

STRUCTURAL CHANGE AND THE RISE IN MARKUPS

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May 8th 2024

Spring Conference on Structural Changes and the Implications for Inflation

Deutsche Bundesbank

Eltville am Rhein

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 - Industries have become more **concentrated** (Grullon, Larkin and Michaely (2019), Covarrubias, Gutierrez and Philippon (2018))

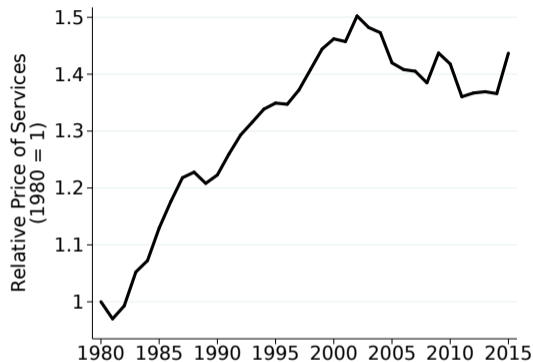
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- Current hypotheses
 - Rise of superstar firms (e.g. Autor, Dorn, Katz, Patterson, and Van Reenen (2020))
 - Firms are responding to the increase of barriers to entry or other fixed costs (e.g. De Ridder (2021))
 - Mismeasurement (e.g. Bond, Hashemi, Kaplan, and Zoch (2021), De Ridder, Grassi, and Morzenti (2022), Raval (2020), Traina (2018))

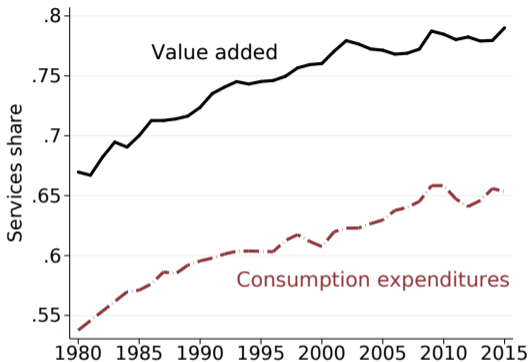
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- **My hypothesis: structural change** \Rightarrow rise in markups

>>> WHY STRUCTURAL CHANGE?



(A) Relative price of services



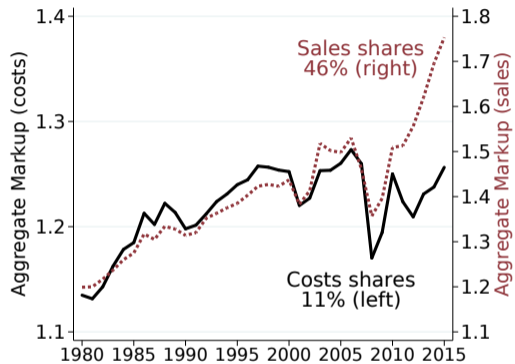
(B) Service shares

Data: CEX and KLEMS.

- $P_t = M_t \times MC_t$: Markups or/and marginal costs?

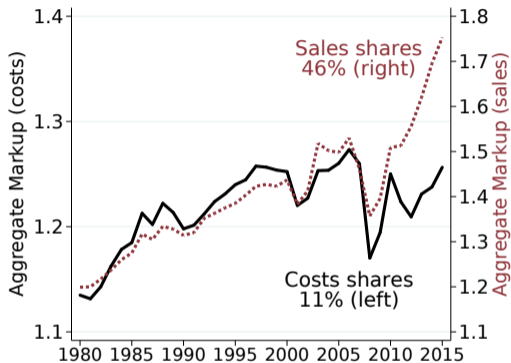
▶ Examples of prices of goods and services ▶ Patterns across European countries ▶ U.S. since 1947

>>> THE RISE IN MARKUPS

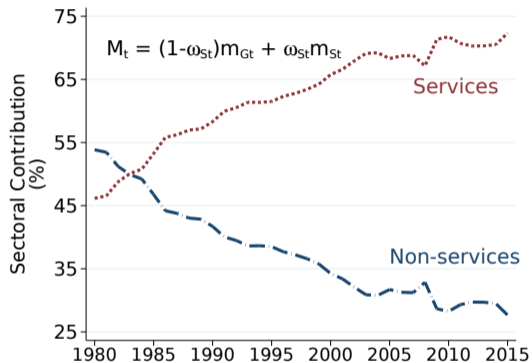


(A) Aggregate markups

>>> THE RISE IN MARKUPS



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(B) Sectoral contribution

Data: Compustat and KLEMS.

► Since 1960

>>> THE RISE OF MARKUPS IN SERVICES

	Non-services			Services		
	1980	2015	Δ	1980	2015	Δ
Average markups (cogs)	1.13	1.21	7.3%	1.14	1.27	11.9%
Average markups (cogs + sga)	1.18	1.44	22.3%	1.19	1.65	37.8%
Average markups (sales)	1.17	1.47	25.5%	1.22	1.86	52.2%
Sectoral shares (comp + II)	54.0	28.6	-47.0%	46.0	71.4	55.1%
Sectoral shares (gross output)	47.4	27.6	-41.8%	52.6	72.4	37.7%

Data: Compustat and KLEMS.

- ▶ Average markups over time
- ▶ Average markups by subsector
- ▶ Distribution of markups by sector
- ▶ Fixed costs, superstars, and other stats

>>> DRIVERS OF STRUCTURAL CHANGE AND MARKUPS

- **Can drivers of structural change explain the rise in markups?**
 - Stronger increase in **average** markups in services than in manufacturing?
 - **Jointly** with decline in relative price of manufacturing and reallocation of economic activity?

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 - I. Differential rates of technological progress (e.g. Ngai and Pissarides (2007))
 - ↓ Relative price of goods
 - II. Income effects (e.g. Kongsamut, Rebelo, and Xie (2001), Boppart (2014))
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 - As people become wealthier, they become less price sensitive
- **Do price elasticities of demand fall with income?** (*IRB-approved survey*)
 - **Yes, they do**
 - Novel experimental evidence on relationship between income and price elasticities

Quantitative framework

>>> QUANTITATIVE MODEL

Markets

- 2-sector GE model of structural change $j = \{G, S\}$ with **differentiated varieties** (ω)
- Monopolistic competition

Incumbent firms

- Firms are **retailers** and produce a variety within a sector
- Choose **price** and **quality** to maximize profits
- Free entry in each sector

Consumers

- Heterogeneous in **skills** $i \in \{H, L\}$

>>> PREFERENCES

- Start from the **indirect utility** of consumer i

$$v(e_{i_t}, \mathbf{p}_{G_t}, \mathbf{p}_{S_t}, \mathbf{q}_{G_t}, \mathbf{q}_{S_t}) = u(\mathbf{c}^*(e_{i_t}, \mathbf{p}_{G_t}, \mathbf{p}_{S_t}, \mathbf{q}_{G_t}, \mathbf{q}_{S_t}))$$

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$$v_j(e_{i_t}, \mathbf{p}_{j_t}, \mathbf{q}_{j_t}) = \frac{1}{1+\gamma} \int_{N_{j_t}} \left[\left(\frac{\overbrace{\phi_j e_{i_t}}^{\text{choke price}} - p_{j_t}(\omega)}{e_{i_t}} \right) \overbrace{q_{j_t}(\omega)^\delta}^{\text{variety quality}} \right]^{1+\gamma} d\omega, \quad \phi_j, \gamma, \delta > 0$$

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- Admit **direct utility** representation [▶ Direct utility](#)
- Special case: **Two-sector CES with quality** ($\phi_j = 0$, $\gamma < -1$, and $\delta < 0$) [▶ Proposition](#)

>>> DEMAND AND ELASTICITIES

- Use Roy's identity to write demand as function of income, prices, and quality

$$c_{ijt}(\omega) = \left(\underbrace{\phi_j e_{i_t}}_{\text{choke price}} - p_{j_t}(\omega) \right)^\gamma \underbrace{q_{j_t}(\omega)^{\delta(1+\gamma)}}_{\text{variety quality}} \underbrace{A_{ijt}}_{\text{sectoral composite}}$$

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- Increasing in price, decreasing in income

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- Quality elasticity of demand

$$\sigma_{ijt}(\omega) \equiv \frac{\partial c_{ijt}(\omega)}{\partial q_{jt}(\omega)} \frac{q_{jt}(\omega)}{c_{ijt}(\omega)} = \delta(1 + \gamma)$$

- Same across consumers and sectors, independent of quality

>>> INCUMBENT FIRMS

- Each firm produces variety ω of sector j using CES technology

$$y_{j_t} = z_{j_t} [\alpha x_t h_{j_t}^\iota + (1 - \alpha) \ell_{j_t}^\iota]^{1/\iota} \quad (0 < \iota < 1)$$

- **Neutral** technological progress: $\uparrow z_{j_t}$
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 - Firms choose price and quality to maximize profits

$$\pi_{j_t} = \max_{p_{j_t}, q_{j_t}} (p_{j_t} - mc_{j_t}) y_{j_t} - \kappa q_{j_t}^\vartheta - f_{j_t}$$

$$\text{s.t.} \quad y_{j_t} = \mu_{H_t} c_{H,j_t} + \mu_{L_t} c_{L,j_t}$$

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- \uparrow incomes \Rightarrow \downarrow price elasticity \Rightarrow \uparrow markups (income channel)
- \uparrow productivity \Rightarrow \downarrow prices \Rightarrow \downarrow price elasticity \Rightarrow \uparrow markups (price channel)
- \uparrow fraction of high-skilled \Rightarrow \uparrow high-skilled cons. share \Rightarrow \uparrow markups (composition channel)

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- Firms choose better quality for high markup varieties

Taking the model to the data

>>> TAKING THE MODEL TO THE DATA

- Two-step procedure to match trends over 1980 and 2015
 1. Estimate parameters [▶ Parameters and Targeted moments](#)

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1. Estimate parameters ▶ Parameters and Targeted moments

2. Match trends

Exogenous forces

- Neutral tech. change
- Skill-biased tech. change
- Fixed costs
- High-skilled share

Targets

- ⇒ Relative price of services + Aggregate markup
- ⇒ Skill premium
- ⇒ Rel. number of services firms + HS income share

