The Elusive Explanation for the Declining Labor Share

Gene Grossman & Maurice Oberfield

Annual Review of Economics, 2022

Introduction

Introduction

- Smith (1776) noted that the distribution of national income to wages, rents, and profits was closely related to inequality.
- Kaldor (1961) named the constancy of the labor share as the first of his stylized facts about economic growth.
- After more than a century of relative stability, the labor share has declined recently.
- This has lead to revival of interest into the labor share.

Outline

The labor share in the US

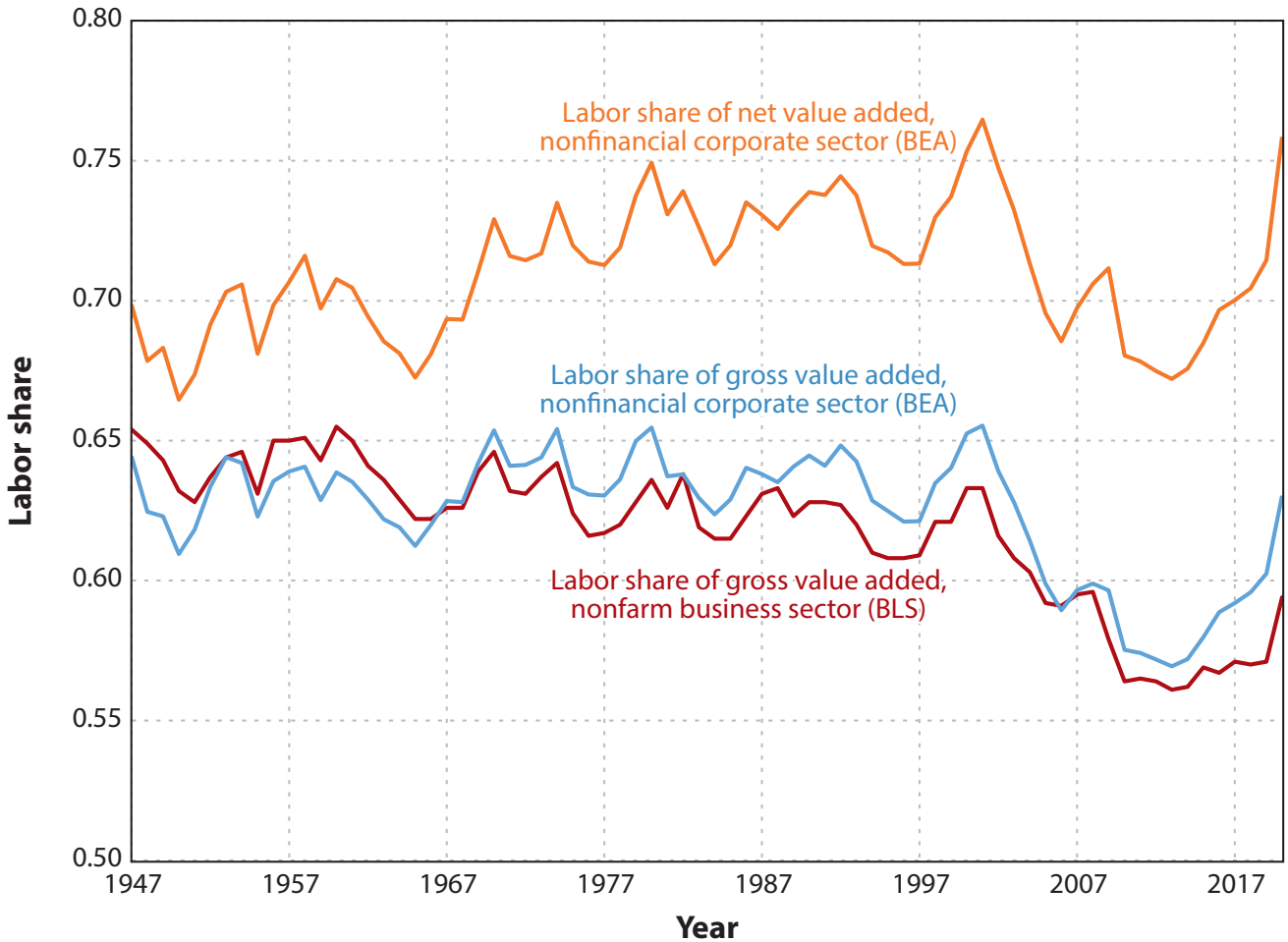


Figure 1

Alternative measures of the labor share in the United States. Data from the BEA national income and product account (NIPA) data set (at **https://apps.bea.gov/iTable/index_nipa.cfm**) and the BLS major sector productivity and costs data set (at **https://www.bls.gov/lpc/data.htm**). Abbreviations: BEA, Bureau of Economic Analysis; BLS, Bureau of Labor Statistics.

Various measures of labor shares

- Various measures of labor shares depending on:
  1. Gross versus net value added
  2. Treatment of Intellectual Property (IP)
  3. Treatment of self-employment and entrepreneurial income
  4. Treatment of owner-occupied housing
  5. Treatment of factorless income
- Nonetheless, there is a consensus that the labor share today is below its level of 1970s and 1980s in the US.
- Same is true for many other countries.

The global labor share (Karabarbounis & Neiman 2014)

