ affect Q in equilibrium. Under monopolistic competition:
  - A decrease in τ_c increases Q ▸ graph
  - A decrease in κ increases Q ▸ graph

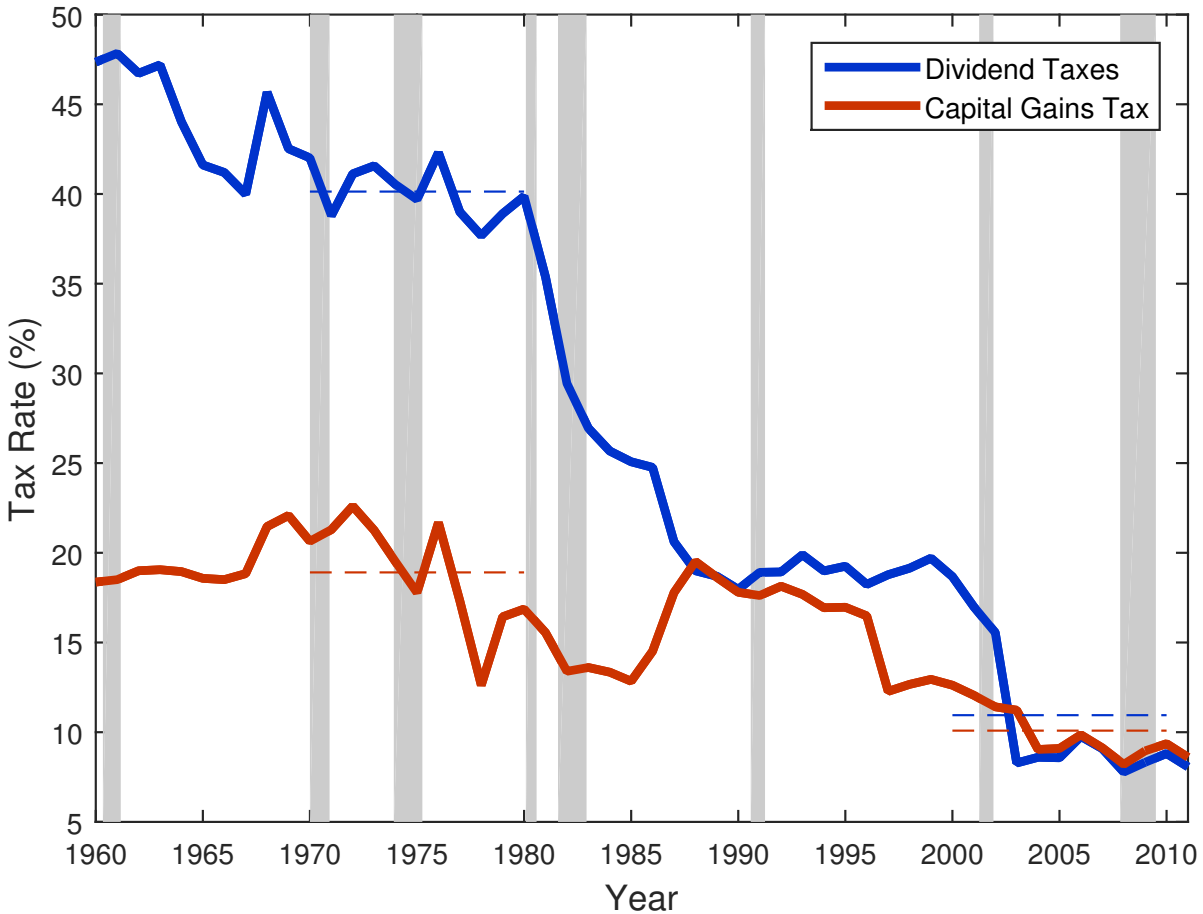
Effective Corporate Tax Rate

Figure: Decrease in τ_c,1960-2012



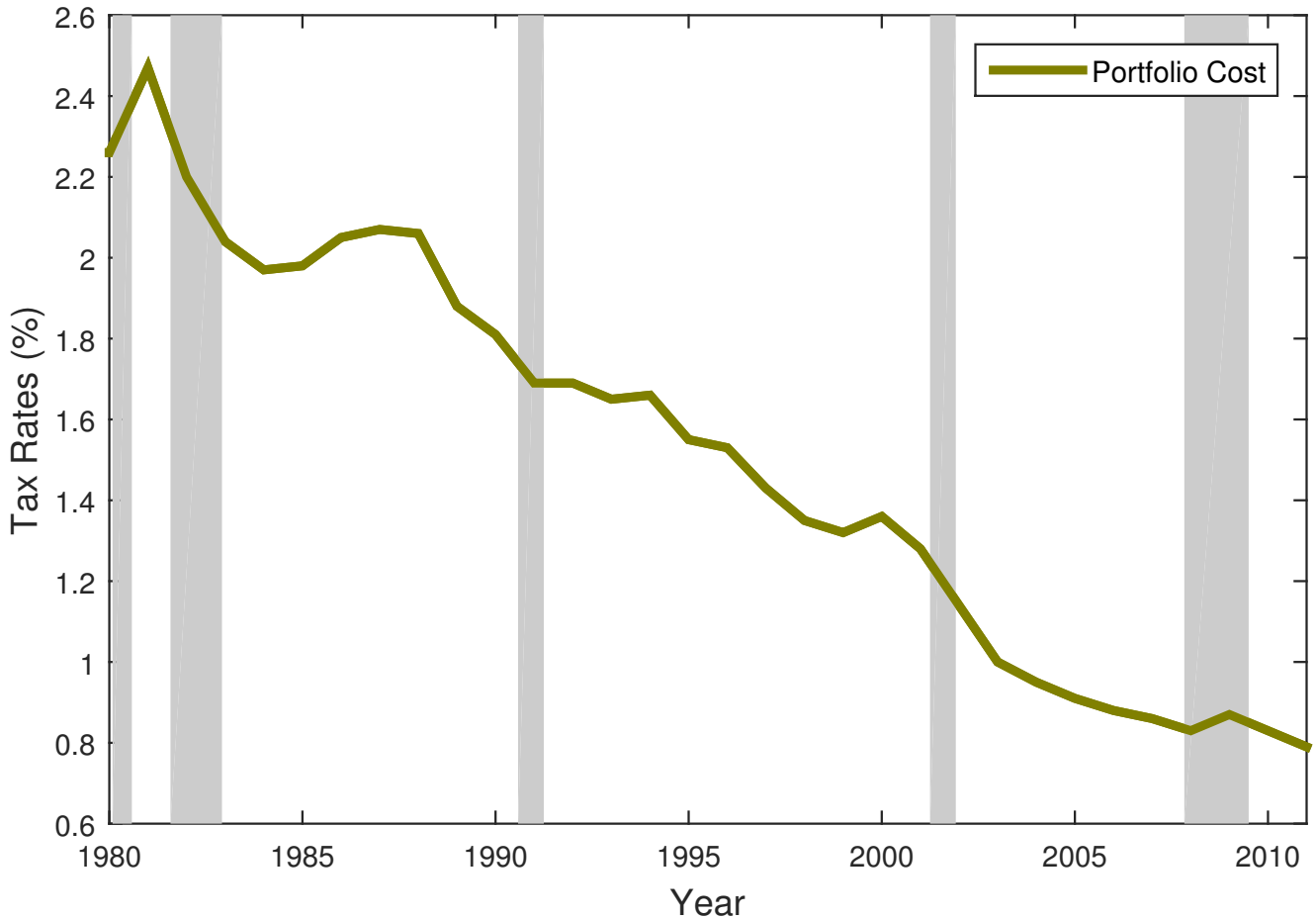
Dividend and Capital Gains Taxes

Figure: Decrease in τ_d and τ_g, 1960-2012



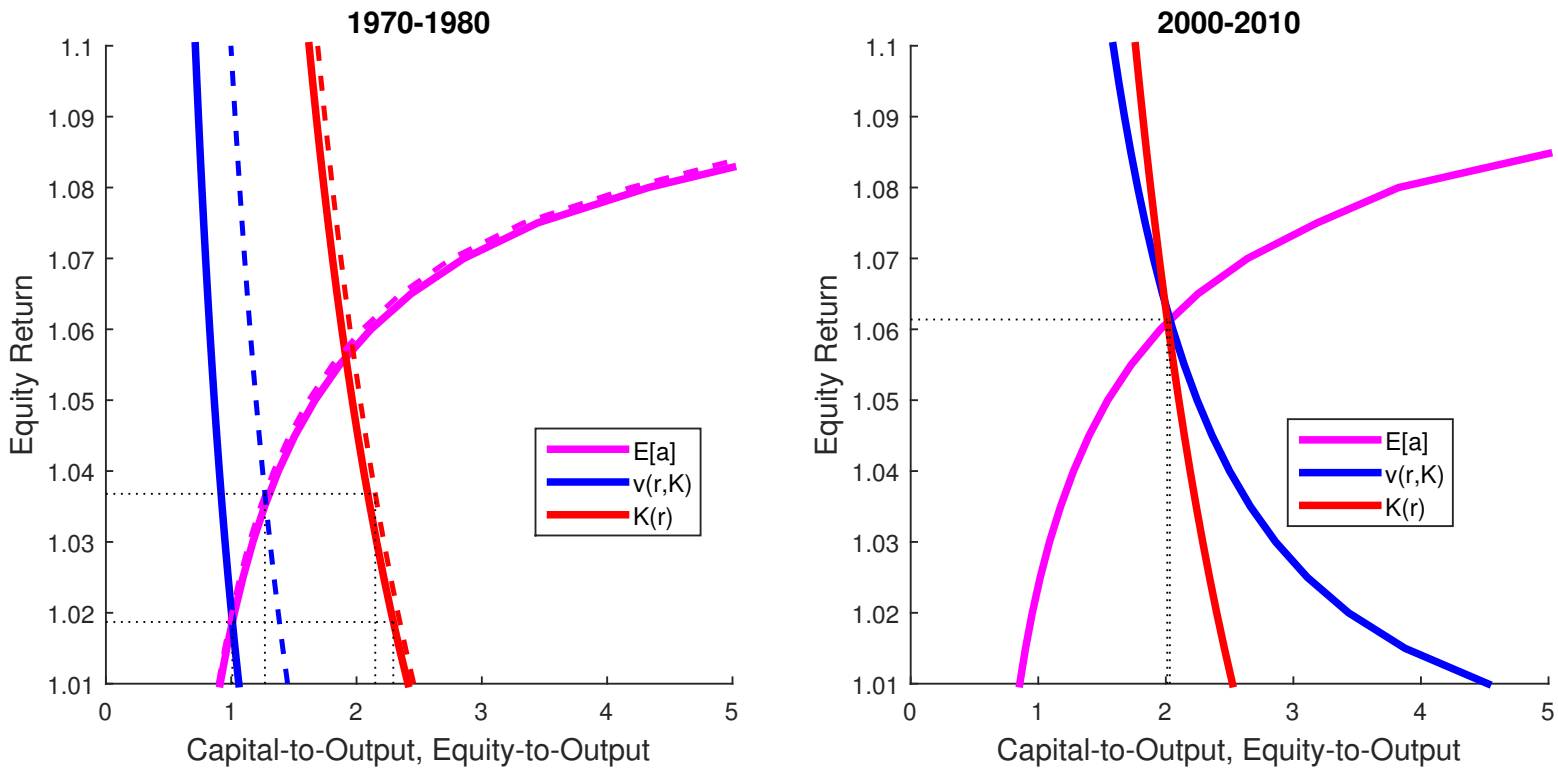
Portfolio Costs