▶ Exogenous trends ▶ Targeted trends ▶ Nontargeted trends

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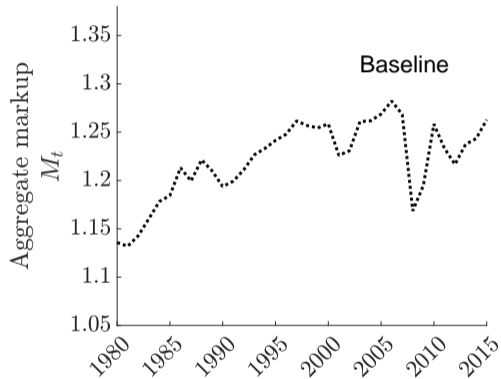
▶ Exogenous trends ▶ Targeted trends ▶ Nontargeted trends

- **Experiments**

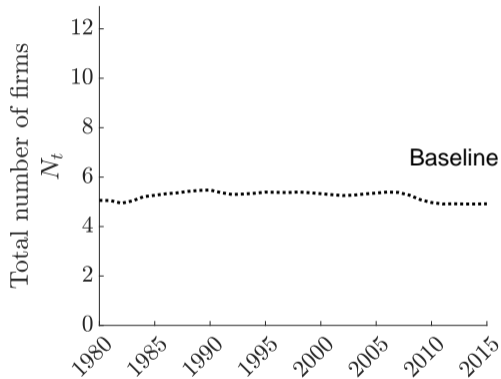
1. Set neutral productivity to keep **prices of goods and services** constant at 1980 values
2. Set skill-biased productivity to keep **incomes** constant at 1980 values
3. Set **fixed costs** constant at their 1980 values

Counterfactual experiments

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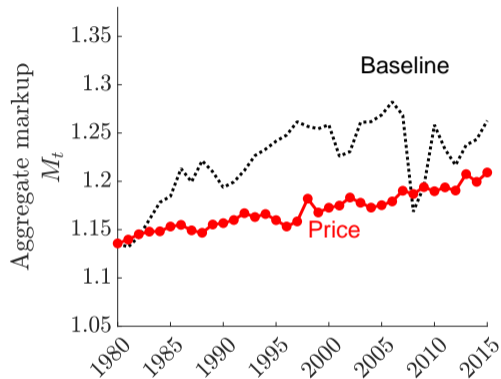


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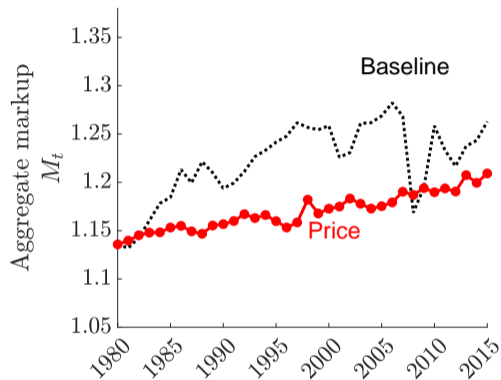
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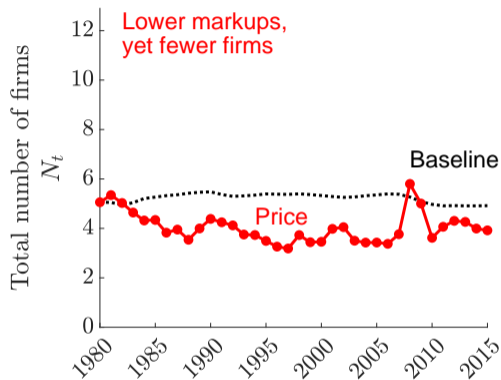
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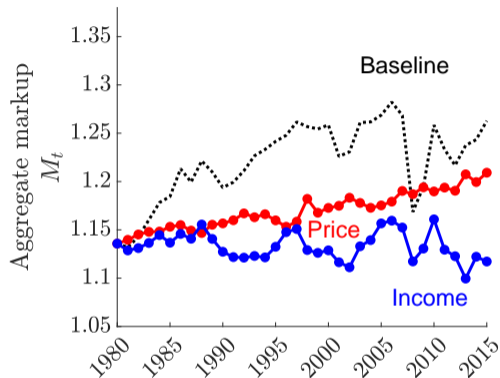
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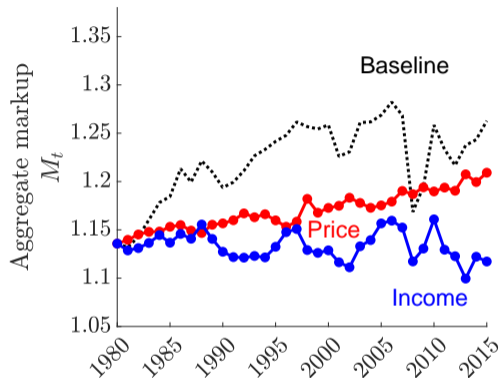
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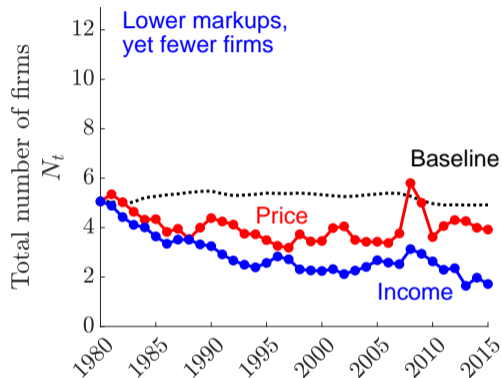
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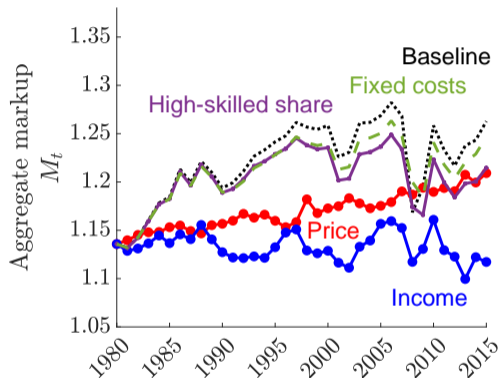
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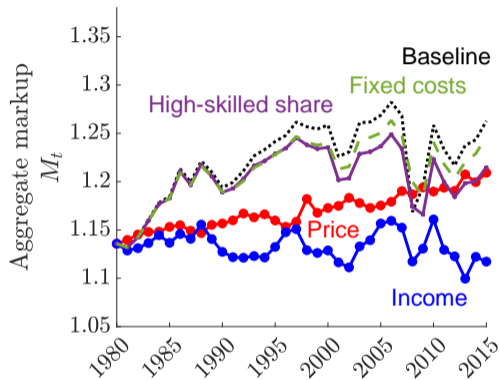
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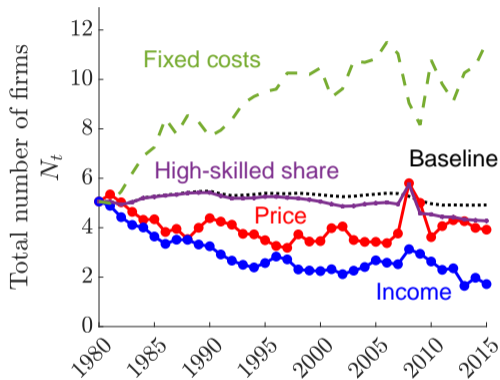
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>>> DRIVERS OF RISE IN MARKUPS



(A) Aggregate markups



(B) Number of firms

- Lower barriers to entry \Rightarrow More firms, yet little impact on markups
- Consumers are better off even if markups are higher ▶ Welfare
- Entry costs are stronger with Cournot competition ▶ Markups with Cournot

Eliciting demand elasticities: Online experiment

▶ [Skip to Conclusion](#)

>>> DO PRICE ELASTICITIES OF DEMAND FALL WITH INCOME?

- **Online survey** designed to capture individuals' perception of the impact of changes in prices on their purchase of goods and services
- Cover **24 categories** of goods and services following CEX structure

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- Cover **24 categories** of goods and services following CEX structure
- **607 consumers** across the U.S. selected through ResearchMatch (between March and May 2022)
 - Median time to complete survey: 14min (average: 54min)
 - Representative sample in terms of gender, age, race, educational attainment, marital status, employment status, home ownership, household income ▶ [Sample characteristics](#)

>>> SURVEY SAMPLE CHARACTERISTICS

	Sample (%)	Population (%)
Female	51.93	51.64
18-25 y.o.	10.90	10.96
25-35 y.o.	17.92	17.91
35-45 y.o.	16.60	16.61
45-55 y.o.	16.29	16.26
55-65 y.o.	17.02	17.01
White	74.37	74.22
Black	12.24	12.28
Asian	5.91	5.99
No college degree	67.98	68.21
Bachelor's degree	20.06	19.95
Married	51.20	51.07
Single	29.56	29.62
Employed	63.46	63.47
Unemployed	2.84	2.85
Owner with mortgage	43.96	43.95
Owner without mortgage	25.93	25.92
Household income \leq 40k	22.90	22.88
Household income \in [40k, 80k)	27.68	27.66
Household income \in [80k, 120k)	20.10	20.09

Source: Statistics for the U.S. population are taken from the 2019 Current Population Survey.

>>> SURVEY QUESTIONS

- Demographic and spending questions
- **Experiments:** *"Suppose you spent $\$x$ on the following items in any given y . If the same items you purchased in the past now cost $\$1.2x$, how much would you now be willing to spend?"*
 - Five options: $\{0.9x, 1.0x, 1.1x, 1.2x, 1.3x\}$
 - ⇒ Price elasticity of demand > 1 , $= 1$, $\in (0, 1)$, $= 0$, and < 0



>>> DISTRIBUTION OF PRICE ELASTICITIES

- **Highly elastic** categories

Category	Avg. spend. (yearly, US\$)	% with $\xi = 0$	% with $\xi \in (0, 1)$	% with $\xi = 1$	% with $\xi > 1$
Furniture	436	9.25	8.38	28.43	50.54
Appliances	382	12.24	8.43	24.57	50.43
Audio and visual equipment	613	8.33	12.58	23.83	49.96
Alcohol	602	12.72	9.68	22.52	47.54
Other lodging expenses out of town	1,493	14.74	7.74	26.34	44.31
Apparel	1,616	11.49	7.88	31.21	43.92
Entertainment, hobbies, pets, and toys	879	11.43	13.33	28.92	42.01
Public transportation	313	23.06	18.84	10.70	36.09
Food away	2,036	16.04	7.33	34.02	34.92
Tobacco	484	4.74	19.32	21.35	32.21
Child care, preschool tuition	1,110	29.03	7.65	18.50	27.86
Housekeeping expenses	1,893	19.40	15.70	30.68	27.22
Vehicle purchases, repairs, leases	1,585	20.62	17.76	28.04	26.81
House maintenance and repairs	1,295	22.97	7.98	35.89	26.29

Note: The price elasticities of demand are for individuals who reported positive expenditures on that category.