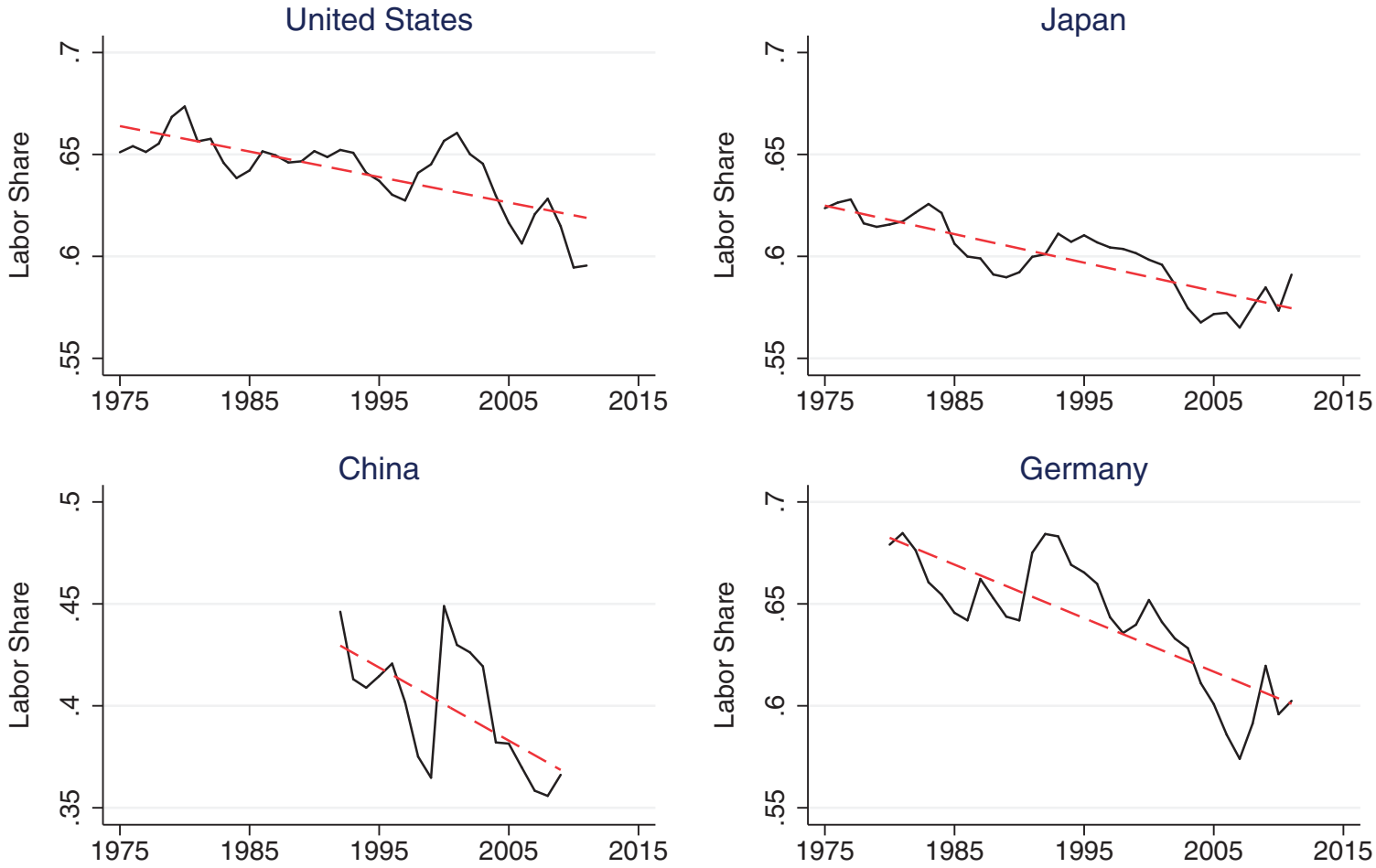


FIGURE II

Declining Labor Share for the Largest Countries

The figure shows the labor share and its linear trend for the four largest economies in the world from 1975.

Outline

Defining the labor share

- Assume a CRS production function $Y = F(K, L; \tau)$.
- Parameter τ influences relative factor demands.
- The unit cost function is $c(r, w; \tau)$.
- The labor share is given by:

$$\theta_L \equiv \frac{wL}{Y} = \frac{wc_w(r, w; \tau)Y}{Y} = wc_w(r, w; \tau)$$

- The capital share is given by $\theta_K = rc_r(r, w; \tau)$

Changes in the labor share

Differentiating $\ln(\theta_L/\theta_K)$ with respect to τ analyzes demand-driven changes in the labor share:

$$\begin{aligned}
\frac{d\ln(\theta_L/\theta_K)}{d\tau} &= \frac{d\ln(wc_w/rc_r)}{d\tau} \\
&= \frac{\partial\ln(c_w/c_r)}{\partial\tau} + \left[\frac{\partial\ln(wc_w/rc_r)}{\partial\ln(r/w)}\right]\frac{d\ln(r/w)}{d\tau} \\
&= \frac{\partial\ln(c_w/c_r)}{\partial\tau} + \left[\frac{\partial\ln(w/r)}{\partial\ln(r/w)} + \frac{\partial\ln(L/K)}{\partial\ln(r/w)}\right]\frac{d\ln(r/w)}{d\tau} \\
&= \frac{\partial\ln(L/K)}{\partial\tau} + [\sigma - 1]\frac{d\ln(r/w)}{d\tau} \qquad (1)
\end{aligned}$$

with $\sigma > 0$ the elasticity of substitution between K and L.

Changes in the labor share

- Decomposition of demand-driven changes in the labor share:

$$\frac{d \ln(\theta_L/\theta_K)}{d\tau} = \frac{\partial \ln(L/K)}{\partial \tau} + [\sigma - 1]\frac{d \ln(r/w)}{d\tau} \qquad (1)$$

- The labor share changes because of a *shift in relative factor demands* (i.e. a change in relative factor quantities for given relative factor prices) and a *change in relative factor prices*.
- $\sigma \geq 1$ plays a key role.
- Equation (1) is general and must hold for all $d\tau$.

Example: BGP and Harrod-neutral technological progress

- In growth models, a BGP is defined by constant growth in Y/L and constant K/Y, r and θ_L/θ_K (Kaldor 1963).
- In Solow growth models, Kaldor facts require tech progress is Harrod-neutral (purely labor-augmenting) (Uzawa 1961).
- Wage grows at constant rate τ: $d\ln(w) = \tau$.
- Also: $c_w(r, w; \tau) = c_w(1, \omega; \tau) = e^{-\tau}\tilde{c}_w(1, \omega e^{-\tau})$ and $c_r(r, w; \tau) = c_r(1, \omega; \tau) = \tilde{c}_r(1, \omega e^{-\tau})$.
- Given this, is equation (1) consistent with $d\ln(\theta_L/\theta_K) = 0$?

Example: BGP and Harrod-neutral technological progress

- When deriving equation (1), we used that:

$$\begin{aligned}\sigma - 1 &= \frac{\partial \ln(rc_r(r,w;\tau)/wc_w(r,w;\tau))}{\partial \ln(w/r)} \\ &= \frac{\partial \ln(c_r(r,w;\tau)/\omega c_w(r,w;\tau))}{\partial \ln(\omega)} \\ &= \frac{\partial \ln(c_r(1,\omega;\tau)/\omega c_w(1,\omega;\tau))}{\partial \ln(\omega)}\end{aligned}$$

- Kaldor facts and Harrod-neutral technological progress imply:

$$\begin{aligned}\sigma - 1 &= \frac{\partial \ln(\tilde{c}_r(1,\omega e^{-\tau})/\omega e^{-\tau}\tilde{c}_w(1,\omega e^{-\tau}))}{\partial \ln(\omega)} \\ &= \frac{\partial \ln(\tilde{c}_w(1,\omega e^{-\tau})/\tilde{c}_r(1,\omega e^{-\tau}))}{\partial \tau}\end{aligned}$$

Pitfalls when estimating changes in factor shares

- Let $d\tau_i$ be a shock in firm or region i and estimate:

$$d\ln(\theta_{L,i}/(1-\theta_{L,i}) = \alpha + \beta d\tau_i + \epsilon_i \tag{2}$$

  with $d\tau_i$ a shock measure (e.g. tech progress).

- If relative factor prices don't vary across i, $\hat{\beta}$ captures the partial equilibrium impact of $d\tau_i$ on shifts in relative factor demands (e.g. $\beta = 0 \Rightarrow$ tech progress is Hicks-neutral).

- If relative factor demand-shifts and prices vary across i, $\hat{\beta}$ captures the general equilibrium impact of $d\tau_i$ (e.g. $\beta = 0 \Rightarrow$ tech progress is Harrod-neutral).

