

Labor shares in the EU - sectoral effects and the role of relative prices

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- The labor share is the fraction of domestic income that goes to labor compensation
 - It is important both as an indicator of income distribution, and for macroeconomic modeling
 - A large literature documents and interprets labor share trends over the last decades
- Our goal is to examine labor share in the European Union, both at the aggregate and at the sectoral level

- In many countries, the labor share has fallen, although the exact details and explanations are disputed
 - Measurement: Bridgman (2018) and Rognlie (2015)
 - Globalization, fdi, global trade: Elsby, Hobijn and Sahin (2013), Decreuse and Maarek (2015)
 - Technological progress: Karabarbounis and Neiman (2014), Alvarez-Cuadrado, Van Long and Poschke (2018)
 - Superstar firms: Autor, Dorn, Katz, Patterson and Van Reenen (2017)
 - Weakening trade unions: IMF (2017), Koeniger, Leonardi, and Nunziata. (2007)

- We contribute to this literature by
 - Providing a comprehensive picture for the European Union and the new member states in particular in 1995-2018
 - Identifying various sources of measurement problems
 - Decomposing the aggregate labor share along various sectoral dimensions
 - Calling attention to the role of relative prices in understanding/explaining cross-country differences in the LS
 - Interpreting the findings in a simple modeling framework

- Eurostat
 - National accounts, PPPs
 - Sectoral value added, employment and hours
- EU-KLEMS 2017, 2007
 - Sectoral value added, employment and hours
- New and updated data has become available recently, and we are still incorporating that into the paper ...

- A major issue: how to split the mixed income (income of self-employed?)

$$VA = COMP + GOS + MIXED$$

- COMP: compensation of employees
 - VA: gross value added at factor cost
 - GOS: gross operating surplus
 - HEMP: total hours worked by the employed
 - HEMPE: total hours worked by employees
- Self-employed do not report capital and labor income separately

- Unadjusted labor share

$$LS^U = \frac{COMP}{VA}$$

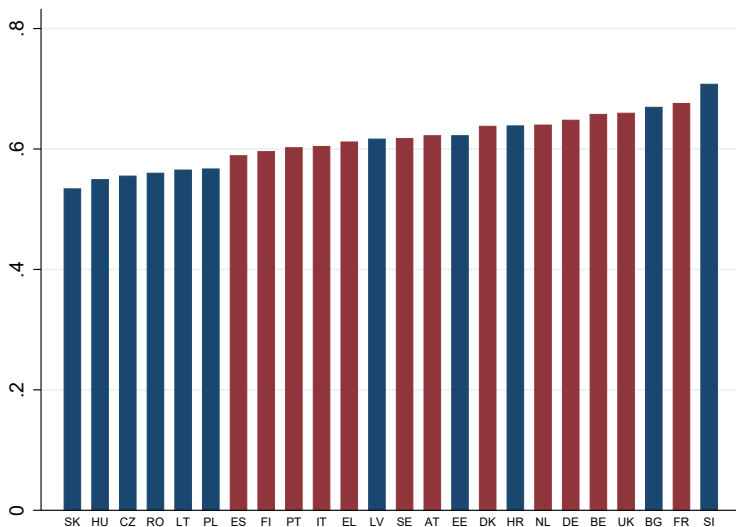
- Labor share w/o mixed income: aggregate or corporate

