Structural Unemployment

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Mismatch and structural unemployment

Firms have jobs, but can't find appropriate workers. The workers want to work, but can't find appropriate jobs. There are many possible sources of **mismatch***—geography, skills, demography—and they are probably all at work.*

Whatever the source, though, it is **hard to see how the Fed can do much to cure this problem***. Monetary stimulus has provided conditions so that manufacturing plants want to hire new workers. But the Fed does not have a means to transform construction workers into manufacturing workers.*

Given the structural problems in the labor market, I do **not expect unemployment to decline rapidly***.*

Kocherlakota. Inside the FOMC, Speech in Marquette, MI, Aug 17, 2010

This paper

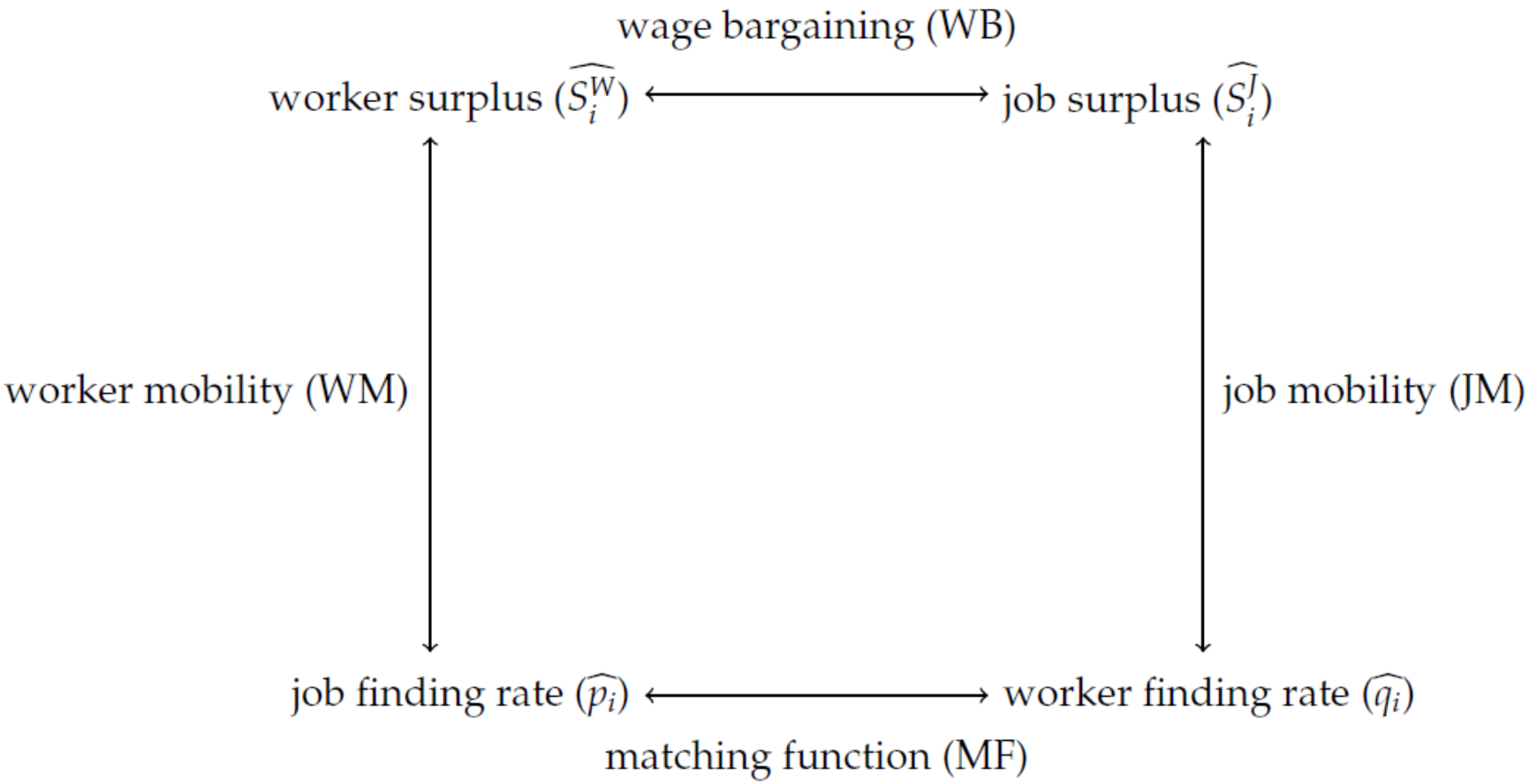
1. Model of segmented labor market
   - Search frictions within segments $\Rightarrow$ frictional unemployment
   - Mismatch across segments $\Rightarrow$ mismatch unemployment
2. A structural increase in mismatch unemployment?
   - Less cyclical? More persistent?
   - More important in the Great Recession?
3. Decompose mismatch unemployment into its sources
   - Worker and job mobility costs
   - Wage adjustment costs

