

# The Fall of the Labor Share and the Rise of Superstar Firms

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***DARES Polarisation in Labour Markets***

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# Falling Labor Share of Corporate sector Value-Added Evident in Many Countries

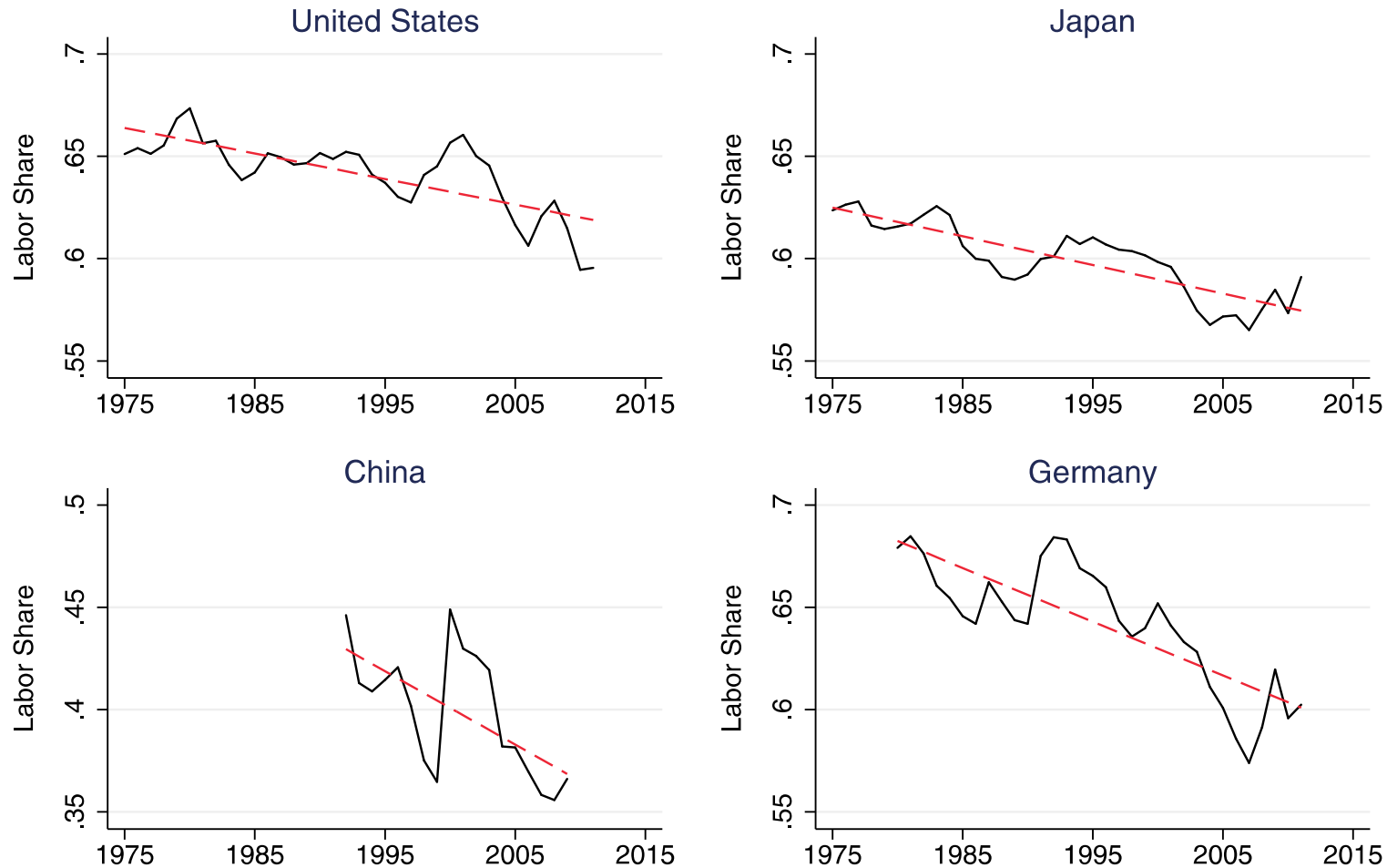


FIGURE II  
Declining Labor Share for the Largest Countries

# Significance of decline in Labor share

- **Overturms a key ‘Kaldor fact’**
- **Fall is real and significant**
  - Elsby et al. '13; Karabarbounis & Neiman '14; Rognlie '15; Koh et al. '17; Piketty '14; Bridgman '14; Smith et al '17
- **Why is this a concern?**
  1. Slow GDP growth → Labor getting a shrinking slice of slow-growing pie
  2. Distribution of capital far more unequal than distribution of labor → Growing income inequality (IMF, '17)

# Causes of the Falling Labor Share?

## Role of technical change: Karabarbonis & Neiman '14

- Falling capital price and, critically, elas. of L-K sub  $\sigma > 1$
- But empirical literature suggests  $\sigma < 1$ , e.g., Lawrence '15, Oberfield-Raval '14, Antras '04, Hamermesh '90

## Role of trade exposure: Elsby et al. '13

- Driven by falling labor share in trade-impacted manufacturing industries (China competition)

**These representative firm models overlook that aggregate fall reflects *reallocation* between firms**

- Role of rising profit share – higher aggregate mark-up

# Contributions of this Paper

## **Offers a new ‘Superstar Firms’ hypothesis**

- Large firms tend to have lower labor shares
- Rising prevalence of “winner take most” competition
- Small set of large firms capture increasing share of market, aggregate labor share falls due to reallocation

## **Presents evidence consistent with this hypothesis**

1. Three decades of outcome measures
2. U.S. firm & establishment data – Economic Censuses from multiple sectors (not just manufacturing)
3. Cross-national OECD comparisons using industry (KLEMS, COMPNET) & firm-level (BVD ORBIS) data

# Summary of Evidence

1. A rise in sales concentration within four-digit industries **across US private sector**
2. Industries with **larger increases in concentration** see **larger falls in labor share**
3. Labor share fall largely due to **reallocation** of activity **between** firms, **not primarily** a general fall **within** all firms
4. **Reallocation** component of falling labor share largest in industries with rising sales concentration
5. These patterns are seen **internationally**, not just in US

# Some Related Literature

- **General Trends:** Piketty '14; IMF '17
- **Explanations of labor share fall:** (a) Measurement: Rognlie '15; Smith et al '17; (b) Market Power: Kalecki '38; Barkai '16; Gutierrez & Philippon '16; Grullon et al '17; Berkowitz et al '17; Eeckhout & De Loecker '17; Hall '18 (c) ICT: Karabarbounis & Neiman '14; (d) Trade: Elsby et al '13; (e) Regulations & Institutions: Blanchard & Giavazzi '03; Azmat et al '12
- **“Superstar” Firms:** Brynjolfsson & McAfee '08; Furman & Orszag '15; Bain '51; Demsetz '73; Schmalensee '87
- **Productivity:** Bartelsman, Haltiwanger & Scarpetta '13; Decker, et al. '17; Andrews et al '15;
- **Firms & Inequality increase:** Davis & Haltiwanger, '92; Faggio et al, '10; Card et al '13; Song et al '17
- **Firm-level Decompositions of labor share:** Bockerman & Maliranta '12; Kehrig & Vincent '17

# Overview

## **1. A Model of Superstar Firms**

## **2. Data and Measurement**

## **3. Evidence**

## **4. Discussion**



# Superstar Firm Model Sketch

Heterogeneous firms  $i$  in an industry,  $z_i$  (TFPQ)

- $Y_i = z_i N_i^\alpha K_i^\beta$ 
  - $Y$  = value-added
  - $K$  = capital
  - $N$  = labor
- Imperfectly competitive product markets with a mark-up of price over marginal cost (App I uses monop. comp.)
  - $m_i = P_i / c_i$
- Competitive factor markets: wage  $w$ , capital cost  $r$
- Firms take random draw of productivity from a distribution with pdf  $\lambda(z)$ . Productivity draw determines firm's idiosyncratic marginal cost

# The Firm-level Labor Share, $S_i$

Taking FOC with respect to labor gives *labor share*,  $S = \text{payroll } (wN) \text{ over value added } (PY) \text{ for firm } i$

- $S_i = \left( \frac{wN}{PY} \right)_i = \frac{\alpha}{m_i}$
- More productive/lower marginal cost (high  $z_i$  “superstars”) firms have:
  - larger market share ( $\omega_i = \frac{P_i Y_i}{\sum P_i Y_i}$ ) - more output due to lower marginal costs
  - lower labor share ( $S_i$ ) because their mark-up  $m_i$  is higher (e.g. Melitz & Ottaviano '08; oligopoly models like Cournot). Why?...

# Change in economic environment

- Change in environment which reallocates more market share to superstar firms will tend to (i) increase concentration and (ii) reduce aggregate labor share. Examples:
  - Increased importance of **platform competition** (network effects, especially in digital markets)
  - Larger investments needed to make **new technology** successful – Besson '17 on ICT
  - **Globalization** reallocates more output to more efficient firms (Melitz, '03; Mrázová & Neary '17)
  - **Falling competition?** (Eeckhout & De Loecker '17; Grullon et al. '16; Gutierrez & Philippon '17, '18 on anti-trust, regulation & occupational licensing). But **increase in competition** can also cause rising concentration & aggregate mark-up (App 1)

## Predictions: Consider a Change in Environment that Favors Most Productive/Superstar Firms

1. Concentration levels will increase
2. Industries with largest increases in concentration will have biggest falls in labor share
3. Fall in labor share mainly due to *reallocation* towards low labor share firms (rather than uniform fall)
4. Rising industry concentration will predict the *reallocation* component of rising labor share
5. If the underlying forces are global, these regularities will be seen in many countries

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# Data Sources (USA)

## Labor share and sales concentration

- US quinquennial Economic Censuses, 1982 – 2012
- Use six sectors covering ~ 80% of private sector jobs
  1. Manufacturing
  2. Retail
  3. Wholesale
  4. Services
  5. Utilities & Transportation
  6. Finance
- 5.2 million establishment-year observations
- 4.0 million firm-year observations
- Consistent series of four digit SIC codes

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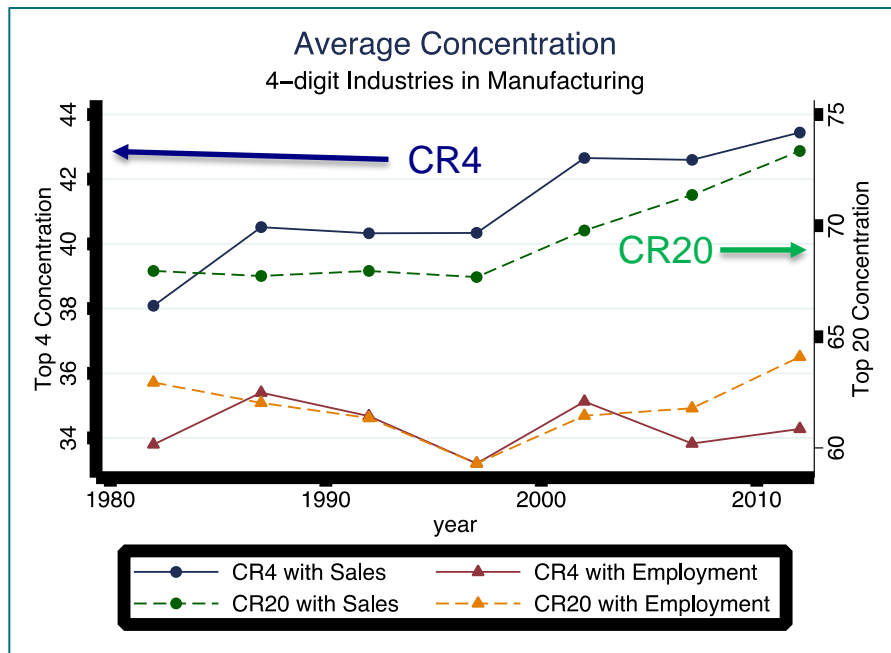
# Summary of Evidence