Outline

Investment-specific technological change

Decline in price of investment goods

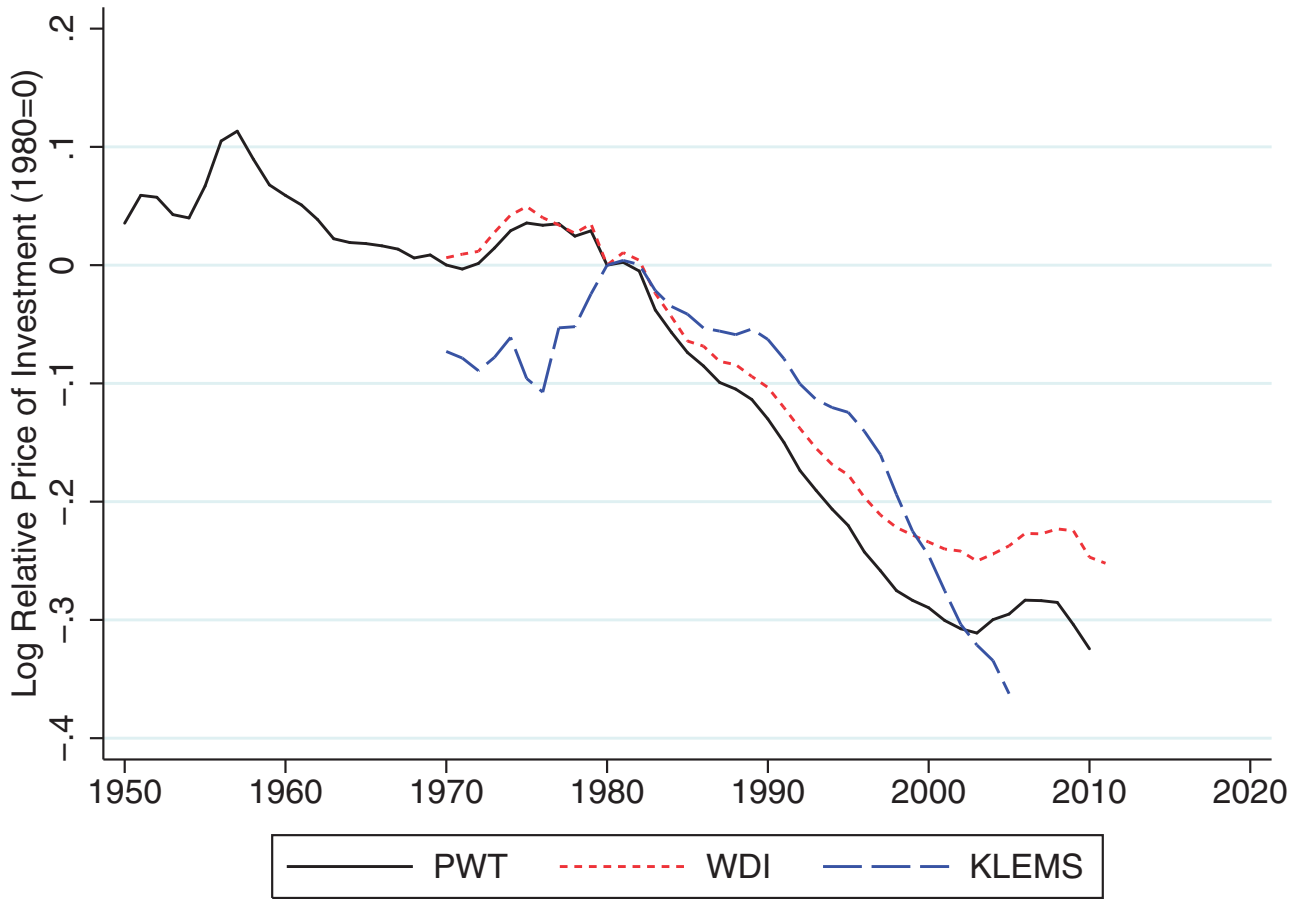


FIGURE VII

Declining Global Price of Investment Goods

The figure shows year fixed effects from regressions of the log relative price of investment that absorb country fixed effects to account for entry and exit during the sample. The regressions are weighted by GDP measured in U.S. dollars at market exchange rates.

Investment-specific technological change

- Assume tech progress decreases the relative price of investment goods R_i.
- Karabarbounis & Neiman (2014) use data for 59 countries for 1975-2012 and a general equilibrium equation:

$$\frac{\theta_{L,i}}{1-\theta_{L,i}} d\ln(\theta_{L,i}) = \gamma + [\sigma - 1] d\ln(R_i) + \epsilon_i \qquad \text{(KN-19)}$$

  with an estimate $\hat{\sigma} = 1.25$.
- A decrease in R_i induces a substitution from labor to capital to such extent that the labor share falls.

Labor share and price of investment goods

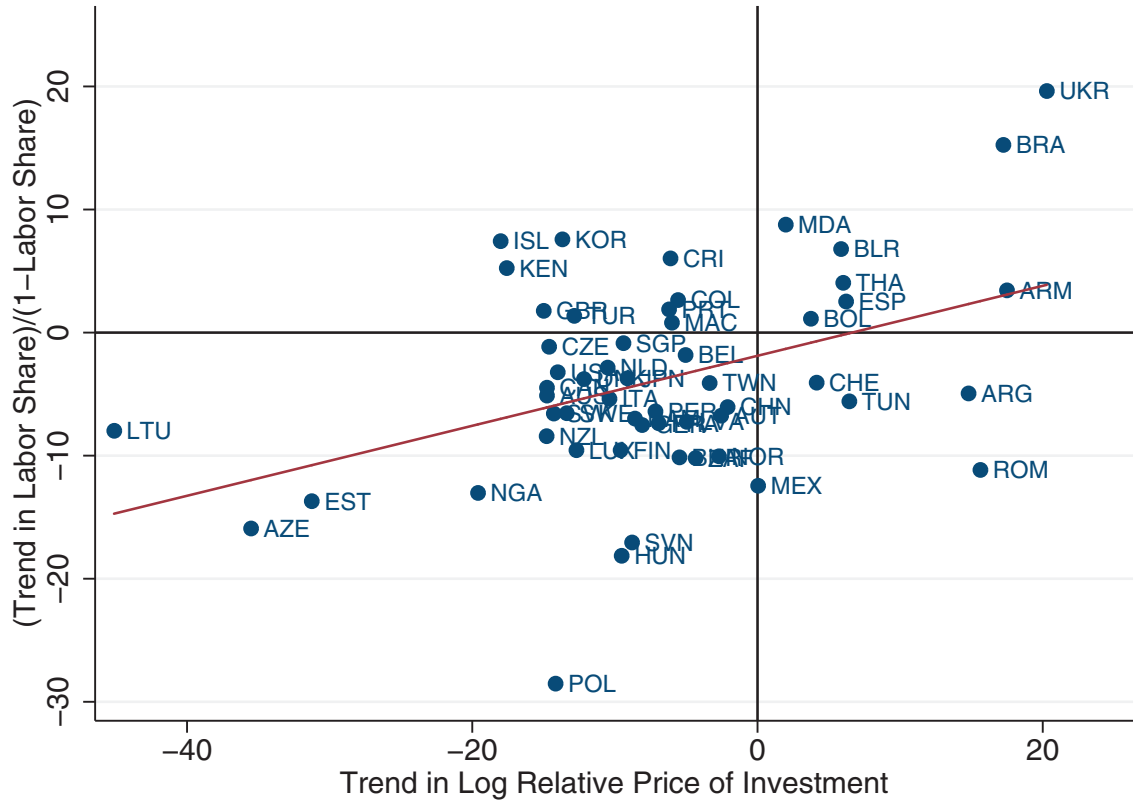


FIGURE VIII

Labor Share and Relative Price of Investment

The figure plots the left-hand and right-hand sides of equation (19). All values are scaled to denote changes per 10 years. For example, a value of −10 for the trend in the log relative price of investment means a roughly 10% decline of the price every 10 years. The figure excludes three countries (Kazakhstan, Kyrgyzstan, and Niger) with extremely low weights in the baseline regression of the first row of Table I. The best-fit line shown in the figure has a slope of 0.28.