Figure: Decrease in κ, 1980-2012



Steady States

Figure: Capital Market Equilibria in the 1970-1980 and the 2000-2010



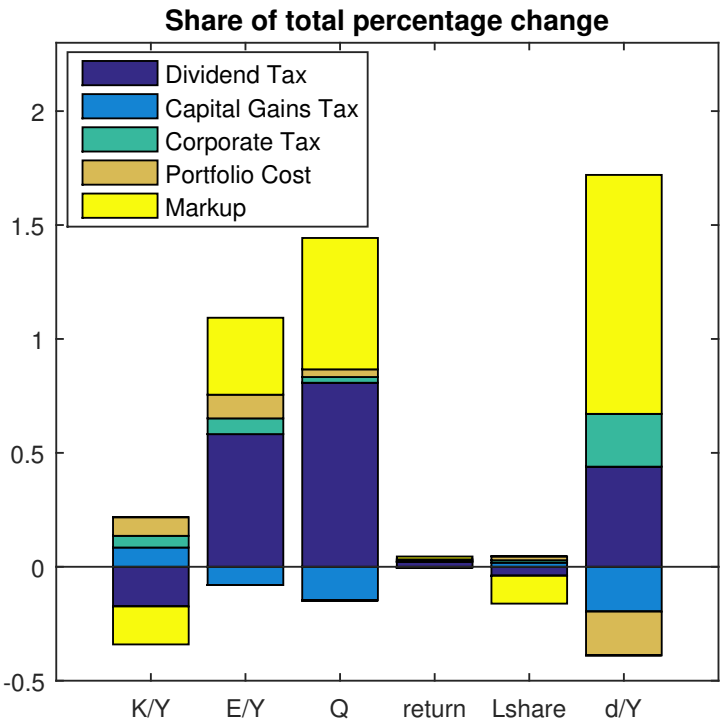
Results

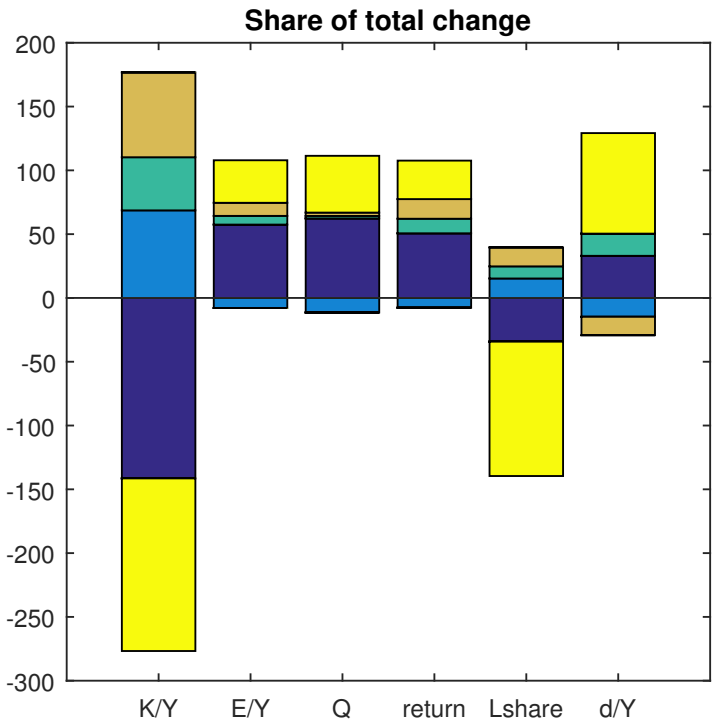
Table: Data vs Model

Variable	Data 1970-1980	Model SS1	Data 2000-2010	Model SS2
Dividend Tax Rate τ_d	40.13%	40.13%	10.95%	10.95%
Capital Gains Tax τ_g	18.91%	18.91%	10.09%	10.09%
Corporate Tax τ_c	35.38%	35.38%	23.28%	23.28%
Portfolio Cost κ	2.26%	2.26%	0.99%	0.99%
Labor Tax τ_l	-	30.71%	-	34.57%
Markup $\frac{\xi}{\xi-1}$	-	1	-	1.10
Equity-Output Ratio $\frac{E}{Y}$	0.99	1.01	2.12	2.03
Capital-Output Ratio $\frac{K}{Y}$	2.29	2.29	2.11	2.01
Tobin's $Q = \frac{E}{K}$	0.44	0.44	1.01	1.01
Equity Return r	1.91%	1.87%	5.01%	6.14%
Labor Share $\frac{wL}{Y}$	64.27	66.18	61.39	58.52
Dividend-Output Ratio $\frac{d}{Y}$	7.13	4.21	8.06	14.60