$$LS^M = \frac{COMP}{COMP + GOS}$$

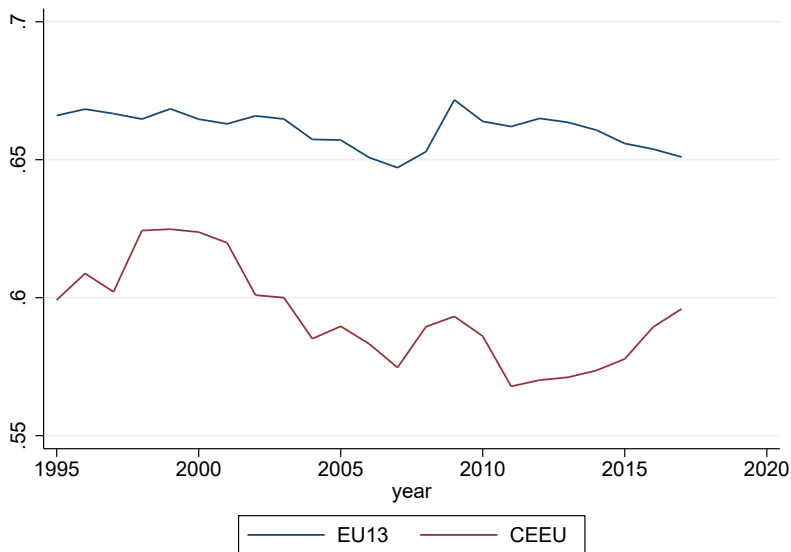
- **Adjusted labor share** (baseline)

$$LS^A = \frac{COMP}{VA} \frac{HEMP}{HEMPE}$$

Labor shares in the EU, 2018

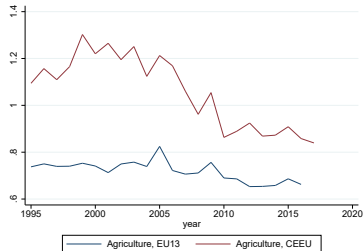
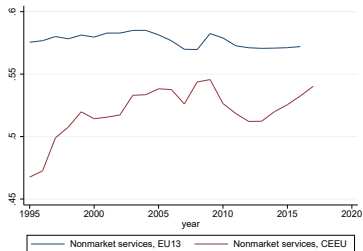
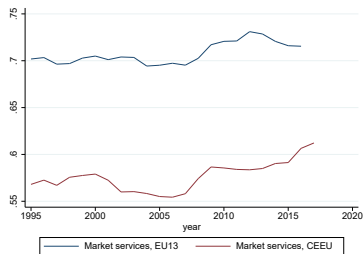
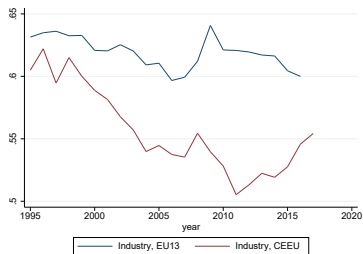


Labor shares in EU13 and CEEU



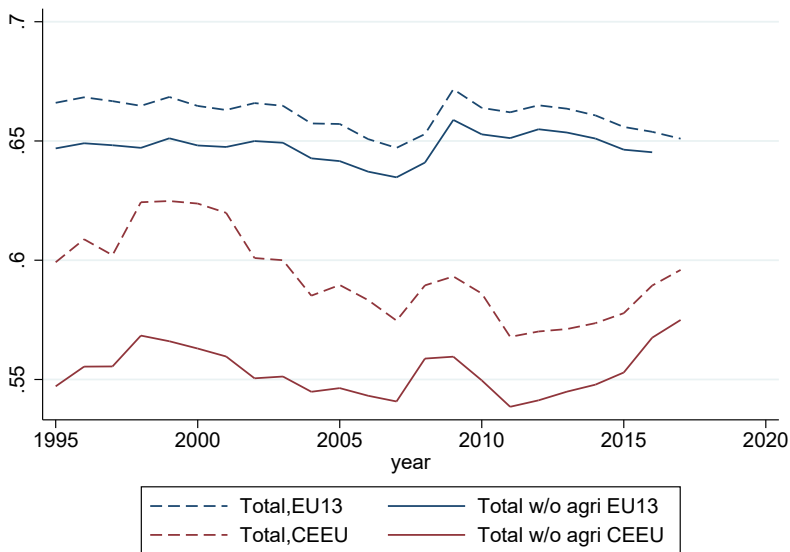
- What is the role of sectoral reallocation in labor share developments?
 - Also look at cross-country differences
- We create four broad sectors on the production side
 - Agriculture: A
 - Industry: B, C, D, E, F
 - Market services: G, H, I, J, K, M, N, R, S, T, U
 - Non-market services: L, O, P, Q
- We also look at the aggregate economy without agriculture

