

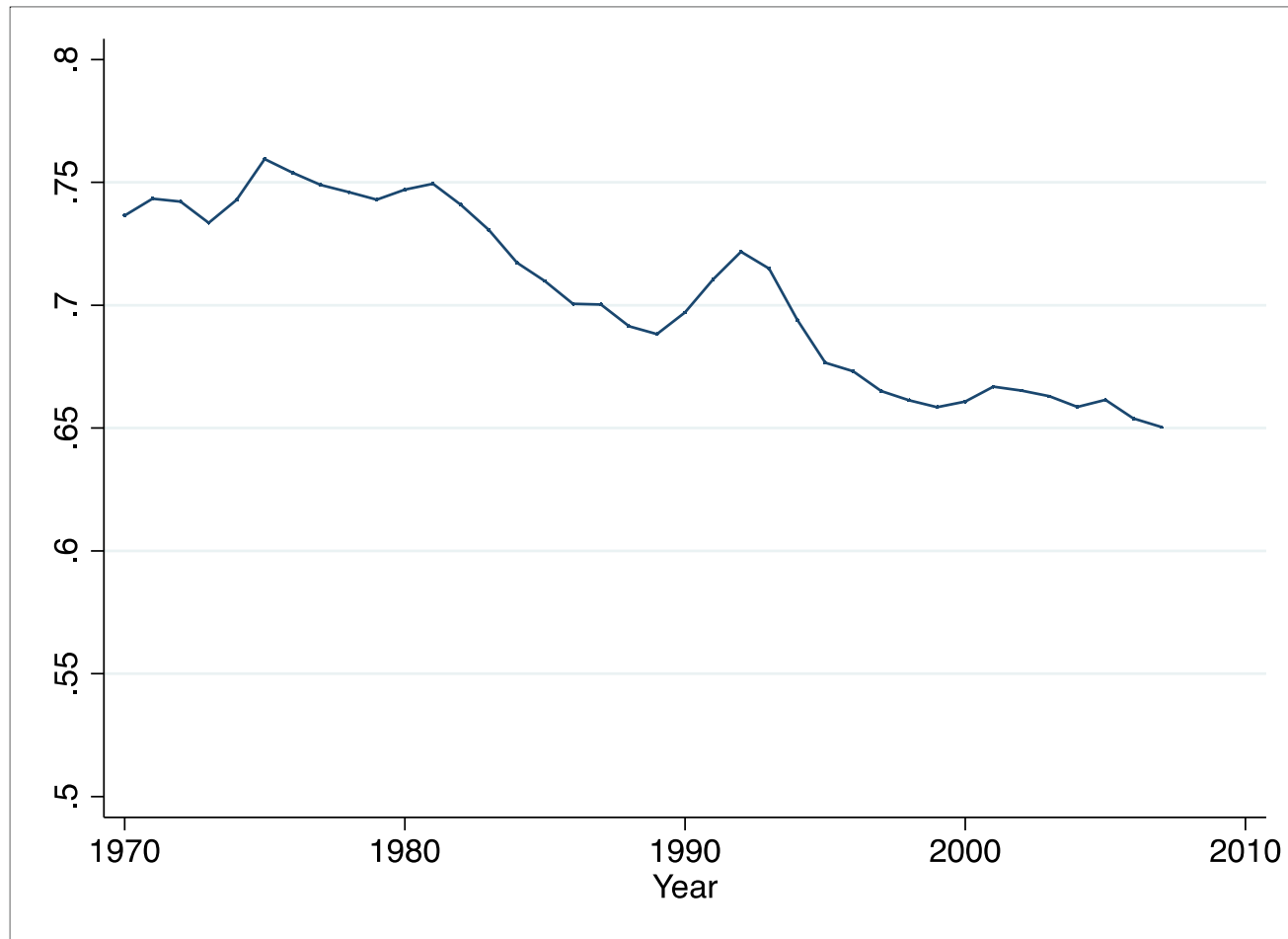
Technology, Intangible Assets and the Decline in the Labour Share

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Labour share dynamics in OECD countries, (1970-2007)

Wage bill as a share of GDP, average across countries



What factors affect the movements of the labour shares?