- **Inelastic** categories

>>> DISTRIBUTION OF PRICE ELASTICITIES

- Highly elastic categories
- Inelastic categories

Category	Avg. spend. (yearly, US\$)	% with $\xi = 0$	% with $\xi \in (0, 1)$	% with $\xi = 1$	% with $\xi > 1$
Mortgage payments and rent	13,747	50.54	4.79	20.53	13.46
Food at home	4,704	46.00	13.15	17.64	10.22
Home insurance	2,717	43.46	13.13	17.48	11.95
Health insurance	5,065	42.30	15.11	20.09	11.61
Utilities	4,694	41.22	16.63	21.64	7.72
Vehicle insurance	3,918	41.21	16.77	16.31	17.63
Gasoline	3,490	37.72	16.76	20.77	13.31
Medical and dental services, drugs	3,629	34.53	16.42	23.16	16.93
Personal insurance	5,032	34.24	13.47	24.69	21.57

Note: The price elasticities of demand are for individuals who reported positive expenditures on that category.

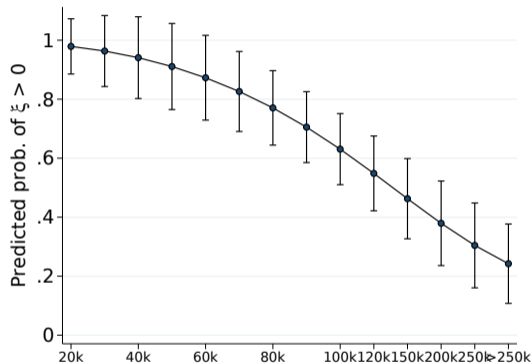
>>> ELASTICITIES ACROSS INCOME: EMPIRICAL STRATEGY

- Estimate LPM/Probit models: $\xi_{ij} = \alpha + \beta e_i + \gamma z_i + \epsilon_{ij}$ ▶ Estimated $\hat{\beta}$
 - $\xi_{ij} = \begin{cases} 1 & \text{if (a) demand is elastic} \\ & \text{(b) demand is inelastic} \\ 0 & \text{otherwise} \end{cases}$
 - e_i : household income
 - z_i : age, employment status, gender, household size, industry of employment, occupation, race, relationship status

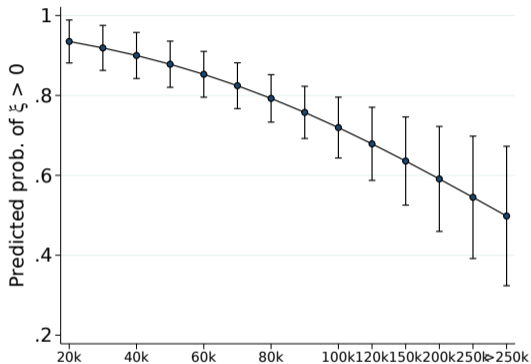
>>> ELASTICITIES ACROSS INCOME: EMPIRICAL STRATEGY

- Estimate LPM/Probit models: $\xi_{ij} = \alpha + \beta e_i + \gamma z_i + \epsilon_{ij}$ ▶ Estimated $\hat{\beta}$
 - $\xi_{ij} = \begin{cases} 1 & \text{if (a) demand is elastic} \\ & \text{(b) demand is inelastic} \\ 0 & \text{otherwise} \end{cases}$
 - e_i : household income
 - z_i : age, employment status, gender, household size, industry of employment, occupation, race, relationship status
- Predicted probabilities of (a) **adjusting** demand vs. (b) **not adjusting** demand for different values of income e_i keeping z_i as given

>>> WHO IS MORE LIKELY TO ADJUST DEMAND IN RESPONSE TO A PRICE INCREASE?



(A) Child care



(B) Food away

- Similar results for food at home, apparel, public transportation, vehicle insurance, medical and dental services, drugs and medical supplies, health insurance, school and college tuition and related expenses, personal insurance, audio and visual equipment and services, and vehicle purchases, maintenance and repairs, leases and rental charges
- 95% CIs are for the point estimates

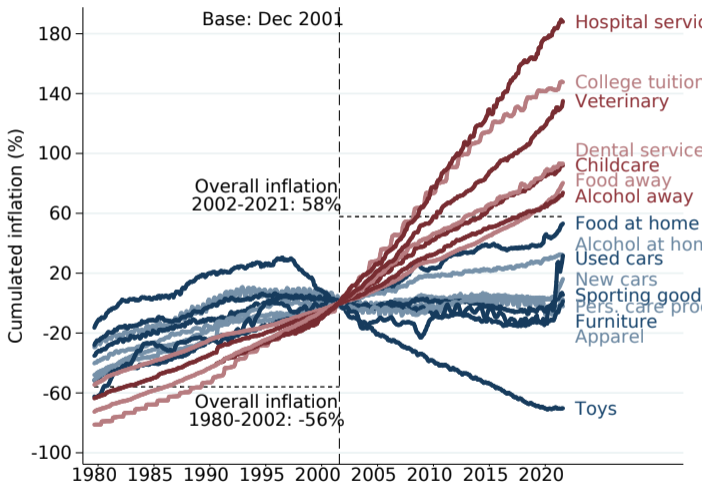
>>> CONCLUDING REMARKS

- Rise in markups driven by **services** sector
 - Reallocation of economic activity and faster increase in services markups relative to goods
- Standard forces of structural change explain rise of markups
 - **Preferences** play an important role in determining markups
 - Move away from CES \Rightarrow **New channels** emerge
 - Markups can increase **without** a decline in competition (number of firms)
 - Consumers are better off even if markups are higher \blacktriangleright [Welfare](#)
- **Rising incomes** explain the bulk of the increase in markups
 - Change in relative prices explain half of the increase in markups
 - Different policy implications than current view?

Thank you

Appendix

>>> PRICES OF GOODS AND SERVICES [◀ BACK TO SLIDE](#)

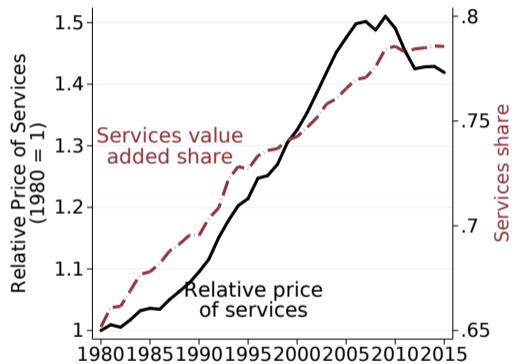


(A) A few examples

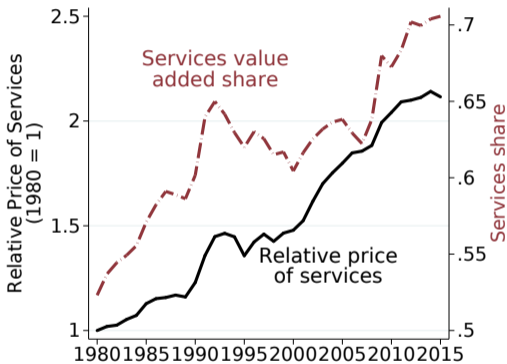
Data: CPI.

>>> STRUCTURAL CHANGE ACROSS EUROPEAN COUNTRIES

◀ BACK TO SLIDE



(A) France

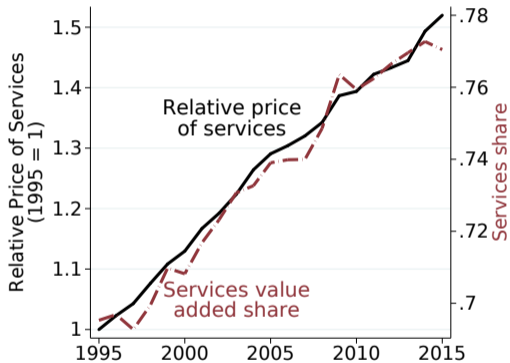


(B) Finland

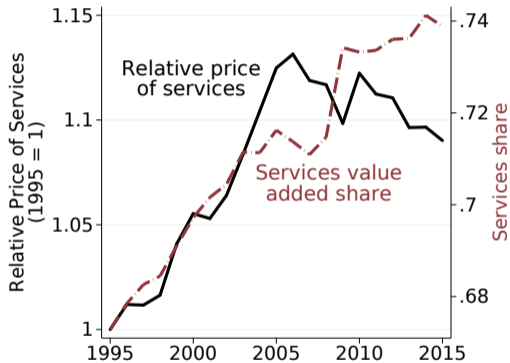
Data: EUKLEMS.

>>> STRUCTURAL CHANGE ACROSS EUROPEAN COUNTRIES

◀ BACK TO SLIDE



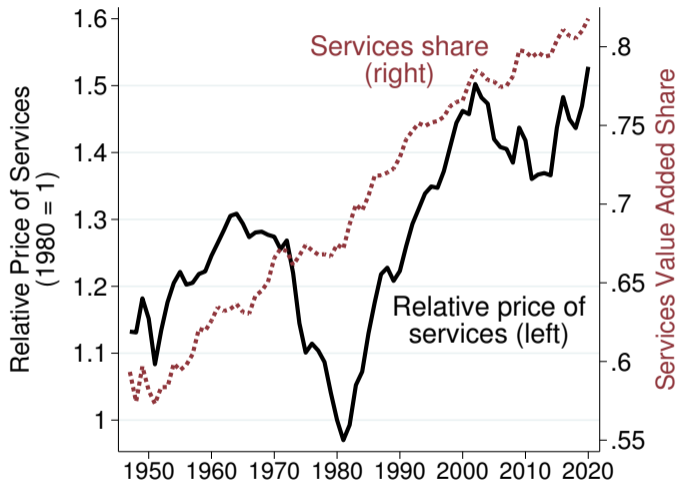
(A) Belgium



(B) Italy

Data: EUKLEMS.