Sectoral labor shares

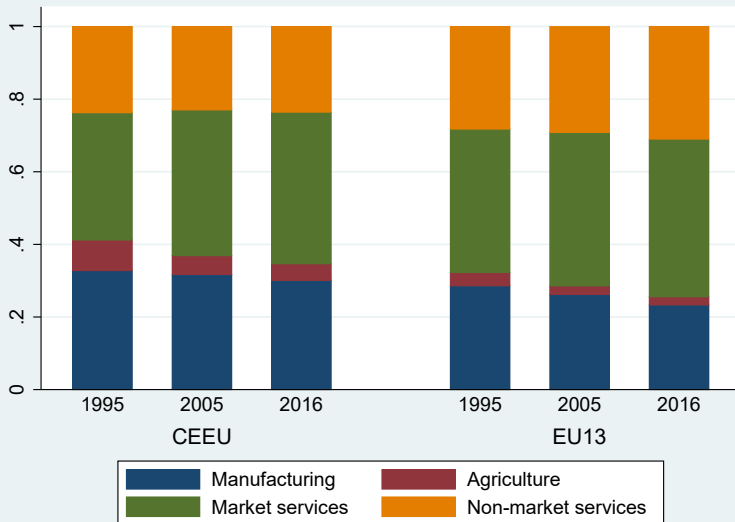


- Agricultural subsidies
 - A significant source of income in the EU is subsidies
 - Value added at basic prices (EU-KLEMS) omits subsidies
 - Labor share at factor cost does not, still very volatile
- High share of self-employed
 - The adjusted labor share imputes SE wages
 - When SE share is large, this can be very misleading
 - Labor shares well above one (Poland)

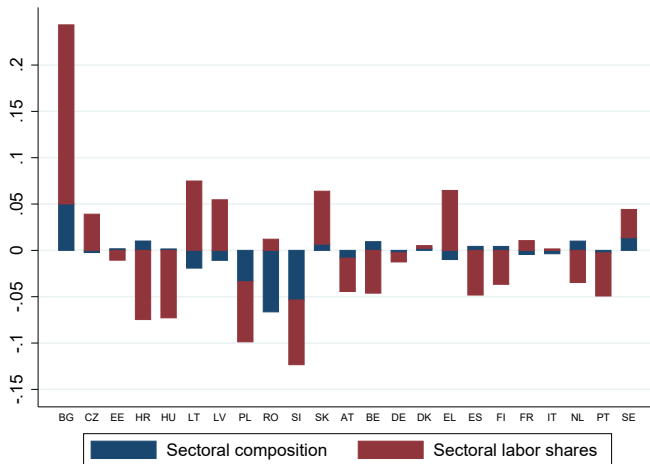
The importance of agriculture



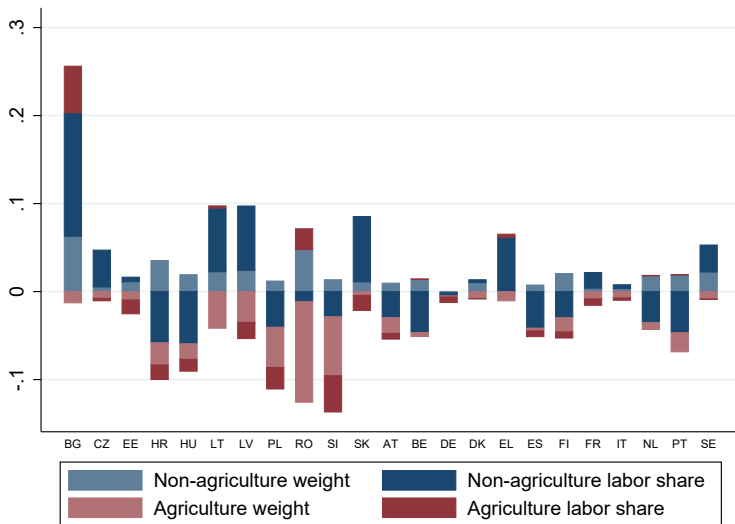
Sectoral reallocation (value added)



