The Global Rise of Asset Prices and the Decline of the Labor Share

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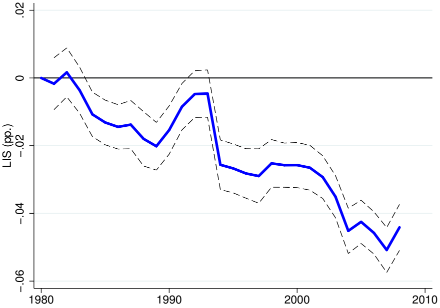
Global Labor Share Decline

Figure 1: Labor income share, 1980-2008



Notes: Own calculations obtained as year fixed effects from a GDP weighted regression including country fixed effects to control for the entry and exit of countries throughout the sample.

Motivation

- An important branch of this literature uses cross-country data and emphasizes the role of capital deepening ($\uparrow \frac{k}{y}$).
  - CES technology $\Rightarrow lis = f(\frac{k}{y})$
  - Piketty and Zucman (2014) $s > g \Rightarrow\uparrow \frac{k}{y} \Rightarrow\downarrow lis \quad \text{if} \quad \sigma > 1$
  - Karabarbounis and Neiman (2014) $\downarrow rp \Rightarrow\uparrow \frac{k}{y} \Rightarrow\downarrow lis \quad \text{if} \quad \sigma > 1$
- These mechanisms require $\sigma > 1$, but literature finds that $\sigma < 1$ (Oberfield and Raval, 2014; Chirinko and Mallick, 2017).
  - We need more theories that don't rely on capital deepening.

Our Contribution

- The "capital deepening" literature has ignored the role of valuation effects in financial assets.
- Our argument: The rise of asset valuations increases financial wealth. More financial wealth crowds out capital formation. This has a negative impact on the labor share.
  - consistent with $\sigma < 1$
- We build a simple model and show empirical evidence based on panel time series.
- We find evidence for several mechanisms that operate through the same channel.

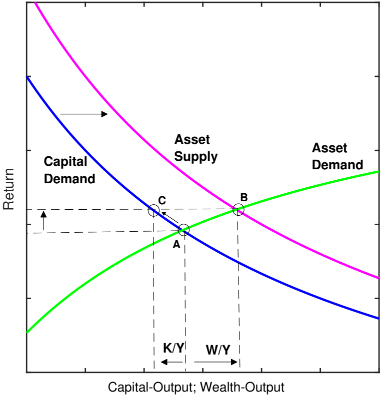
Asset Supply and Tobin's Q

- Our argument is based on the asset supply:

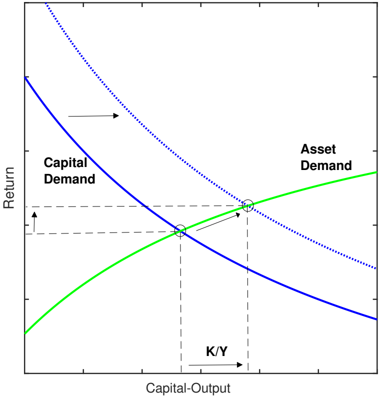
$$p(\,r\,) = Q * k(\,r\,)$$

  - An increase in Q has a positive impact on $p(r)$
  - But it can also have a negative general equilibrium effect on $k(r)$

Graphical Analysis



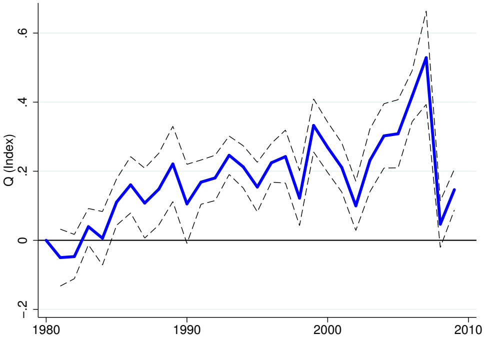
(a) Increase in Average Tobin's Q.



(b) Decline in price of capital goods

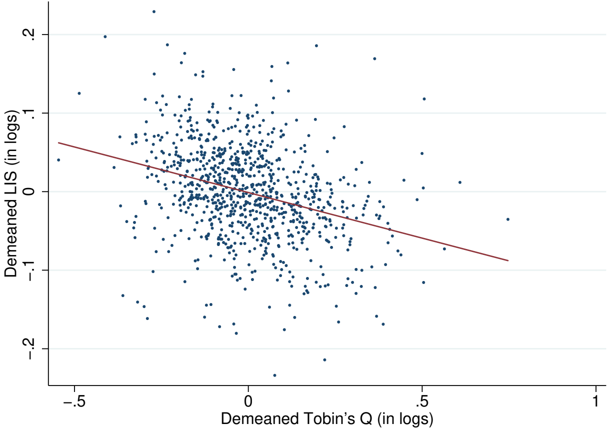
Global Tobin's Q

Figure 2: Tobin's Q, 1980-2009



Notes: Own calculations obtained as year fixed effects from a GDP weighted regression including country fixed effects to control for the entry and exit of countries throughout the sample.