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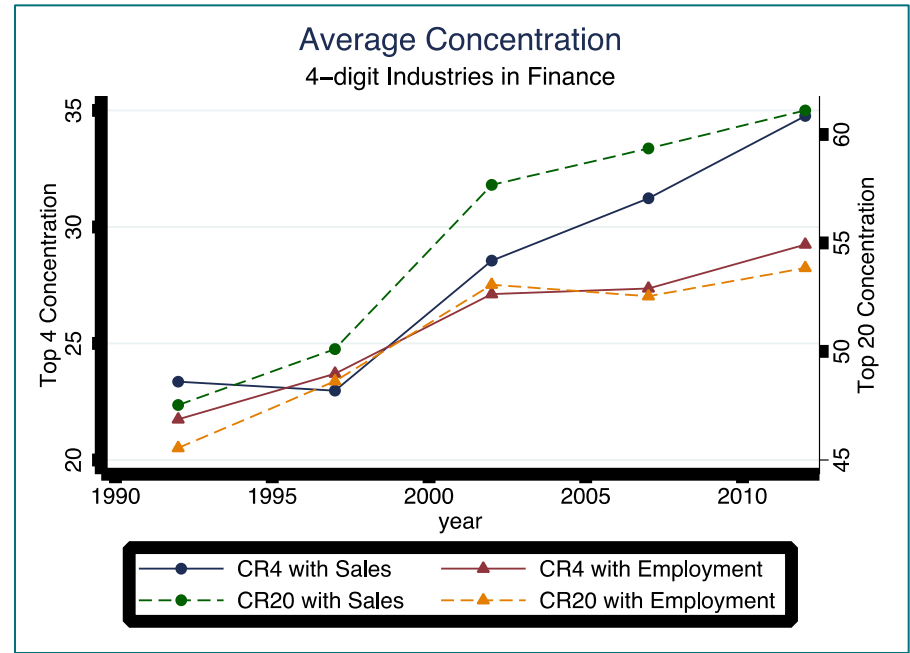


# Fig 4: Rising Concentration: Manufacturing and Finance

## Manufacturing Sector



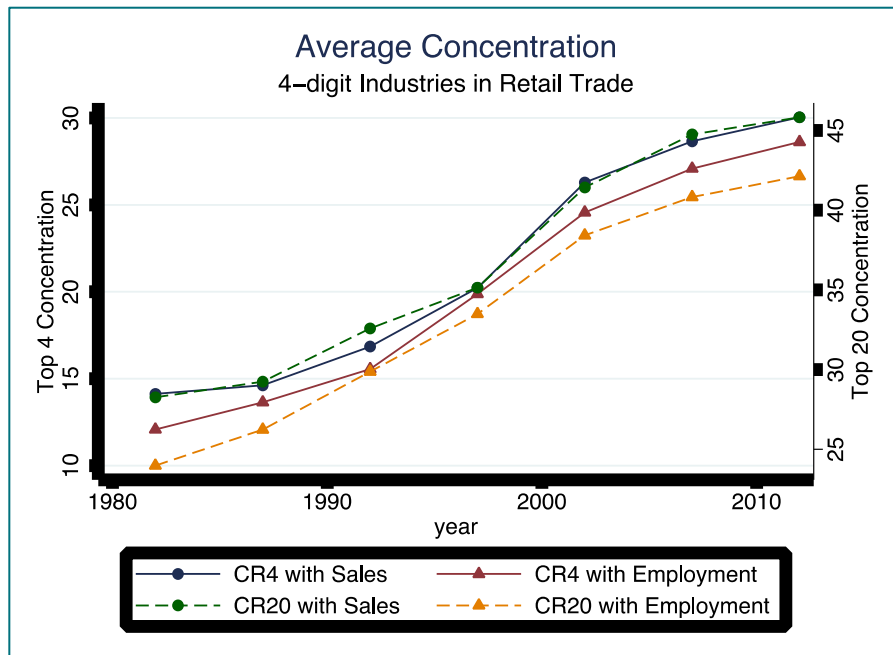
## Finance Sector



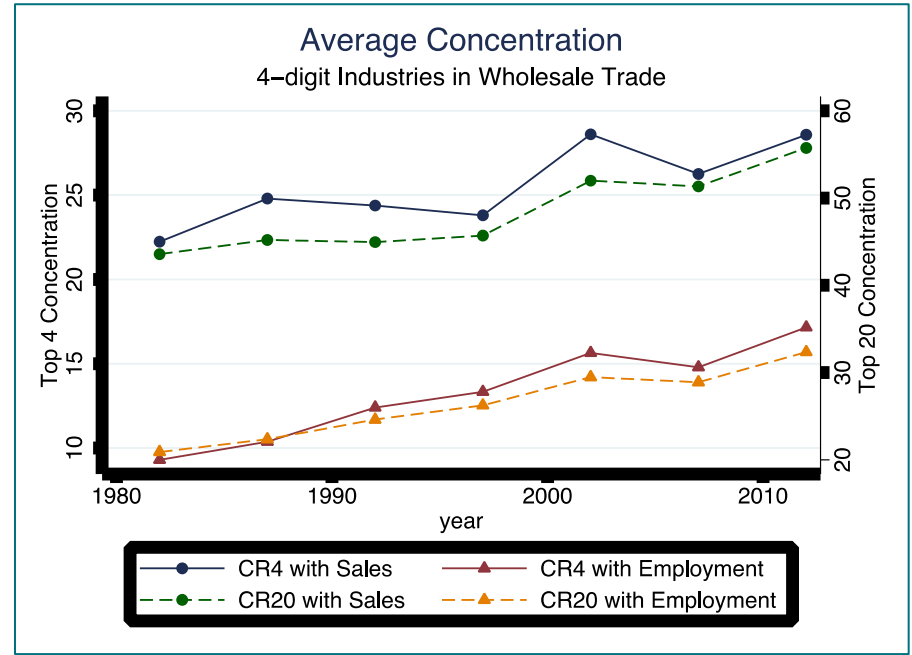
**Notes:** Weighted average of 4 digit industries within each large sector. Manufacturing: 388 inds; Finance: 31.

# Fig 4: Rising Concentration: Retail and Wholesale Trade

## Retail Trade



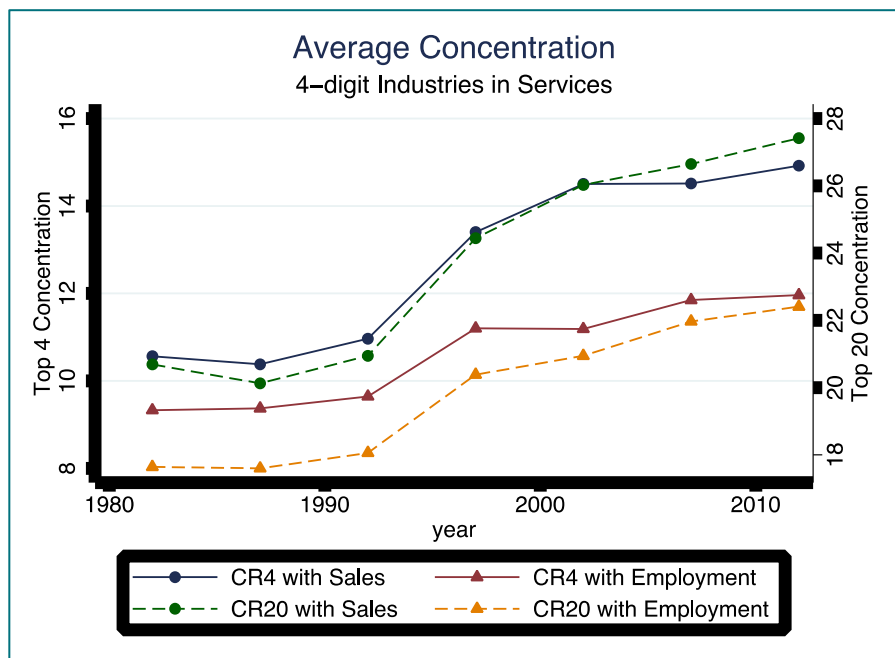
## Wholesale Trade



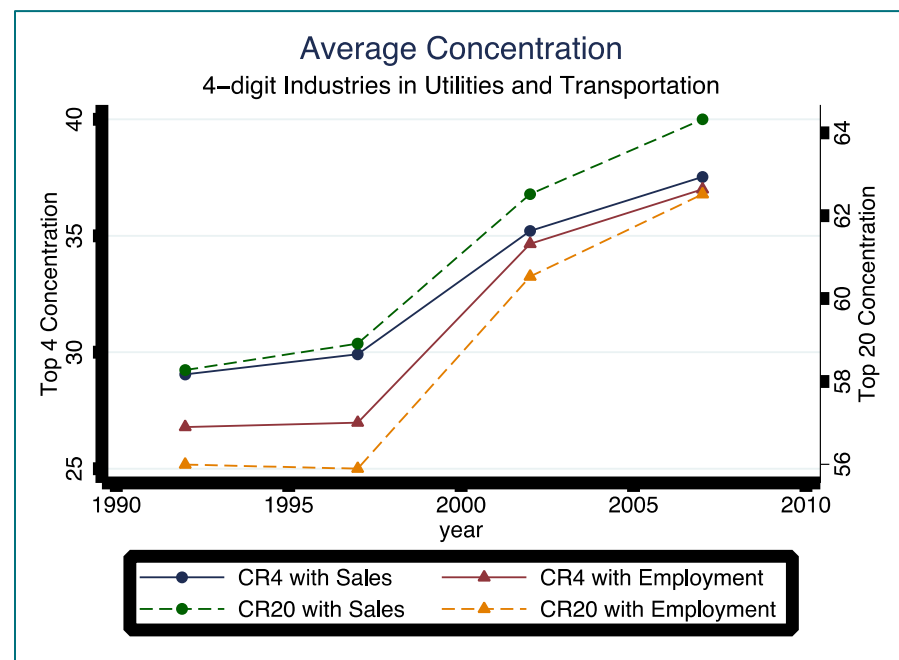
**Notes:** Weighted average of 4 digit industries within each large sector. Retail: 58; Wholesale: 56.

# Fig 4: Rising Concentration: Services and Utilities + Transport

## Service Sector



## Utilities + Transportation Sector

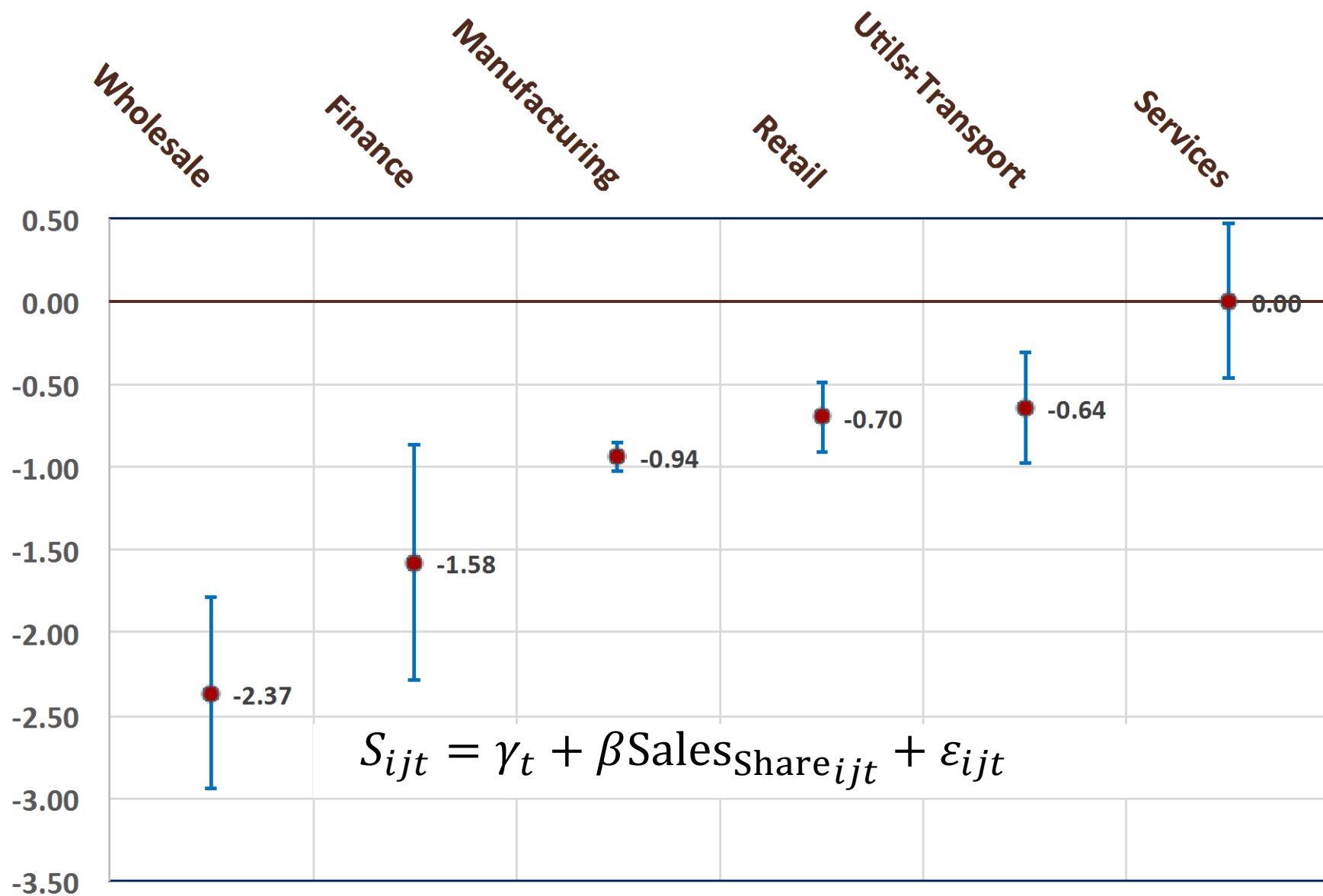


**Notes:** Weighted average of 4 digit industries within each large sector. Services: 95; Utilities & Transport: 48.

# Summary of Evidence

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# Fig 5: Basic Descriptive Relationship- Larger Firms Have Lower Labor Shares



