Large Firms, Monopsony, and Concentration in the Labor Market

741 Macroeconomics
Topic 8

Masao Fukui

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Motivation

- We have been talking about firm size…
  … but no firm is really “large” in Hopenhayn-Rogerson – each firm is measure zero

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  - The wage HHI of a local labor market is 0.11-0.35 on average.
    - "Effective" number of firms: 3-9
  - Local labor market: 3-digit NAICS $\times$ commuting zone

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  - Local labor market: 3-digit NAICS $\times$ commuting zone
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- Today: a model of oligopsony in the labor market

General Equilibrium Oligopsony Model

– Based on Berger-Mongey-Herkenhoff (2022)

Environment

- Static model
- Representative family
  - Continuum of labor markets $j \in [0,1]$
  - Labor market j has a fixed number of firms $i \in \{1,2,\ldots,M_j\}$
  - Continuum of workers within a family, choosing where to work (i,j)
- Firms
  - Each firm produces final goods using $y_{ij} = z_{ij}^{1-\alpha} n_{ij}^{\alpha}$
- Markets
  - Local labor market: Cournot competition for labor

Representative Family

- Mass L of workers within the family
- Each worker $l \in [0,L]$ has efficiency unit of labor $\epsilon_{ij}(l)$ when working at (i,j)
- The family solves

$$\max_{C,\{\mathbb{1}_{ij}(l)\}} \; C$$

$$\text{s.t.} \quad C = \int_0^1 \sum_{i=1}^{M_j} \int_0^L w_{ij}\epsilon_{ij}(l)\mathbb{1}_{ij}(l)dldj + \Pi$$

- Assume the distribution of $\epsilon_{ij}(l)$ follow nested Fréchet (GEV)

$$\Pr\left(\{\epsilon_{ij}(l) \leq a_{ij}\}_{ij}\right) = \exp\left[-G\left(\{a_{ij}\}_{ij}\right)\right], \quad G(\{a_{ij}\}) = \int_0^1 \left(\sum_{i=1}^{M_j} a_{ij}^{-(\eta+1)}\right)^{\frac{\eta+1}{\theta+1}} dj$$

with $\eta > \theta$

Representation Result

- The family's problem can be equivalently represented as

$$\max_{C,\{\ell_{ij}\}:\sum_{ij}\ell_{ij}=1} C$$

$$\text{s.t.} \quad C = \int_0^1 \sum_{i=1}^{M_j} w_{ij}\ell_{ij}\, S_{ij}\left(\{\ell_{ij}\}\right) dj \times L + \Pi$$

$$\int_0^1 \sum_j \ell_{ij} di = 1$$

where

$$S_{ij}\left(\{\ell_{ij}\}\right) = \left(\frac{\ell_{ij}}{\sum_i \ell_{ij}}\right)^{-1/(\eta+1)} \left(\sum_i \ell_{ij}\right)^{-1/(\theta+1)}$$

- ℓ_{ij}: share of workers working for firm i in market j
- S_{ij}: average efficiency of workers in (i, j), and it captures selection:

  more workers work in $(i, j) \Rightarrow$ average efficiency of workers worsens
- See Donald-Fukui-Miyauchi (2024) Appendix C for a proof

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FOC: $w_{ij}\left[S_{ij} + \ell_{ij}\partial_{\ell_{ij}} S_{ij}\right] = \lambda$

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Nested CES Labor Supply System

Solutions: Given a vector of wages, $\{w_{ij}\}_{ij}$,

- The share of workers who choose to work in (i, j) is

$$\ell_{ij}(\{w_{ij}\}_{ij}) = \left(\frac{w_{ij}}{\mathbf{w}_j}\right)^{\eta+1} \left(\frac{\mathbf{w}_j}{\mathbf{W}}\right)^{\theta+1}$$

$$\text{where} \quad \mathbf{w}_j \equiv \left[\sum_i w_{ij}^{\eta+1}\right]^{1/(\eta+1)}, \quad \mathbf{W} \equiv \left[\int_0^1 \mathbf{w}_j^{\theta+1} dj\right]^{1/(\theta+1)}$$

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- The efficiency units of labor supply for (i, j) is

$$n_{ij}(\{w_{ij}\}_{ij}) \equiv \ell_{ij} S_{ij}(\{\ell_{ij}\}) L = \left(\frac{w_{ij}}{\mathbf{w}_j}\right)^{\eta} \left(\frac{\mathbf{w}_j}{\mathbf{W}}\right)^{\theta} L$$

Oligopsonistic Labor Market

- The inverse labor supply function is

$$w_{ij}(\{n_{ij}\}) = \left(\frac{n_{ij}}{\mathbf{n}_j}\right)^{\frac{1}{\eta}} \left(\frac{\mathbf{n}_j}{\mathbf{N}}\right)^{\frac{1}{\theta}} \tag{1}$$

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- Firms engage in Cournot competition, taking competitor's hiring as given, $n_{-ij} = n^*_{-ij}$

$$\max_{n_{ij}} z_{ij}^{1-\alpha} n_{ij}^{\alpha} - w_{ij}(n_{ij}, n^*_{-ij}) n_{ij} \quad (2)$$

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  - General solution:

$$w_{ij} = \mu_{ij} \times \alpha z_{ij}^{1-\alpha} n_{ij}^{\alpha-1}, \quad \mu_{ij} \equiv \frac{\varepsilon_{ij}}{\varepsilon_{ij}+1}, \quad \varepsilon_{ij} \equiv \frac{d \ln n_{ij}}{d \ln w_{ij}}$$