Tobin's Q and Labor Income Share



Notes: Own calculation based on a sample of 41 countries and 911 observations. Variables are demeaned to control for country fixed-effects. Correlation coefficient= -0.28.

The Model

- **Capitalists**

$$V(a) = \max_{c,a'} u(c) + h(a) + \beta V(a')$$

$$s.t. \quad c + a' = (1+r)a$$

  - $a(r)$ is upward-sloping (under certain conditions)

- **Firms**

$$y = \left[\phi k^{\left(\frac{\sigma-1}{\sigma}\right)} + (1-\phi) l^{\left(\frac{\sigma-1}{\sigma}\right)}\right]^{\frac{\sigma}{\sigma-1}}$$

  - $k(r)$ is downward-sloping

The Model

- **Equilibrium (with exogenous Q)**

$$a(r^*) = p(\, r^* \,) \equiv Q * k(\, r^* \,)$$

- **Labor share:**

$$\frac{wl}{y} = g\left(\frac{k}{y}\right)$$

Equilibrium with endogenous Q

- We can endogenize Q:
  - Dividend taxes
  - Monopoly rents
  - Short-termism
- Tobin's Q (at the steady state):

$$Q(r) = (1-\tau)\left(m(\gamma, r) + \frac{F(k(r), l)}{\xi r k(r)}\right)$$

- Equilibrium

$$a(r^*) = p(r^*) \equiv Q(r^* | \tau, \xi, \gamma)\, k(r^*)$$

Data

41 countries, 1980-2009. Sample

- Tobin's Q:
  - Worldscope Database.
  - Doidge *et al.* (2013) methodology.
- Labor income share:
  - Extended Penn World Table 4.0.
  - No adjustment for mixed rents, no distinction of the corporate sector.
  - Correlation between 0.87 and 0.96 with Karabarbounis and Neiman (2014).
- Relative prices:
  - Extension of Karabarbounis and Neiman (2014) database.
  - Penn World Table 7.1 and BEA.

Empirical Implementation

- Our benchmark empirical equation:

$$lis_{it} = \beta_0 + \beta_1 q_{it} + \beta_2 rp_{it} + \Omega_{it}$$

- To avoid misspecification problems, our estimable equations will be based on:
  - Mean Group estimator

$$lis_{it} = \beta_{i0} + \beta_{i1} q_{it} + \beta_{i2} rp_{it}$$

  - Common Correlated Effects Mean Group estimator:

$$\begin{aligned} lis_{it} = {} & \beta_{i0} + \beta_{i1} q_{it} + \beta_{i2} rp_{it} \\ & + \beta_3 \overline{lis_t} + \beta_4 \overline{q_t} + \beta_5 \overline{rp_t} + \Omega_{it} \end{aligned}$$

  - And its Error Correction Model version using the Dynamic Common Correlated Effects Mean Group estimator.

	[1] 2FE	[2] CCEP	[3] MG	[4] CMG	[5] CMGt	[6] CMGt1	[7] CMGt2
lis_{t-1}	-0.176	-0.395	-0.449	-0.5	-0.694	-0.72	-0.812
	(0.026)***	(0.049)***	(0.034)***	(0.053)***	(0.061)***	(0.085)***	(0.125)***
q_{t-1}	0.011	-0.012	-0.035	-0.039	-0.067	-0.076	-0.058
	(0.013)	(0.015)	(0.014)**	(0.018)**	(0.026)**	(0.028)***	(0.033)*
rp_{t-1}	-0.032	-0.016	0.064	0.15	0.092	0.129	-0.005
	(0.024)	(0.040)	(0.070)	(0.091)*	(0.115)	(0.166)	(0.186)
Δq	-0.031	-0.033	-0.038	-0.038	-0.051	-0.053	-0.058
	(0.014)**	(0.015)**	(0.009)***	(0.012)***	(0.017)***	(0.019)***	(0.018)***
Δrp	-0.141	-0.214	-0.021	0.049	0.093	0.05	-0.11
	(0.050)***	(0.056)***	(0.065)	(0.108)	(0.099)	(0.107)	(0.095)
t			0.001		0.001	0.001	0.001
			(0.001)		(0.002)	(0.003)	(0.004)
Constant	-0.106		-0.301	-0.273	-0.277	-0.431	-0.356
	(0.018)***		(0.033)***	(0.050)***	(0.084)***	(0.089)***	(0.124)***
Number of id	30	30	30	30	30	29	26
Observations	732	732	732	732	732	700	631
R-squared	0.26	0.59					
RMSE	0.0264	0.0224	0.0191	0.0142	0.0127	0.0101	0.0067
Trends			0.23		0.20	0.21	0.23
lr-q	0.0621	-0.0307	-0.0779	-0.0785	-0.0965	-0.1061	-0.0718
se-q	0.0739	0.0357	0.0327	0.0374	0.0388	0.0405	0.0422
lr-rp	-0.1826	-0.0405	0.1417	0.2999	0.1325	0.1796	-0.0063
se-rp	0.1306	0.1016	0.1573	0.185	0.1661	0.2312	0.2285
CD test	-2.4749	-1.5637	4.9547	-0.0134	-0.2654	1.0079	1.3218
Abs Corr	0.1884	0.217	0.2038	0.2189	0.2216	0.2393	0.2466
Int	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