# Table 2: Rising Concentration and Falling Labor Share; Manufacturing, 5 year changes

$$\Delta \left( \frac{\text{Payroll}}{\text{Value Added}} \right)_{it} = \Delta S_{jt} = \alpha + \beta \Delta \text{Conc}_{jt} + \gamma_t + \varepsilon_{jt}$$

	CR4		CR20		HHI	
1 Baseline	-0.148	**	-0.234	**	-0.189	*
	(0.036)		(0.047)		(0.096)	

**Notes:** \*\* significant at 1% level; \* = significant at 5% level; ~ = significant to 10% level

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	<b>CR4</b>		<b>CR20</b>		<b>HHI</b>	
<b>1 Baseline</b>	<b>-0.148</b>	<b>**</b>	<b>-0.234</b>	<b>**</b>	<b>-0.189</b>	<b>*</b>
	(0.036)		(0.047)		(0.096)	
<b>2 Compensation Share of Value Added</b>	<b>-0.175</b>	<b>**</b>	<b>-0.264</b>	<b>**</b>	<b>-0.231</b>	<b>~</b>
	(0.046)		(0.061)		(0.121)	
<b>3 Deduct Service Intermediates from VA</b>	<b>-0.331</b>	<b>**</b>	<b>-0.517</b>	<b>**</b>	<b>-0.501</b>	<b>**</b>
	(0.062)		(0.071)		(0.176)	
<b>4 Industry Trends (Four-Digit Dummies)</b>	<b>-0.171</b>	<b>**</b>	<b>-0.307</b>	<b>**</b>	<b>-0.208</b>	<b>~</b>
	(0.042)		(0.053)		(0.118)	
<b>5 1992 - 2012 Sub-Period</b>	<b>-0.181</b>	<b>**</b>	<b>-0.316</b>	<b>**</b>	<b>-0.23</b>	<b>*</b>
	(0.044)		(0.063)		(0.117)	
<b>6 Including Imports (1992 - 2012)</b>	<b>-0.204</b>	<b>**</b>	<b>-0.288</b>	<b>**</b>	<b>-0.138</b>	
	(0.052)		(0.045)		(0.180)	

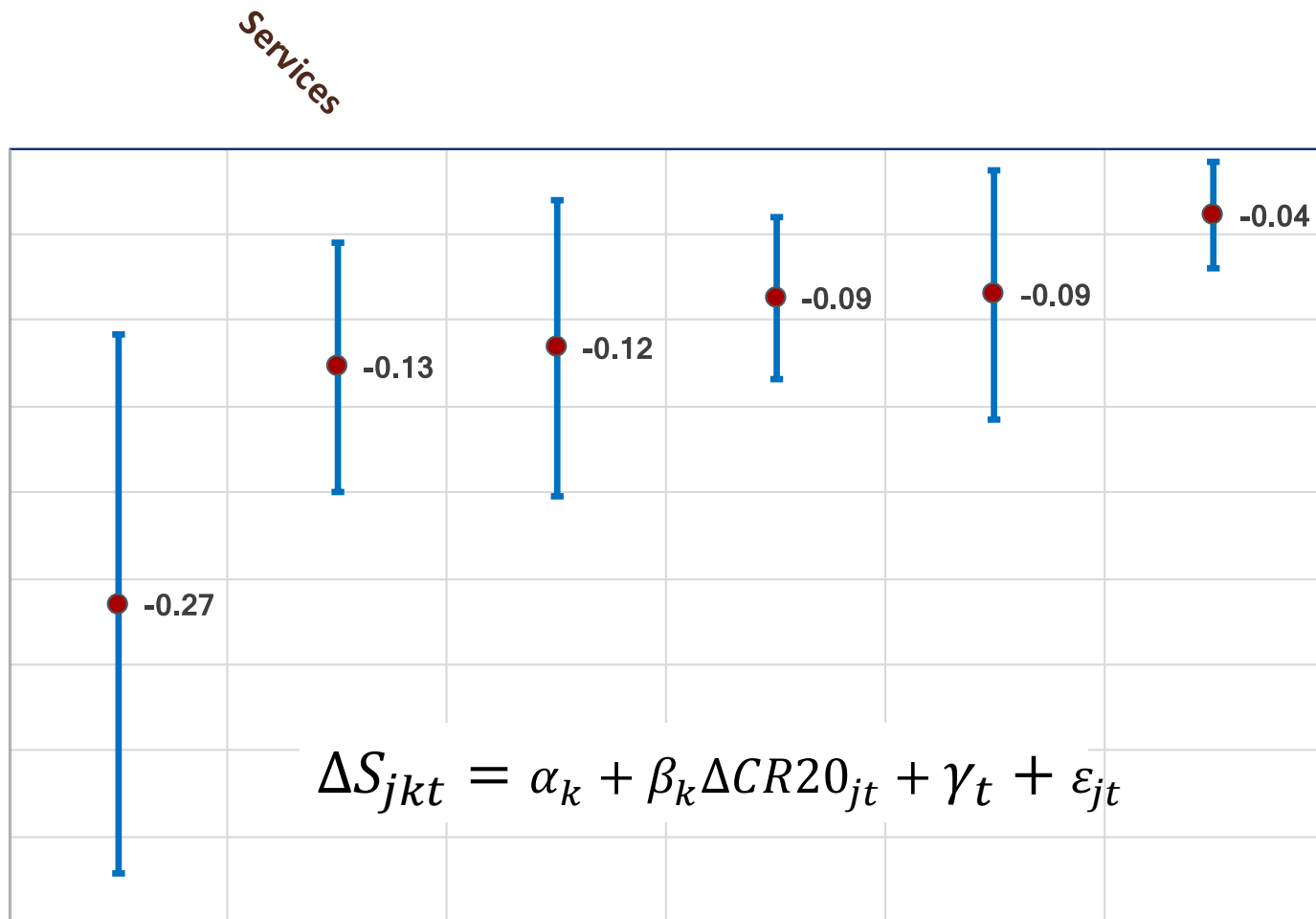
**Notes:** \*\* significant at 1% level; \* = significant at 5% level; ~ = significant to 10% level

Table 3: Industry Regressions of the Change in the Payroll-to-Sales Ratio on the Change in Concentration, Different Sectors

		Stacked Five-Year Changes			Stacked Ten-Year Changes		
		CR4	CR20	HHI	CR4	CR20	HHI
		(1)	(2)	(3)	(4)	(5)	(6)
1	Manufacturing <i>n</i> = 2,328; 1,164	-0.064 ** (0.013)	-0.087 ** (0.024)	-0.107 ** (0.027)	-0.044 * (0.022)	-0.044 (0.034)	-0.096 ** (0.037)
2	Retail <i>n</i> = 348; 174	-0.036 ~ (0.021)	-0.085 * (0.037)	-0.045 ~ (0.026)	-0.045 * (0.018)	-0.070 * (0.029)	-0.075 ** (0.023)
3	Services <i>n</i> = 570; 285	-0.090 (0.057)	-0.127 ** (0.037)	-0.354 ** (0.083)	-0.087 (0.070)	-0.129 ** (0.043)	-0.378 * (0.158)
4	Wholesale <i>n</i> = 336; 168	-0.035 ** (0.012)	-0.039 * (0.016)	-0.079 * (0.039)	-0.037 * (0.018)	-0.036 * (0.018)	-0.067 (0.050)
5	Finance <i>n</i> = 124; 62	-0.230 ** (0.083)	-0.265 ** (0.080)	-0.565 ** (0.204)	-0.252 ** (0.091)	-0.291 ** (0.070)	-0.740 * (0.294)
6	Utilities + Transport <i>n</i> = 144; 48	-0.118 ** (0.026)	-0.116 ** (0.044)	-0.434 ** (0.054)	-0.048 (0.072)	-0.122 * (0.051)	-0.269 ** (0.104)
7	All combined <i>n</i> = 3,850; 1,901	-0.076 ** (0.016)	-0.093 ** (0.022)	-0.144 ** (0.028)	-0.063 ** (0.019)	-0.083 ** (0.024)	-0.122 ** (0.033)



# Fig 6: $\Delta$ Labor Share of Sales regressed on $\Delta$ Concentration: Results Across Six Sectors



**Notes:** OLS Regression coefficient of  $\Delta$ Labor Share (payroll over sales) on CR20 (5 year changes); 95% confidence intervals; 1982-2012.

# Summary of Evidence

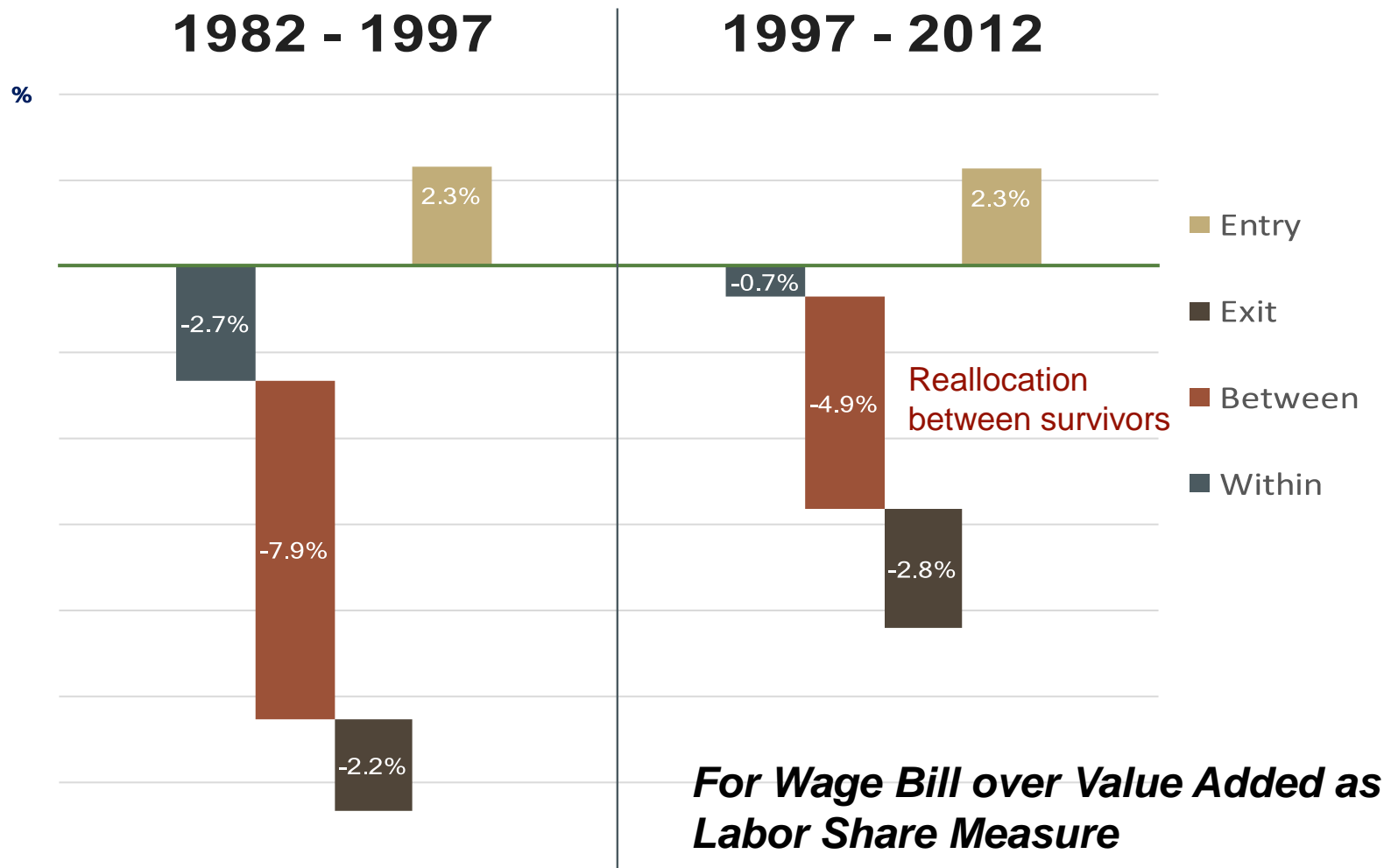
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5. These patterns broadly international in scope