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wage markdown

MPL

Equilibrium Definition

A (Cournot) equilibrium consists of $\{w_{ij}(\{n_{ij}\}), n_{ij}\}$ such that

- $w_{ij}(\{n_{ij}\})$ is consistent with household's optimality (1)
- Taking $\{n_{-ij}\}$ as given, firm i solves (2)

Wage Markdown

- With our functional form assumption, the labor supply elasticity takes the form of

$$\varepsilon_{ij}(s_{ij}) = \left[\frac{1}{\eta}(1 - s_{ij}) + \frac{1}{\theta}s_{ij}\right]^{-1}, \quad \mu_{ij}(s_{ij}) = \frac{\varepsilon_{ij}(s_{ij})}{\varepsilon_{ij}(s_{ij}) + 1}$$

where

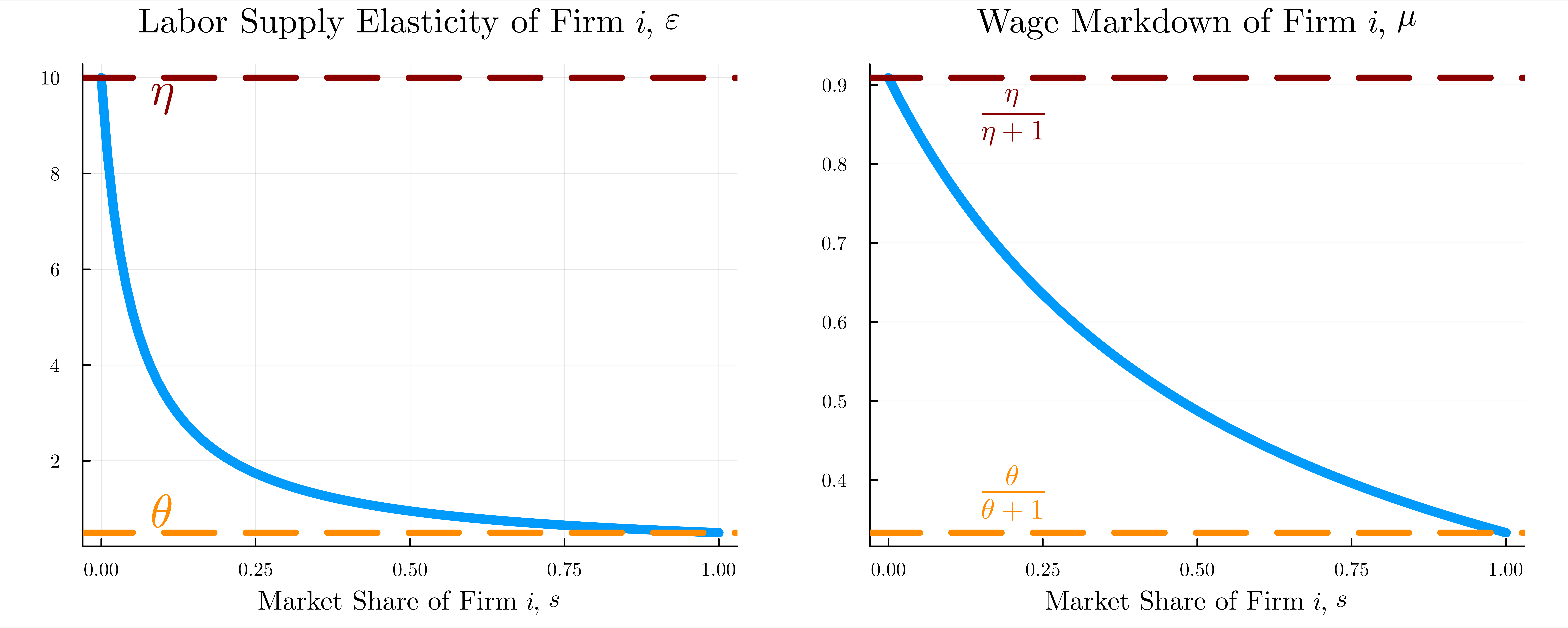
$$s_{ij} = \frac{w_{ij}n_{ij}}{\sum_k w_{kj}n_{kj}} \tag{3}$$

is the labor market share of firm i in market j

1. Competitive labor market: $\theta, \eta \to \infty \Rightarrow \varepsilon_{ij} \to \infty$
2. Monopsonistic competition within a market j: $M_j \to \infty \Rightarrow s_{ij} \to 0 \Rightarrow \varepsilon_{ij} \to \eta$
3. Monopsony within a market j: $s_{ij} \to 1 \Rightarrow \varepsilon_{ij} \to \theta$

- See also Atkeson-Burstein (2008)

Numerical Ilustration



Equilibrium System

The equilibrium $\{s_{ij}\}$ solve

$$s_{ij} = \frac{\left(\mu_{ij}(s_{ij}) z_{ij}^{1-\alpha}\right)^{\frac{1+\eta}{1+\eta(1-\alpha)}}}{\sum_k \left(\mu_{kj}(s_{kj}) z_{kj}^{1-\alpha}\right)^{\frac{1+\eta}{1+\eta(1-\alpha)}}}$$

- Proof: Relative employment between i and k:

$$\frac{n_{ij}}{n_{kj}} = \left(\frac{w_{ij}}{w_{kj}}\right)^{\eta} = \left(\frac{\mu_{ij}(s_{ij}) z_{ij}^{1-\alpha} n_{ij}^{\alpha-1}}{\mu_{kj}(s_{ij}) z_{kj}^{1-\alpha} n_{kj}^{\alpha-1}}\right)^{\eta} \quad \Leftrightarrow \quad \frac{n_{ij}}{n_{kj}} = \left(\frac{\mu_{ij}(s_{ij}) z_{ij}^{1-\alpha}}{\mu_{kj}(s_{kj}) z_{ij}^{1-\alpha}}\right)^{\frac{\eta}{1+\eta(1-\alpha)}}$$