Robot adoption

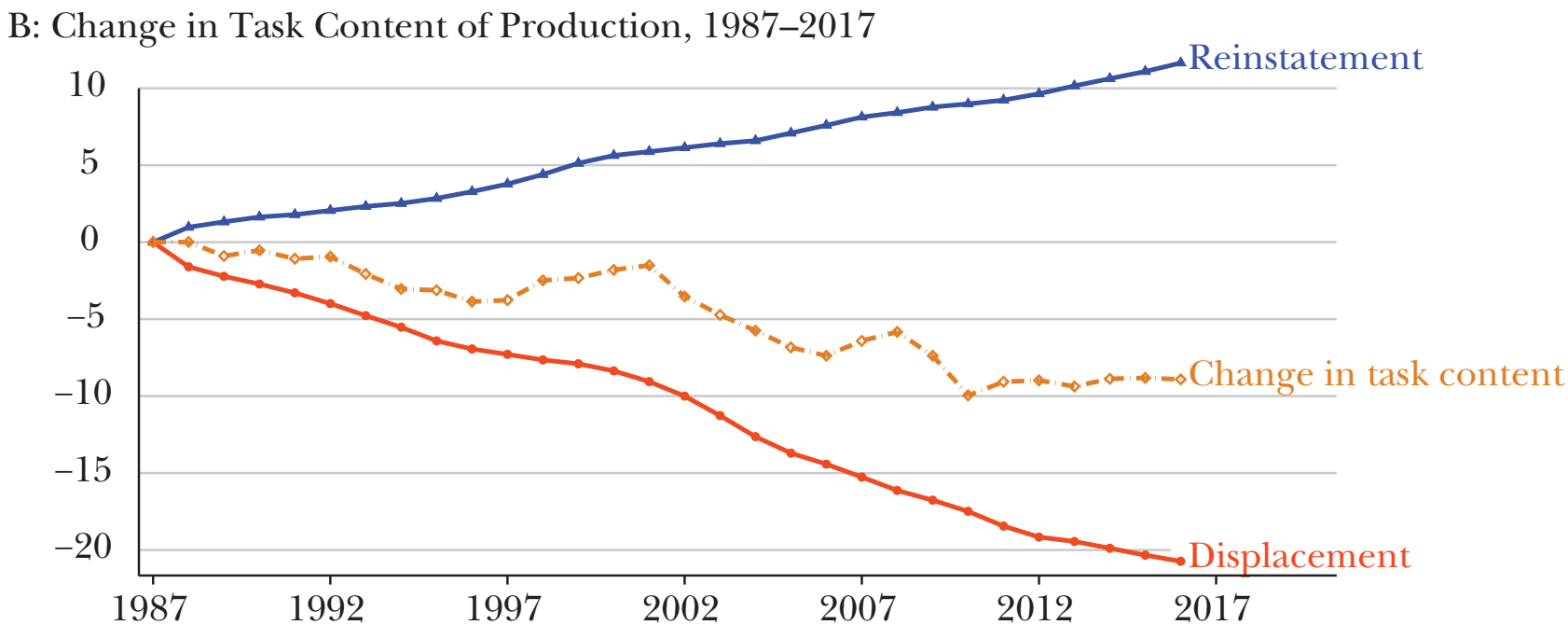
Automation and creation of labor tasks

- Automation (*creation*) of labor tasks assumes that capital (*labor*) directly substitutes for some labor (*capital*) tasks.
- Acemoglu & Restrepo (2019) use data for US sectors for 1947-1987 and estimate:

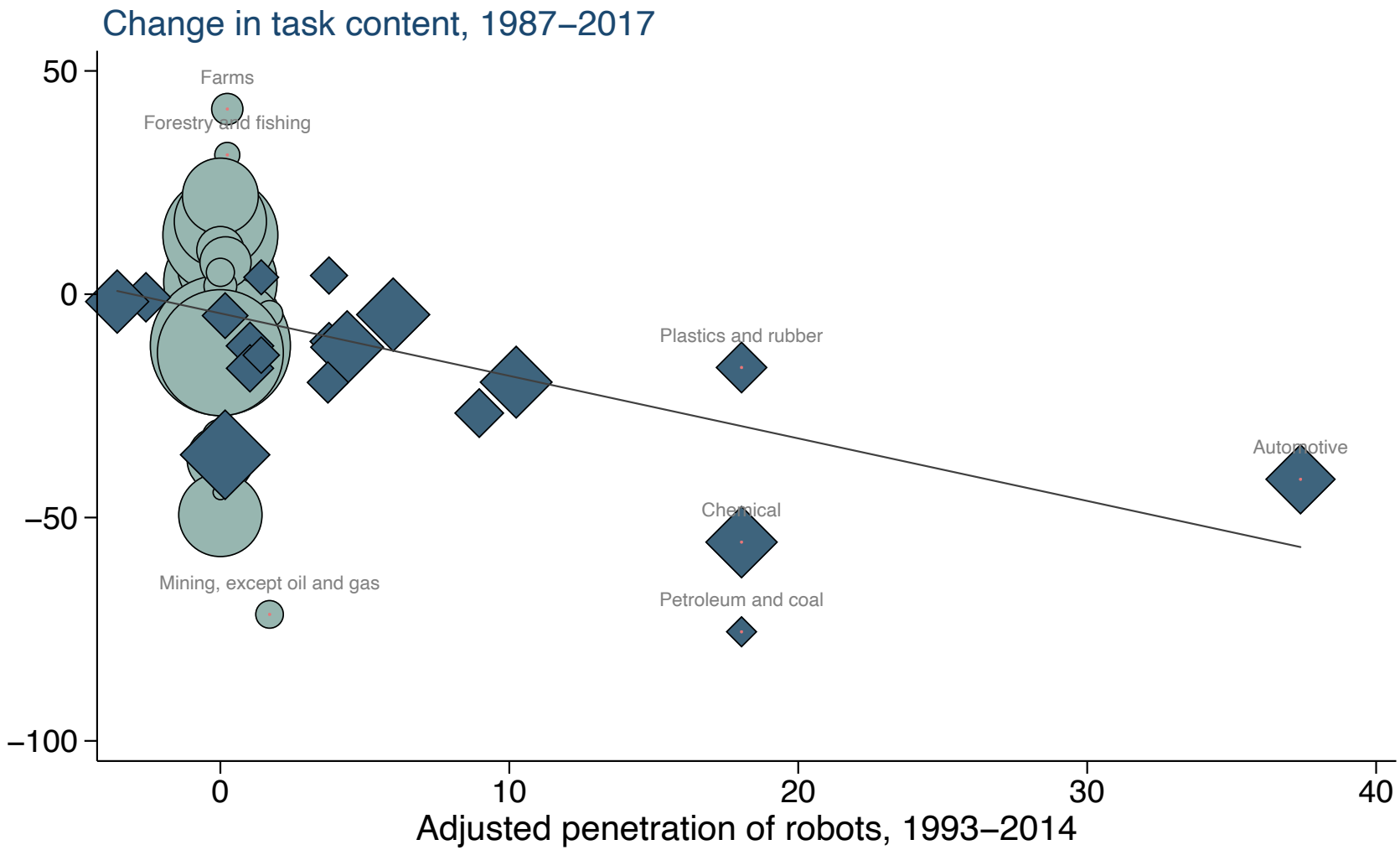
$$\frac{1}{1-\theta_{L,i}} d\ln(\theta_{L,i}) = \frac{d\ln(\Gamma_i)}{1-\Gamma_i} + [\sigma - 1] d\ln(\frac{r_i}{w_i}) \quad \text{(AR-A10)}$$