# Dynamic OP Decomposition between periods 2 & 1: Melitz-Polanec '15 add Entry + Exit

$$\Delta S = S_2 - S_1 = \Delta \bar{S}_S + \Delta [\Sigma(\omega_i - \bar{\omega})(S_i - \bar{S})]_S + \omega_{X,1}(S_{S,1} - S_{X,1}) + \omega_{E,2}(S_{E,2} - S_{S,2})$$

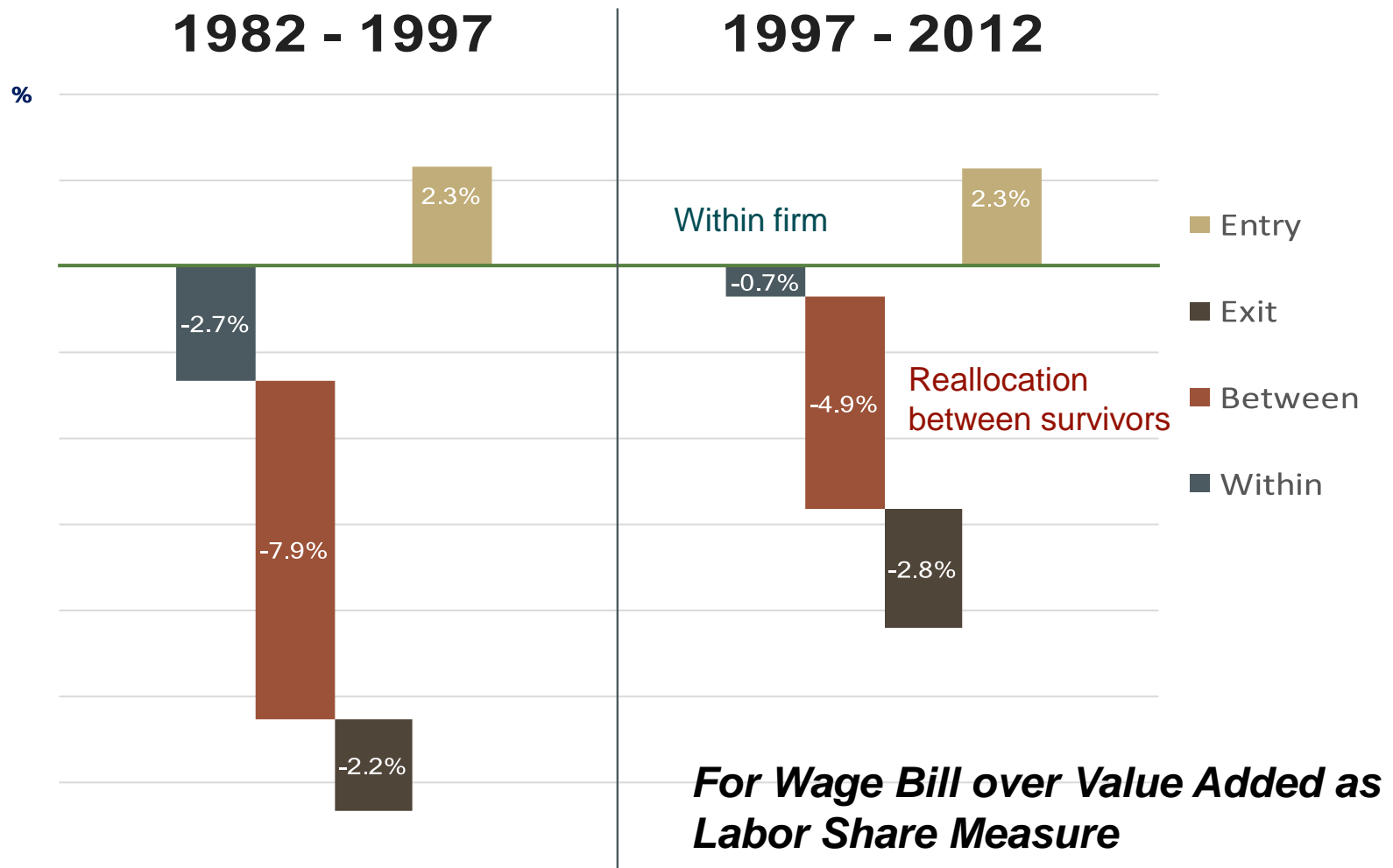
1.  $\Delta \bar{S}_S$  is the change in unweighted mean labor share *within* surviving firms
  2.  $\Delta [\Sigma(\omega_i - \bar{\omega})(S_i - \bar{S})]_S$  is reallocation *between* survivors
  3.  $\omega_{X,1}(S_{S,1} - S_{X,1})$  is contribution of *exiting* firms
  4.  $\omega_{E,2}(S_{E,2} - S_{S,2})$  is contribution of *entering* firms
- Also do alternative shift-share decompositions

# Fig 9: MP Decomposition for Manufacturing: Between firm reallocation main component



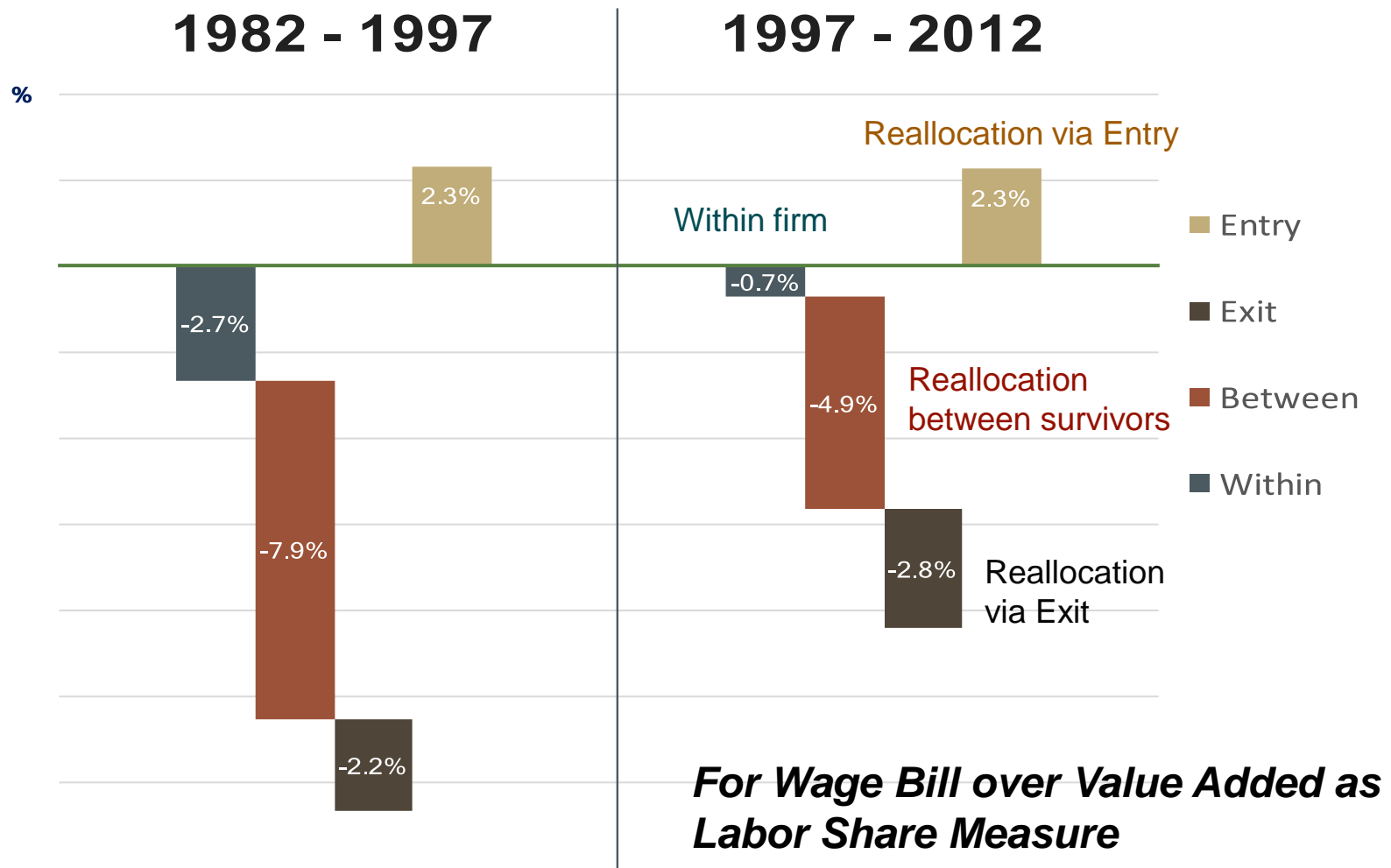
**Notes:** Overall labor share falls 16.5 percentage points 1982-2012. MP decomposition over 5 year periods, aggregated to two 15 year periods