- Substituting into (3) gives the expression
- Given $\{s_{ij}\}$, we can immediately compute $\{\mu_{ij}, n_{ij}, w_{ij}\}$

Sufficient Statistics for Labor Share

- Define the aggregate labor share as

$$LS = \frac{\int_0^1 \sum_{i \in j} w_{ij} n_{ij} dj}{\int_0^1 \sum_{i \in j} y_{ij} dj}$$

- Define the payroll weighted HHI as

$$\text{HHI} = \int_0^1 s_j \text{HHI}_j dj, \quad s_j = \frac{\sum_{i \in j} w_{ij} n_{ij}}{\int_0^1 \sum_{i \in j} w_{ij} n_{ij} dj}, \quad \text{HHI}_j = \sum_{i \in j} s_{ij}^2$$

- Result:

$$LS = \alpha \left[(1 - \text{HHI}) \left(\frac{\eta}{\eta + 1} \right)^{-1} + \text{HHI} \left(\frac{\theta}{\theta + 1} \right)^{-1} \right]^{-1}$$

$\Rightarrow$ Conditional on the knowledge of (α, θ, η), payroll shares are sufficient to infer LS

Planning Problem

Planning Problem

- The planner maximizes total consumption subject to the resource cosntraints:

$$\max_{\{n_{ij},\ell_{ij}\}} \int_0^1 \sum_i z_{ij}^{1-\alpha} n_{ij}^{\alpha} dj$$

$$\text{s.t.} \quad n_{ij} = \ell_{ij} S_{ij}(\{\ell_{ij}\}) L$$

$$\int_0^1 \sum_j \ell_{ij} di = 1$$

- The FOC is

$$\alpha z_{ij}^{1-\alpha} n_{ij}^{\alpha-1} \left[S_{ij} + \ell_{ij} \partial_{\ell_{ij}} S_{ij} \right] = \lambda$$

Equilibrium vs. Planner

Planner:

$$\alpha z_{ij}^{1-\alpha} n_{ij}^{\alpha-1} \left[S_{ij} + \ell_{ij} \partial_{\ell_{ij}} S_{ij}\right] = \lambda$$

Equilibrium:

$$\mu_{ij}\, \alpha z_{ij}^{1-\alpha} n_{ij}^{\alpha-1} \left[S_{ij} + \ell_{ij} \partial_{\ell_{ij}} S_{ij}\right] = \lambda$$

- Is the equilibrium efficient? – No, as long as $\{\mu_{ij}\}$ vary in equilibrium
  - If $\mu_{ij} = \mu$ for all i, j, then μ is indistinguishable from λ
- In what way?
  - Firms with low μ_{ij} (high labor market power) are too small in eqm!
  - Firms with high μ_{ij} (low labor market power) are too large in eqm!
- Minimum wage reallocates workers from high μ_{ij} to low μ_{ij}
  $\Rightarrow$ can improve efficiency (but Berger-Herkenhoff-Mongey (2025) say it's small)

Bringing the Model to the Data

Identification

- Key parameters: (θ, η)
- Labor supply equation with potential labor supply shifter ξ_{ij}

$$n_{ij}(\{w_{ij}\}_{ij}) = \xi_{ij}\left(\frac{w_{ij}}{\mathbf{w}_j}\right)^{\eta}\left(\frac{\mathbf{w}_j}{\mathbf{W}}\right)^{\theta} L$$

- Taking log,

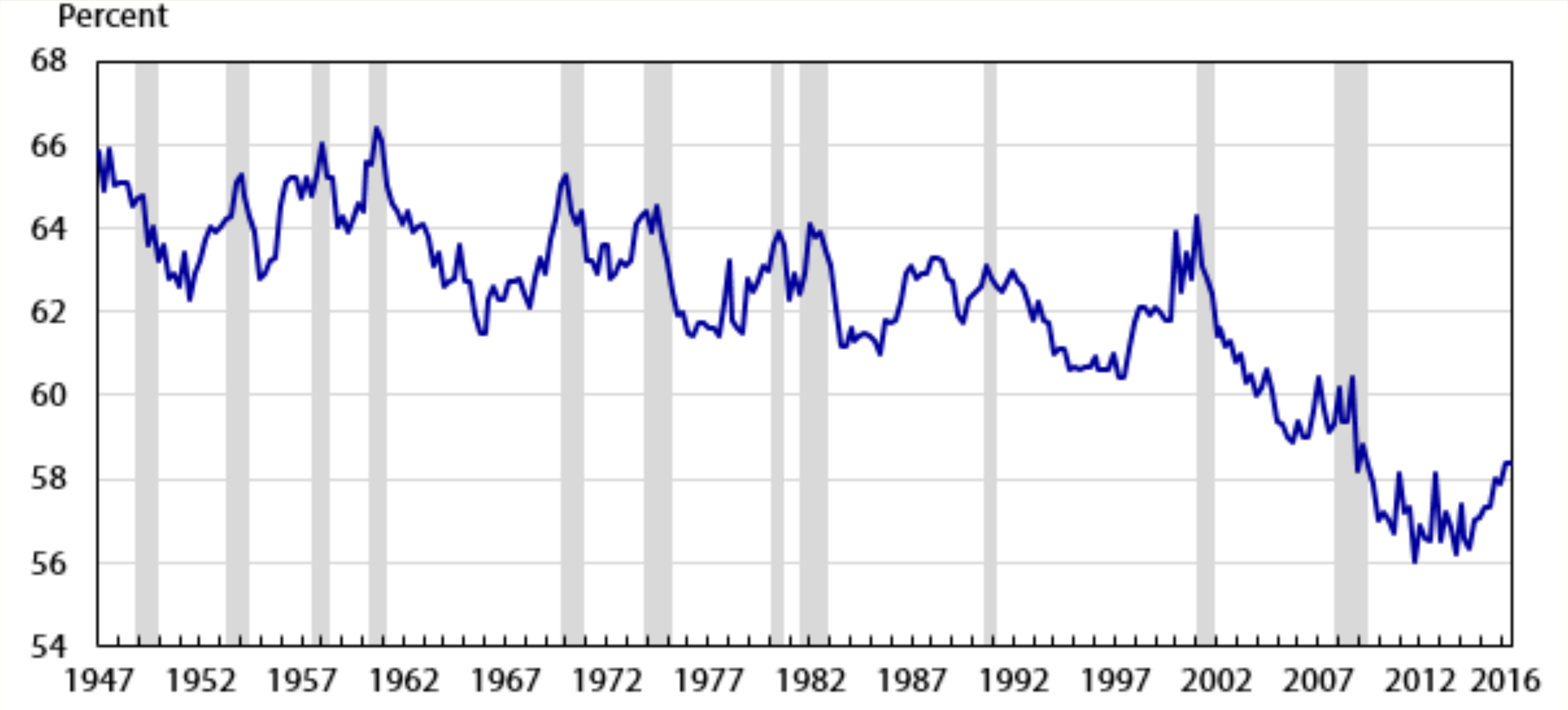
$$\log n_{ij} = \eta \log(w_{ij}) + (\theta - \eta)\log \mathbf{w}_j - \theta \log \mathbf{W} + \log L + \log \xi_{ij}$$