Decomposing the change in aggregate labor share, 1995-2017

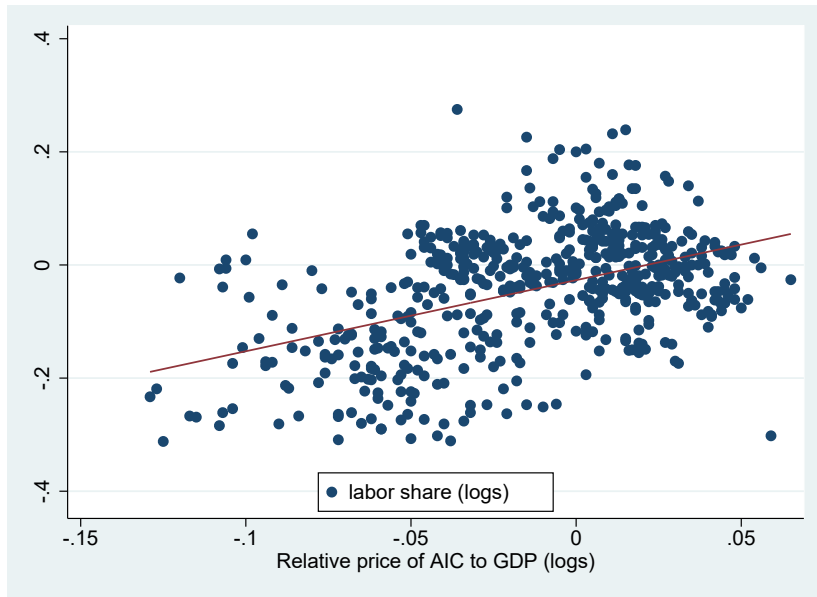


Sectoral reallocation - agriculture

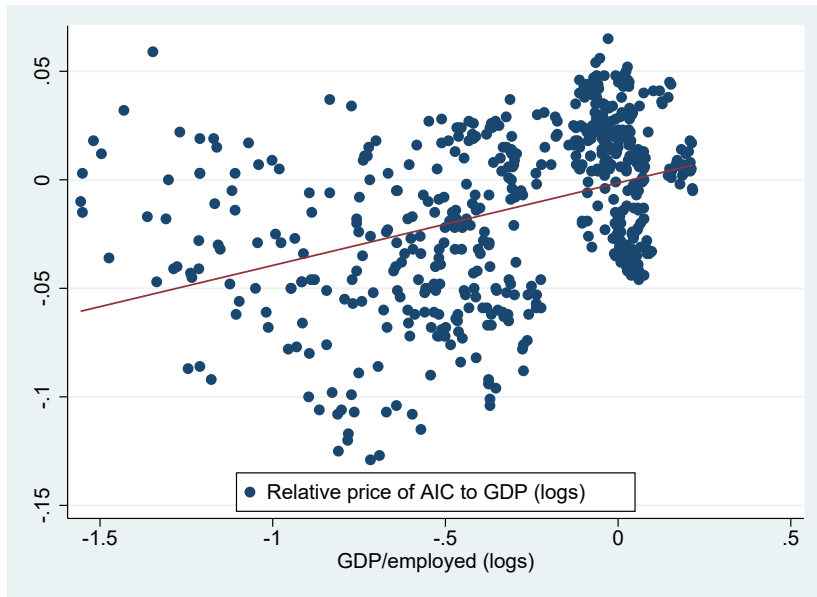


- The labor share seems generally lower in CEEU countries
- We test for this more formally
- We also look for possible reasons
- One possibility: relative prices
 - Hsieh and Klenow (2007): investment and relative productivity
 - Important to control for relative price differences