	[1] 2FE	[2] CCEP	[3] MG	[4] CMG	[5] CMGt	[6] CMGt1	[7] CMGt2
lis_{t-1}	-0.176	-0.395	-0.449	-0.5	-0.694	-0.72	-0.812
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q_{t-1}	0.011	-0.012	-0.035	-0.039	-0.067	-0.076	-0.058
	(0.013)	(0.015)	(0.014)**	(0.018)**	(0.026)**	(0.028)***	(0.033)*
rp_{t-1}	-0.032	-0.016	0.064	0.15	0.092	0.129	-0.005
	(0.024)	(0.040)	(0.070)	(0.091)*	(0.115)	(0.166)	(0.186)
Δq	-0.031	-0.033	-0.038	-0.038	-0.051	-0.053	-0.058
	(0.014)**	(0.015)**	(0.009)***	(0.012)***	(0.017)***	(0.019)***	(0.018)***
Δrp	-0.141	-0.214	-0.021	0.049	0.093	0.05	-0.11
	(0.050)***	(0.056)***	(0.065)	(0.108)	(0.099)	(0.107)	(0.095)
t			0.001		0.001	0.001	0.001
			(0.001)		(0.002)	(0.003)	(0.004)
Constant	-0.106		-0.301	-0.273	-0.277	-0.431	-0.356
	(0.018)***		(0.033)***	(0.050)***	(0.084)***	(0.089)***	(0.124)***
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lr-rp	-0.1826	-0.0405	0.1417	0.2999	0.1325	0.1796	-0.0063
se-rp	0.1306	0.1016	0.1573	0.185	0.1661	0.2312	0.2285
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Abs Corr	0.1884	0.217	0.2038	0.2189	0.2216	0.2393	0.2466
Int	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

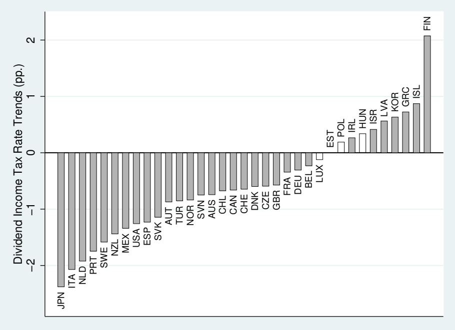
Beyond the Q: What is Behind?

- Dividend Income Tax Rate
- Market Power: The Industry Concentration Rate
- Short-termism: Corporate Governance

Dividend Income Tax Rate (I)

- Data (Max 1980-2014):
  - Dividend Income Tax Rate: OECD Tax Database
  - Capital-Output Ratio: AMECO
  - Tobin's Q: Worldscope

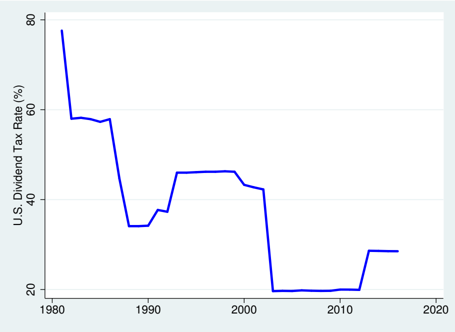
Figure 3: Country-specific Trends: Dividend Tax Rate



Notes: Own calculations obtained from $TAX_t = \alpha_0 + \alpha_1 t + \epsilon_t$, where Tax is the dividend tax rate, t is a linear trend, and *epsilon* is a classic disturbance term. The vertical axis show α_1 in %. Dark bars indicate that α_1 is significant at 5% level. Each regression only includes countries which have at least 10 observations for the period 1980-2014.

Dividend Income Tax Rate: U.S.

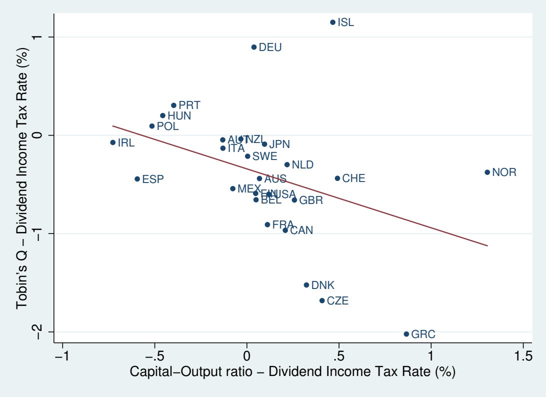
Figure 4: U.S. Dividend Tax Rate 1981-2014



Notes: Net top statutory rate to be paid at the shareholder level. This rate takes into account all types of reliefs and gross-up provisions at the shareholder level.

Dividend Income Tax Rate (II)

Figure 5: Tobin's Q, Capital-Output Ratios and Dividend Income Tax Rates



Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 TAX_t + \epsilon_t$, where X represents the Tobin's Q and the capital-output ratio in the vertical and the horizontal axis respectively. TAX is the dividend income tax rate, and ϵ is a classic disturbance term. Both axis show the coefficient α_1 in %. Both equations are constraint to have the same number of observations (Max. 1980-2014). The scatter plot is obtained after excluding outliers. An outlier is defined as an observation with a weight of 0 after using the *rreg* command in STATA.