  - With suitable instruments (labor demand shifter), one can identify (θ, η)
    1. Berger-Mongey-Herkenhoff (2021): changes in state corporate taxes
    2. Felix (2023): changes in tariffs

Estimation Results

- BHM's implementation: US Census LBD data
- Market: 3-digit NAICS $\times$ commuting zone
- Estimates: $\eta = 10.85$, $\theta = 0.42$
- With $HHI = 0.11$ in 2014, the model implies **30%** aggregate wage markdown

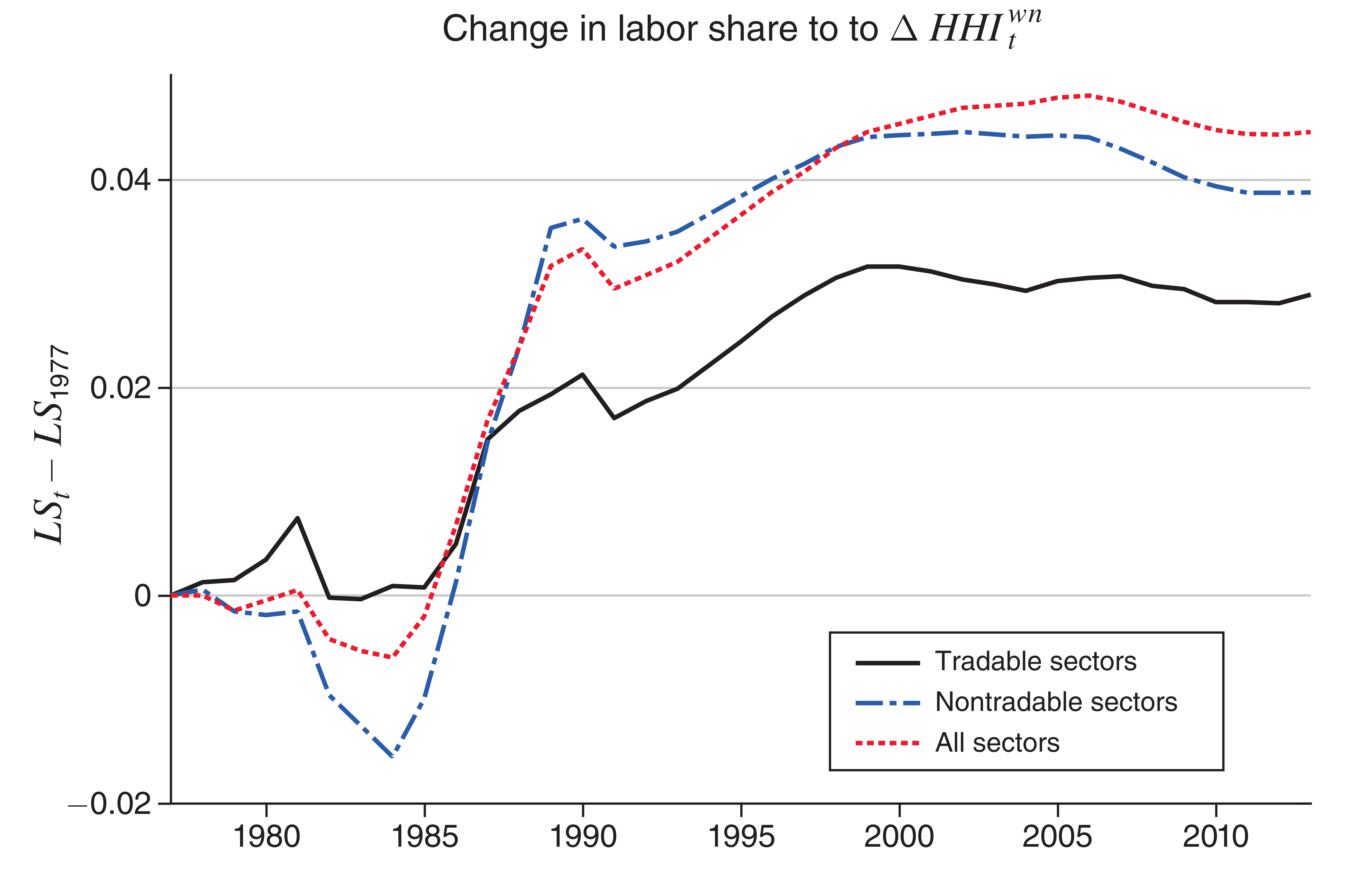
Labor Share



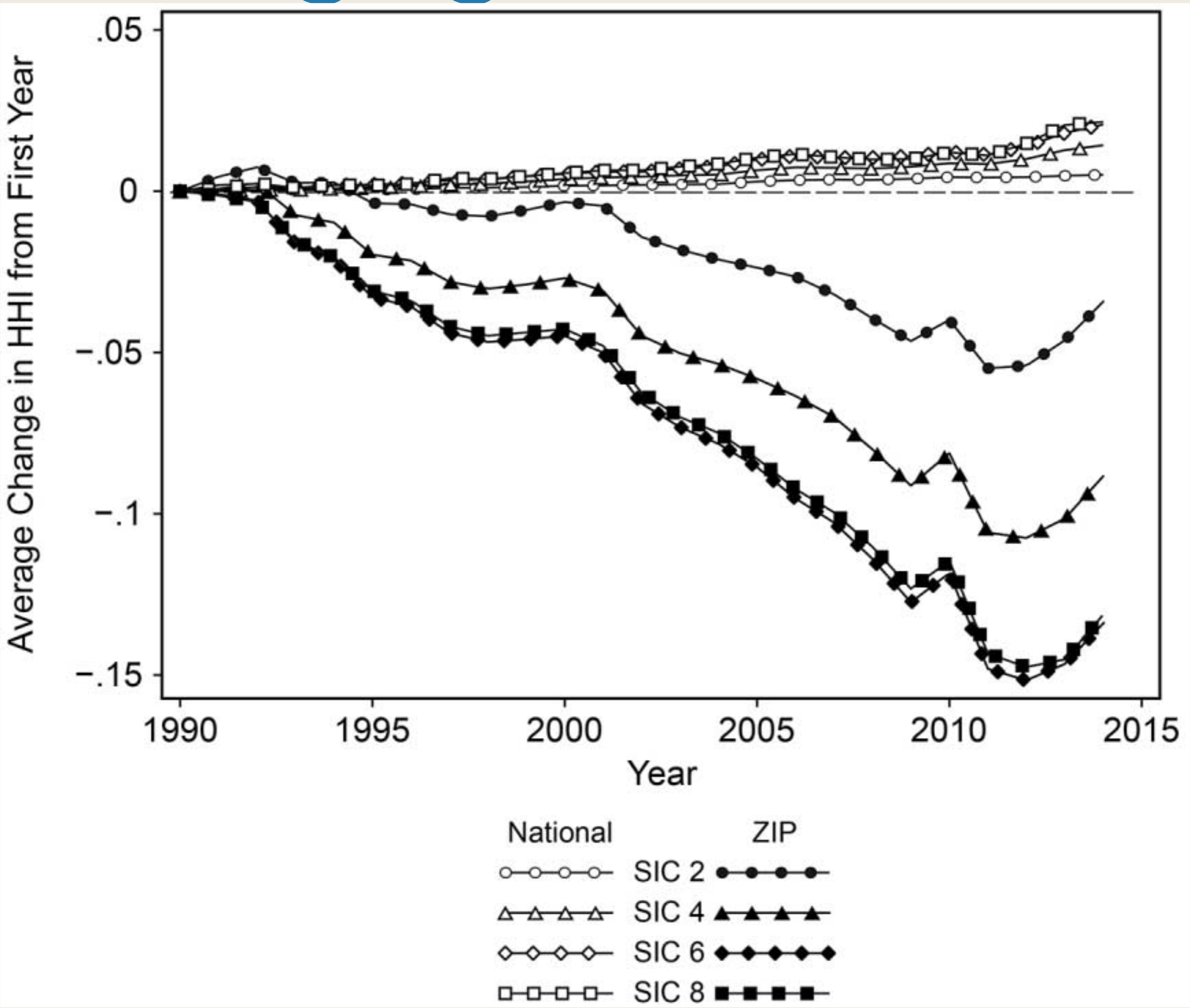
- Can the changes in concentration explain the changes in labor share?