  with $d\ln(\Gamma_i)/(1-\Gamma_i)$ shifts in relative labor demand due to automation (-) or creation (+) of labor tasks.
- Assuming $\sigma = 0.8$, they impute $d\ln(\Gamma_i)/(1-\Gamma_i)$ and find that automation has decreased θ_L after 1987.

Shifts in relative labor demand (Figure 5)



Shifts in relative labor demand and robot adoption (Figure 4A)



The rise of superstar firms

The rise of superstar firms (Autor et al. 2020)

- The sales-weighted labor share decreases if superstar firms become more important and have lower labor shares.
- Autor et al. (2020) decompose the sales-weighted labor share:

$$S = \sum \omega_i S_i = \bar{S} + \sum (\omega_i - \bar{\omega})(S_i - \bar{S}) \qquad \text{(ADKPR-3)}$$

  with $\omega_i \equiv PiY_i / PY$, $\bar{S}$ the unweighted mean labor share, and $\bar{\omega}$ the unweighted mean value-added share.

- Change in the labor share can be written as:

$$\Delta S = \Delta \bar{S} + \Delta \left[\sum (\omega_i - \bar{\omega})(S_i - \bar{S}) \right] \qquad \text{(ADKPR-4)}$$

The rise of superstar firms decreases the labor share

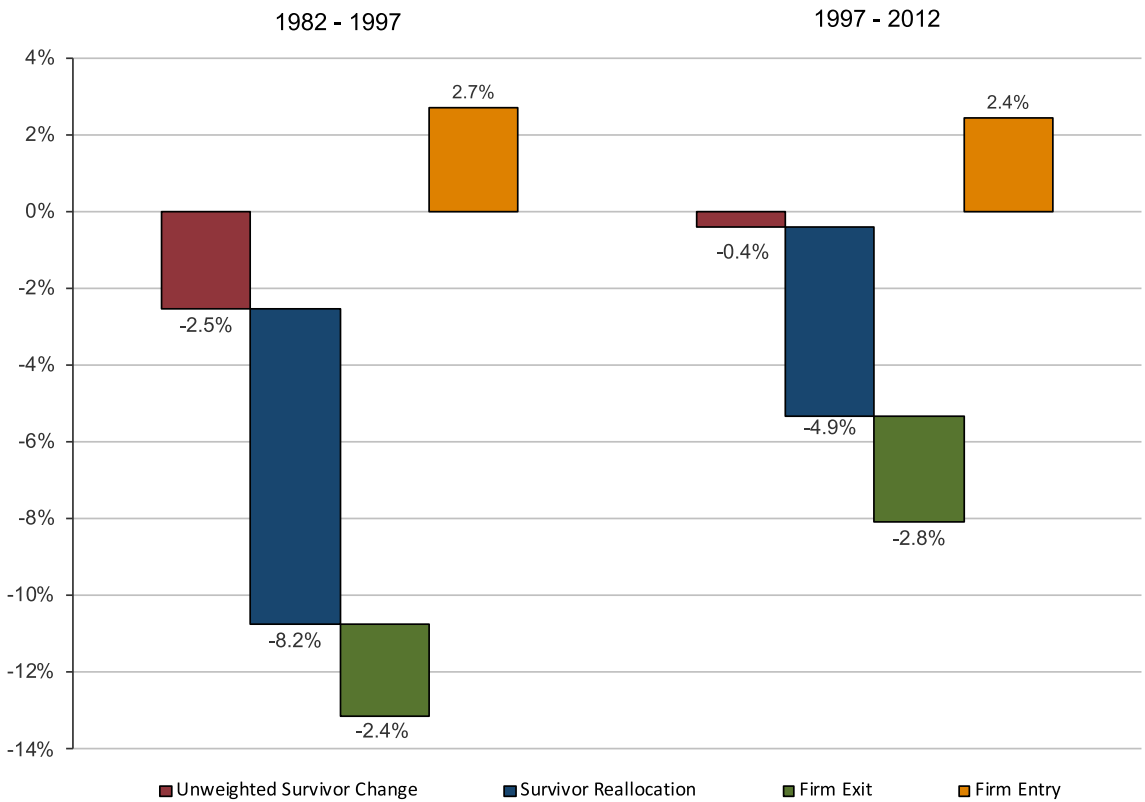


FIGURE VII

Melitz-Polanec Decomposition of the Change in Labor Share in Manufacturing

Each bar represents the cumulated sum of the Melitz-Polanec decomposition components calculated over adjacent five-year intervals for payroll over value added. The left side shows the sum of the decompositions from 1982–1987, 1987–1992, and 1992–1997 and the right side shows the sum of the decompositions from 1997–2002, 2002–2007, and 2007–2012. Table IV reports the underlying estimates for each five-year period.