Market Power: The Industry Concentration Rate (I)

- Data (U.S. Industry Data, 2002-2012):
  - Market Power: U.S. Economic Census
  - Capital-Output Ratio: NBER-CES Manufacturing Industry
  - Tobin's Q: Worldscope

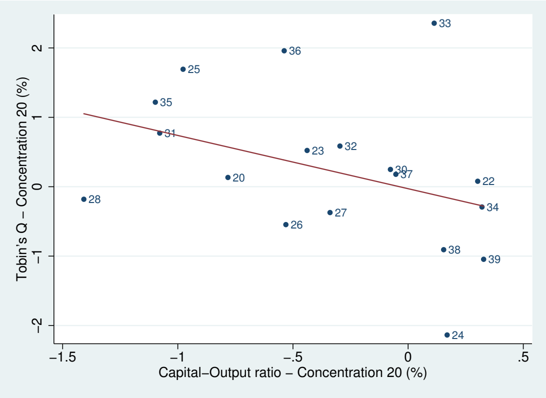
Table 1: Tobin's Q, Capital-Output Ratio and Industry Concentration

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
	Dependent variable: Δq								Dependent variable: Δky			
$\Delta Con4$	0.066				0.087				-0.153			
	(0.078)				(0.083)				(0.068)**			
$\Delta Con8$		0.088				0.120				-0.172		
		(0.109)				(0.118)				(0.087)*		
$\Delta Con20$			0.271				0.332				-0.160	
			(0.126)**				(0.134)**				(0.097)	
$\Delta Con50$				0.340				0.413				-0.099
				(0.157)**				(0.174)**				(0.094)
Constant	0.28	0.28	0.278	0.28	0.315	0.315	0.315	0.317	-0.079	-0.082	-0.083	-0.083
	(0.031)***	(0.030)***	(0.030)***	(0.031)***	(0.027)***	(0.027)***	(0.027)***	(0.028)***	(0.014)***	(0.014)***	(0.014)***	(0.015)***
R-squared	0.11	0.11	0.12	0.12	0.16	0.16	0.17	0.17	0.26	0.26	0.25	0.25
Observations	834	833	832	825	834	833	832	825	467	467	465	458
SIC4	480	480	480	473	480	480	480	473	280	280	280	273
SIC2	59	59	59	59	59	59	59	59	20	20	20	20
Sectors	6	6	6	6	6	6	6	6	1	1	1	1
Sector FE	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO
SIC2 FE	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES
TIME FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors clustered at 2-digit SIC level in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%. SIC4 and SIC2 indicate the number of groups included in the regressions classified at the 4 and 2-digit SIC level. Sectors indicates the number of groups included using the broader sector definition.

Market Power: The Industry Concentration Rate (II)

Figure 6: Tobins' Q, Capital-Output Ratios and Industry Concentration



Notes: Own calculations obtained from $\Delta \ln (X_{it}) = \alpha_0 + \alpha_1 \Delta \ln (ConY_{it}) + \epsilon_{it},$, where X represents the Tobin's Q and the capital-output ratio in the vertical and the horizontal axis respectively. $Con20$ is the share of sales of the 20 largest companies in the industry, and ϵ is a classic disturbance term. Both axis show the coefficient α_1 in %. Both equations are constraint to have the same number of observations. The scatter plot is obtained after excluding outliers. An outlier is defined as an observation with a weight of 0 after using the *rreg* command in STATA.

Market Power: International Markups

Table 2: Markups: International Comparison (1980-2014)