Labor Share Increases due to ΔHHI

- Fix (η, θ, α) and feed the changes in HHI over time



Diverging Trends in HHI

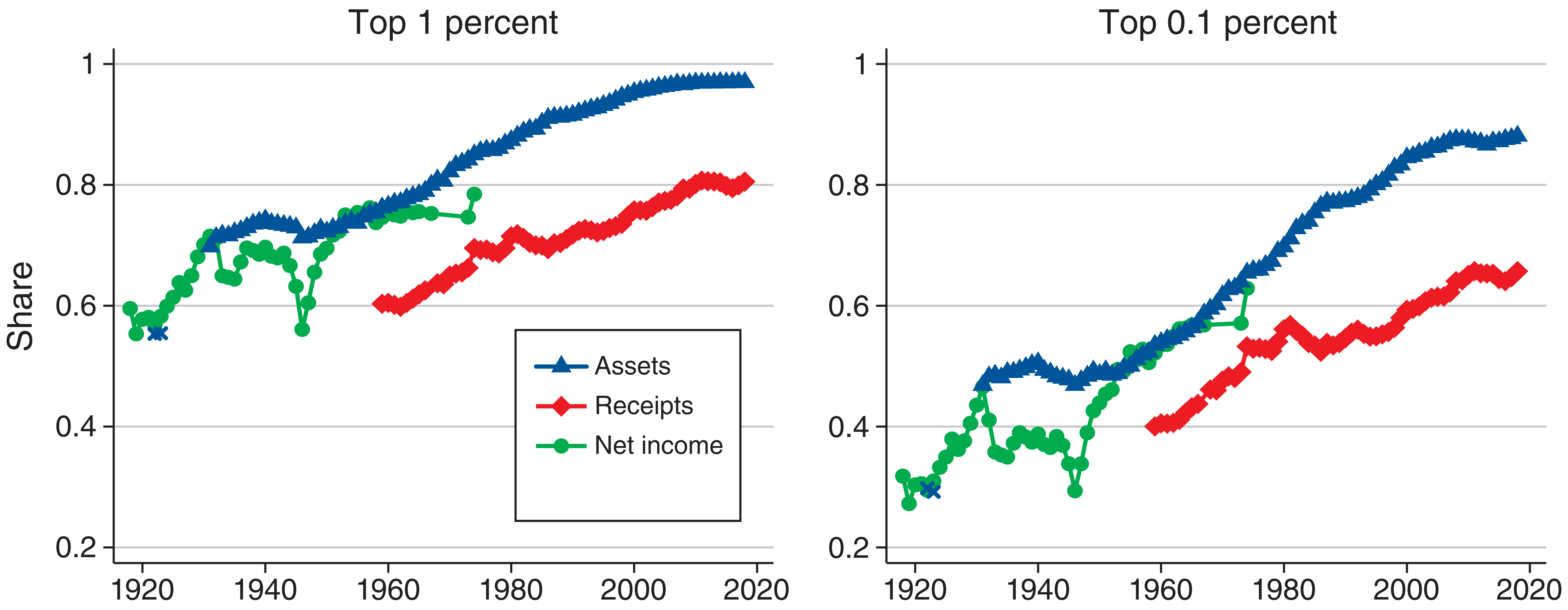


Source: Rossi-Hansberg, Sarte, & Trachter (2021)

The Rise of Large Firms

– Ma, Zhang, and Zimmermann (2025)

100 Years of Rising Concentration in the US

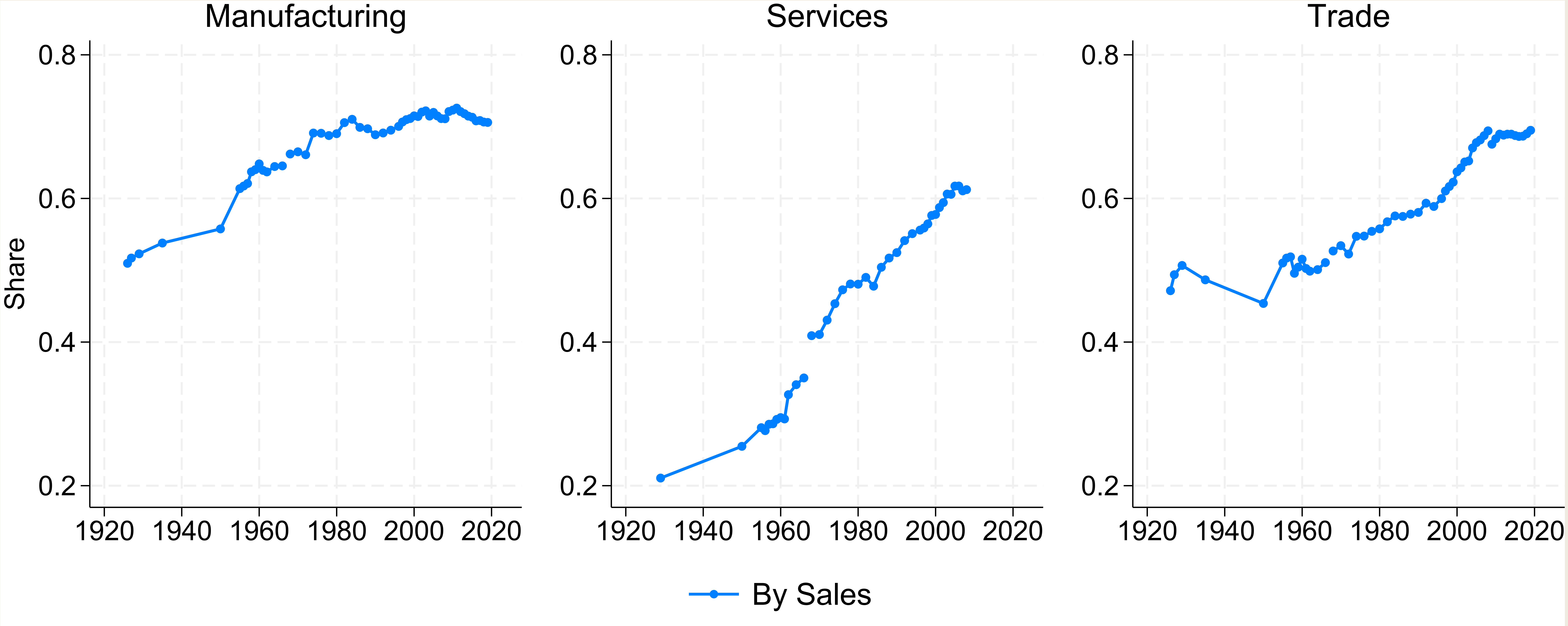


Source: Kwon, Ma, & Zimmermann (2024)