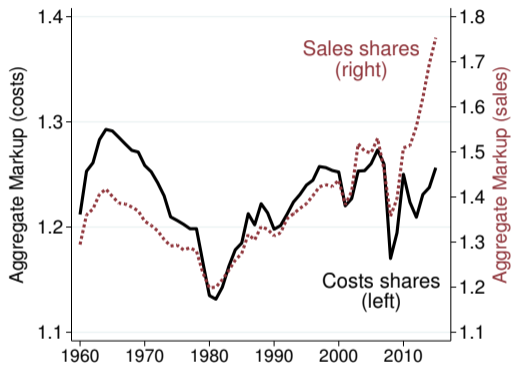
>>> STRUCTURAL CHANGE SINCE 1947 [◀ BACK TO SLIDE](#)



(A) Services: relative price and value added share

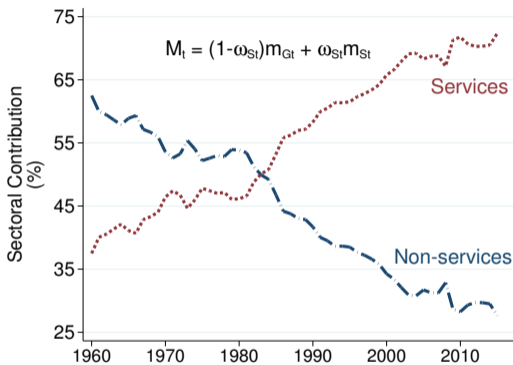
Data: KLEMS.

>>> THE RISE IN MARKUPS SINCE 1960 [◀ BACK TO SLIDE](#)



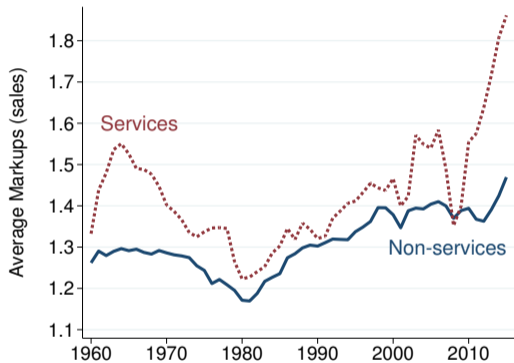
(A) Aggregate markups

Data: Compustat and KLEMS.

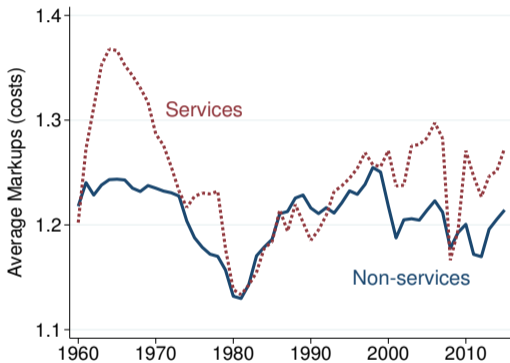


(B) Sectoral contribution

>>> THE RISE OF MARKUPS IN SERVICES SINCE 1960 ◀ BACK TO SLIDE

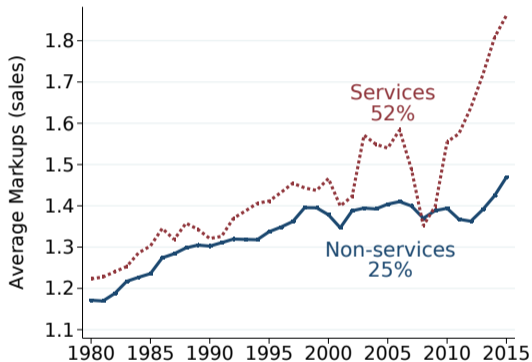


(A) Average markups (sales)

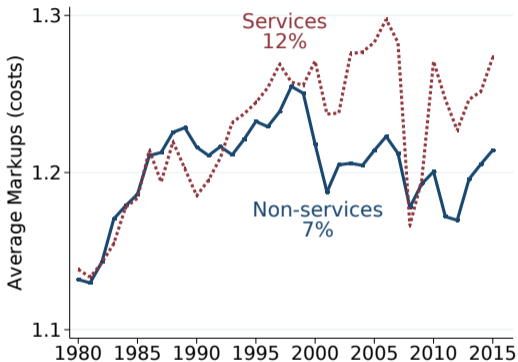


(B) Average markups (costs)

>>> THE RISE OF MARKUPS IN SERVICES ◀ BACK TO SLIDE



(A) Average markups (sales)



(B) Average markups (costs)

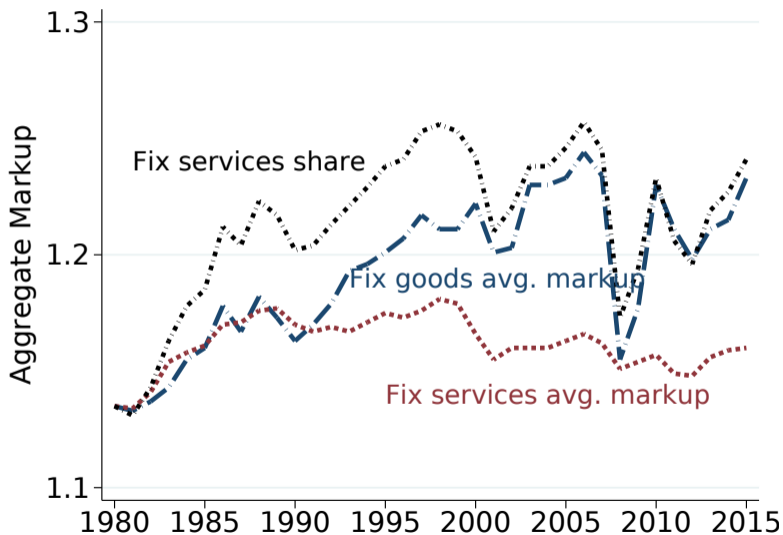
>>> DECOMPOSING THE RISE IN MARKUPS [◀ BACK TO SLIDE](#)

- Decompose change in markups

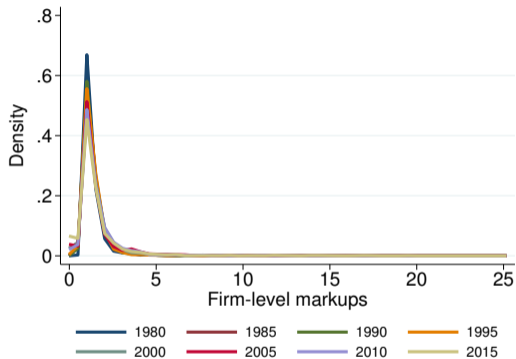
$$\begin{aligned} M_{2015} - M_{1980} &= \left(\frac{\omega_{G_{1980}} + \omega_{G_{2015}}}{2} \right) (\bar{m}_{G_{2015}} - \bar{m}_{G_{1980}}) && \text{Non-services avg. markup (28\% / 20\%)} \\ &+ \left(\frac{\omega_{S_{1980}} + \omega_{S_{2015}}}{2} \right) (\bar{m}_{S_{2015}} - \bar{m}_{S_{1980}}) && \text{Services avg. markup (65\% / 72\%)} \\ &+ \left(\frac{\bar{m}_{S_{2015}} - \bar{m}_{G_{2015}} + \bar{m}_{S_{1980}} - \bar{m}_{G_{1980}}}{2} \right) (\omega_{S_{2015}} - \omega_{S_{1980}}) && \text{Services share (7\% / 8\%).} \end{aligned}$$

▶ Experiments over time

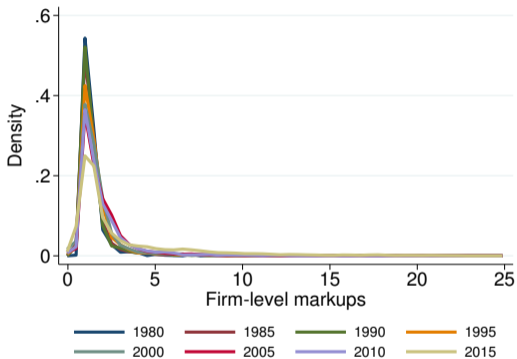
>>> DECOMPOSING THE RISE IN MARKUPS [◀ BACK TO SLIDE](#)



>>> THE DISTRIBUTION OF MARKUPS [◀ BACK TO SLIDE](#)

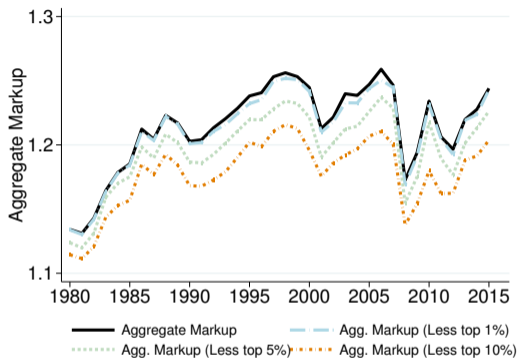


(A) Non-services

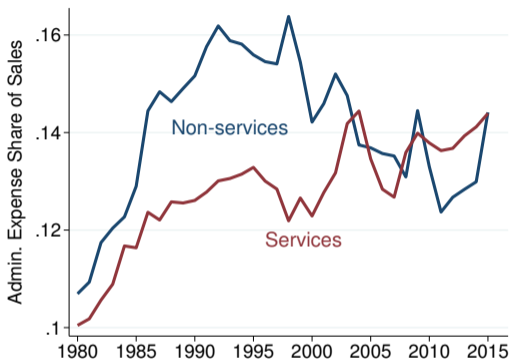


(B) Services

>>> NOT THE SUPERSTARS, NOR THE FIXED COSTS ◀ BACK TO SLIDE



(A) Dropping the right tail



(B) Fixed costs/Sales

Data: Compustat.