# Fig 9: MP Decomposition for Manufacturing: Between firm reallocation main component



**Notes:** MP decomposition over 5 year periods, aggregated to two 15 year periods

# Fig 9: MP Decomposition for Manufacturing: Between firm reallocation main component

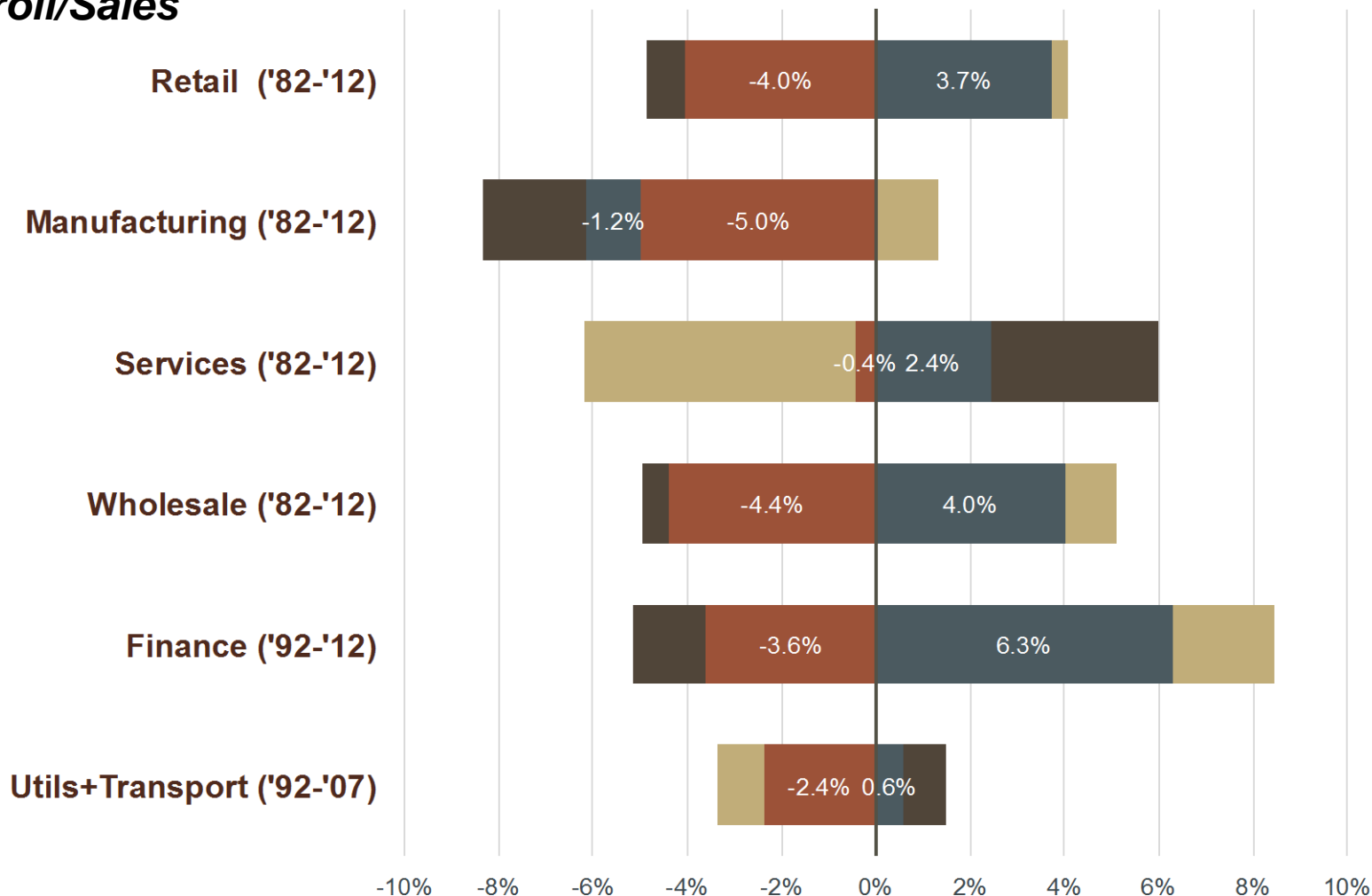


**Notes:** MP decomposition over 5 year periods, aggregated to two 15 year periods

# △ Labor-Share Decomposition in 6 Sectors: Reallocation component dominates

**Uses**  
**Payroll/Sales**

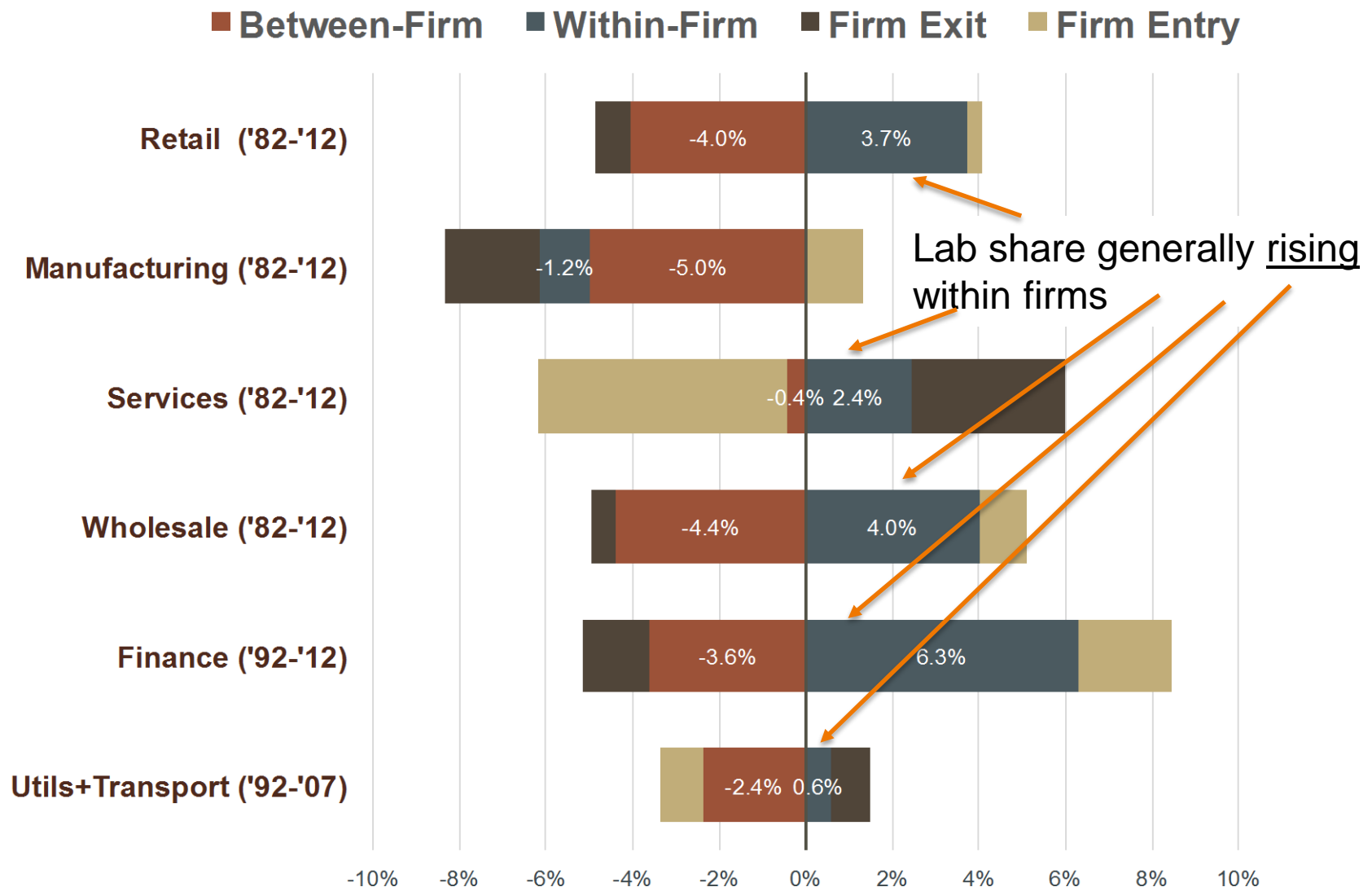
■ Between-Firm   ■ Within-Firm   ■ Firm Exit   ■ Firm Entry



**Notes:** MP decomposition over 5 year periods, aggregated over the full sample period

# △ Labor-Share Decomposition in 6 Sectors

## Unweighted mean lab share for incumbents *rises*



**Notes:** MP decomposition over 5 year periods, aggregated over the full sample period



# Price-cost markups (Preliminary)

## 1. Harder to estimate mark-ups than labor shares!

- Sales/Costs (Antras, Fort & Tintelnot '17)
- Using FOC (de Loecker & Warzynski '12; Hall '88)
  - Estimate production function in each industry to obtain elasticity of output wrt to variable factor ( $\alpha_{it}$ ); divide by factor share ( $SHARE_{it}$ ):

$$\widehat{m}_{it} = \frac{\alpha_{it}}{SHARE_{it}}$$

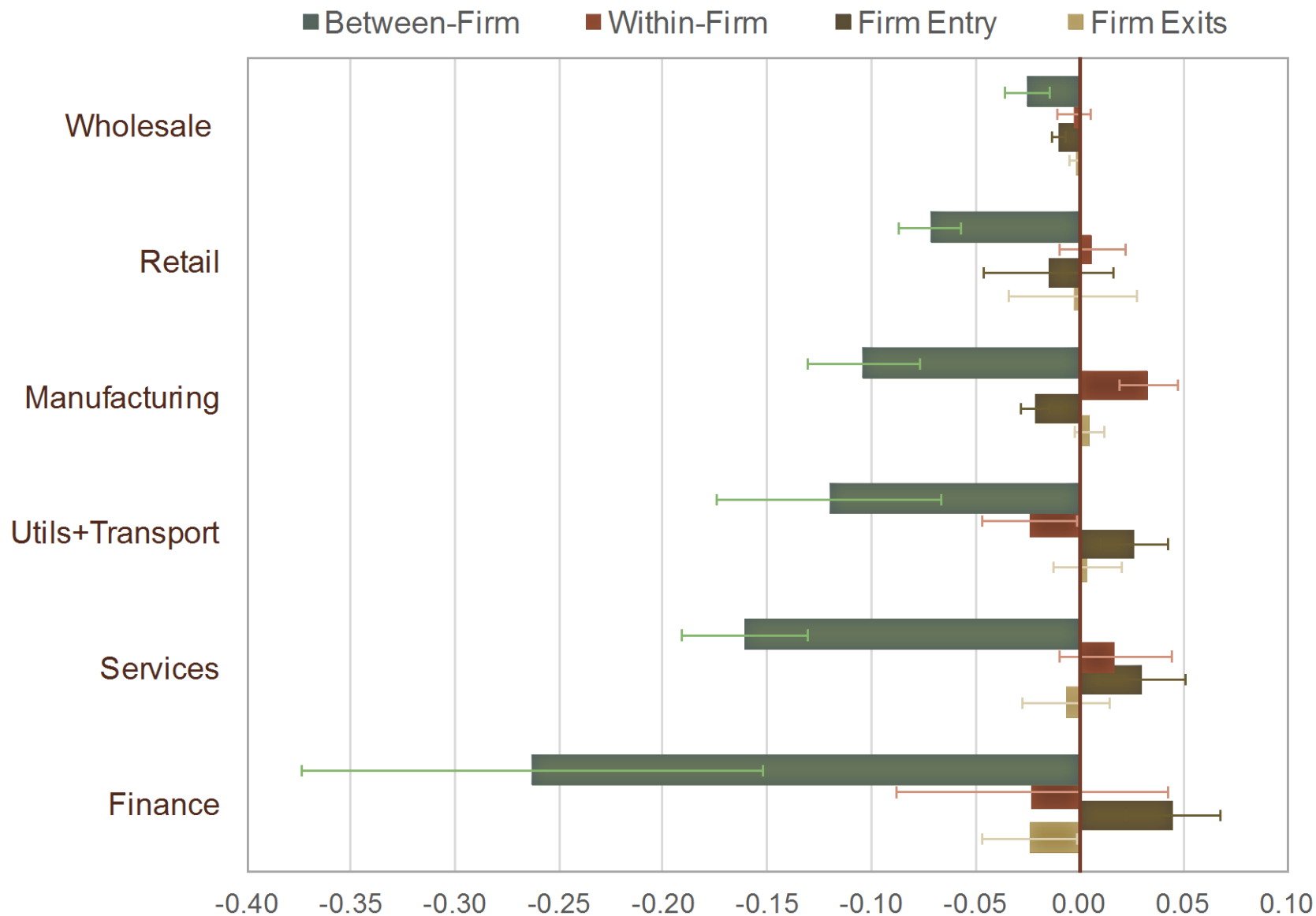
## 2. Using all methods we observe (in CM):

- Higher mark-ups for larger firms in cross section
- Increase in aggregate mark-up but relatively little change in unweighted average mark-up (again, it's reallocation)

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# Fig 11: Regression of $\Delta$ Labor Share Components on Sector Level $\Delta$ CR20: Loads on reallocation term



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5. These patterns are broadly **international** in scope

# Data Sources (International)

## **Industry-level labor shares, intermediate services**

- KLEMS data
- 11 countries, 32 industries

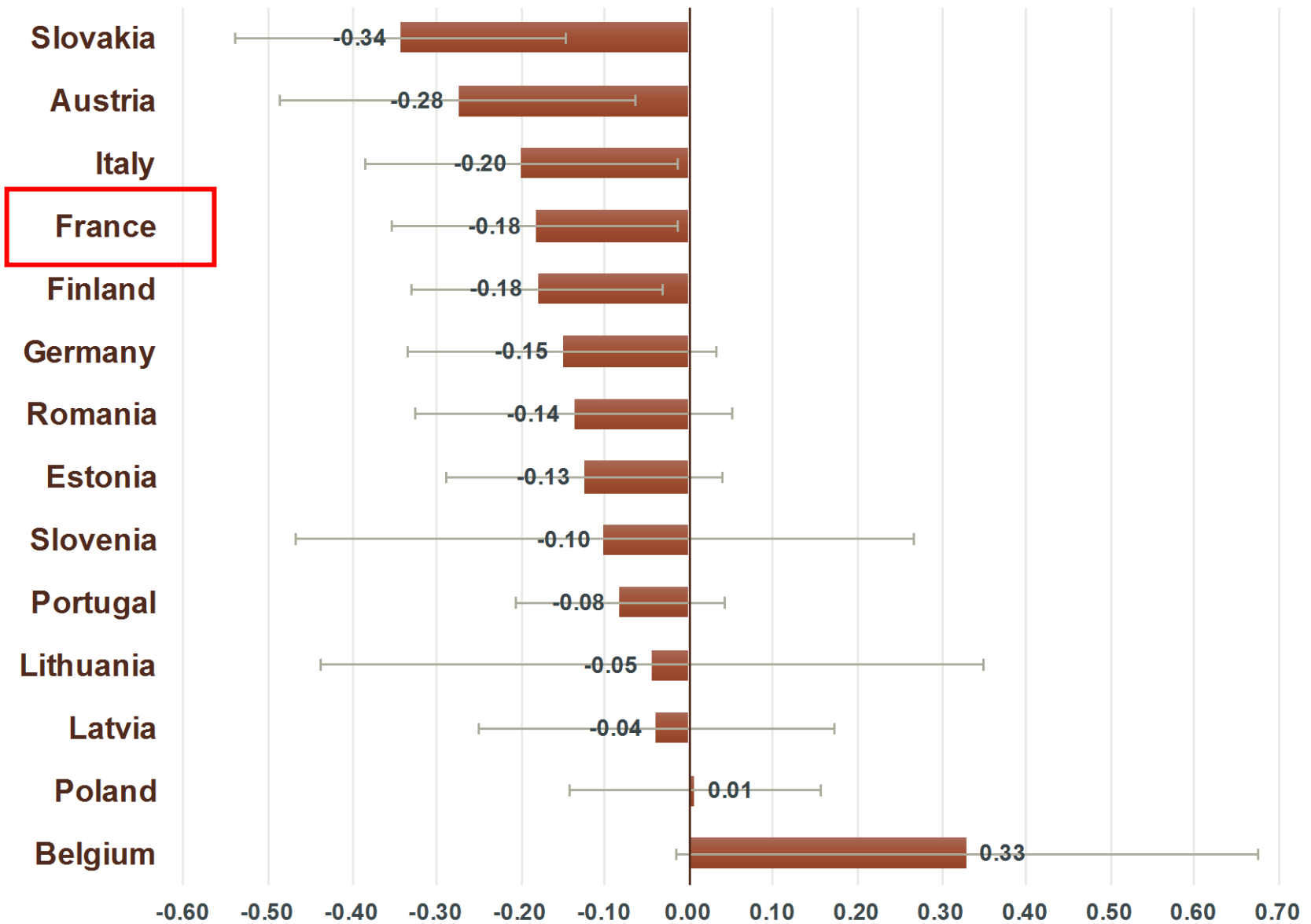
## **Industry-level labor shares and concentration**