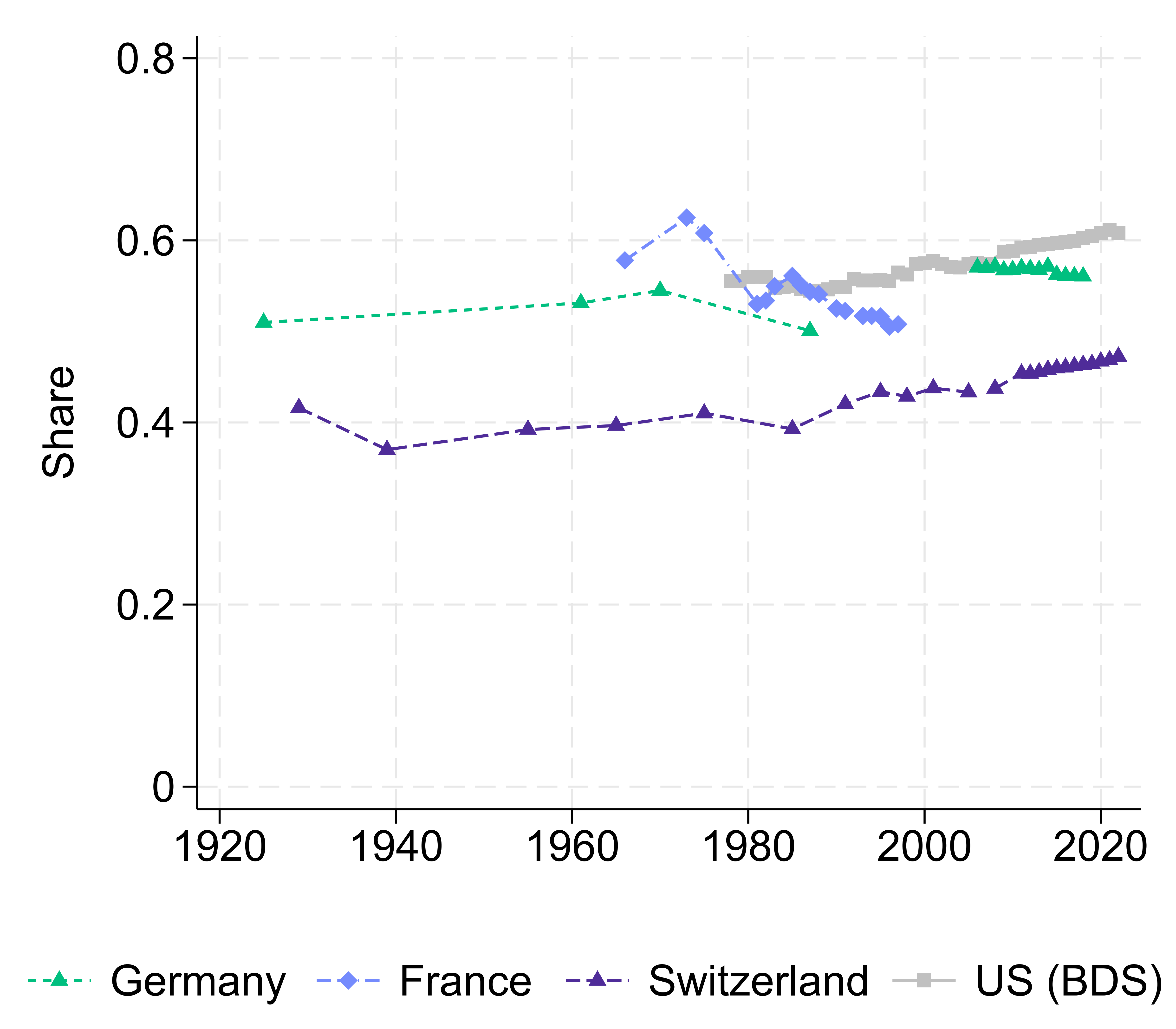
Top 1% Share in the World

Top 1% Sales Share by Sectors

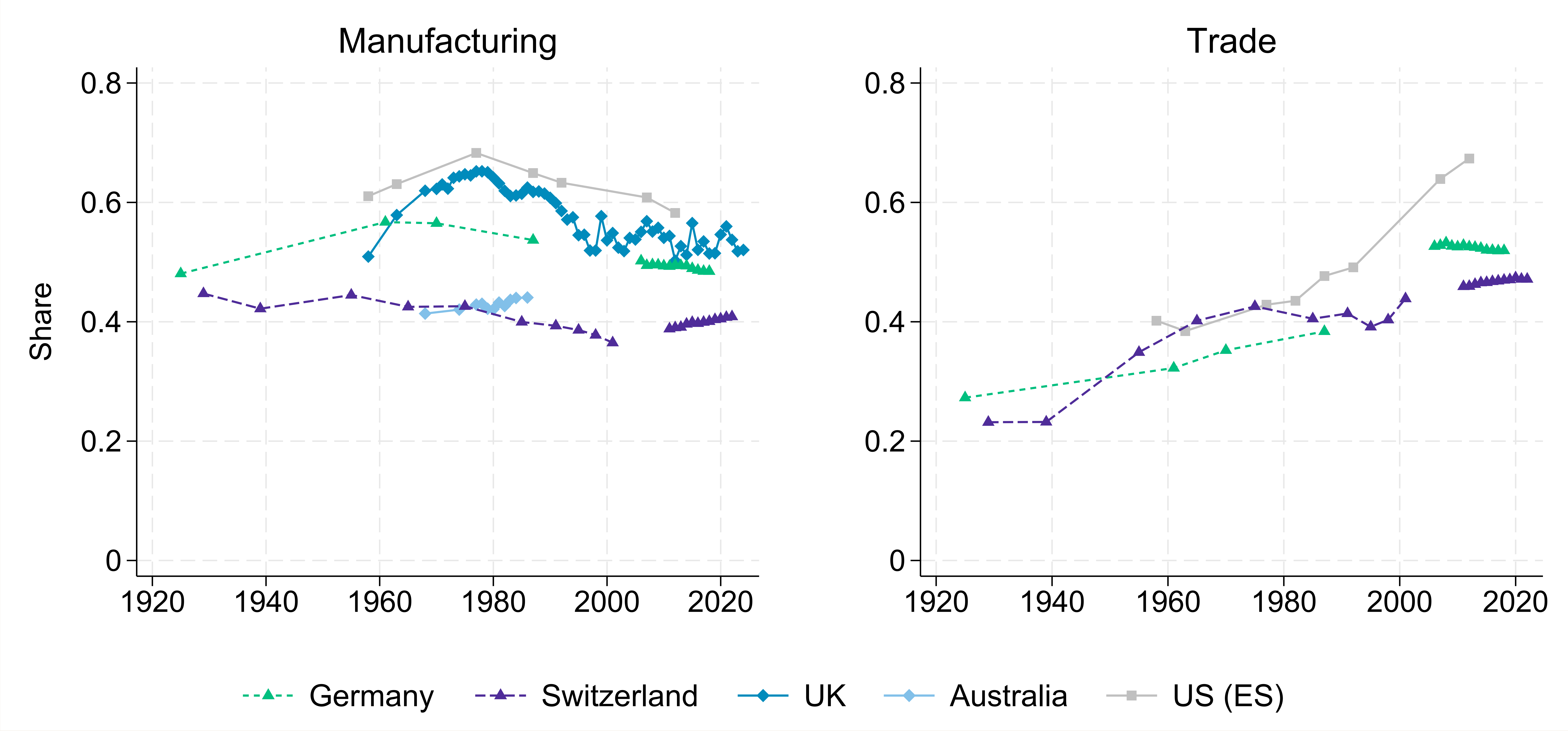
Panel A. Top 1% Share



Top 1% Employment Share Has Been Stable



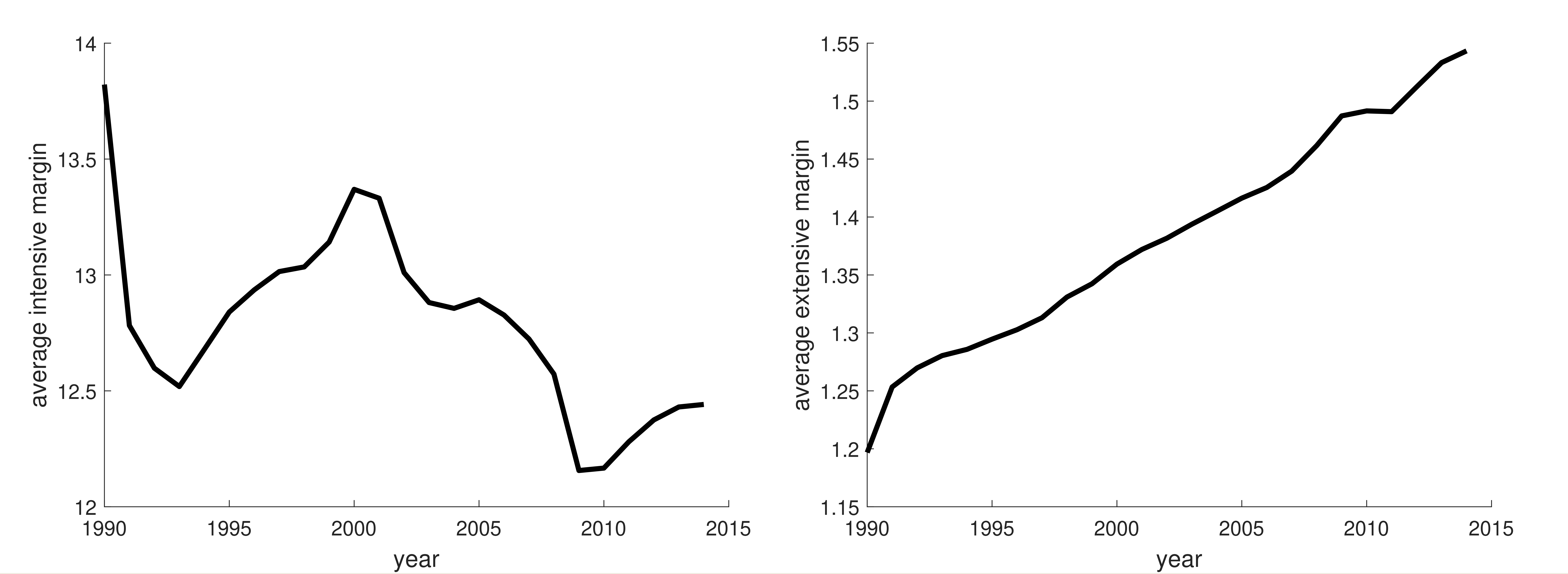
Top 1% Emp. Share in Manufacturing & Trade



Firm Growth Through Establishments

Average size of establishment

Number of establishments



Source: Cao, Hayyatt, Mukoyama, Sager (2022)

Wrapping Up

1. Problem set 2 is due Dec 21
2. I also look forward to reading your research proposal!