Results

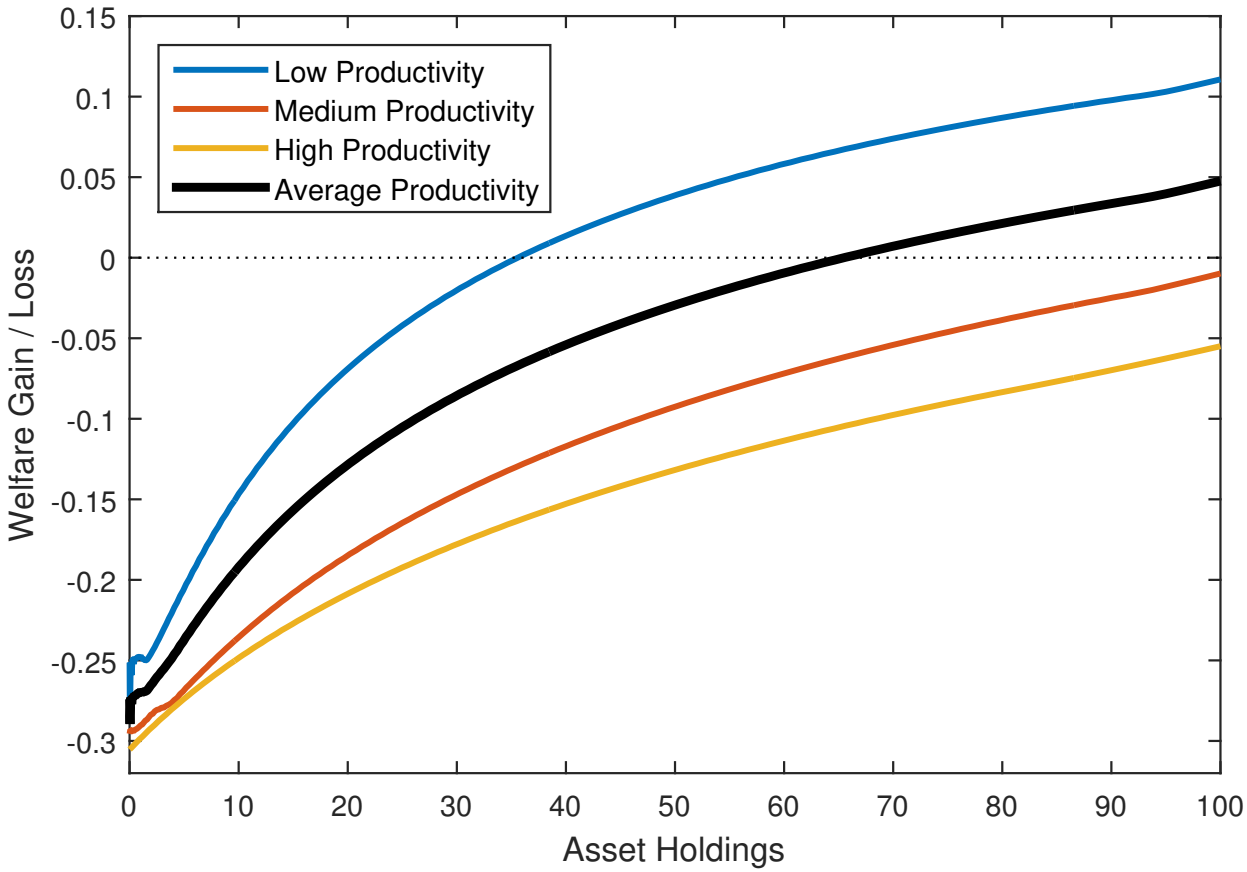
Figure: Decomposition Analysis





Welfare Analysis

Figure: Welfare Gain/Loss per Asset Holdings and Productivity



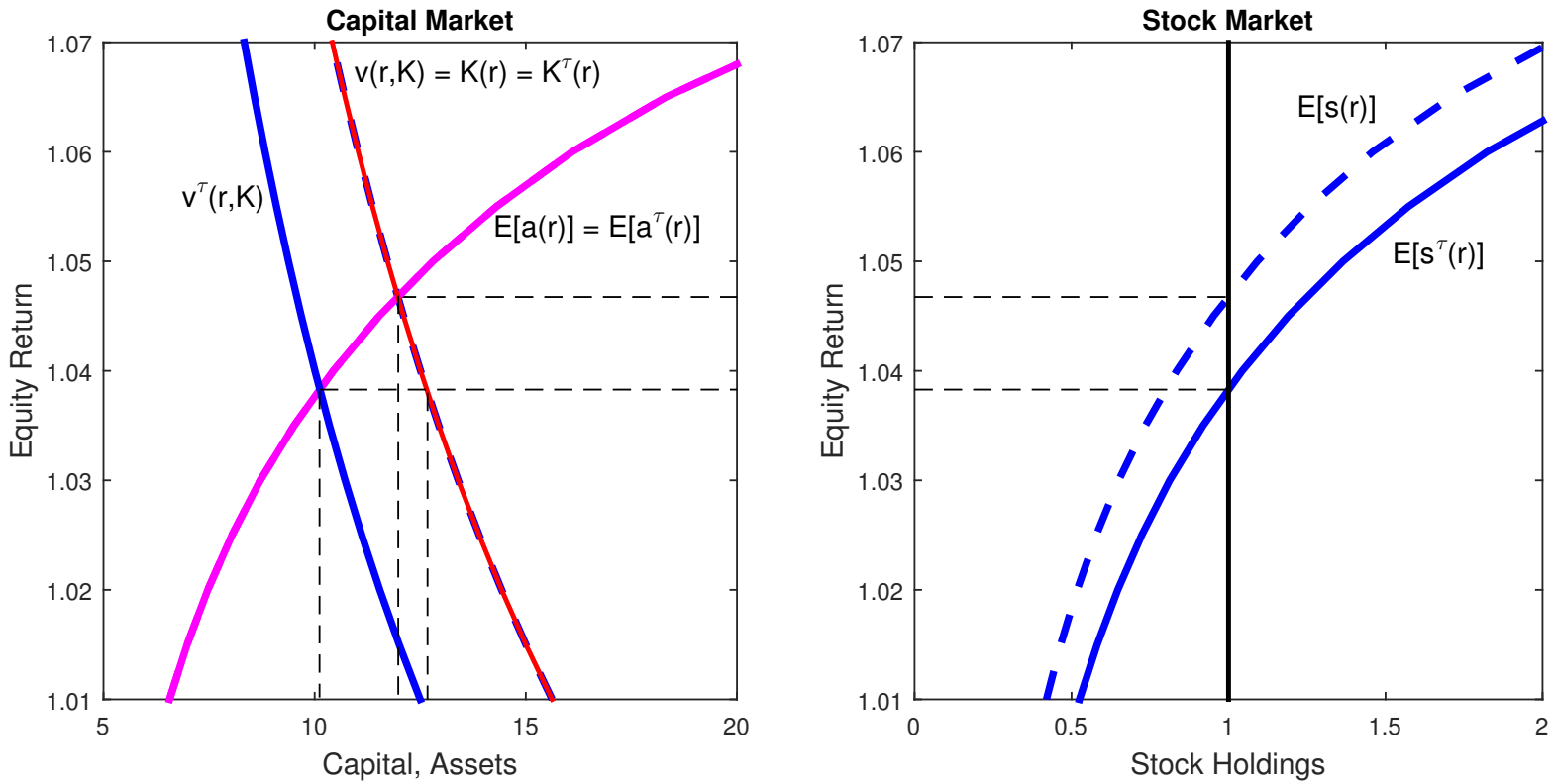
Conclusions

- Changes Q have
  - a direct effect on wealth
  - an indirect effect on investment, factor prices, factor shares and welfare.
  - at a global scale, González and Trivín (2016)
- Post-1980 drivers of Q: capital taxation and rents. Other drivers?
- Capital income taxation that lowers Q has a positive effect on capital formation and equality. This is the case of dividend income taxation or corporate taxation in interaction with monopoly markups
  - Implications for optimal tax policy. Brun, González and Rojas, forthcoming (2018)

Thanks!