	[1] 2FE	[2] MG	[3] CMG	[4] CMGt	[5] 2FE	[6] MG	[7] CMG	[8] CMGt	[9] 2FE	[10] MG	[11] CMG	[12] CMGt
	Dependent variable: Δq				Dependent variable: Δky				Dependent variable: Δlis			
X_{t-1}	-0.293	-0.55	-0.558	-0.627	-0.031	-0.162	-0.086	-0.254	-0.206	-0.414	-0.351	-0.444
	(0.059)***	(0.049)***	(0.069)***	(0.070)***	(0.014)**	(0.034)***	(0.037)**	(0.040)***	(0.046)***	(0.044)***	(0.054)***	(0.067)***
$markup_{t-1}$	0.117	0.526	0.426	0.505	-0.066	-0.084	-0.112	-0.051	-0.133	-0.227	-0.229	-0.268
	(0.052)**	(0.135)***	(0.203)**	(0.238)**	(0.033)*	(0.040)**	(0.027)***	(0.030)*	(0.050)**	(0.045)***	(0.034)***	(0.056)***
$\Delta markup_t$	0.021	-0.094	0.005	0.088	0.158	0.363	0.175	0.15	-0.168	-0.015	-0.133	-0.139
	(0.106)	(0.222)	(0.229)	(0.272)	(0.045)***	(0.042)***	(0.028)***	(0.031)***	(0.070)**	(0.061)	(0.069)*	(0.071)*
t		-0.001		0.0001		0.0001		-0.001		-0.001		-0.001
		(0.002)		(0.002)		(0.000)		(0.001)		(0.000)		(0.001)
Constant	-0.147	-0.431	-0.215	-0.118	0.106	0.265	0.047	0.119	0.003	-0.037	0.004	-0.149
	(0.047)***	(0.167)***	(0.277)	(0.431)	(0.030)***	(0.043)***	(0.034)	(0.044)***	(0.028)	(0.053)	(0.033)	(0.086)*
Number of id	31	31	31	31	25	25	25	25	17	17	17	17
Observations	710	710	710	710	572	572	572	572	404	404	404	404
R-squared	0.43				0.61				0.4			
RMSE	0.1029	0.0982	0.0706	0.0652	0.0137	0.013	0.0082	0.0074	0.02	0.0173	0.0137	0.013
lr-*markup*	0.4009	0.9562	0.7644	0.8051	-2.099	-0.5162	-1.2963	-0.2011	-0.6487	-0.5494	-0.6526	-0.6039
se-*markup*	0.1838	0.2591	0.3751	0.3905	1.6899	0.268	0.6427	0.1216	0.1444	0.1231	0.1399	0.1562
Trend		0.29		0.1		0.32		0.36		0.12		0.29
CD test	-2.3471	28.0625	-0.4653	-0.9004	-2.5823	14.3125	-2.1381	-0.7576	-3.0758	3.6063	-1.5579	-1.6566
Abs Corr	0.2702	0.3476	0.238	0.2365	0.2708	0.2774	0.217	0.2357	0.2116	0.1994	0.2286	0.236

Corporate Governance (I)

- Data (U.S. Firm Level and Cross-Country, 2002-2014):
  - Corporate Governance: Asset4 ESG Database
  - Investment: Worldscope
  - Capital-Output Ratio: AMECO
  - Tobin's Q: Worldscope

Figure 7: Tobin's Q, Investment and Corporate Governance (U.S.)

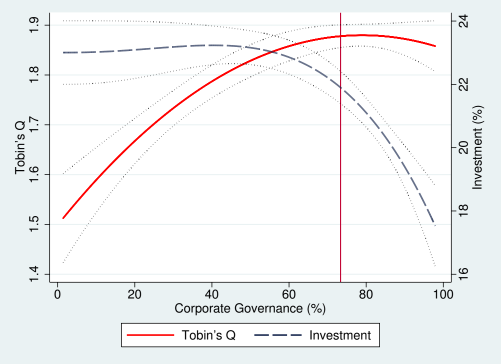
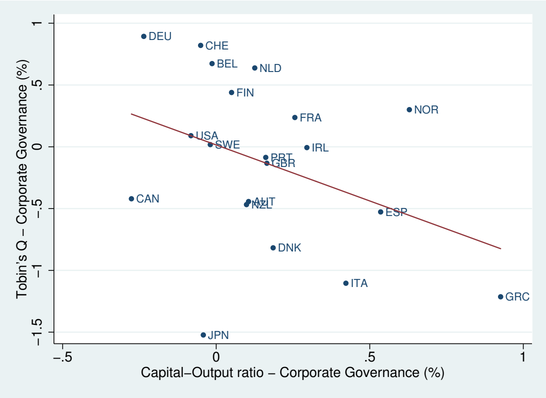


Table 3: Tobin's Q, Investment and Corporate Governance (U.S.)

Panel A	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Dependent variable: q						
GOV_{t-1}	0.170	0.178	0.187	0.160	0.083	0.151	0.112
	(0.044)***	(0.047)***	(0.048)***	(0.051)***	(0.036)**	(0.045)***	(0.040)***
Constant	0.350	0.446	0.340	0.358	0.409	0.377	0.446
	(0.029)***	(0.029)***	(0.032)***	(0.034)***	(0.024)***	(0.031)***	(0.026)***
R-squared	0.25	0.28	0.33	0.48	0.42	0.44	0.5
Panel B	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**
	Dependent variable: INV						
GOV_{t-1}	-0.042	-0.044	-0.046	-0.039	-0.044	-0.043	-0.050
	(0.019)**	(0.019)**	(0.019)**	(0.018)**	(0.018)**	(0.017)**	(0.019)***
Constant	0.242	0.218	0.245	0.241	0.244	0.245	0.261
	(0.013)***	(0.014)***	(0.013)***	(0.012)***	(0.012)***	(0.011)***	(0.012)***
R-squared	0.09	0.1	0.14	0.25	0.18	0.19	0.22
Observations	12574	12574	12574	12574	12574	12574	12574
Firms	1683	1683	1683	1683	1683	1683	1683
SIC4	365	365	365	365	365	365	365
SIC3	212	212	212	212	212	212	212
SIC2	62	62	62	62	62	62	62
SIC2 FE	YES	YES	NO	NO	NO	NO	NO
SIC3 FE	NO	NO	NO	NO	NO	YES	NO
SIC4 FE	NO	NO	NO	NO	YES	NO	YES
Time FE	NO	YES	NO	NO	NO	NO	NO
SIC2*Time	NO	NO	YES	NO	NO	YES	YES
SIC3*Time	NO	NO	NO	YES	NO	NO	NO