Outline

Globalization and the rise of China

- When do imported inputs decrease the domestic labor share?
- Elsby, Hobijn & Sahin (2013) use data for US sectors for 1993-2010 and the equation:

$$\frac{1}{1-\theta_{L,i}}\frac{d\ln(\theta_{L,i})}{d\ln(M_i)} = -s_{M,i}\left(\rho_{LM}-\rho_{KM}\right) \qquad \text{(EHS-11)}$$

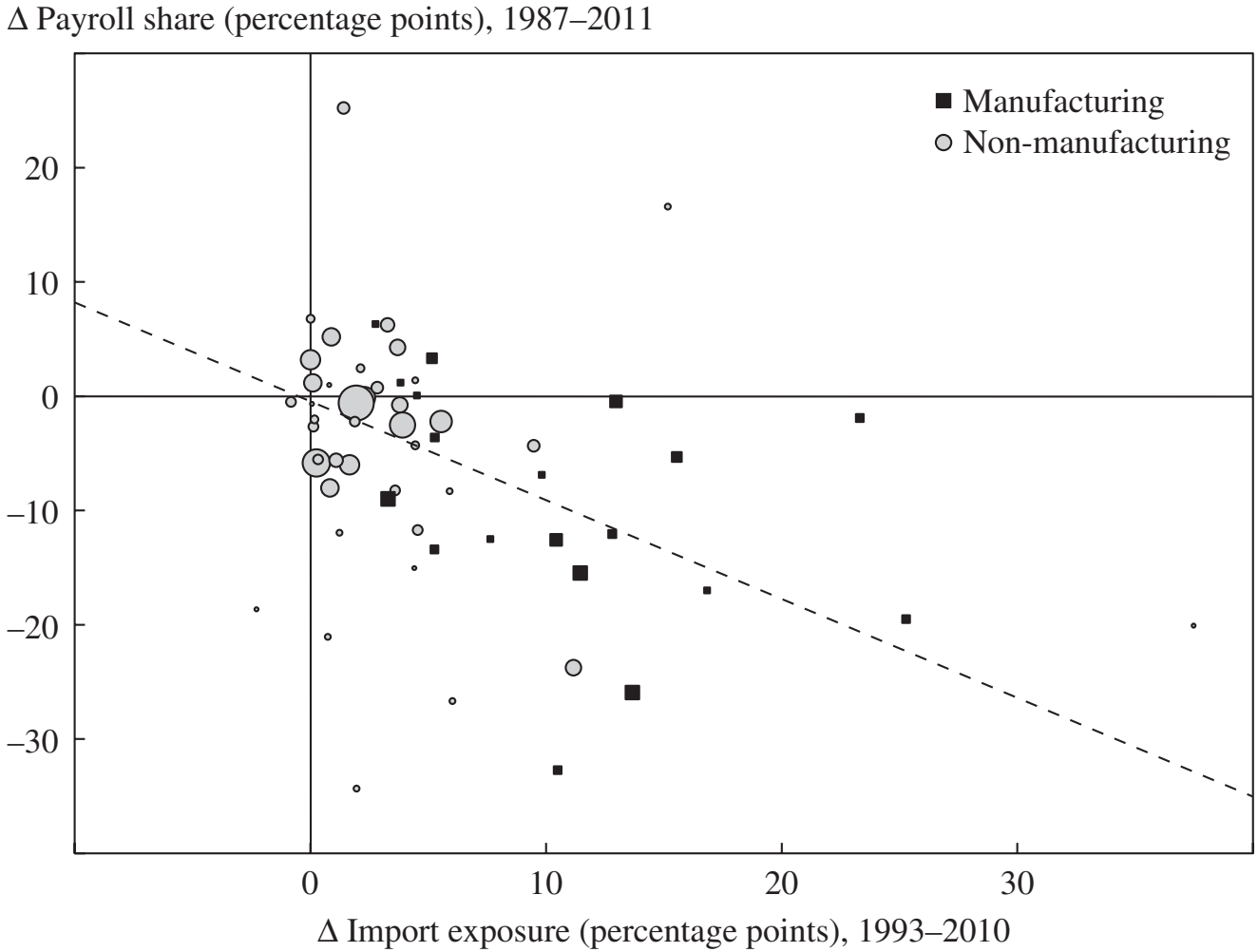
$$= -s_{M,i}\left(\frac{\sigma_{LM}-1}{\sigma_{LM}}-\frac{\sigma_{KM}-1}{\sigma_{KM}}\right)$$

  with $s_{M,j} \equiv M_i/(P_i Y_i)$.

- If $\sigma_{LM} > \sigma_{KM}$, imported inputs will induce greater substitution away from labor than from capital and $\theta_{L,i}$ decreases.

The labor share and import competition across industries

Figure 12. Import Competition and Changes in Payroll Shares by Industry



Source: Bureau of Economic Analysis, Bureau of Labor Statistics, and authors' calculations.
Note: Data cover 59 NAICS sectors; size of circle/square reflects value added share.

Outline

The rise of markups (De Loecker, Eeckhout & Unger 2020)

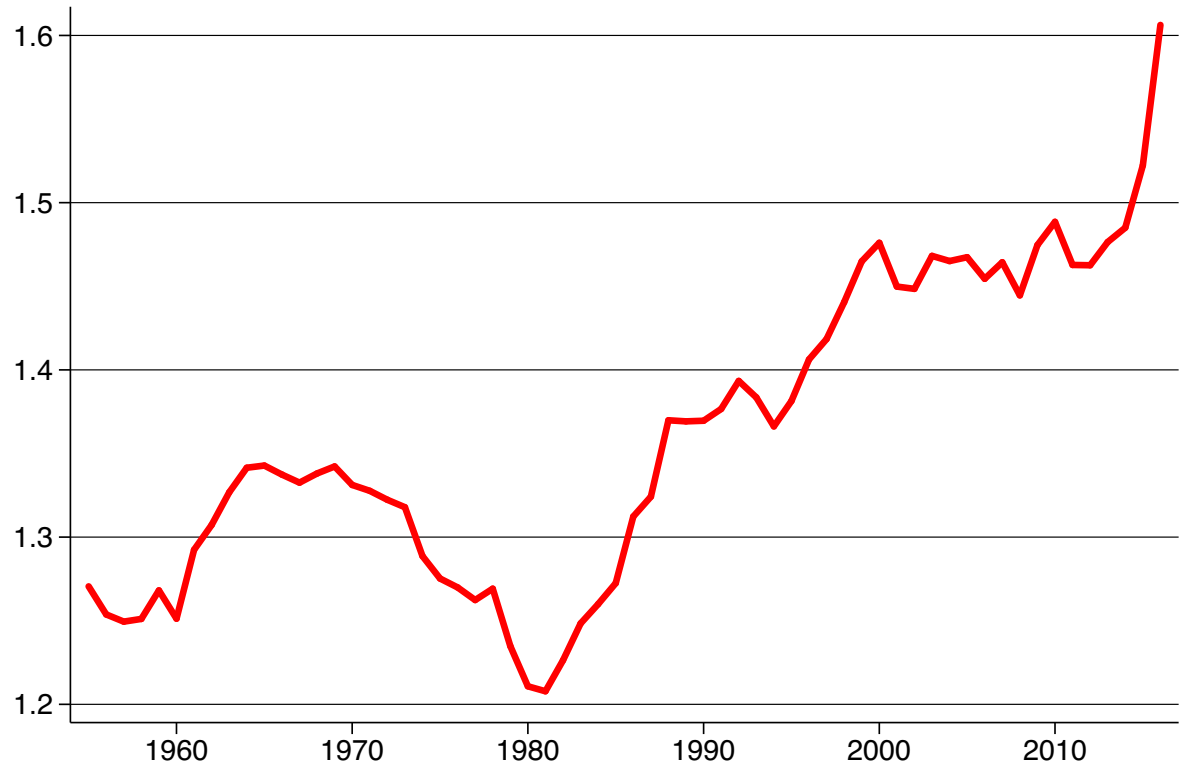


FIGURE I

Average Markups

Output elasticities θ_{st} from the estimated production function are time-varying and sector-specific (two-digit). The average is revenue weighted. The figure illustrates the evolution of the average markup from 1955 to 2016.