Dividend Tax

Figure: $\tau_d = 20\%$

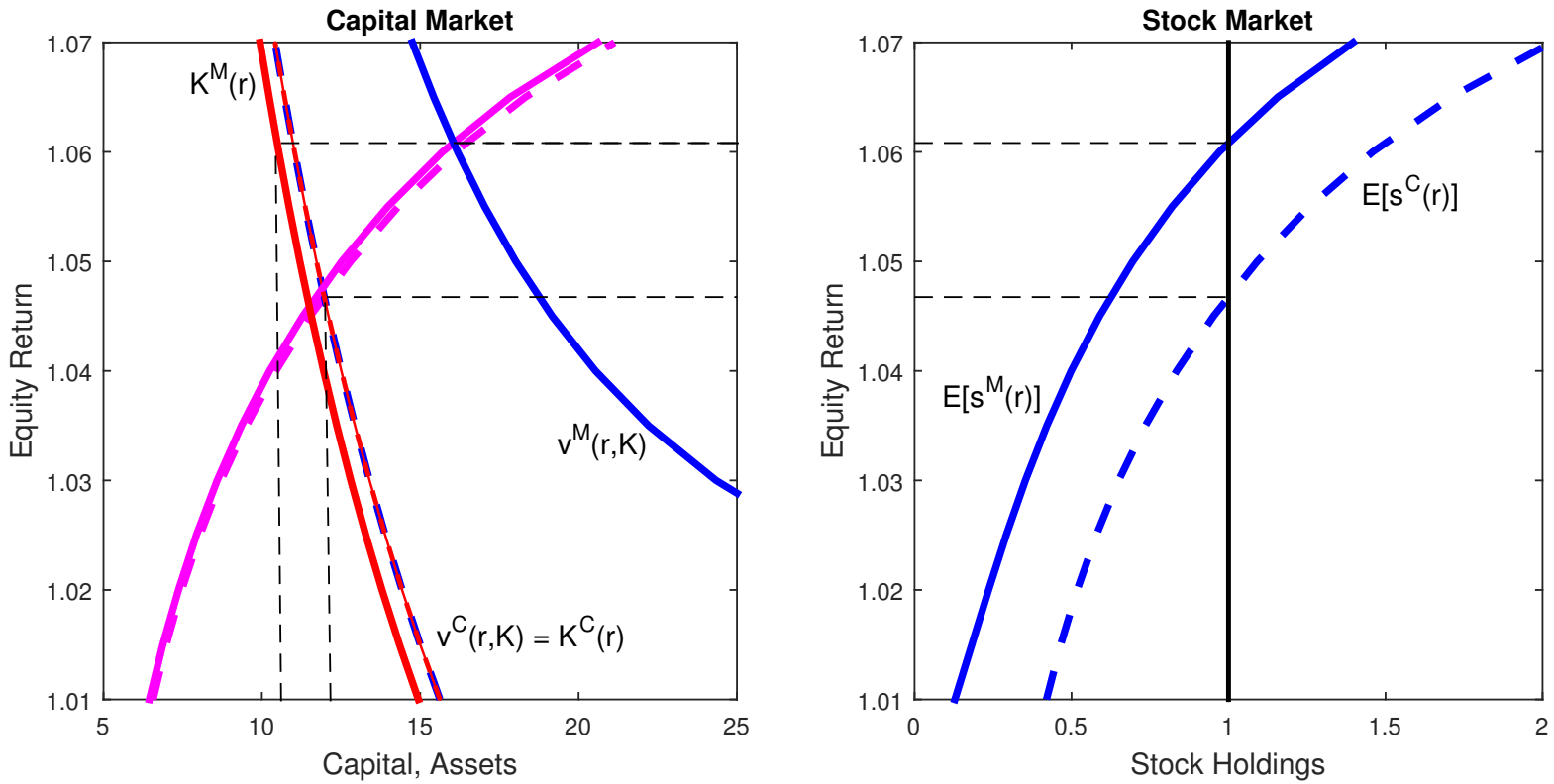


An increase in τ_d reduces the Tobin's Q

▸ model

Monopoly Power

Figure: Markup $\frac{\xi}{\xi-1} = 1.05$

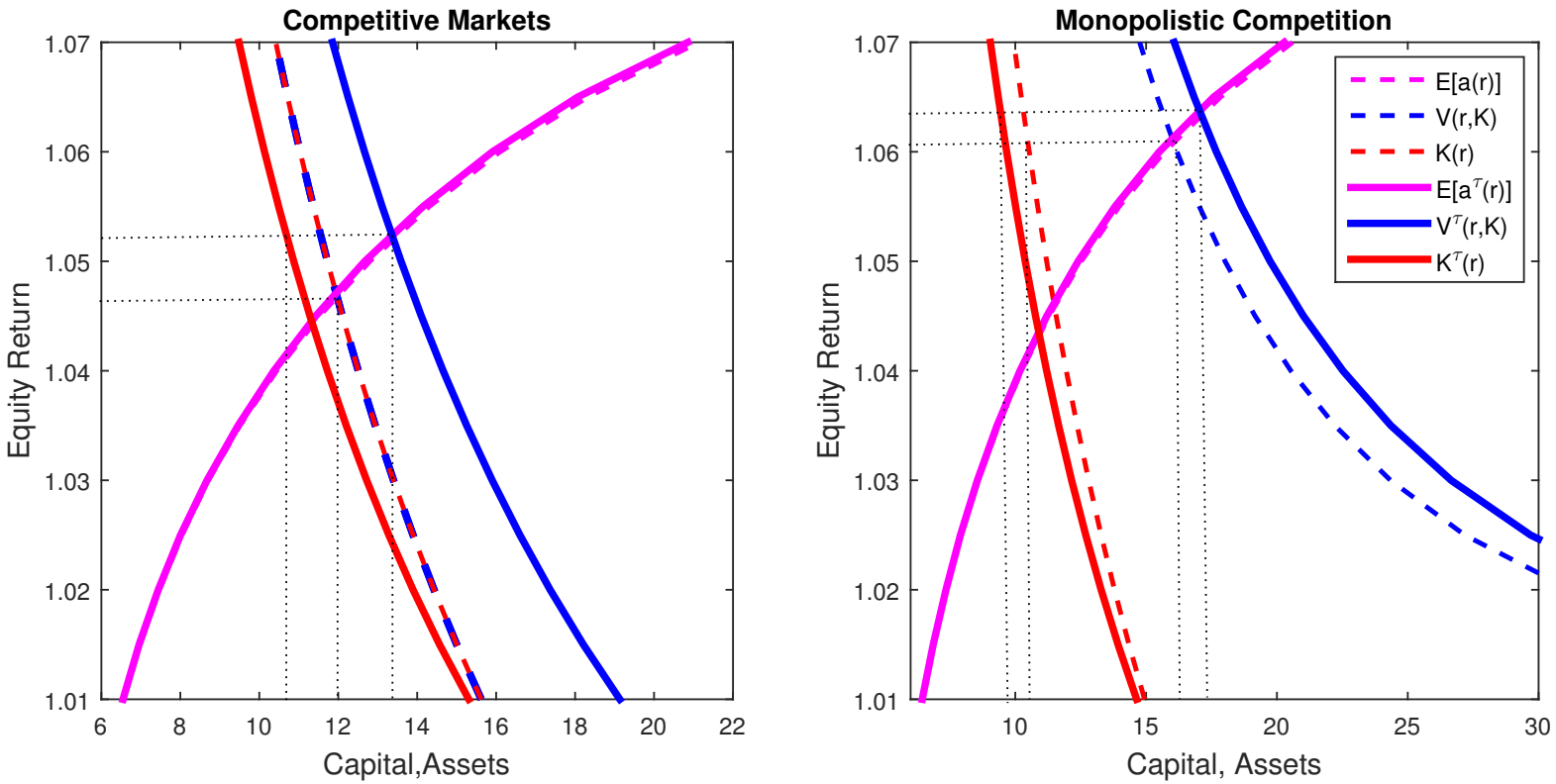


An increase in monopoly power increases the Tobin's Q *and* reduces capital demand