- Firms are otherwise similar ▶ [Reg, More data](#) ▶ [Correlation between \$\Delta\$ markups, \$\Delta\$ sales](#)

>>> NOT THE SUPERSTARS, NOR THE FIXED COSTS [◀ BACK TO SLIDE](#)

Correlation coefficients for the 1980-2015 change in markups, sales, and cost shares

	Δ Markup, Δ Sales share	Δ Markups, Δ Fixed costs share
Aggregate	-0.0850	-0.0270
Non-services	-0.0467	0.0343
Services	-0.1028	-0.0464

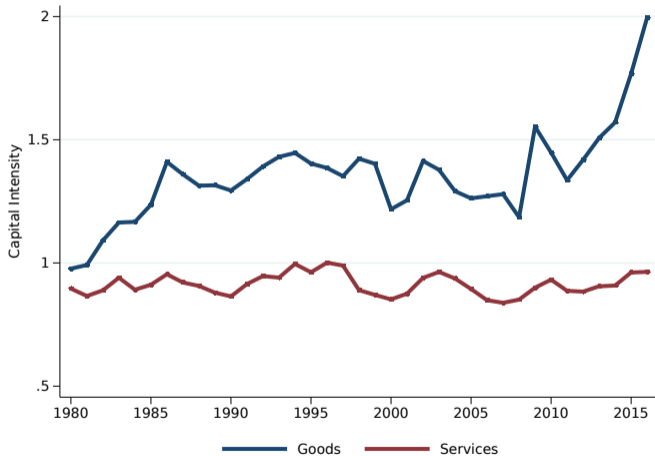
Data: Compustat.

>>> THE RISE OF MARKUPS IN SERVICES [◀ BACK TO SLIDE](#)

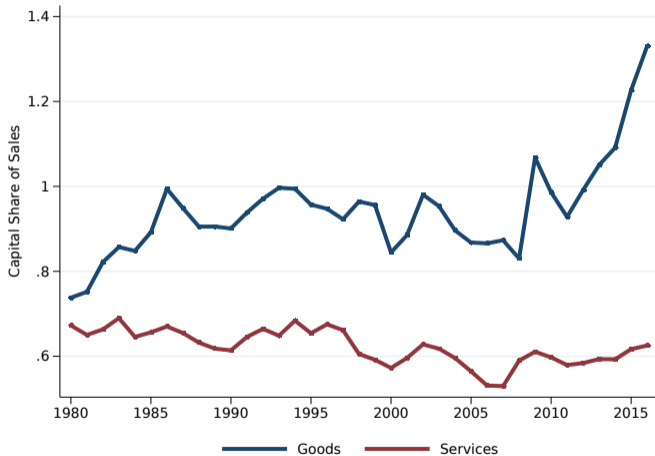
	Non-services			Services		
	1980	2015	Δ	1980	2015	Δ
Average markups (cogs)	1.13	1.21	7.3%	1.14	1.27	11.9%
Capital goods	1.12	1.24	10.9%			
Consumption goods	1.19	1.67	40.5%			
Intermediate goods	1.12	1.13	0.4%			
Consumer services				1.19	1.29	8.6%
Producer services				1.06	1.20	12.6%

Data: Compustat and KLEMS.

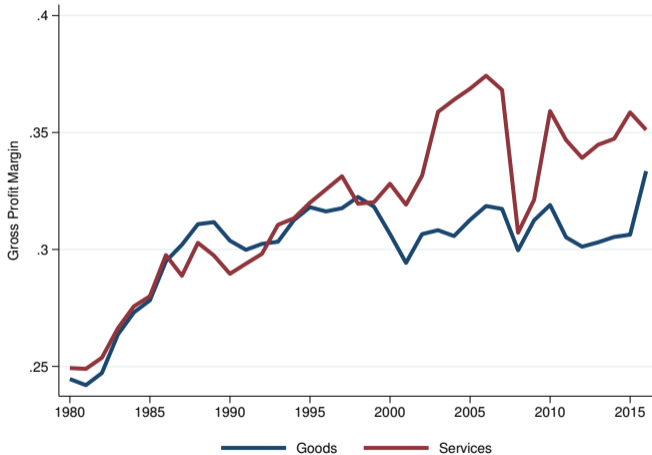
>>> CAPITAL INTENSITY ACROSS SECTORS [◀ BACK TO SLIDE](#)



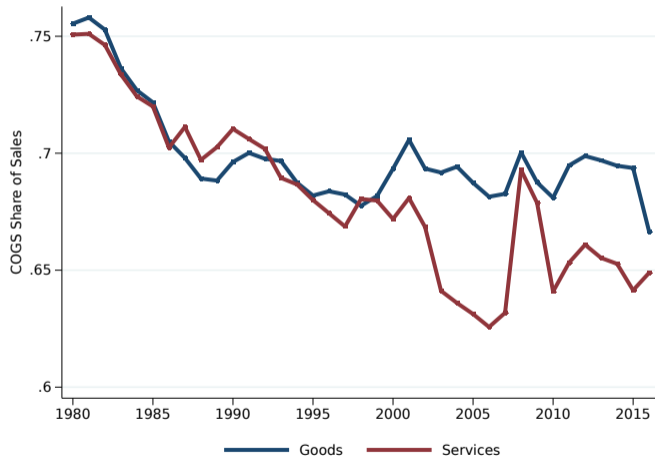
>>> CAPITAL SHARE ACROSS SECTORS [◀ BACK TO SLIDE](#)



>>> GROSS PROFIT MARGIN ACROSS SECTORS [◀ BACK TO SLIDE](#)



>>> COGS SHARE ACROSS SECTORS [◀ BACK TO SLIDE](#)

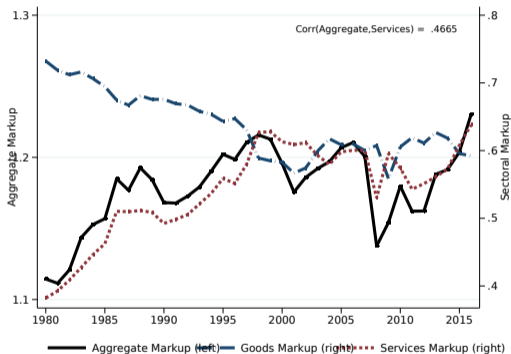
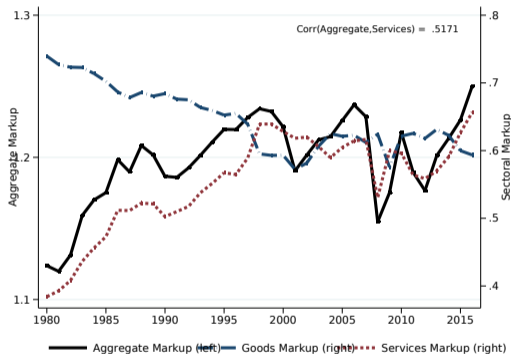


>>> FIRMS ARE OTHERWISE SIMILAR [◀ BACK TO SLIDE](#)

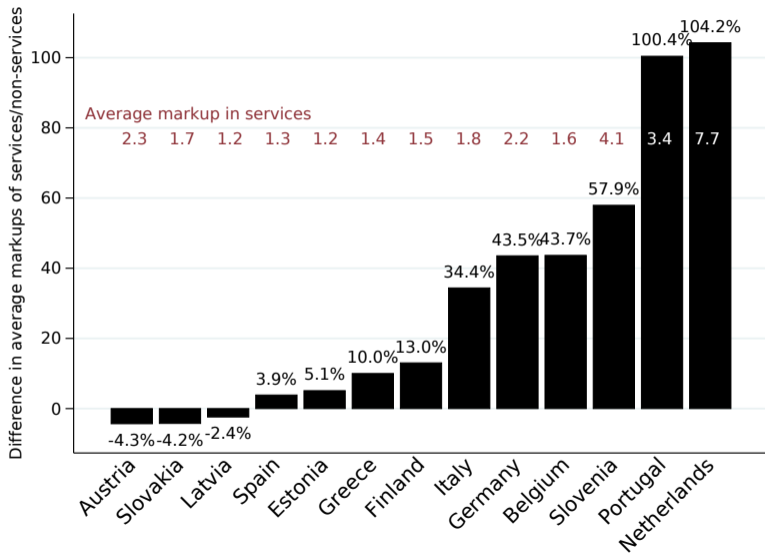
	Firm-level markups (in logs)	
	Non-services (1)	Services (2)
Capital share	0.028*** (0.007)	0.017*** (0.005)
Intangible capital share	0.146*** (0.023)	0.009 (0.010)
Cogs share	-1.072*** (0.093)	-1.228*** (0.055)
Fixed cost share	0.126* (0.074)	0.156*** (0.028)
Time FE	Yes	Yes
Observations	97,351	74,197
Adjusted R ²	0.732	0.847

Note: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Firms are weighted by their cost shares. Data is taken from Compustat for the 1980-2015 period.