Monopoly and price markups

- Why do higher markups lower the labor share?
- Assuming $Y = F(K, L)$ and inverse product demand given by $p = P(Y)$, profit maximization implies:

$$\rho F_L = w$$

with $\rho \equiv p + YP_Y$ marginal revenue.

- Rearranging terms and multiplying through by L/Y:

$$\epsilon_{YL} \equiv \frac{LF_L}{Y} = \frac{wL}{\rho Y} = \frac{p}{\rho}\frac{wL}{pY} = \frac{p}{\rho}\theta_L$$

with ϵ_{YL} the elasticity of Y with respect to L.

Markups decrease factor shares

- Equating marginal revenue to marginal cost, $\rho = MC$:

$$\epsilon_{YL} = \frac{p}{\rho}\theta_L = \frac{p}{MC}\theta_L = \mu\theta_L \tag{4}$$

  with μ the markup of output price over marginal cost.

- The analogous expression for capital is:

$$\epsilon_{YK} = \frac{p}{\rho}\theta_K = \frac{p}{MC}\theta_K = \mu\theta_K$$

- For given ϵ_{YL} and ϵ_{YK}, an increase in μ decreases θ_L and θ_K.

Markups increase the profit share

- Summing $\theta_L = \epsilon_{YL}/\mu$ and $\theta_K = \epsilon_{YK}/\mu$ gives:

$$\theta_L + \theta_K = \frac{\epsilon_{YL} + \epsilon_{YK}}{\mu} = 1 - \theta_\pi \tag{5}$$

  with θ_π the profit share and $\epsilon_{YL} + \epsilon_{YK}$ return to scale.

- For given $\epsilon_{YL} + \epsilon_{YK}$, an increase in μ increases θ_π.

- Alternatively, we can write for $j = L, K$:

$$\theta_j = \frac{\epsilon_{Yj}}{\epsilon_{YL} + \epsilon_{YK}}[1 - \theta_\pi] \tag{6}$$

  showing that an increase in θ_π decreases θ_L and θ_K.

Estimating and interpreting rising markups

- De Loecker, Eeckhout & Unger (2020) estimate firm-level markups using a composite of variable inputs:

$$\hat{\mu}_{it} = \frac{\hat{\epsilon}_{YV,t}}{\hat{\theta}_{V,it}}$$

  with $\epsilon_{YV,t}$ estimated using Olley-Pakes technique.

- The sales-weighted average markup in year t is given by:

$$\mathbb{E}_t[\hat{\mu}_{i,t}] = \sum_i \frac{p_{it} y_{it}}{P_t Y_t} \frac{\hat{\epsilon}_{YV,t}}{\hat{\theta}_{V,it}}$$

- Measures have been critized and rising markups is a proximate (not primitive) cause of fall in θ_j.

Outline

The decline in union membership

Declining union membership

- When does de-unionisation decrease the labor share?
- Bentolila & Saint-Paul (2003) use CES production to get:

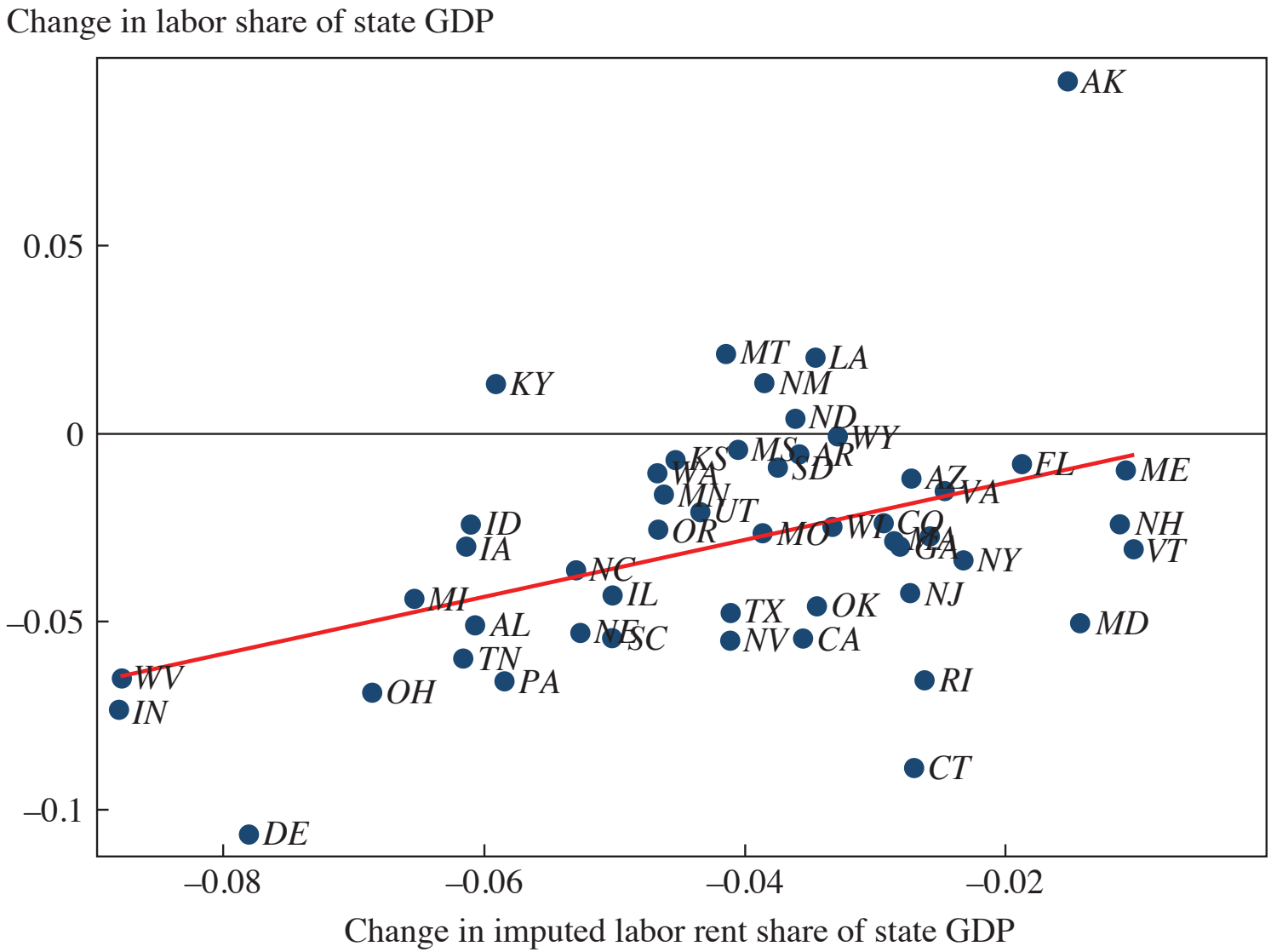
$$\theta_{L,i} = 1 - \alpha k_i^{\frac{\sigma-1}{\sigma}} \qquad \text{(BS-10)}$$

  with $k_i \equiv K_i / Y_i$ and α capital's distribution parameter.