model

Capital Gains Tax

Figure: $\tau_g = 20\%$

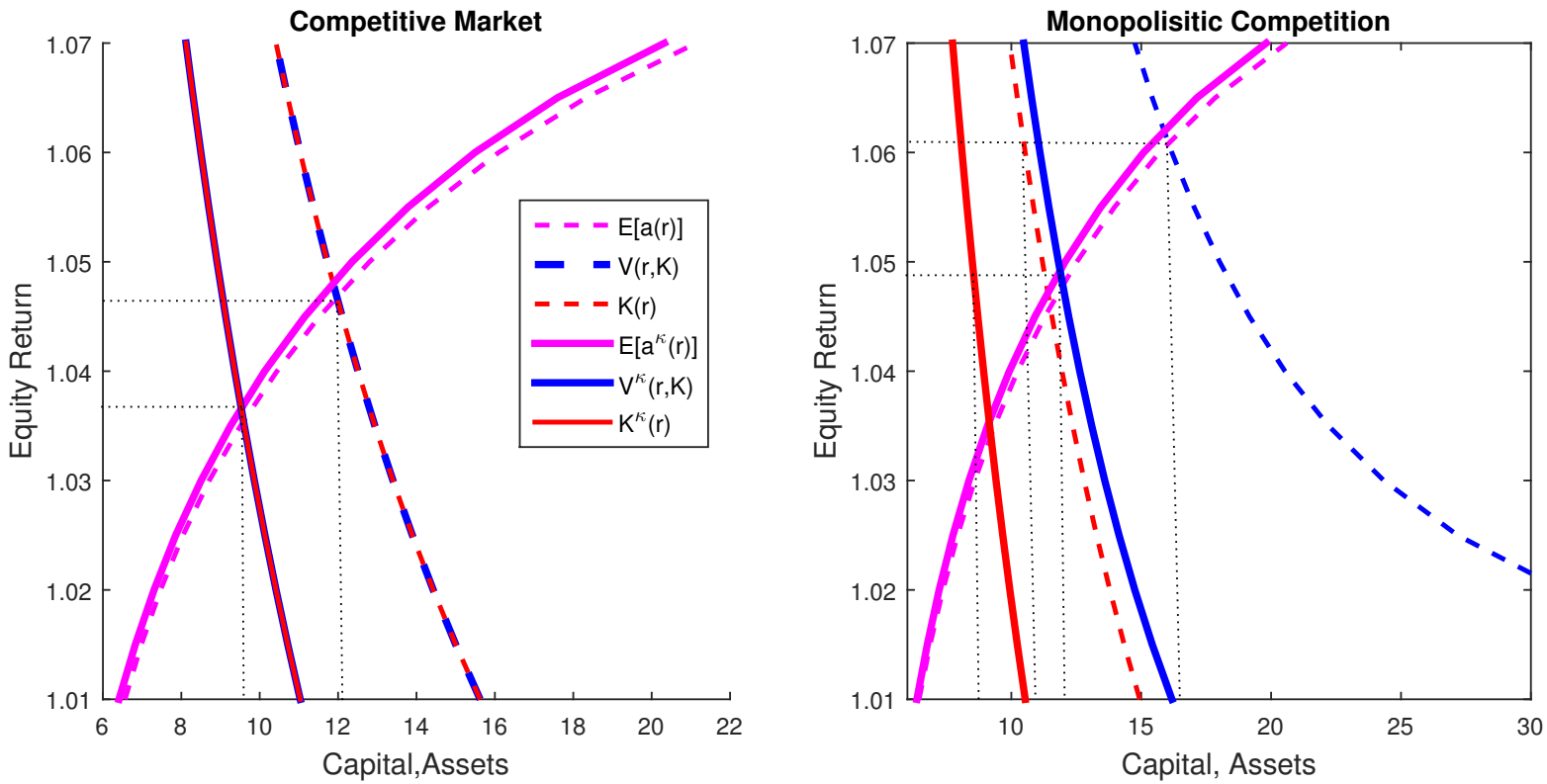


τ_g reduces capital demand *and* increases the Tobin's Q.

model

Portolio Costs

Figure: $\kappa = 0.5\%$



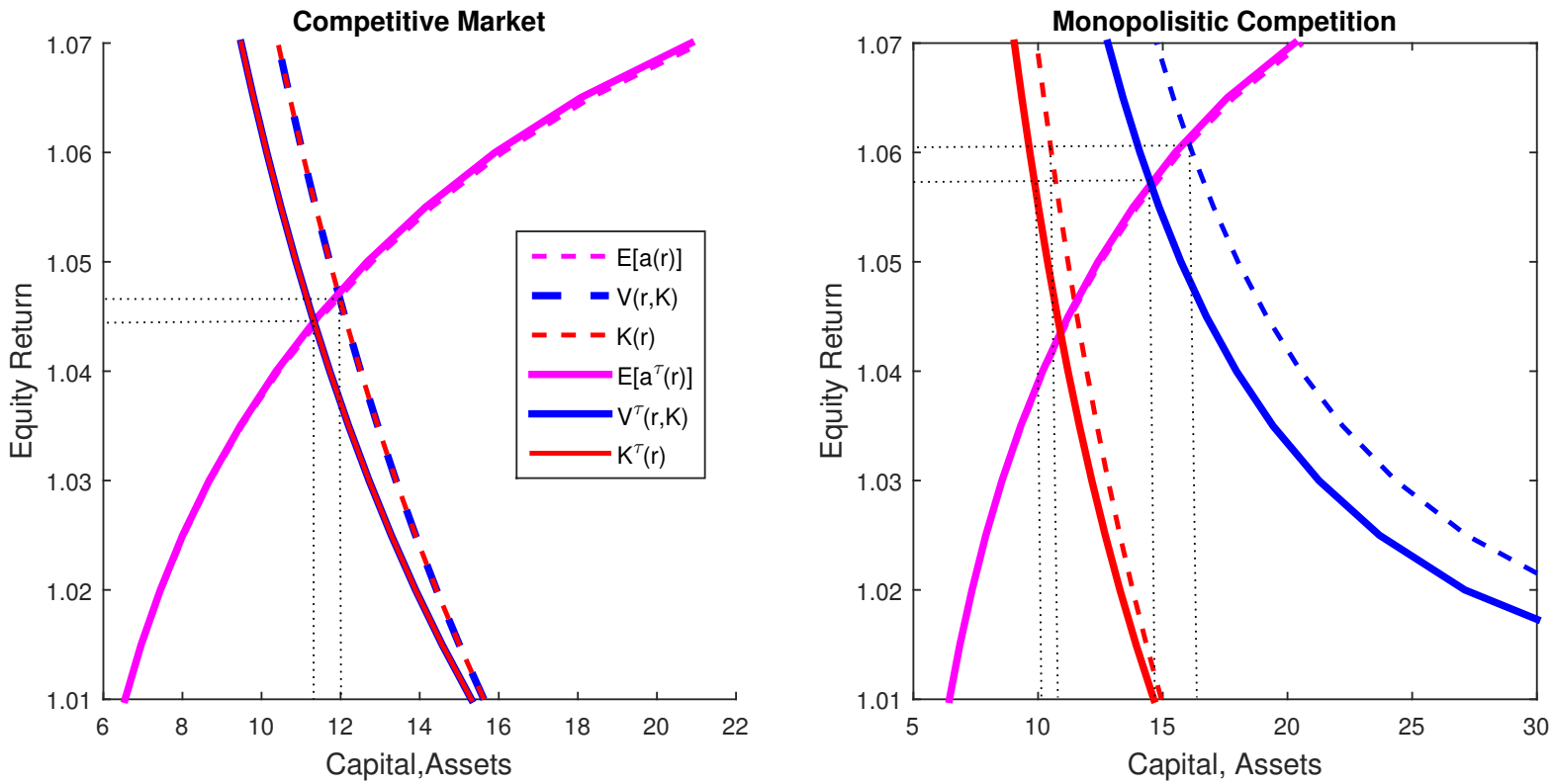
Under perfect competition, κ reduces capital demand but does not affect the Tobin's Q.

Under monopolistic competition, κ reduces capital *and* the Tobin's Q.

model

Corporate Tax

Figure: $\tau_c = 20\%$



Under perfect competition, τ_c reduces capital demand but does not affect the Tobin's Q.