Consumption price and labor share



Consumption price and productivity



Labor share, productivity, prices

VARIABLES	(1)	(2)	(3)	(4)
	relative labor share			relative price of AIC
relative productivity	0.308*** (0.0479)		0.282*** (0.0622)	0.0688*** (0.0200)
relative price of AIC		1.265*** (0.290)	0.394 (0.384)	
Constant	0.690*** (0.0449)	-0.405 (0.302)	0.301 (0.364)	0.987*** (0.0177)
Observations	551	551	551	576
R-squared	0.510	0.189	0.524	0.248
Year FE	YES	YES	YES	YES
country FE	NO	NO	NO	NO

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses. All variables are expressed relative to Germany.

A corrected labor share

- The adjusted labor share in logs

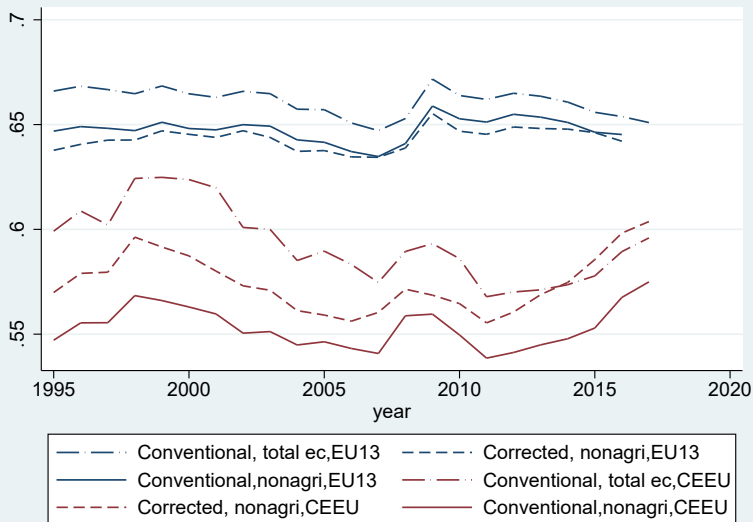
$$ls = \underbrace{[(comp - p_{gdp}) - empe]}_{\text{Prod. real wage}} - \underbrace{(q_{gdp} - emp)}_{\text{Labor productivity}}$$

- Price correction

$$ls_{corr} = [(comp - p_c) - empe] - (q_{gdp} - emp)$$

- Labor share from household perspective

Adjusted wage shares: conventional and corrected indicators



Two stylized facts

- 1 There is a positive correlation between relative development and the labor share across countries.
- 2 There is a positive correlation between the relative price of consumption and the labor share across countries.

- Two sectors: consumption+investment

$$y_s = A_s \left[\alpha k_s^{1-\frac{1}{\sigma}} + (1-\alpha) l_s^{1-\frac{1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

- First-order condition

$$\begin{aligned} \alpha p k_c^{-\frac{1}{\sigma}} A_c \left(\frac{y_c}{A_c} \right)^{\frac{1}{\sigma}} &= \alpha k_i^{-\frac{1}{\sigma}} A_i \left(\frac{y_i}{A_i} \right)^{\frac{1}{\sigma}} \\ (1-\alpha) p l_c^{-\frac{1}{\sigma}} A_c \left(\frac{y_c}{A_c} \right)^{\frac{1}{\sigma}} &= (1-\alpha) l_i^{-\frac{1}{\sigma}} A_i \left(\frac{y_i}{A_i} \right)^{\frac{1}{\sigma}}, \end{aligned}$$