Corporate Governance (II)

Figure 8: Tobin's Q, Capital-Output ratio and Corporate Governance (II)



Notes: Own calculations obtained from $\ln(X_t) = \alpha_0 + \alpha_1 GOV_t + \epsilon_t$, where X represents the Tobin's Q and the capital-output ratio in the vertical and the horizontal axis respectively. GOV is the corporate governance index, and ϵ is a classic disturbance term. Both axis show the coefficient α_1 in %. Both equations are constraint to have the same number of observations. Each regression only includes countries which have at least 10 observations for the period 2002-2014. The scatter plot is obtained after excluding outliers. An outlier is defined as an observation with a weight of 0 after using the *rreg* command in STATA.

Conclusions

- Our model emphasizes the role of financial wealth in explaining the decline of the labor share within a standard capital-output framework.
- We find that relative prices of investment are not relevant.
- Indeed, our model suggests that the problem is not too much physical capital, but the increase of financial wealth at the expense of real investment.
  - Consistent with values of $\sigma < 1$.
- Policies aiming at reversing the trend should target the way financial markets and corporations behave.

Additional Materials

Capital-Output ratio

Figure A.1: Capital-Output ratio 1980-2009

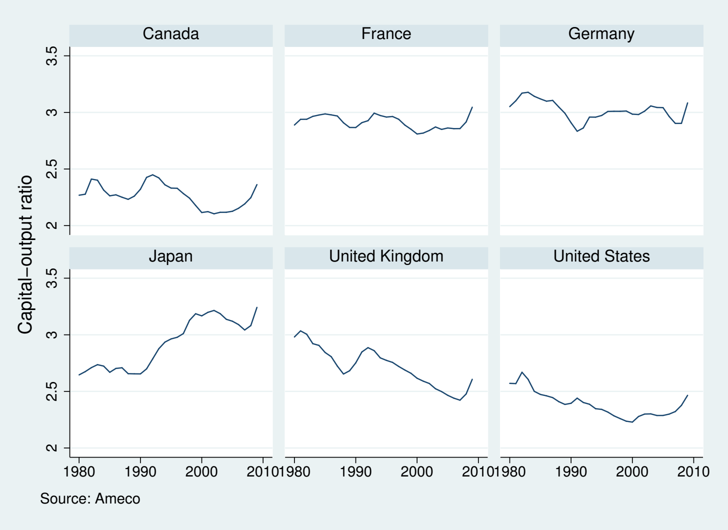


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Table A.1: Selected economies and sample period

id	Country	Sample period	id	Country	Sample period
1	Australia**	1980-2008	22	Luxembourg*	1991-2008
2	Austria**	1980-2008	23	Mexico**	1988-2008
3	Belgium**	1980-2008	24	Morocco	1998-2007
4	Brazil*	1992-2008	25	Netherlands**	1980-2008
5	Canada**	1980-2008	26	New Zealand**	1986-2008
6	Chile*	1990-2008	27	Norway**	1980-2007
7	China	1995-2007	28	Peru	1992-2003
8	Colombia	1993-2007	29	Philippines**	1988-2008
9	Denmark**	1980-2009	30	Poland	1995-2008
10	Finland**	1987-2009	31	Portugal**	1988-2009
11	France**	1980-2009	32	South Africa**	1980-2008
12	Germany**	1983-2008	33	Spain**	1986-2008
13	Greece**	1988-2009	34	Sri Lanka	1994-2008
14	Hong Kong**	1980-2003	35	Sweden**	1982-2009
15	Hungary	1995-2008	36	Switzerland**	1980-2007
16	India*	1991-2008	37	Thailand	1988-2003
17	Ireland**	1981-2008	38	Turkey	1990-2003
18	Israel	1993, 1995-2008	39	UK**	1980-2008
19	Italy**	1980-2008	40	US**	1980-2008
20	Japan**	1980-2007	41	Venezuela	1992-2006
21	Korea**	1980-2003			

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Pesaran (2004) CD test

Table A.2: Cross-section dependence tests

a) Levels:				b) Diff:			
Variable	*lis*	*q*	*rp*	Variable	Δlis	Δq	Δrp
CD-test	16.73	29.76	42.37	CD-test	12.99	34.45	6.66
p-value	0.00	0.00	0.00	*p*-value	0.00	0.00	0.00
corr	0.132	0.250	0.345	corr	0.11	0.296	0.049
abs(corr)	0.472	0.394	0.558	abs(corr)	0.235	0.349	0.223

c) Het. AR(2)				d) Het. AR(2) CCE			
Variable	*lis*	*q*	*rp*	Variable	*lis*	*q*	*rp*
CD-test	9.93	33.58	3.40	CD-test	-0.24	-0.66	-2.38
p-value	0.00	0.00	0.00	*p*-value	0.81	0.51	0.02
corr	0.088	0.301	0.027	corr	-0.006	-0.011	-0.023
abs(corr)	0.243	0.344	0.213	abs(corr)	0.220	0.237	0.213

Notes: CD-test shows the Pesaran (2004) cross-section dependence statistic, which follows a $N(0,1)$ distribution. H_0 = cross-section independence. corr, and abs(corr) report, respectively, the average and average absolute correlation coefficients across the $N(N-1)$ set of correlations.