Model

Model of mismatch unemployment

- Labor market consists of segments (submarkets)
  - Each worker searches in one submarket
  - Each vacancy searches in one submarket
- Search frictions *within* submarkets
  - Matching technology with diminishing returns
  - Submarket i characterized by p_i, S_i^W, q_i, S_i^J
- Adjustment costs *between* submarkets
  - $\Rightarrow$ Dispersion labor market conditions
  - $\Rightarrow$ Mismatch unemployment

Model of mismatch unemployment



Worker mobility

- Value of searching in segment i

$$z_i^W = b_i + p_i S_i^W$$

- Arbitrage through worker mobility

$$z_i^W = \bar{z}^W \Rightarrow p_i S_i^W = \bar{z}^W - b_i$$

  - Unemployed workers move to more attractive segment
  - Decreases p_i, decreases S_i^W (wage)
- Worker mobility curve: attractive jobs are hard to find

$$\hat{p}_i + \hat{S}_i^W = \alpha_i^{WM}$$

- Deviations from WM curve $\Rightarrow$ mismatch
  - Differences in unemployment benefits: $\alpha_i^{WM} = -\frac{\bar{b}}{\bar{z}^W - \bar{b}} \hat{b}_i$
  - Worker mobility costs

Sources of mismatch unemployment

1. Worker mobility
$$\hat{p}_i + \hat{S}_i^W = \alpha_i^{WM}$$
   - Differences in unemployment benefits: $\alpha_i^{WM} = -\frac{\bar{b}}{\bar{z}^W - \bar{b}} \hat{b}_i$
   - Worker mobility costs
2. Job mobility
$$\hat{q}_i + \hat{S}_i^J = \alpha_i^{JM}$$
   - Differences in vacancy posting costs: $\alpha_i^{JM} = \frac{\bar{k}}{\bar{z}^J + \bar{k}} \hat{k}_i$
   - Job mobility costs (costs of moving vacancy)
3. Wage setting
$$\hat{S}_i^W = \hat{S}_i^J + \alpha_i^{WB}$$
   - Differences in effective bargaining power: $\alpha_i^{WB} = \frac{\phi_i}{1-\phi_i}$
   - Wage adjustment costs (rebargaining costs, wage rigidities)
4. Matching technology
$$\hat{q}_i = -\mu \hat{\theta}_i = -\frac{\mu}{1-\mu} \hat{p}_i + \alpha_i^{MF}$$
   - Differences in matching technology: $\alpha_i^{MF} = \frac{\hat{B}_i}{1-\mu} - \frac{\mu}{1-\mu} (\bar{p} - \bar{q}) \hat{\mu}_i$

Sources of mismatch unemployment

1. Worker mobility

$$\hat{p}_i + \hat{S}_i^W = \alpha_i^{WM}$$

2. Job mobility

$$\hat{q}_i + \hat{S}_i^J = \alpha_i^{JM}$$

3. Wage setting

$$\hat{S}_i^W = \hat{S}_i^J + \alpha_i^{WB}$$

4. Matching technology

$$\hat{q}_i = -\mu\hat{\theta}_i = -\frac{\mu}{1-\mu}\hat{p}_i + \alpha_i^{MF}$$

$$\Downarrow$$

$$\hat{p}_i = (1-\mu)\left(\alpha_i^{WM} - \alpha_i^{JM} - \alpha_i^{WB} + \alpha_i^{MF}\right)$$

Data and Measurement

Measuring match surplus

- BE for match surplus

$$(1+r)\,S_{it} = y_{it} + (1-\tau_{it})\,E_t S_{it+1}$$

  - Match payoff: $y_{it}^W = w_{it} - b_{it}$, $y_{it}^J = \pi_{it} + k_{it}$ (CPS, NIPA)
  - Turnover: $\tau_{it}^W = \lambda_{it} + p_{it}$, $\tau_{it}^J = \lambda_{it} + q_{it}$ (CPS)