>>> SECTORAL CONTRIBUTION WITHOUT SUPERSTARS [◀ BACK TO SLIDE](#)

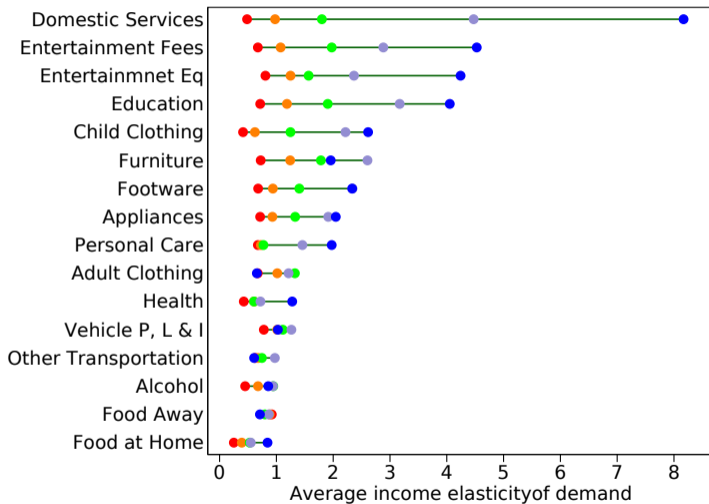


>>> MARKUPS ACROSS EUROPE [◀ BACK TO SLIDE](#)



>>> LUXURIES ACROSS INCOME GROUPS

◀ BACK TO SLIDE



Appendix: Model

$$u(\mathbf{c}_{G_t}, \mathbf{c}_{S_t}, \mathbf{q}_{G_t}, \mathbf{q}_{S_t}) = \psi \left(\frac{\hat{C}_t - 1}{\tilde{C}_{G_t}^\lambda \tilde{C}_{S_t}^{1-\lambda}} \right)^{(1+\gamma)}$$

- $\hat{C}_t = \sum_{j=G,S} \phi_j \int_{\mathcal{N}_{j_t}} c_{j_t}(\omega) d\omega$ Agg. value of cons.
- $\tilde{C}_{j_t} = \left(\int_{\mathcal{N}_{j_t}} \left[\frac{c_{j_t}(\omega)}{q_{j_t}(\omega)^\delta} \right]^{\frac{1+\gamma}{\gamma}} d\omega \right)^{\frac{\gamma}{1+\gamma}}$ Quality-adjusted composite of commodity j
- $\psi = (1 + \gamma)^{-1} \lambda^{\lambda(1+\gamma)} (1 - \lambda)^{(1-\lambda)(1+\gamma)} > 0$

>>> PREFERENCES: A SPECIAL CASE ◀ BACK TO SLIDE

- Special case: **Two-sector CES with quality**

PROPOSITION

Assume $\phi_j = 0$, $\gamma < -1$, and $\delta < 0$ for $j = \{G, S\}$. Then, these preferences collapse to the two-sector CES preferences with quality and $(-\gamma)$ as the sector-specific price elasticity of demand, where

$$u(\mathbf{c}_{G_t}, \mathbf{c}_{S_t}, \mathbf{q}_{G_t}, \mathbf{q}_{S_t}) = \psi \left[C_{G_t}^\lambda C_{S_t}^{(1-\lambda)} \right]^{(\hat{\gamma}-1)}$$

$$- C_{jt} = \left(\int_{\mathcal{N}_{jt}} \left[c_{jt}(\omega) q_{jt}(\omega)^{\hat{\delta}} \right]^{\frac{\hat{\gamma}-1}{\hat{\gamma}}} d\omega \right)^{\frac{\hat{\gamma}}{\hat{\gamma}-1}} \quad \text{Quality-adjusted composite of commodity } j$$

$$- \hat{\gamma} = -\gamma > 1 \text{ and } \hat{\delta} = -\delta > 0$$

>>> FIRMS' MARGINAL COSTS ◀ BACK TO SLIDE

- Choose capital and labor to minimize total costs (net of quality)

$$mc_{j_t} = \frac{w_{L_t}}{z_{j_t}} \left[(\alpha x_t)^{\frac{1}{1-\iota}} \left(\frac{w_{H_t}}{w_{L_t}} \right)^{\frac{\iota}{1-\iota}} + (1-\alpha)^{\frac{1}{1-\iota}} \right]^{\frac{\iota-1}{\iota}}$$

- An increase in **TFP** decreases the firm's marginal cost
- Rise of **skill premium** prevents marginal costs from dropping to 0
- **Skill-biased technical change** decreases marginal cost since $\iota > 0$ (somewhat subs)

>>> MARKET CLEARING CONDITIONS ◀ BACK TO SLIDE

- Labor markets clear

$$\mu_{H_t} = \int_0^{N_{G_t}} h_{G_t}(\omega) d\omega + \int_0^{N_{S_t}} h_{S_t}(\omega) d\omega$$

$$\mu_{L_t} = \int_0^{N_{G_t}} \ell_{G_t}(\omega) d\omega + \int_0^{N_{S_t}} \ell_{S_t}(\omega) d\omega$$

- Aggregate nonlabor earnings are the sum of operating firms' fixed and entry costs

$$\Lambda_t = \int_0^{N_{G_t}} q_{G_t}(\omega)^\vartheta d\omega + \int_0^{N_{S_t}} q_{S_t}(\omega)^\vartheta d\omega + N_{G_t} f_{G_t} + N_{S_t} f_{S_t}$$

- Quality tightly linked to markup

$$\frac{\kappa q_{j_t}^\vartheta}{p y_{j_t}} = \frac{\bar{\sigma}_t (m_{j_t} - 1)}{\vartheta m_{j_t}}$$

Appendix: Quantitative analysis

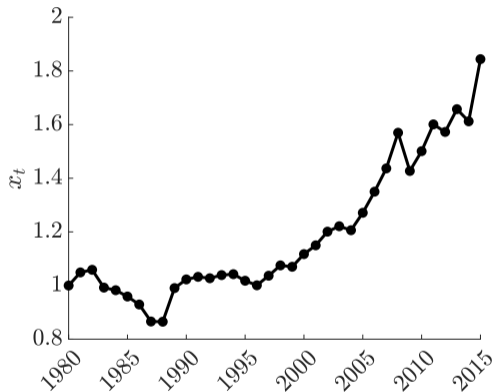
>>> FIRST STEP: ESTIMATED PARAMETERS [◀ BACK TO SLIDE](#)

Parameter	Description	Value	Identification	Model 1980, 2015	Data 1980, 2015
<i>Preferences</i>					
λ	Indirect utility's weight on goods	0.181	Services share	0.670, 0.790	0.670, 0.790
γ	Exponent in indirect subutility	17.359	Services share		
ϕ_G	Choke price of goods	7.725	Average goods markup	1.215	1.214
ϕ_S	Choke price of services	12.780	Average services markup	1.276	1.273
δ	Quality-specific utility exponent	0.072	Normalization	1.000	
<i>Technology</i>					
α	High-skilled weight	0.465	Skill premium	1.347, 1.928	1.347, 1.928
ι	Elasticity of substitution between high and low-skilled	0.400	Exogenous		
x_t	Skilled-biased prod. in 1980, 2015	1.000, 1.844	Normalization, Skill premium		
z_{G_t}	TFP in goods sector in 1980, 2015	0.530, 0.485	Aggregate markup	1.136, 1.263	1.136, 1.263
z_{S_t}	TFP in services sector in 1980, 2015	0.580, 0.355	Relative price of services	1.000, 1.437	1.000, 1.437
<i>Fixed Costs</i>					
f_{G_t}	Entry costs in goods sector in 1980, 2015	0.009, 0.027	High-skilled income share	0.365, 0.603	0.365, 0.603
f_{S_t}	Entry costs in services sector in 1980, 2015	0.010, 0.024	Rel. number of service firms	4.059, 5.180	4.059, 5.180
κ	Quality cost parameter (level)	0.018	Quality costs/sales in services	0.144	0.144
ϑ	Quality cost parameter (exponent)	2.000	Exogenous		
<i>Measure</i>					
μ_{H_t}	Share of high-skilled households in 1980, 2015	0.325, 0.424	Empl. in high-skilled occupations	0.325, 0.424	0.325, 0.424

>>> EXOGENOUS TRENDS [◀ BACK TO SLIDE](#)

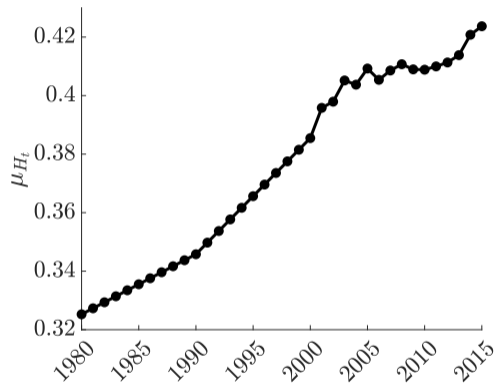


(A) Neutral productivity

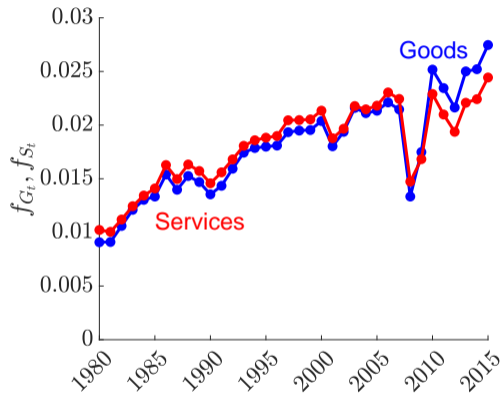


(B) Skill-biased productivity

>>> EXOGENOUS TRENDS [◀ BACK TO SLIDE](#)

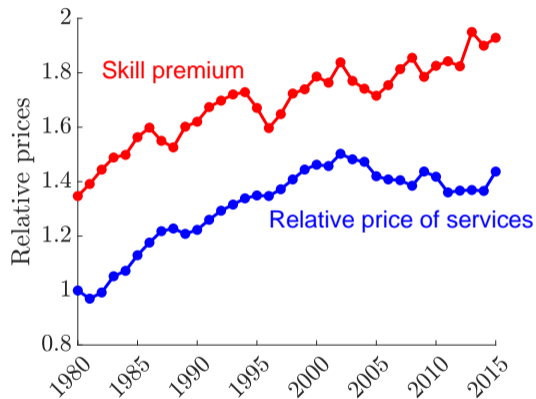


(A) High-skilled share

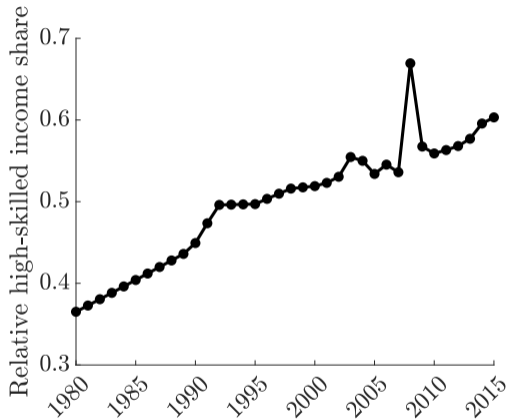


(B) Fixed costs

>>> TARGETED TRENDS: PRICES [◀ BACK TO SLIDE](#)