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Pesaran (2007) CIPS Unit Root Test

Table A.3: Unit root tests

a) Pesaran (2007) CIPS test: Constant

Lags	*lis*	(*p*)	*q*	(*p*)	*rp*	(*p*)
0	0.431	0.667	-2.744	0.003	-0.118	0.453
1	-0.207	0.418	-2.405	0.008	-0.141	0.444
2	-1.199	0.115	0.103	0.541	0.655	0.744
3	1.802	0.964	2.942	0.998	2.254	0.988
4	5.477	1.000	6.091	1.000	7.211	1.000

b) Pesaran (2007) CIPS test: Constant and deterministic trend

Lags	*lis*	(*p*)	*q*	(*p*)	*rp*	(*p*)
0	1.044	0.852	-2.068	0.019	2.483	0.993
1	0.390	0.652	-1.628	0.052	2.052	0.980
2	-0.033	0.487	1.304	0.904	0.998	0.841
3	5.280	1.000	6.785	1.000	6.006	1.000
4	8.090	1.000	8.949	1.000	9.127	1.000

Notes: Pesaran (2007) CIPS test values are obtained from the standardised Z-tbar statistic. H_0 = nonstationarity. Lags indicates the number of lags included in the ADF regression.

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Intuition

$$y_{it} = \beta_i x_{it} + \phi_i f_t + \psi_i + \varepsilon_{it}, \tag{A.1}$$

$$\overline{y_t} = \overline{\beta}\overline{x_t} + \overline{\phi} f_t + \overline{\psi}, \qquad \overline{\varepsilon_t} \to 0 \quad \text{as} \quad N \to \infty \tag{A.2}$$

$$f_t = \overline{\phi}^{-1}(\overline{y_t} - \overline{\psi} - \overline{\beta}\overline{x_t}) \tag{A.3}$$

Substitution for f_t in equation (A.1):

$$y_{it} = \beta_i x_{it} + \phi_i \overline{\phi}^{-1}(\overline{y_t} - \overline{\psi} - \overline{\beta}\overline{x_t}) + \varepsilon_{it}, \tag{A.4}$$

$$y_{it} = \beta_i x_{it} + \Pi_{1i}\overline{y_t} + \Pi_{2i}\overline{x_t} + \Pi_{3i} + \varepsilon_{it} \tag{A.5}$$

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Table A.4: Error Correction Model: WID Q

	[1] 2FE	[2] CCEP	[3] MG	[4] CMG	[5] CMGt	[6] CMGt1	[7] CMGt2
lis_{t-1}	-0.136	-0.192	-0.461	-0.442	-0.579	-0.714	-0.958
	(0.047)***	(0.068)***	(0.111)***	(0.112)***	(0.155)***	(0.181)***	(0.337)***
q_{t-1}	-0.001	-0.003	-0.039	-0.001	-0.05	-0.066	-0.135
	(0.009)	(0.012)	(0.036)	(0.007)	(0.029)*	(0.038)*	(0.078)*
rp_{t-1}	0.043	0.075	0.151	0.108	-0.019	-0.044	0.296
	(0.032)	(0.055)	(0.108)	(0.093)	(0.054)	(0.124)	(0.461)
Δq	-0.039	-0.052	-0.061	-0.043	-0.042	-0.049	-0.091
	(0.018)**	(0.022)**	(0.039)	(0.018)**	(0.010)***	(0.020)**	(0.036)**
Δrp	0.088	0.078	-0.062	0.038	0.02	0.158	0.094
	(0.076)	(0.080)	(0.104)	(0.077)	(0.075)	(0.054)***	(0.297)
t			0.001		0.002	0.001	-0.002
			(0.001)		(0.003)	(0.004)	(0.004)
Constant	-0.066		-0.349	0.048	0.143	0.273	0.181
	(0.034)*		(0.082)***	(0.129)	(0.130)	(0.179)	(0.253)
Number of id	9	9	9	7	7	7	6
Observations	199	199	199	175	175	171	149
R-squared	0.51	0.75					
RMSE	0.0124	0.0098	0.0106	0.0067	0.0061	0.0051	0.0039
Trends			0.22		0.43	0.14	0
lr-q	-0.0052	-0.0164	-0.0847	-0.0011	-0.0863	-0.0919	-0.1404
se-q	0.065	0.0599	0.0799	0.0149	0.0556	0.0576	0.0949
lr-rp	0.3149	0.3911	0.3266	0.2434	-0.0324	-0.062	0.3092
se-rp	0.2716	0.3177	0.247	0.2199	0.0938	0.1747	0.4931
CD test	-3.8732	-2.7485	3.7987	-2.0474	-2.347	-2.4567	-1.9305
Abs Corr	0.2378	0.2169	0.3325	0.2104	0.2141	0.2757	0.2229
Int	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