- ECB COMPNET data
- 14 countries, 53 industries

## **Firm-level labor shares**

- BvD Orbis data
- 6 EU countries

**Table 6: Industry Regs of  $\Delta$  Labor Share of Sales on  $\Delta$  Concentration (COMPNET, 10 year change)**



# Overview

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# Summary of Empirical Findings

1. A pervasive fall in labor share across countries
2. Mainly due to reallocation of sales between-firms within industries rather than within-firm changes
3. Industries with largest increases in concentration had largest falls in labor share
4. And this was due to the reallocation component of falling labor share, not a general fall in share
5. Comparable international findings in industry & firm-level data across OECD countries

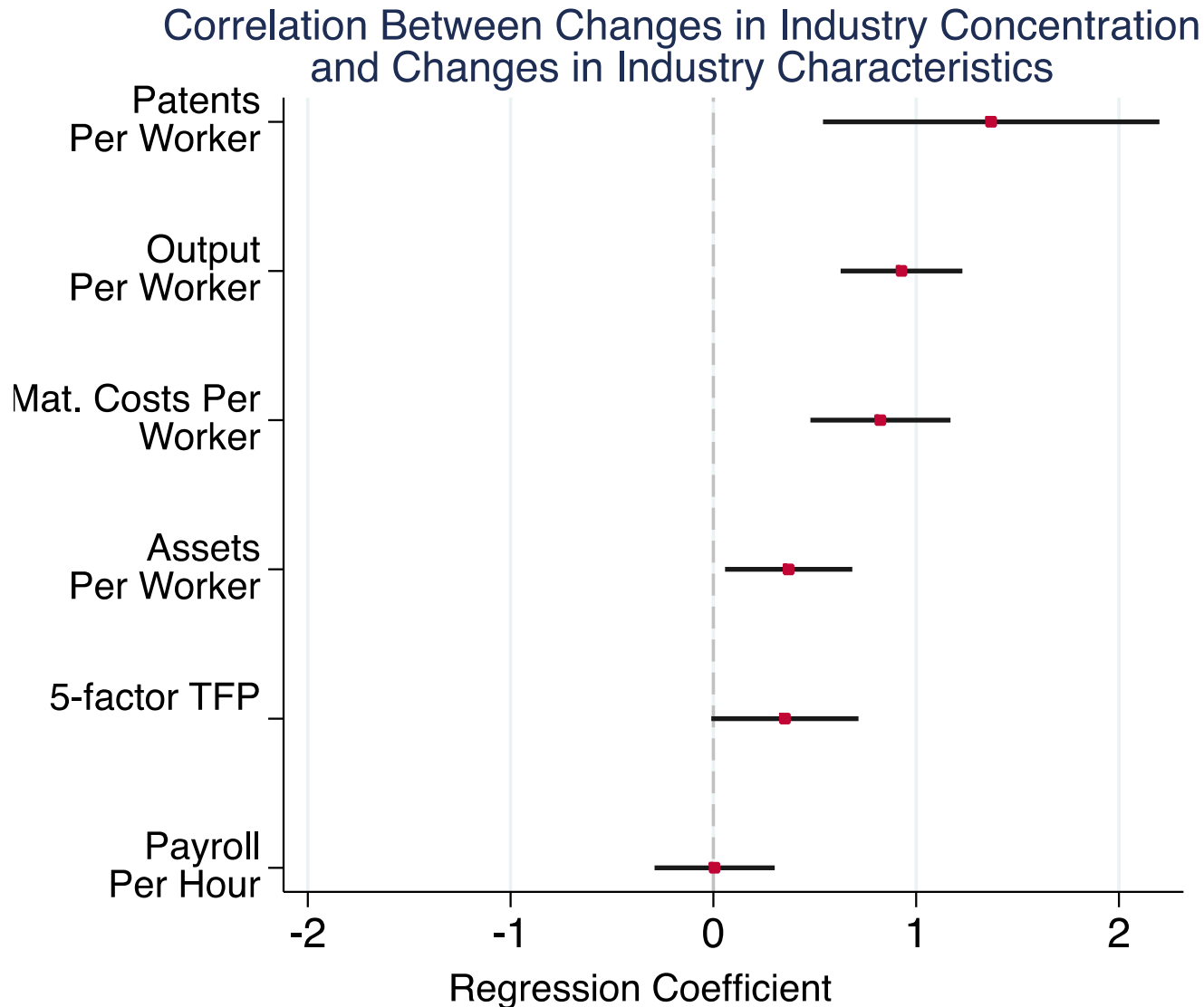


# What's Not Going on

## Results do not appear explained by

1. Country-specific institutional factors like specific regulations or weakening labor unions
2. Susceptibility to 'routine-replacing technical change' (ICT)
3. 'China shock' – trade exposure not major predictor

**Fig 14: Not Simply “Rigged Economy:” Concentrating Industries Show Larger Increase in Innovation, Productivity**



# Conclusion: Much Supporting Evidence for 'Superstar Firms'

## 1. Tougher competition?

- More consumer sensitivity to price/quality

## 2. Shift towards 'winner take most' markets?

- IP and information-intensive goods

## 3. Less creative destruction?

- Less entry/exit/startup, Decker et al '14, Şahin et al '17
- More persistent tech. leaders, Acemoglu-Hildebrand '17
- Laggard firms catching up less quickly, Andrews et al, '16

## 4. Does ↑ concentration indicate *weaker* competition?

- **Good news:** concentrating industries look dynamic
- **But** once dominant, firms can raise barriers to growth/entry

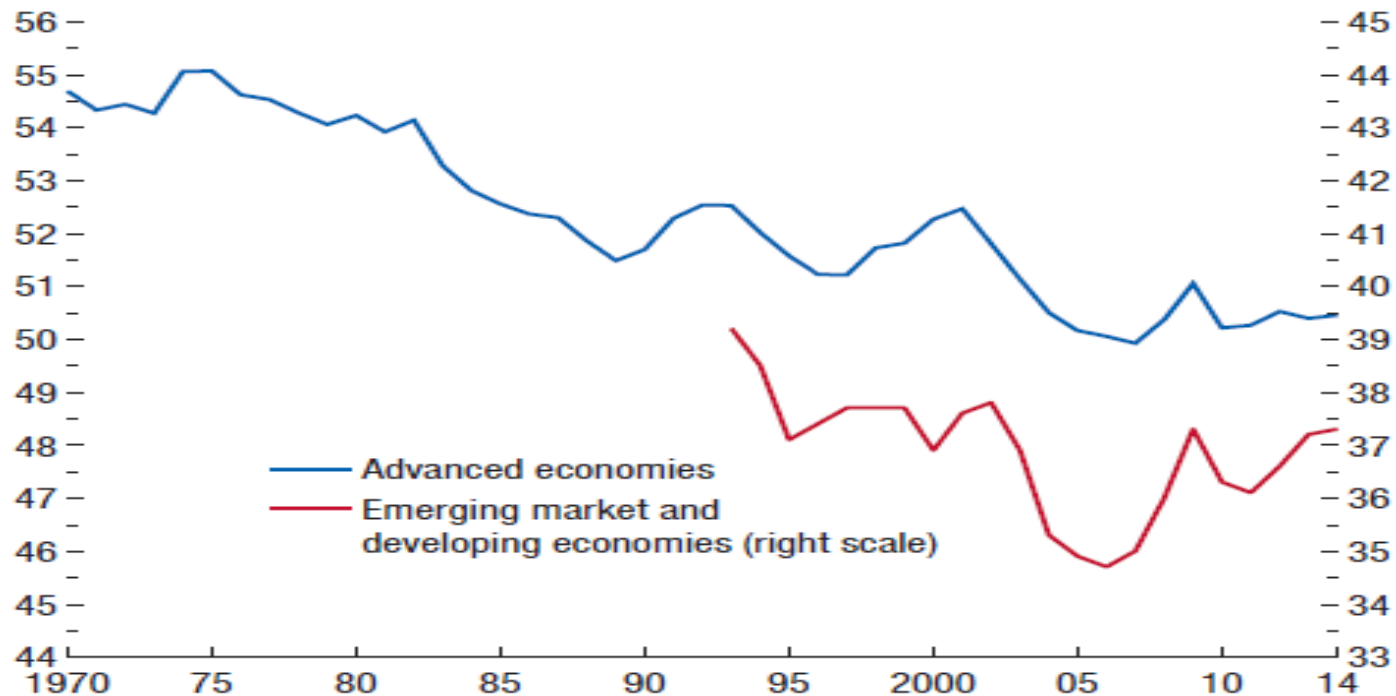
# Back Up

# Superstar Firm Model (Generalization of Melitz & Ottaviano, 2008)

- Monopolistic Competition with heterogeneous firms
  - General class of utility functions consistent with “Marshall’s 2<sup>nd</sup> Law of Demand” (generates variable mark-ups unlike CES Dixit-Stiglitz preferences)
  - General class of underlying firm productivity distributions (nests Pareto pdf)

**Figure 3.1. Evolution of the Labor Share of Income**  
(Percent)

The labor share of income has been on a downward trend in both advanced economies and emerging market and developing economies.



Sources: CEIC database; Karabarbounis and Neiman (2014); national authorities; Organisation for Economic Co-operation and Development; and IMF staff calculations.

Note: For advanced economies the figure shows averages weighted by nominal GDP in current U.S. dollars. For emerging market and developing economies the figure shows year fixed effects weighted least squares regressions (using nominal GDP weights) that also include country fixed effects. Year fixed effects are normalized to reflect the level of the labor share in 2000.

# Industry Codes

- “Retail & wholesale” has Office equipment, computers & software nec. 5044/4045/5046
- Services – computer programming & related (7371/7372/7273/7279/7378/7377)

# Productivity paradox

- If labor share fall was due to a general drop in competition this would help explain productivity slowdown.
- However we find *unweighted* average firm LS/mark-ups haven't changed much - Reallocation matters more
- But reallocation to more productive firms should generate higher productivity growth, but growth has actually slowed
- We do see faster productivity growth and innovation in the concentrating sectors where LS declining
- So culprit for productivity slowdown need to be found elsewhere than falling competition (finance; uncertainty; ideas harder to find; mismeasurement, etc.)



# Decompositions

- Labor share decomposition similar to (inverse) labor productivity decomposition
  - But different from standard TFP decomposition
  - And standard model would have increased lab productivity growth but unchanged lab share (not secular decline in lab share)
- We find larger role for reallocation than usual decompositions