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- Solving forward

$$S_{it} = \frac{y_{it}}{r + \tilde{\tau}_{it}}$$

  - Turnover constant over duration match
  - State-level wages and profits random walk
    (Blanchard and Katz 1992; Haefke, Sonntag and van Rens 2008)
  - Unemployment benefit $b_i / w_i = 0.73$ (Mortensen and Nagypal 2007)
    Vacancy posting costs $k_i / \pi_i = 0.03$ (Silva and Toledo 2009)
    Discount rate $r = 5\%$ per annum

Measuring match surplus: Bellman equations

- Workers

$$W_{it} = \frac{1}{1+r}\left[w_{it} + \lambda_{it} E_t U^W_{it+1} + (1-\lambda_{it}) E_t W_{it+1}\right]$$

$$U^W_{it} = \frac{1}{1+r}\left[b_{it} + p_{it} E_t W_{it+1} + (1-p_{it}) E_t U^W_{it+1}\right]$$

$$S^W_{it} = W_{it} - U^W_{it} = \frac{1}{1+r}\left[w_{it} - b_{it} + (1-\lambda_{it}-p_{it}) E_t S^W_{it+1}\right]$$

- Jobs

$$J_{it} = \frac{1}{1+r}\left[\pi_{it} + \lambda_{it} E_t U^J_{it+1} + (1-\lambda_{it}) E_t J_{it+1}\right]$$

$$U^J_{it} = \frac{1}{1+r}\left[-k_{it} + q_{it} E_t J_{it+1} + (1-q_{it}) E_t U^J_{it+1}\right]$$

$$S^J_{it} = J_{it} - U^J_{it} = \frac{1}{1+r}\left[\pi_{it} + k_{it} + (1-\lambda_{it}-q_{it}) E_t S^J_{it+1}\right]$$

Measuring match surplus: persistence

- BE for match surplus

$$(1+r)\,S_{it} = y_{it} + (1-\tau_{it})\,E_t S_{it+1}$$

  - Match payoff: $y_{it}^W = w_{it} - b_{it}$, $y_{it}^J = \pi_{it} + k_{it}$ (CPS, NIPA)
  - Turnover: $\tau_{it}^W = \lambda_{it} + p_{it}$, $\tau_{it}^J = \lambda_{it} + q_{it}$ (CPS)

- Assumptions that matter
  - *Level* and *persistence* of payoffs (wages and profits)

$$y_{it+1} = (1-\delta)\,y_{it} + \delta \bar{y}_t$$

  - *Level* of turnover: $\tau_{it+s} = \tau_{it}$ or $\tau_{it+s} = \bar{\tau}_t$

- Solving forward

$$S_{it} = \frac{\bar{y}_t}{r+\tilde{\tau}_{it}} + \frac{y_{it}-\bar{y}_t}{r+\tilde{\tau}_{it}+\delta}$$

Controlling for heterogeneity

- Worker heterogeneity
  - 40 homogeneous groups of workers based on observables (2 gender x 5 education x 4 potential experience)
  - Calculate $\hat{S}_i^W$ separately for 40 groups, then average
  - Same for $\hat{S}_i^J$, assuming $\log \pi_{it}^* = \log \pi_{it}^{\text{NIPA}} - \log w_{it}^{\text{CPS}} + \log w_{it}^{*\text{CPS}}$
- Compensating differentials
  - Job characteristics not observable
  - Assume constant over time $\Rightarrow$ state-specific FE
  - $\Rightarrow$ Do not interpret *level* of mismatch unemployment

Measuring job and worker finding rates

- Job finding rate p_i
  - Observe by state, 1967-2009 (CPS)
- Worker finding rate q_i
  - Observe directly, 2000-2009 (JOLTS, confidential)
  - Assume matching technology constant across states

$$\hat{q}_i = -\mu\hat{\theta}_i = -\frac{\mu}{1-\mu}\hat{p}_i$$

  - Elasticity matching function $\mu = 0.6$ (Mortensen and Nagypal 2007)
- Heterogeneity: control same as for surplus