- **Technological change:** new technologies /robotization (Bentolila & Saint Paul, 2003; Karabourbonis & Neiman, 2014; Acemoglu & Restrepo, 2017)
- **Market regulations** (Blanchard & Giavazzi 2003, Checchi and Penalosa, 2010, Bassanini and Manfredi 2012);
- **Globalization** (Elsby et al. 2013, Haskel et al. 2012)
- **Focus on Capital Share.**
 - **Profits and Market concentration:** (Barkai 2016; Autor et al. 2017)
- **Return to unmeasured intangible capital – capital heterogeneity**

Objectives of the paper

- Expand on the concept of **‘capital’**
Substitution/complementarity effects – better understanding of how different types of capital assets are driving the labour share
- **Technology:** need to distinguish between long and short-run effects/trend and cyclical components
- **Econometrics:** Address the time series properties of the data, and endogeneity

Analytical framework

Previous models:

focus on single inputs (L and K) within a CES framework

If include types of K then all are substitutes or complements with L

Alternative analytical framework:

Use a two sector model with each using different types of capital and labour.

For example, a high tech sector could use knowledge capital and skilled labour and a traditional sector could use unskilled labour and tangible capital.



We show that assets can be substitutes or complements with aggregate economy L depending on the share of each sector in aggregate activity.

Structure of the empirical analysis

Part 1: data covering a long time period (1970-2007) & fully dynamic specification. We account for ICT and non-ICT capital, as well as knowledge intensive capital (R&D and patents)

Part 2: includes new data on a broader range of intangible assets, but estimation confined to 1995-2007 period.

In both, the labour share is defined as the ratio of total compensation (including non-wage labour costs) to gross value added, including an imputation for the self employed.

Empirical specification

Static model with two types of capital:

$$\ln LS_{ijt} = \alpha_{0ij} + \alpha_1 \ln A_{ijt} + \alpha_2 \ln \tilde{k}_{N,ijt} + \alpha_3 \ln \tilde{k}_{I,ijt} + \varepsilon_{ijt}$$

$$LS = \frac{wL}{Y} \qquad \tilde{k} = \frac{K}{Y}$$

We also add different measures of intangible capital:

Part 1: R&D stock as a broad measures of intangible capital

Part 2: CHS measures of Innovative property and economic competencies

Estimation method

The static model is affected by three main specifications issues (Eberhardt and Bond 2013):

- Variable non-stationarity
- Parameter heterogeneity
- Cross-sectional dependence (CSD)

ECM specification, with controls for cross-sectional dependence (AMG) – Eberhardt and Teal (2013):

$$\Delta \ln S_{Lijt} = \gamma_{0jt} + \gamma_1 \Delta \ln TFP_{ijt} + \gamma_2 \Delta \ln \tilde{k}_{ijt} + \gamma_3 \ln S_{Lijt-1} + \gamma_4 \ln TFP_{ijt-1} + \gamma_5 \ln \tilde{k}_{ijt-1} + \varepsilon_{ijt}$$

and similarly with different types of capital

Data

Part 1

- 14 EU countries + US + Japan, 20 industries per country.
Time: 1970-2007
- EUKLEMS: labour shares (total compensation/VA), including non wage labour costs and remuneration of self-employed, capital (ict and non-ict)
- OECD ANBERD: R&D

Part 2

- Similar EUKLEMS data for 1995-2007
- Intangible capital, based on industry estimates from Niebel et al. (2018) and INTANInvest

In both parts we also include a division of labour into skilled (university educated) and low/intermediate skilled

Long-run coefficients – Part 1

Explanatory variables	Homogeneous coefficients	Heterogeneous Coefficients AMG	
	(1)	(2)	(3)
Total Factor Productivity (TFP)	-0.187*** (0.000)	-0.395*** (0.000)	-0.457*** (0.000)
Total capital/ value added	-0.010 (0.666)	-0.070** (0.016)	
Non-ICT capital/value added			-0.022 (0.653)
ICT capital/ value added			-0.037*** (0.000)
ECM	-0.134*** (0.000)	-0.515*** (0.000)	-0.632*** (0.000)
Obs	8620	8620	8620
Groups	340	340	340