# Outsourcing/Offshoring

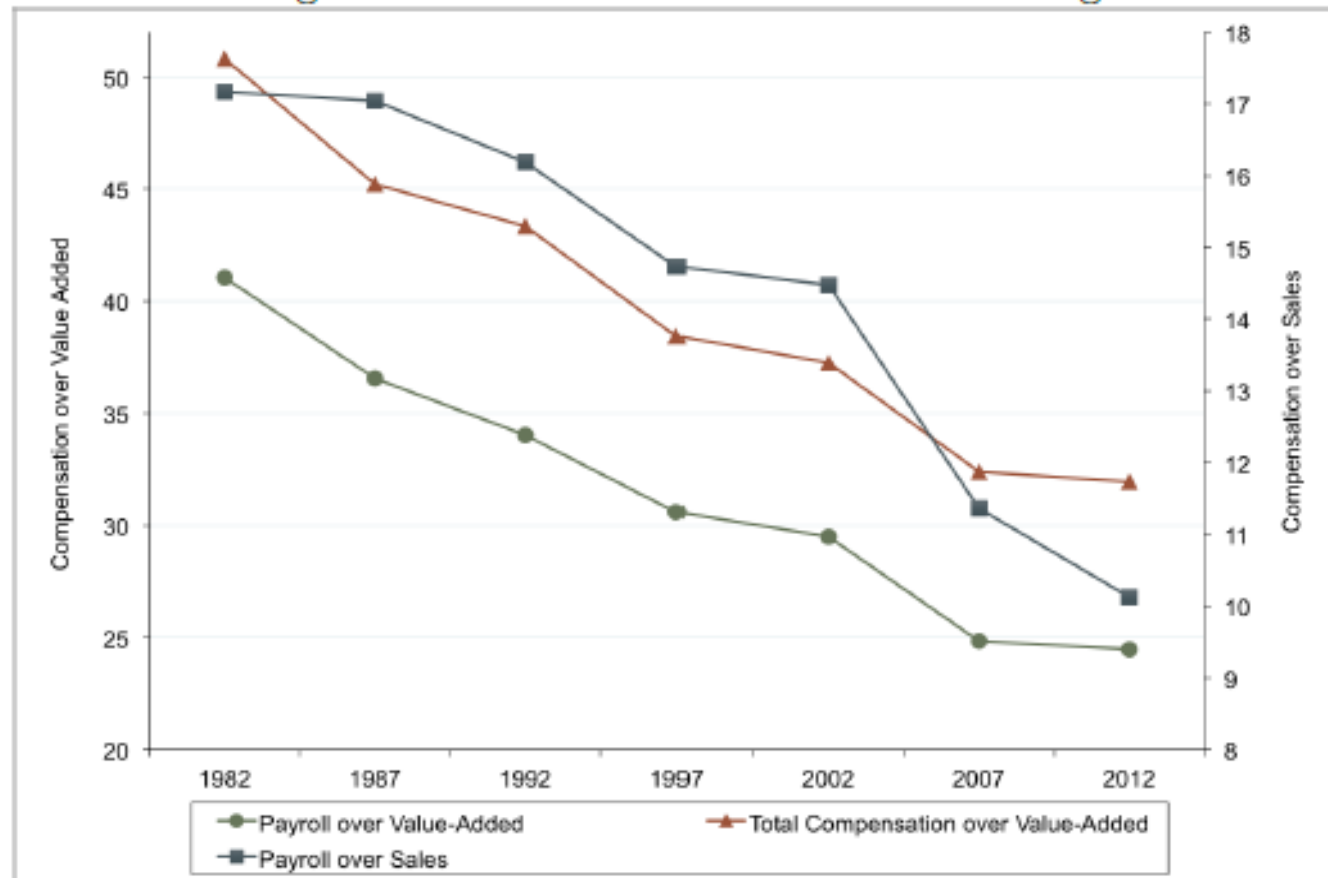
- Domestic outsourcing can't be direct cause of aggregate LS fall - workers show up somewhere (would have to be some fall in rents type story)
- If offshoring was the cause, can assess this by looking at Compustat data – we see fall in even in multinationals (But could be offshoring AND outsourcing (e.g. Apple/FoxComm))
- Payroll/sales could fall with outsourcing, but no obvious bias with payroll/value added (VA net of intermediate inputs)
- Control for underestimated service inputs by looking within SIC4 for decompositions
- Underestimate  $\Delta$ outsourcing for large firms? Implies big within firm fall in LS. We don't see this.

# Concentration & Labor Share: Magnitudes

- Counterfactual: If concentration had stayed at 1982 levels what would the labor share have been in a sector in 2012 compared to actual level?
  - Example of CR20 (see Figure 7)
- Varies from 10% in manufacturing to 100% in retail
- Surprisingly low in manufacturing? Effect increased over time as coefficient on concentration rises. In the last 15 years 1997-2012 over 1/3 of change accounted for

# Change in the Labor Share in US manufacturing

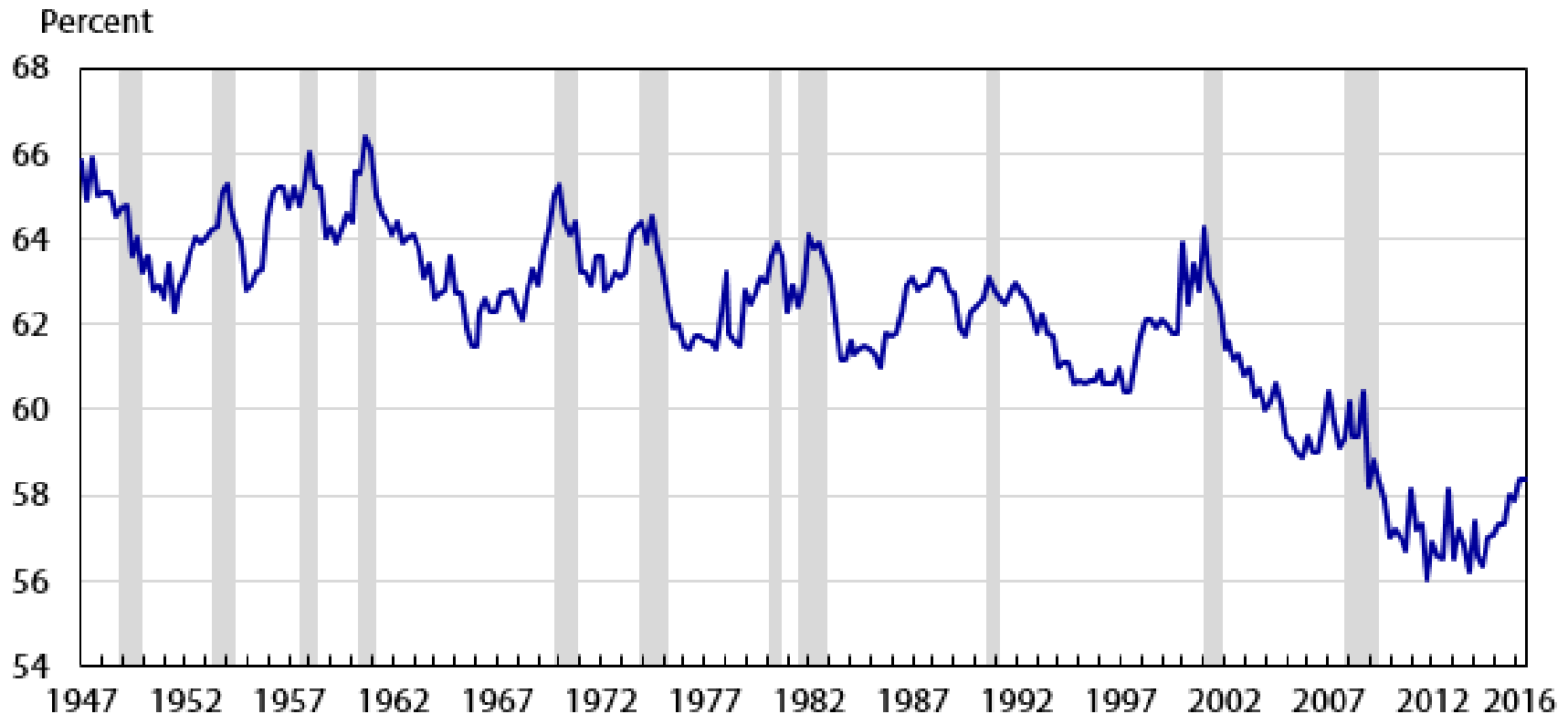
Figure 2: The Labor Share in Manufacturing



Notes: This figure plots the aggregate labor share in manufacturing from 1982-2012. The green circles (plotted on the left axis) represent the ratio of wages and salaries to value-added. The red diamonds (also plotted on the left axis) include a broader definition of labor income and plots the ratio of wages, salaries and fringe benefits to value-added. The blue squares (plotted on the right axis) show wages and salaries normalized by sales rather than value-added.

# US Labor Share 1947-2016

**Figure 1. Labor's share of output in the nonfarm business sector, first quarter 1947 through third quarter 2016**



Note: Shaded areas indicate recessions, as determined by the National Bureau of Economic Research.

Source: U.S. Bureau of Labor Statistics.

# NIPA vs Census. Manufacturing Labor Share

Figure A.8: Comparing Labor Share in NIPA and Census: Manufacturing Only  
Panel A: The Labor Share

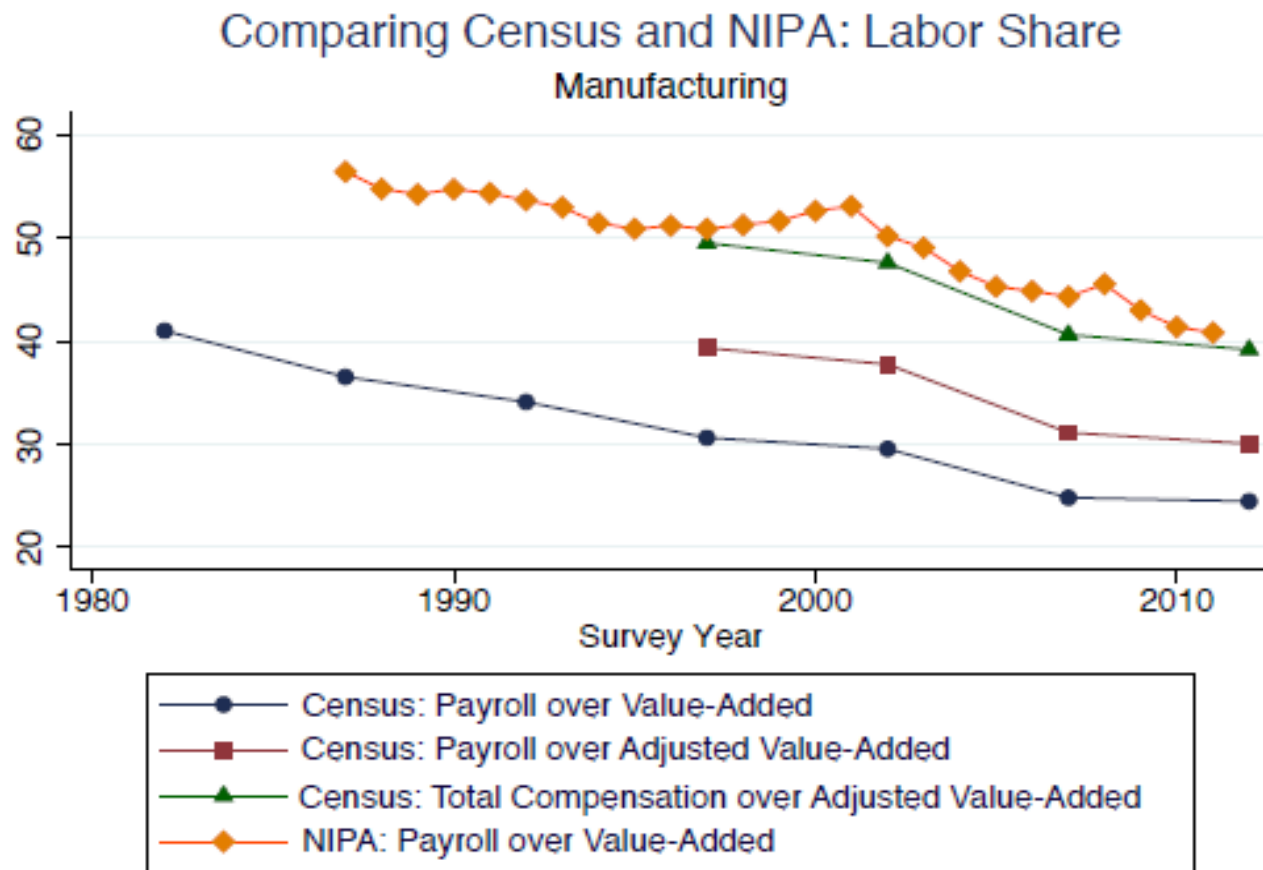
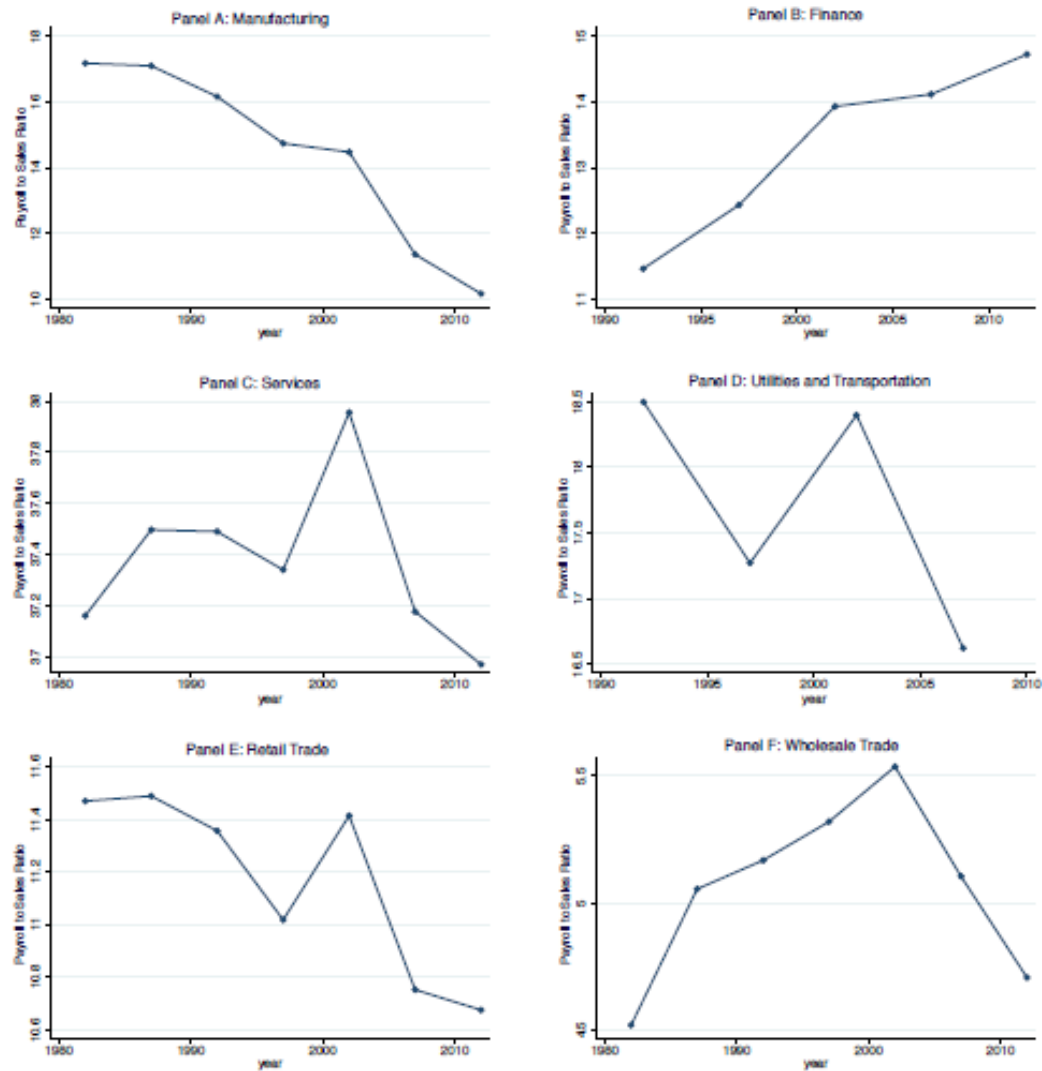