Under monopolistic competition, τ_c reduces capital *and* the Tobin's Q.

model

Figure: Capital - Chained dollars

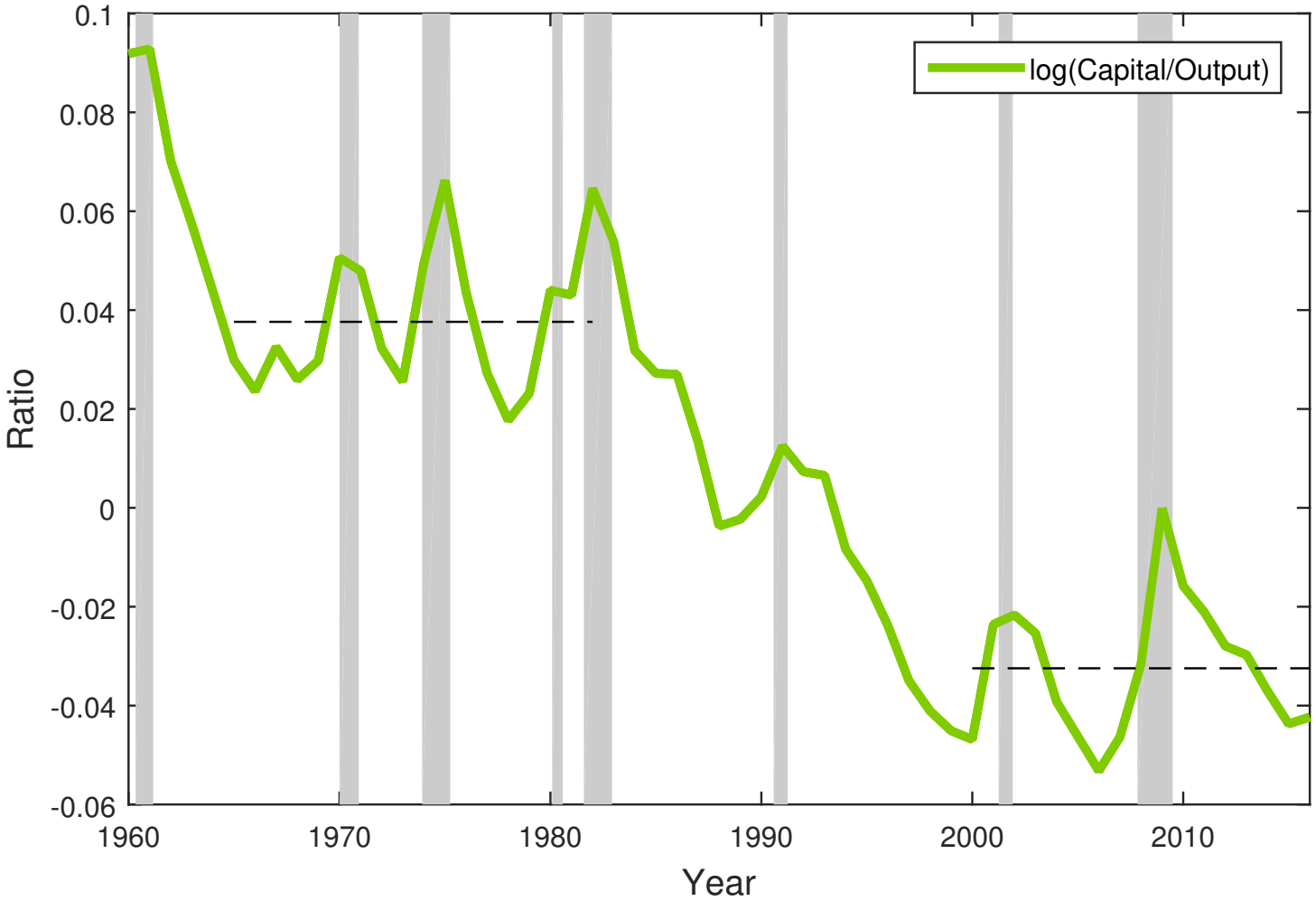
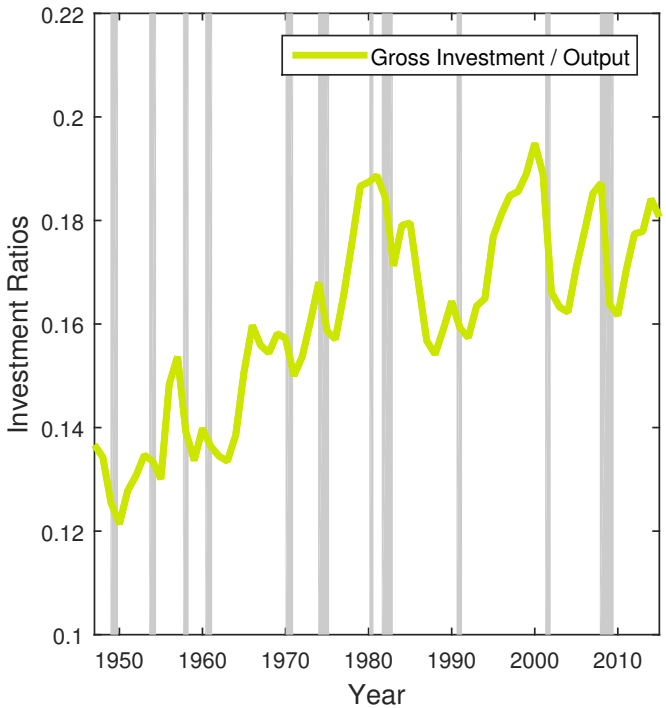
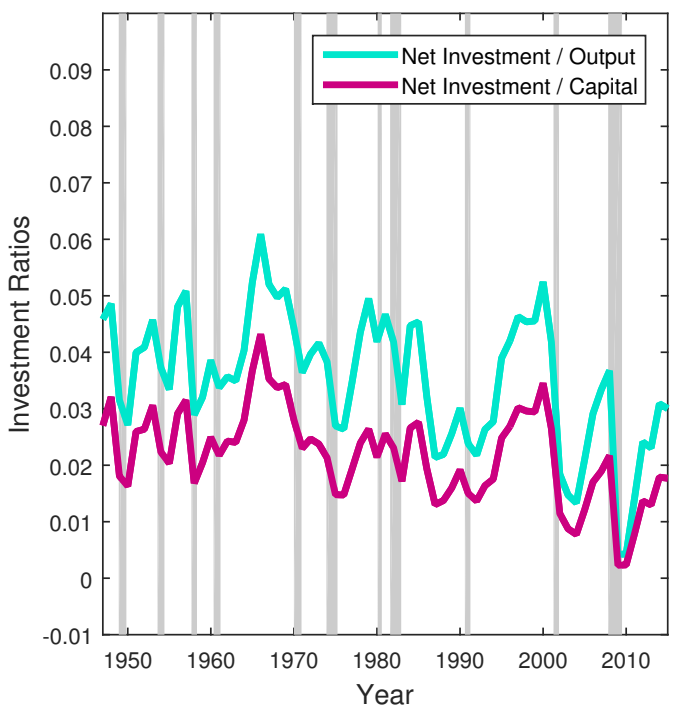