- A decrease in the union-wage premium makes firms substitute labor for capital which decreases k_i.
- If $\sigma < 1$, de-unionisation decreases $\theta_{L,i}$.

Labor share and labor rents (Stansbury & Summers 2020)

Figure 9. Changes in State-Level Labor Share and Labor Rent Share, 1984–1988 to 2012–2016



Increased concentration of labor demand

Monopsony and wage markdowns

- Why do higher wage markdowns lower the labor share?
- Assuming $Y = F(K, L)$ and inverse labor supply $w = W(L)$, profit maximization implies:

$$pF_L = \tilde{\mu} w$$

with $\tilde{\mu} \equiv 1 + \epsilon_{Lw}^{-1}$ and ϵ_{Lw}^{-1} the elasticity of $W(L)$.

- Rearranging terms and multiplying through by L/Y:

$$\epsilon_{YL} \equiv \frac{LF_L}{Y} = \tilde{\mu} \frac{wL}{pY} = \tilde{\mu} \theta_L$$

such that an increase in $\tilde{\mu}$ decreases θ_L for given ϵ_{YL}.

Wages and employer concentration (Azar et al. 2020)

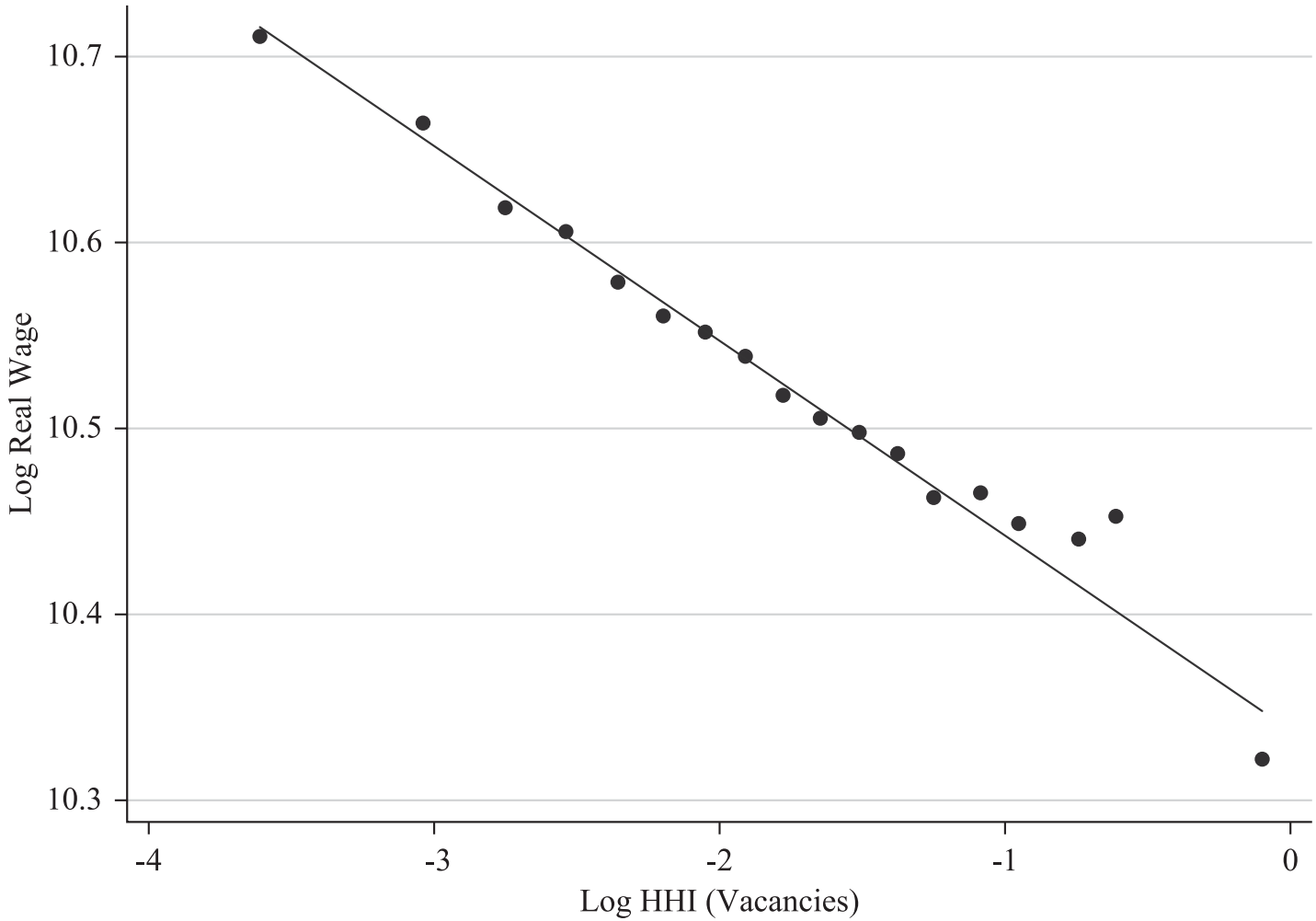


Figure 5

Binned Scatter of Log HHI Based on Vacancies and Log Real Wage

Notes: This figure shows a binned scatter plot of log HHI based on vacancy shares and log real wage in the same market, using 18 quantiles.

Outline

Conclusions

- After remaining constant for a long time, the labor share has been declining in the last decades.
- Several reasons have been documented in the literature:
  - Technological progress and the rise of superstar firms.
  - Increased imported inputs.
  - De-unionisation.
  - Increased price markups and wage markdowns.
- There is overcounting because explanations are not exclusive and not all primitive drivers of change.

Further readings

1. Karabarbounis, L., and B. Neiman (2014b). "The Global Decline of the Labor Share". *Quarterly Journal of Economics*. 129(1): 61–103.
2. Elsby, M., B. Hobijn, and A. Sahin (2013). "The Decline of the U.S. Labor Share". *Brookings Papers on Economic Activity*. 44: 1–52.
3. Acemoglu, D., and P. Restrepo (2019). "Automation and New Tasks: How Technology Displaces and Reinstates Labor". *Journal of Economic Perspectives*. 33:2: 3-30.
4. Stansbury, A., and L. Summers (2020). "The Declining Worker Hypothesis: An Explanation for the Recent Evolution of the American Economy". *Brookings Papers on Economic Activity*. Spring 2020
5. Autor, D., Dorn, D., Katz, L., Patterson, C., and J. Van Reenen (2020). "The Fall of the Labor Share and the Rise of Superstar Firms". *Quarterly Journal of Economics*. 135(2): 645-709.
6. L. Karabarbounis (2023). "Perspectives on the Labor Share". *NBER Working Paper* 31854. November 2023.