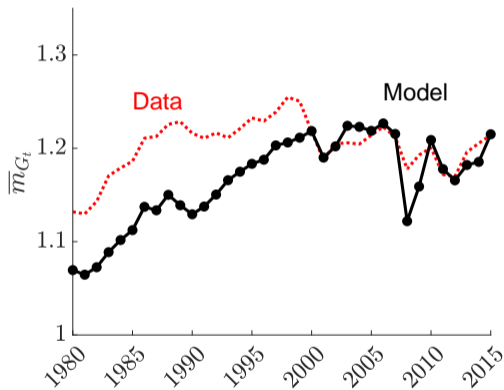


(A) Relative prices

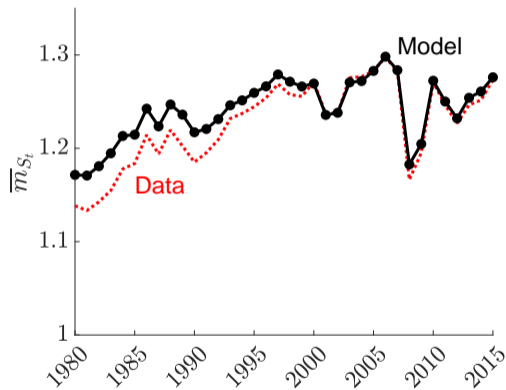


(B) Relative income share

>>> NONTARGETED TRENDS: AVERAGE MARKUPS [◀ BACK TO SLIDE](#)



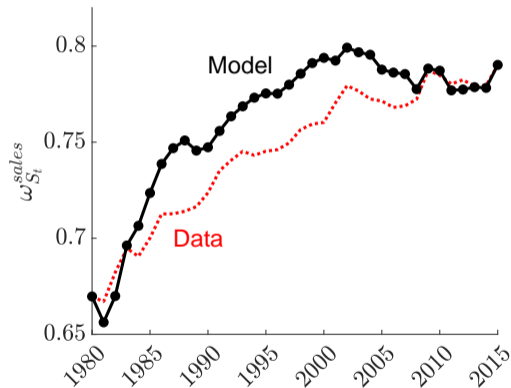
(A) Non-services



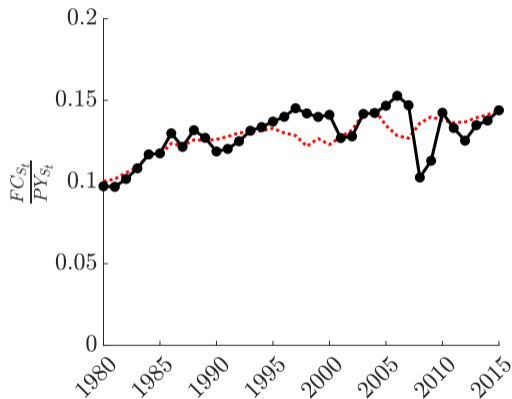
(B) Services

>>> NONTARGETED TRENDS: SERVICES SHARE AND COSTS

◀ BACK TO SLIDE

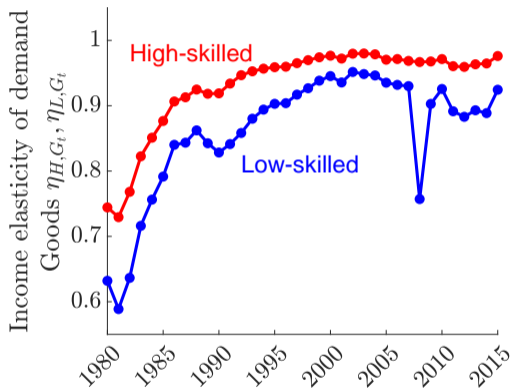


(A) Services share

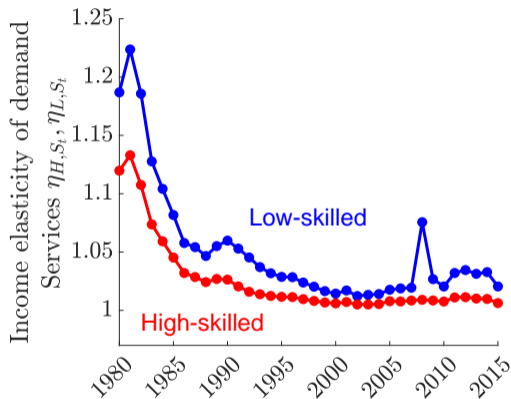


(B) Fixed costs share of sales

>>> INCOME ELASTICITIES OF DEMAND [◀ BACK TO SLIDE](#)

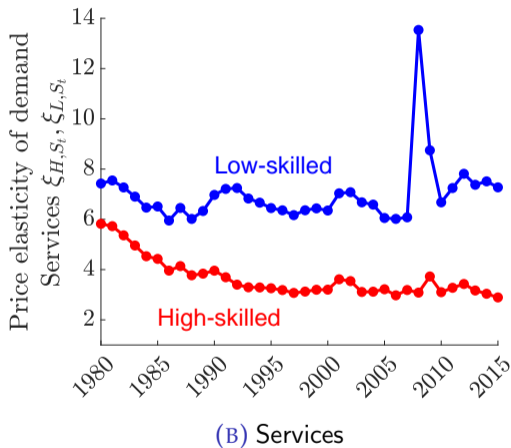
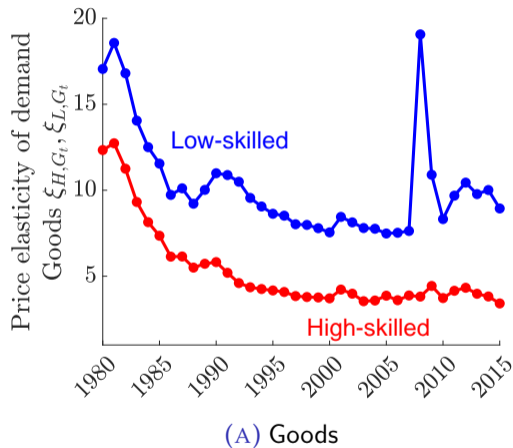


(A) Goods



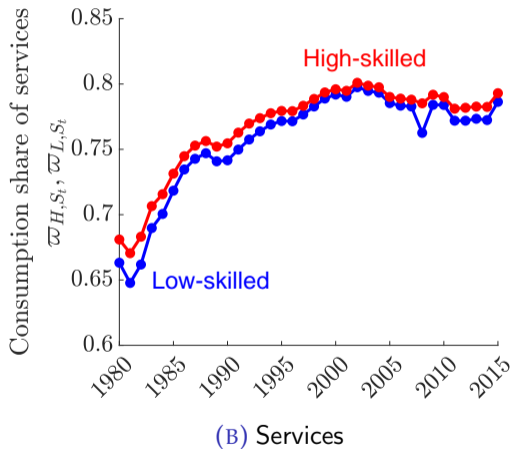
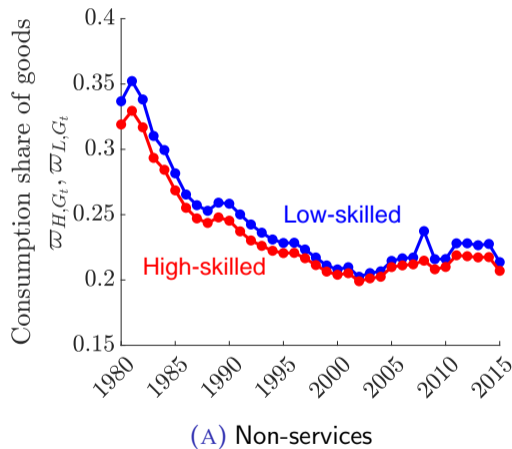
(B) Services

>>> PRICE ELASTICITIES OF DEMAND [◀ BACK TO SLIDE](#)

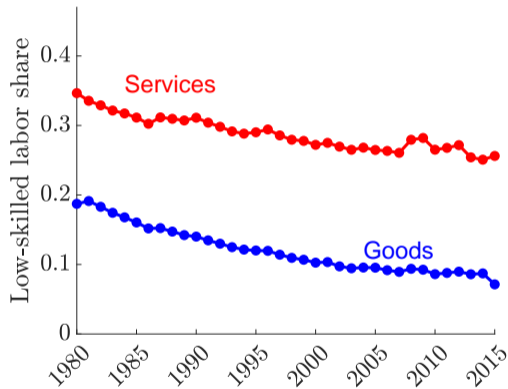


>>> NONTARGETED TRENDS: SERVICES CONSUMPTION SHARES

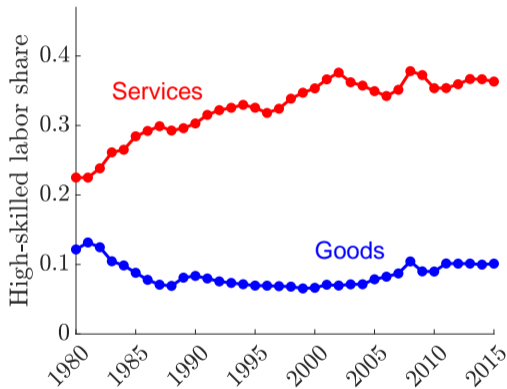
◀ BACK TO SLIDE



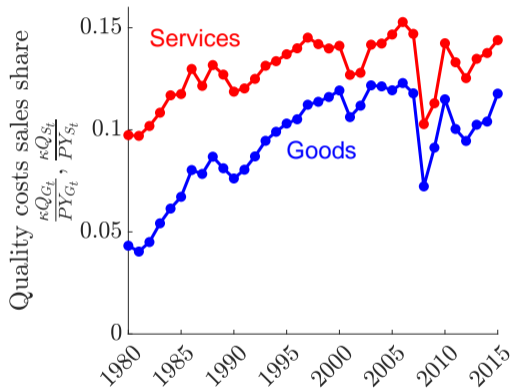
>>> NONTARGETED TRENDS: LABOR SHARES [◀ BACK TO SLIDE](#)



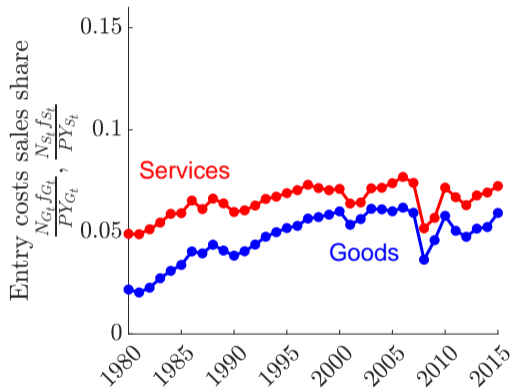
(A) Low-skilled



(B) High-skilled



(A) Quality costs



(B) Entry costs

>>> WELFARE IMPACTS OF THE RISE IN MARKUPS [◀ BACK TO SLIDE](#)

- How much would consumers in 1980 be willing to pay in order to have the utility level they enjoy in 2015?