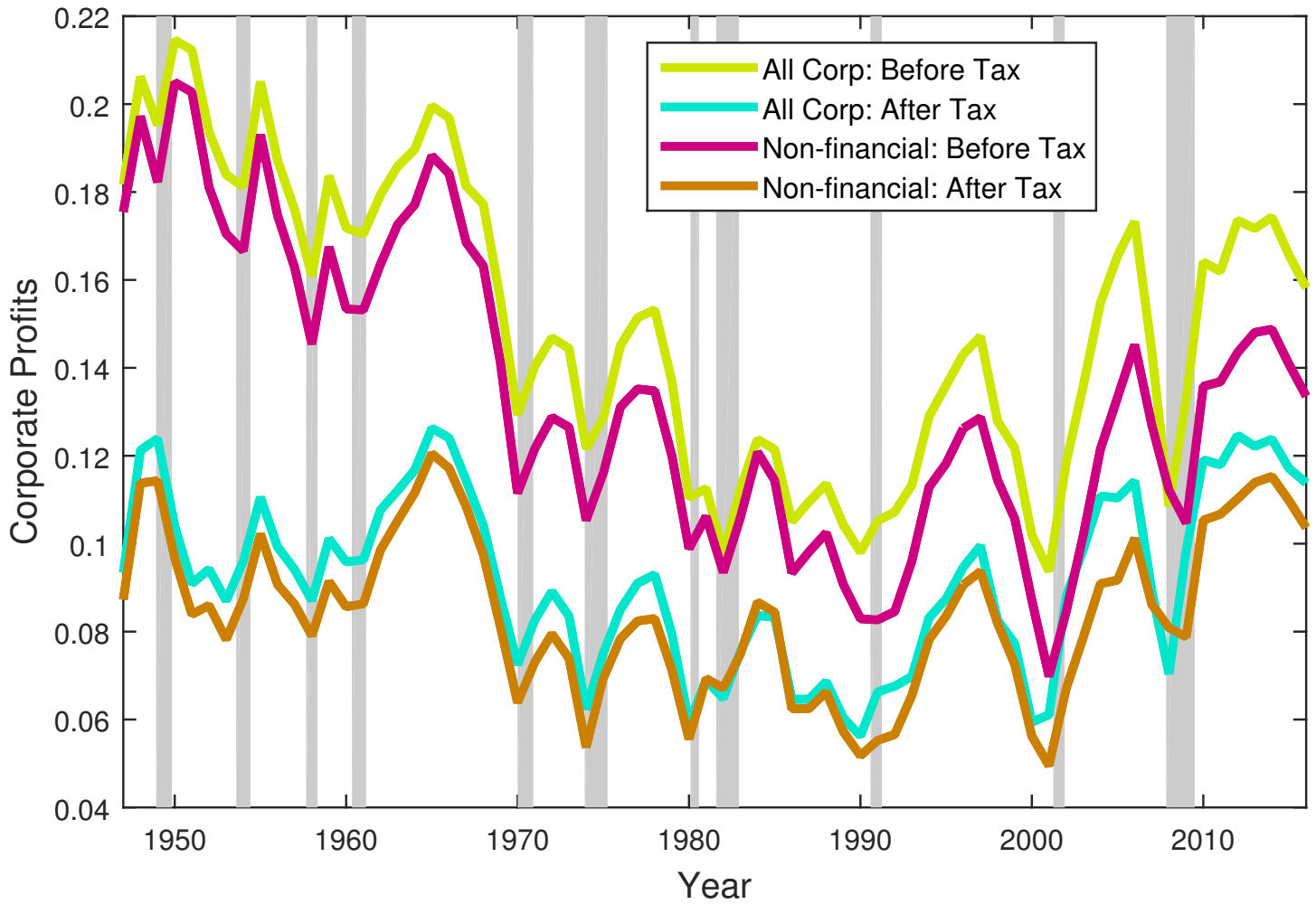
Figure: Corporate Investment





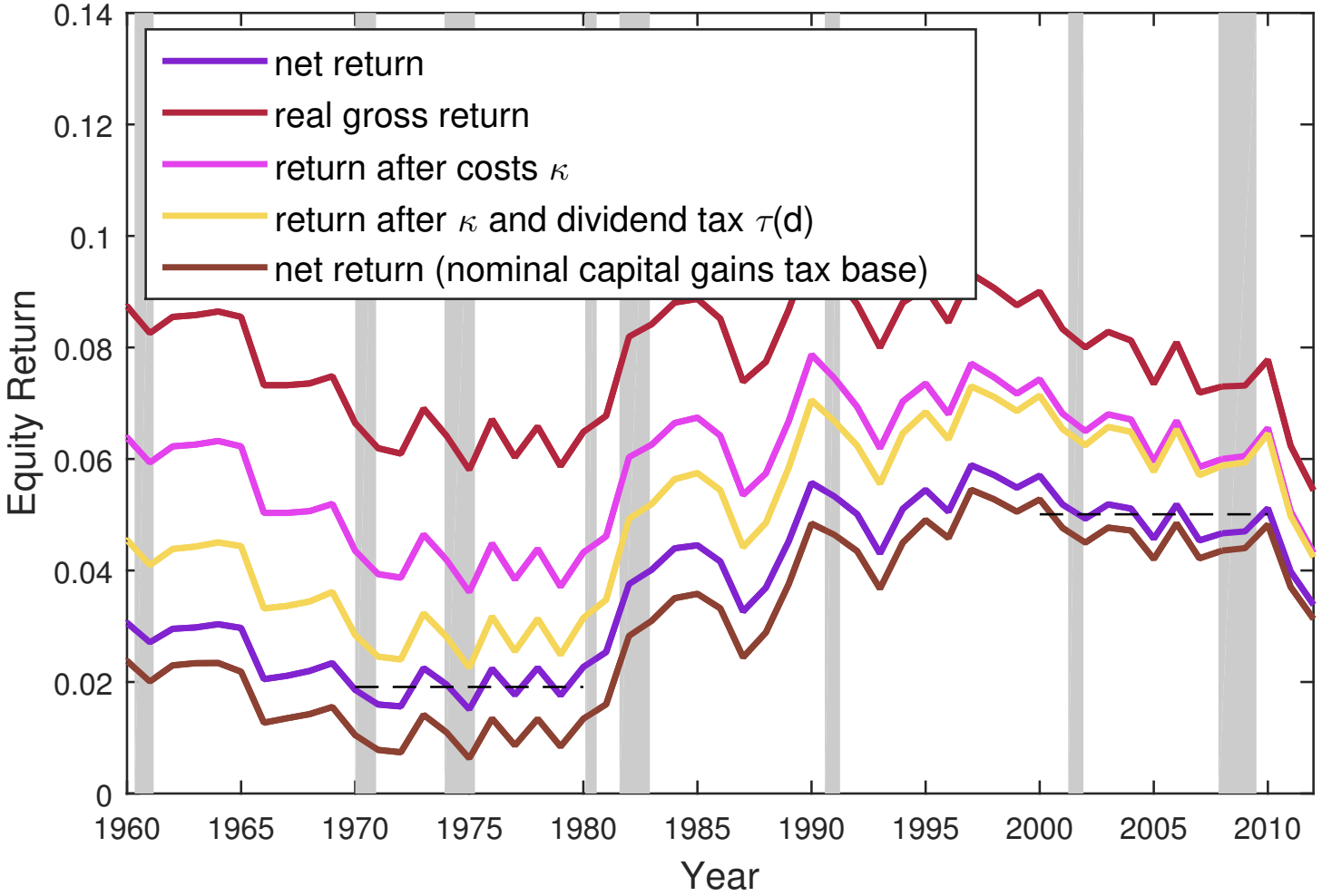
▸ stocks

Figure: Corporate Profits



returns

Figure: Returns adjustment



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