P values in brackets

Introducing knowledge capital

	Total LS	Low/intermediate skilled LS	High skilled LS
	(1)	(2)	(3)
TFP	-0.372*** (0.000)	-0.345*** (0.000)	-0.474*** (0.000)
Non-ICT Cap. /VA	-0.003 (0.093)	-0.046 (0.523)	0.082 (0.529)
ICT Cap./VA	-0.045** (0.000)	-0.065*** (0.000)	-0.036 (0.230)
Knowledge Cap. /VA	0.052** (0.014)	0.035 (0.121)	0.005 (0.899)
ECM	-0.745*** (0.000)	-0.774*** (0.000)	-0.763*** (0.000)
Obs	4648	4018	4018
Groups	171	158	158

P values in brackets

Part 2 Estimation

- Reduced time period in this sample (1995-2007) prevents the use of mean group estimators
- Fixed effect estimator, with controls for first order serial correlation (Prais-Winsten estimator)
- Distinguish between **trend** and **cyclical** TFP component – using Hodrick-Prescott filter
- We also attempt to address endogeneity issues, using regulation measures (telecoms, architectural and engineering services, legal and accounting services) weighted by intensity of use.

THE IMPACT OF INTANGIBLE ASSETS ON LABOUR SHARES

	Total LS		Low/intermediate skilled LS	Skilled LS
TFP - trend	-0.209*** (0.027)	-0.185*** (0.027)	-0.271*** (0.031)	0.316*** (0.049)
TFP - cycle	-0.578*** (0.030)	-0.536*** (0.031)	-0.509*** (0.036)	-0.306*** (0.057)
Non-ICT cap/VA	0.000 (0.022)	-0.003 (0.022)	0.065** (0.026)	0.056* (0.033)
ICT cap./VA	-0.0125*** (0.004)	-0.0132*** (0.004)	-0.071*** (0.004)	0.166*** (0.008)
Intangibles/VA	-0.034*** (0.012)			
Innovative properties/VA		0.064*** (0.018)	0.093*** (0.021)	-0.023 (0.031)
Econ. Competencies/VA		-0.046*** (0.017)	-0.072*** (0.020)	0.095*** (0.031)
Observations	4,120	4,120	4,120	4,120
R-squared	0.902	0.900	0.982	0.912

Standard errors in brackets

THE IMPACT OF INTANGIBLE ASSETS ON LABOUR SHARES: IV ESTIMATES

	Total LS	Low/intermediate skilled LS	Skilled LS
TFP - trend	-0.3437***	-0.4651***	0.0463
	(0.0739)	(0.1338)	(0.1368)
TFP - cycle	-0.6611***	-0.7234***	-0.4735***
	(0.0792)	(0.1403)	(0.1439)
Non-ICT cap/VA	0.0256	0.1016*	0.1203***
	(0.0271)	(0.0530)	(0.0374)
ICT cap./VA	0.0171*	-0.0600***	0.2188***
	(0.0091)	(0.0159)	(0.0176)
Intangibles/VA			
Innovative properties/VA	0.0929	0.2356	-0.5889***
	(0.0943)	(0.1542)	(0.1556)
Econ. Competencies/VA	-0.3354***	-0.5320***	0.1976
	(0.0705)	(0.1211)	(0.1356)
Observations	3,580	3,580	3,580
Hansen J test	0.303	0.405	0.670
Hansen P value	0.582	0.525	0.413
Kleibergen-Paap LM statistic	102.205	49.567	103.372
Kleibergen-Paap P value	0.000	0.000	0.000

Standard errors in brackets

Conclusions

- Focusing on heterogeneous capital suggests the labour share depends on different types of capital.
- Substitution/complementarity effects depend on the type of capital asset.
- ICT capital appears to dominate in terms of the long run decline (negative). Intangible capital is also important but has heterogeneous effects
- The estimates suggest that, of the decline in average labour share from 0.63 in 1995 to 0.60 in 2007, about 20% is due to using more ICT capital and 10% from using more intangible capital
- Within intangibles, those complementary with ICT, economic competencies, are associated with a decline in labour's share whereas knowledge capital is associated with an increase

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