Figure 3: Average Payroll-to-Sales Ratio



**Notes:** Each panel plots the overall payroll-to-sales ratio in one of the six major sectors covered by the U.S. Economic Census.

# Consider increase in market toughness (globalization or higher variety substitutability)

**Modelled as a fall in minimum cost threshold** ( $c^*$ : if a firm's marginal cost,  $c > c^*$  it will exit)

1. Output shifts to low labor share firms. “Between firm” reallocation pushes down aggregate labor share
2. But for an individual firm, labor share rises because mark-up falls (“within firm”)

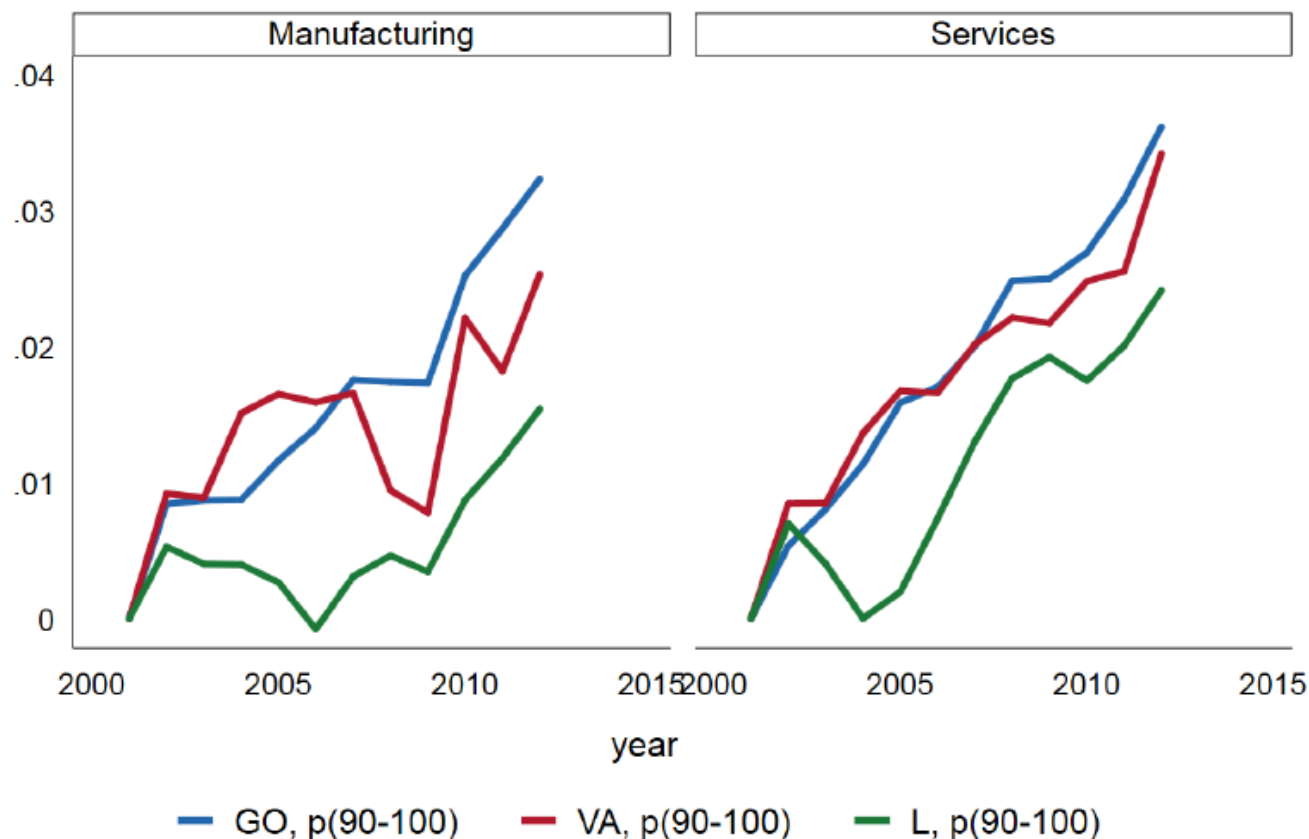
**Result 3: An increase in market toughness depends on pdf of productivity,  $\lambda(z)$**

- **Reduces** industry labor share if  $\lambda(z)$  is log convex
- **Increases** industry labor share if  $\lambda(z)$  is log concave
- Leaves industry labor share **unchanged** if  $\lambda(z)$  is log linear.  
This is standard Pareto case (e.g. Melitz & Ottaviano '08)

**Hence, fundamentally an empirical issue**



## Trends in within-country-sector changes in Share of GO, VA, L in the top decile of sales distribution

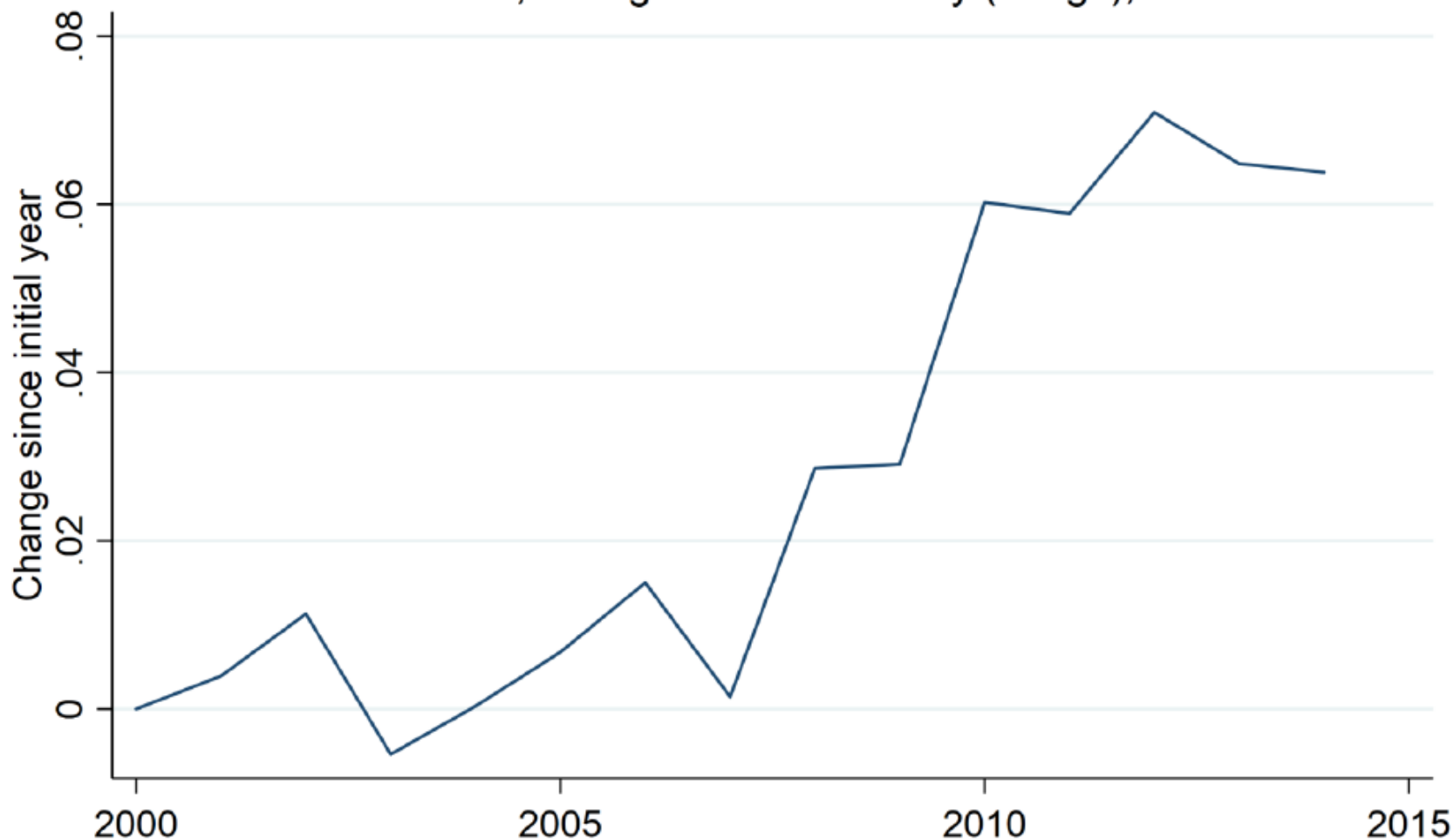


*Note:* Countries included: Australia, Austria, Belgium, Switzerland, Denmark, Finland, Japan, Hungary, Norway, Portugal and Sweden. The estimates reported in the graph are those of year dummies in a cross-country regression of the share of GO, L and VA in the top decile of the distribution with year=2001 being the reference year and with 2-digit sectoral dummies included.

Source: **MultiProd** database, December 2017.

## Top 4 firm market share: Europe

STAN denominator; changes within industry (2-digit); consolidated



The market shares are calculated by dividing sales of top 4 firms in Orbis by the total sales in the OECD STAN database. Year effects from regressions including industry and year dummies.

# Higher mark-up ( $m_i$ ) for more productive firms arises in many standard cases

1. Demand more inelastic when price is lower. Highly productive firms charge lower prices & so face more inelastic demand. Thus mark-ups  $m_i$  higher
2. In our data we confirm that larger firms have lower labor shares (& higher mark-ups as in de Loecker & Warzynski '12)
3. Consistent with Pass-through literature: 1% marginal cost increase causes less than a 1% increase in price (e.g. Arkolakis et al, '18 survey)
4. **Note:** CES preferences imply common mark-up. But if allow fixed costs of labor (Bartelsman et al '13)  $N = V + F$ , then superstar firms still have lower labor shares since

$$S_i = \left( \frac{wN}{PY} \right)_i = \frac{\alpha}{m} + \frac{wF}{(PY)_i}$$

# Consider increase in market toughness (globalization or higher variety substitutability)

**Modelled as a fall in minimum cost threshold to produce in market** ( $c^*$ : if a firm's marginal cost,  $c > c^*$  it will exit)

1. Output shifts to low labor share firms. “Between firm” reallocation pushes down aggregate labor share
2. But for an individual firm, labor share rises because mark-up falls (“within firm”)

**Increase in market toughness depends on pdf of productivity,  $\lambda(z)$**

- **Reduces** industry labor share if  $\lambda(z)$  is log convex;
- Unchanged if log linear (e.g. Pareto case); Increases if log concave

**Hence, fundamentally an empirical issue**

# Fig 13: $\Delta$ Labor Share: Within/Between-Firm Decomposition by Country Using BVD Orbis Data