>>> WELFARE IMPACTS OF THE RISE IN MARKUPS [◀ BACK TO SLIDE](#)

- How much would consumers in 1980 be willing to pay in order to have the utility level they enjoy in 2015?

	High-skilled	Low-skilled
Equivalent variation (ε_j^{ev} , %)	136.1	20.4

>>> WELFARE IMPACTS OF THE RISE IN MARKUPS ◀ BACK TO SLIDE

- How much would consumers in 1980 be willing to pay in order to have the utility level they enjoy in 2015?

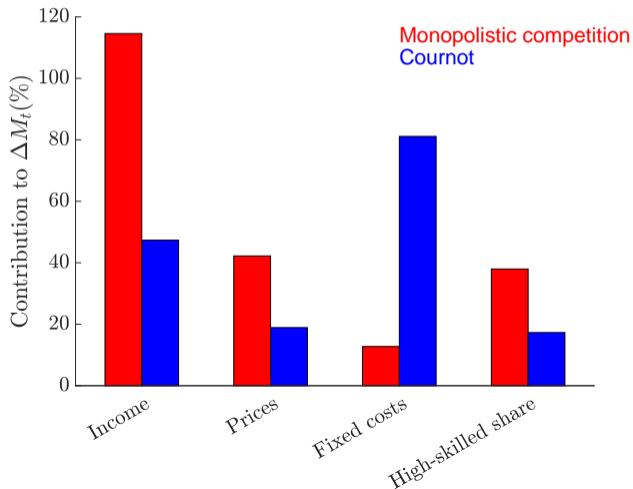
	High-skilled	Low-skilled
Equivalent variation (ε_i^{ev} , %)	136.1	20.4

- Are households better off in the economies with lower markups?
 - How much would consumers be willing to pay to live in these low-markup economies?

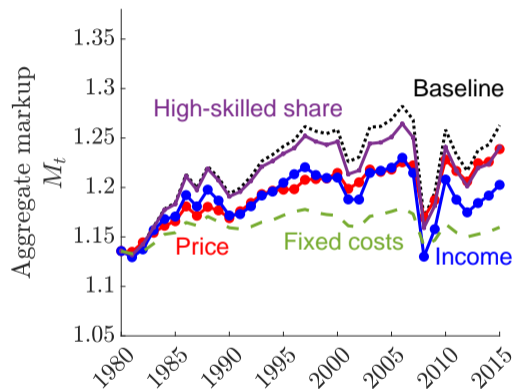
	High-skilled	Low-skilled
Prices constant at 1980 values (ε_i^{ev} , %)	-8.6	-12.5
Incomes constant at 1980 values (ε_i^{ev} , %)	84.1	3.5
High-skilled share constant at 1980 values (ε_i^{ev} , %)	18.3	50.0
Fixed costs constant at 1980 values (ε_i^{ev} , %)	15.5	44.9

>>> MARKUPS WITH COURNOT ◀ BACK TO SLIDE

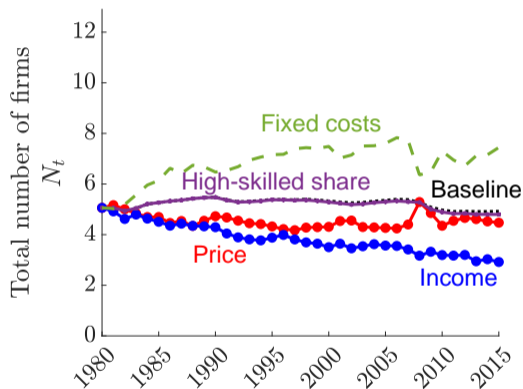
- Restimate parameters: Choke price of services \uparrow and of goods \downarrow ($\phi_S/\phi_G \approx 7$ vs. 1.7)



>>> MARKUPS AND NUMBER OF FIRMS WITH COURNOT ◀ BACK TO SLIDE



(A) Aggregate markups



(B) Number of firms

Appendix: Survey

>>> ESTIMATES OF β [← BACK TO SLIDE](#)

Specification	Price elasticity of demand							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Elastic (LPM)	-0.020*	-0.034***	-0.014*	-0.037**	-0.024**	-0.027**	-0.027*	-0.079**
	(0.011)	(0.010)	(0.008)	(0.014)	(0.012)	(0.012)	(0.014)	(0.034)
Observations	581	555	476	86	513	444	428	52
Adjusted R ²	0.059	0.126	0.190	0.478	0.144	0.115	0.120	0.465
Elastic (Probit)	-0.053*	-0.125***	-0.083**	-0.177***	-0.073**	-0.079**	-0.077**	-0.386***
	(0.029)	(0.033)	(0.036)	(0.050)	(0.032)	(0.031)	(0.038)	(0.121)
Observations	581	555	476	86	513	444	428	52
Adjusted R ²	0.044	0.125	0.207	0.446	0.121	0.094	0.093	0.458
Inelastic (LPM)	0.019*	0.021***	0.014**	0.014	0.015	0.017	0.015	0.029
	(0.010)	(0.008)	(0.007)	(0.010)	(0.011)	(0.012)	(0.013)	(0.027)
Observations	581	555	476	86	513	444	428	52
Adjusted R ²	0.040	0.111	0.108	0.521	0.129	0.074	0.082	0.218
Inelastic (Probit)	0.051*	0.105***	0.111**	0.098*	0.049	0.056*	0.043	-0.042
	(0.028)	(0.033)	(0.044)	(0.053)	(0.031)	(0.033)	(0.036)	(0.105)
Observations	581	555	476	86	513	444	428	46
Adjusted R ²	0.030	0.154	0.198	0.521	0.114	0.067	0.066	0.188

Note: The estimated coefficients are for the effect of household income on the price elasticity of demand for each specification. *Elastic* stands for the case in which the price elasticity of demand is positive, while *Inelastic* stands for the case in which the price elasticity of demand is equal to 0.

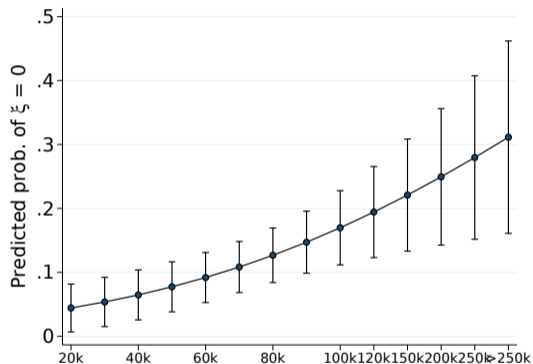
The regressions are estimated for each category of goods and services separately and include the following set of controls: age, employment status, gender, household size, industry, occupation, race, relationship status. Each column is for a category: (1) food at home; (2) food away; (3) apparel; (4) public transportation; (5) vehicle insurance; (6) medical and dental services, drugs and medical supplies; (7) health insurance; (8) child care, preschool tuition, or care of elderly. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

>>> ESTIMATES OF β [◀ BACK TO SLIDE](#)

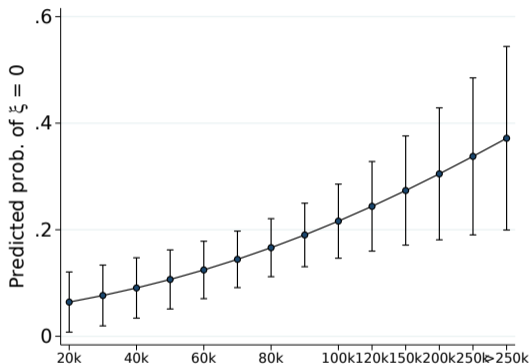
Specification	Price elasticity of demand						
	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Elastic (LPM)	-0.032** (0.015)	-0.054*** (0.013)	-0.012 (0.016)	-0.019 (0.012)	-0.016 (0.011)	-0.028*** (0.009)	-0.037*** (0.011)
Observations	105	270	76	370	279	383	464
Adjusted R ²	0.300	0.162	0.607	0.168	0.153	0.135	0.143
Elastic (Probit)	-0.120** (0.059)	-0.160*** (0.042)	-0.045 (0.066)	-0.067* (0.040)	-0.069* (0.042)	-0.128*** (0.038)	-0.125*** (0.035)
Observations	105	270	76	370	279	383	464
Adjusted R ²	0.260	0.130	0.620	0.159	0.171	0.161	0.134
Inelastic (LPM)	0.009 (0.013)	0.034*** (0.012)	-0.016** (0.008)	0.004 (0.007)	0.012* (0.007)	0.004 (0.005)	0.024** (0.009)
Observations	105	270	76	370	279	383	464
Adjusted R ²	0.342	0.144	0.163	0.118	0.151	0.085	0.068
Inelastic (Probit)	0.051 (0.060)	0.117*** (0.044)	-0.294*** (0.088)	0.019 (0.039)	0.104** (0.050)	0.034 (0.044)	0.094*** (0.032)
Observations	105	270	54	370	279	383	464
Adjusted R ²	0.321	0.132	0.385	0.206	0.325	0.171	0.075

Note: The estimated coefficients are for the effect of household income on the price elasticity of demand for each specification. *Elastic* stands for the case in which the price elasticity of demand is positive, while *Inelastic* stands for the case in which the price elasticity of demand is equal to 0. The regressions are estimated for each category of goods and services separately and include the following set of controls: age, employment status, gender, household size, industry, occupation, race, relationship status. Each column is for a category: (9) school and college tuition and related expenses; (10) personal insurance; (11) tobacco and other smoking products; (12) other lodging expenses out of town; (13) appliances; (14) audio and visual equipment and services; (15) vehicle purchases, maintenance and repairs, leases and rental charges. Robust standard errors in parentheses.
 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

>>> WHO IS MORE LIKELY *not* TO ADJUST DEMAND IN RESPONSE TO A PRICE INCREASE? ◀ BACK TO SLIDE



(A) Food away



(B) Vehicle purchases

- Similar results for food at home, apparel, personal insurance, appliances, and vehicle purchases, maintenance and repairs, leases and rental charges.
- 95% CIs are for the point estimates