- **Supply side**

$$k_i/l_i = k_c/l_c \equiv \kappa$$

$$p = A_c/A_i$$

- Household problem

$$\max \sum_{t=0}^{\infty} \beta^t \log c_t$$

$$\begin{aligned} \text{s.t. } p_t c_t + i_t &= w_t l_t + r_t k_t \\ k_{t+1} &= (1 - \delta) k_t + i_t. \end{aligned}$$

- Demand side**

$$\begin{aligned} \frac{1}{\beta} - 1 + \delta &= \alpha A_i \left[\alpha + (1 - \alpha) \kappa^{1 - \frac{1}{\sigma}} \right]^{\frac{1}{\sigma - 1}} \\ \delta \kappa &= A_i l_i \left(\alpha \kappa^{1 - \frac{1}{\sigma}} + 1 - \alpha \right)^{\frac{\sigma}{\sigma - 1}} \end{aligned}$$

Key equations

- Labor share

$$\frac{w}{py_c + y_i} = \frac{1 - \alpha}{\alpha \kappa^{1 - \frac{1}{\sigma}} + 1 - \alpha}$$

- GDP

$$y = A_i \left(\alpha \kappa^{1 - \frac{1}{\sigma}} + 1 - \alpha \right)^{\frac{\sigma}{\sigma - 1}}$$

- Relative price

$$p = A_c / A_i$$

- The model is consistent with the two stylized facts if
 - Poorer countries are especially unproductive in investment

$$A_i < A_c < 1$$

- The elasticity of substitution is less than one

$$\sigma < 1$$

- The productivity ranking is the same as in Hsieh and Klenow (2007) and Herrendorf and Valentinyi (2012)
- The inelastic production functions are consistent with Alvarez-Cuadrado, Van Long and Poschke (2018) and others

- Set standard parameters

$$\beta = 0.95$$

$$\delta = 0.05$$

- Elasticity of substitution from Alvarez-Cuadrado, Van Long and Poschke (2018)

$$\sigma = 0.64$$

Calibration (2)

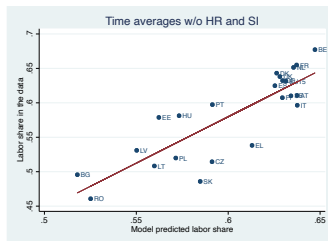
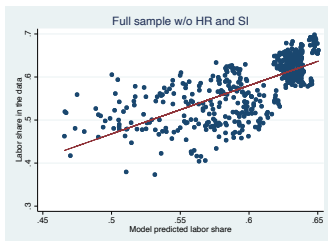
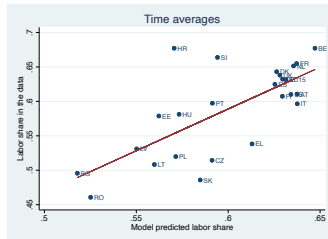
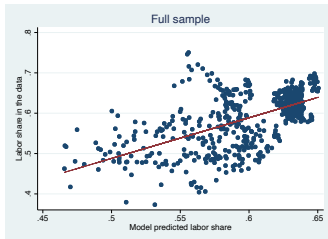
- Use the EU15 as a reference, where $A_i = A_c = 1$
- Match the average labor share (0.63) of the EU15

$$\alpha = 0.7565$$

- Choose sectoral productivities for each country/year to match GDP per hours worked and the relative price of consumption

- Given the calibrated model including sectoral productivities, we use the model to predict the labor share for each country/year observation
- Compare the predicted labor shares against labor shares in the data
- We use the non-agricultural LS given the problems with agriculture discussed earlier
- Results: the model mechanism can explain 30-70% of the variation in the observed LS

Labor shares: model and data



- The fall of the labor share is not a general phenomenon in the EU
 - It is specific to manufacturing, and to CEEU countries
 - Even at CEEU, the aggregate labor share has been broadly constant w/o agriculture
- The labor share is systematically lower in CEEU countries
 - Qualified by differences in the relative price of consumption (investment)
 - Possible explanation based on relative productivity
- Further research: FDI and offshoring