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Weak Exogeneity Test

We estimate an informal causality test based on the Granger Representation Theorem (GRT), which states that cointegrated series can be represented in the form of an ECM, which in our case is:

$$\Delta lis_{it} = \alpha_{1i} + \lambda_{11}\hat{u}_{i,t-j} + \sum_{j=1}^{K}\phi_{11ij}lis_{i,t-j} + \sum_{j=1}^{K}\phi_{12ij}q_{i,t-j}\sum_{j=1}^{K}\phi_{13ij}rp_{i,t-j} + \epsilon_{1it},$$

$$\Delta q_{it} = \alpha_{2i} + \lambda_{21}\hat{u}_{i,t-j} + \sum_{j=1}^{K}\phi_{21ij}lis_{i,t-j} + \sum_{j=1}^{K}\phi_{22ij}q_{i,t-j}\sum_{j=1}^{K}\phi_{23ij}rp_{i,t-j} + \epsilon_{2it},$$

$$\Delta rp_{it} = \alpha_{3i} + \lambda_{31}\hat{u}_{i,t-j} + \sum_{j=1}^{K}\phi_{31ij}lis_{i,t-j} + \sum_{j=1}^{K}\phi_{32ij}q_{i,t-j}\sum_{j=1}^{K}\phi_{33ij}rp_{i,t-j} + \epsilon_{3it},$$

where $\hat{u}_{it} = lis_{it} - \hat{\beta}_{1i}q_{it} + \hat{\beta}_{2i}rp_{it}$ is the disequilibrium term.

Table A.5: Weak exogeneity test

Model		no CA			CA		
		lis	*q*	*rp*	*lis*	*q*	*rp*
MG	Avg. λ	-0.52	-0.45	0.02	-0.50	-0.41	-0.04
	ρ	0.00	0.03*	0.48	0.00	0.21	0.60
CMG	Avg. λ	-0.57	-0.40	-0.01	-0.51	-0.54	0.00
	ρ	0.00	0.15	0.83	0.00	0.18	0.94
CMGt	Avg. λ	-0.75	-0.65	0.00	-0.69	-0.74	-0.04
	ρ	0.00	0.01*	0.98	0.00	0.12	0.72
CMG1	Avg. λ	-0.59	-0.23	0.04	-0.51	-0.58	0.03
	ρ	0.00	0.52	0.24	0.00	0.13	0.61
CMGt1	Avg. λ	-0.77	-0.12	0.06	-0.75	-0.60	0.05
	ρ	0.00	0.75	0.19	0.00	0.19	0.38
CMG2	Avg. λ	-0.73	-0.42	-0.07	-0.64	-1.04	-0.05
	ρ	0.00	0.32	0.09*	0.00	0.04*	0.56
CMGt2	Avg. λ	-0.93	-0.46	0.06	-0.82	-1.20	0.05
	ρ	0.00	0.29	0.25	0.00	0.01*	0.44

Notes: Avg. λ shows the robust mean coefficient for the disequilibrium term on the ECM. Asterisks highlight cases which do not support a causality relationship for our analysis.

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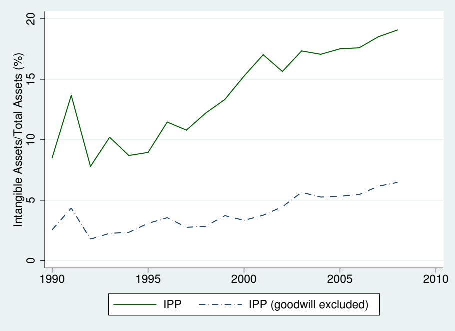
Intangible Assets

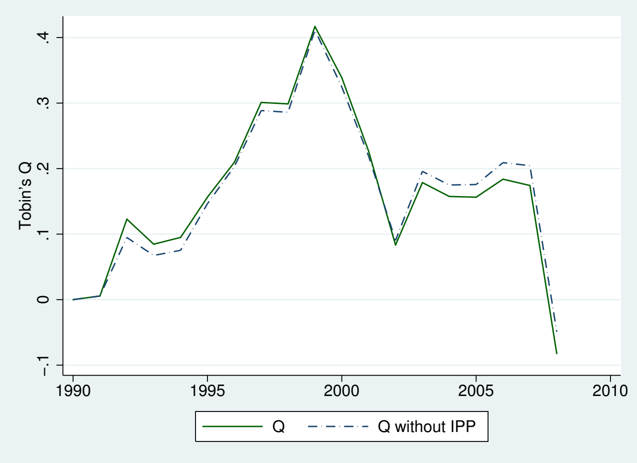
- Koh *et al.* (2016) claim that IPP products can explain 100% of the U.S. labor share decline.
- IPP assets can bias the Tobin's Q if there are measurement problems (but also through equilibrium mechanisms Gonzalez and Trivin, 2017).
- Tobin's Q raise could be accounting for the increasing importance of IPP products.

Figure A.2: Intangible Assets Intensity (1990-2008)



Intangible Assets

Figure A.3: U.S. Tobin's Q with and without IPP



Notes: Market value weighted average Q. 4-digit SIC industry fixed effects.

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