Results

Sources of mismatch unemployment

1. Worker mobility

$$\hat{p}_i + \hat{S}_i^W = \alpha_i^{WM}$$

2. Job mobility

$$\hat{q}_i + \hat{S}_i^J = \alpha_i^{JM}$$

3. Wage setting

$$\hat{S}_i^W = \hat{S}_i^J + \alpha_i^{WB}$$

4. Matching technology

$$\hat{q}_i = -\mu\hat{\theta}_i = -\frac{\mu}{1-\mu}\hat{p}_i + \alpha_i^{MF}$$

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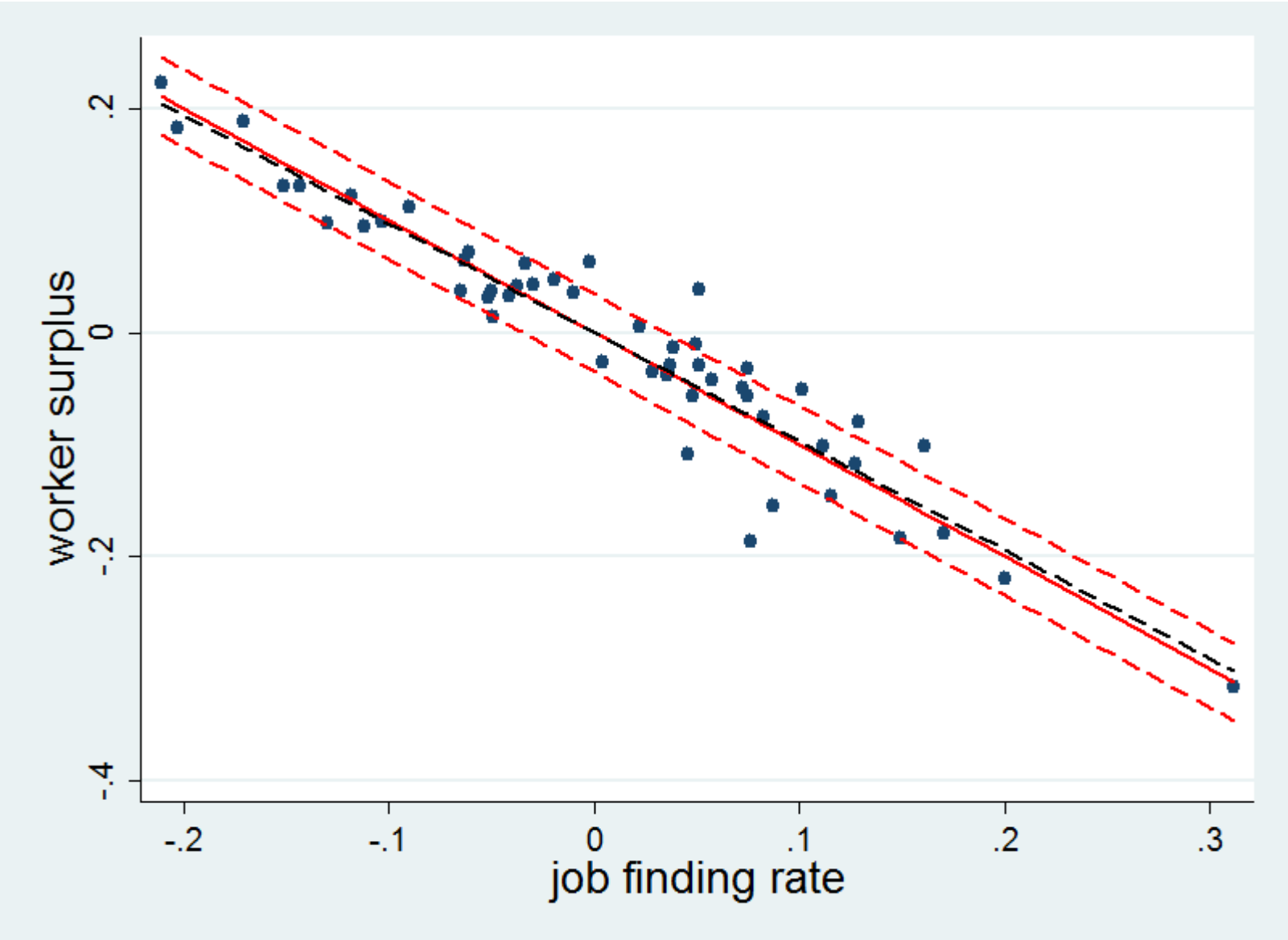
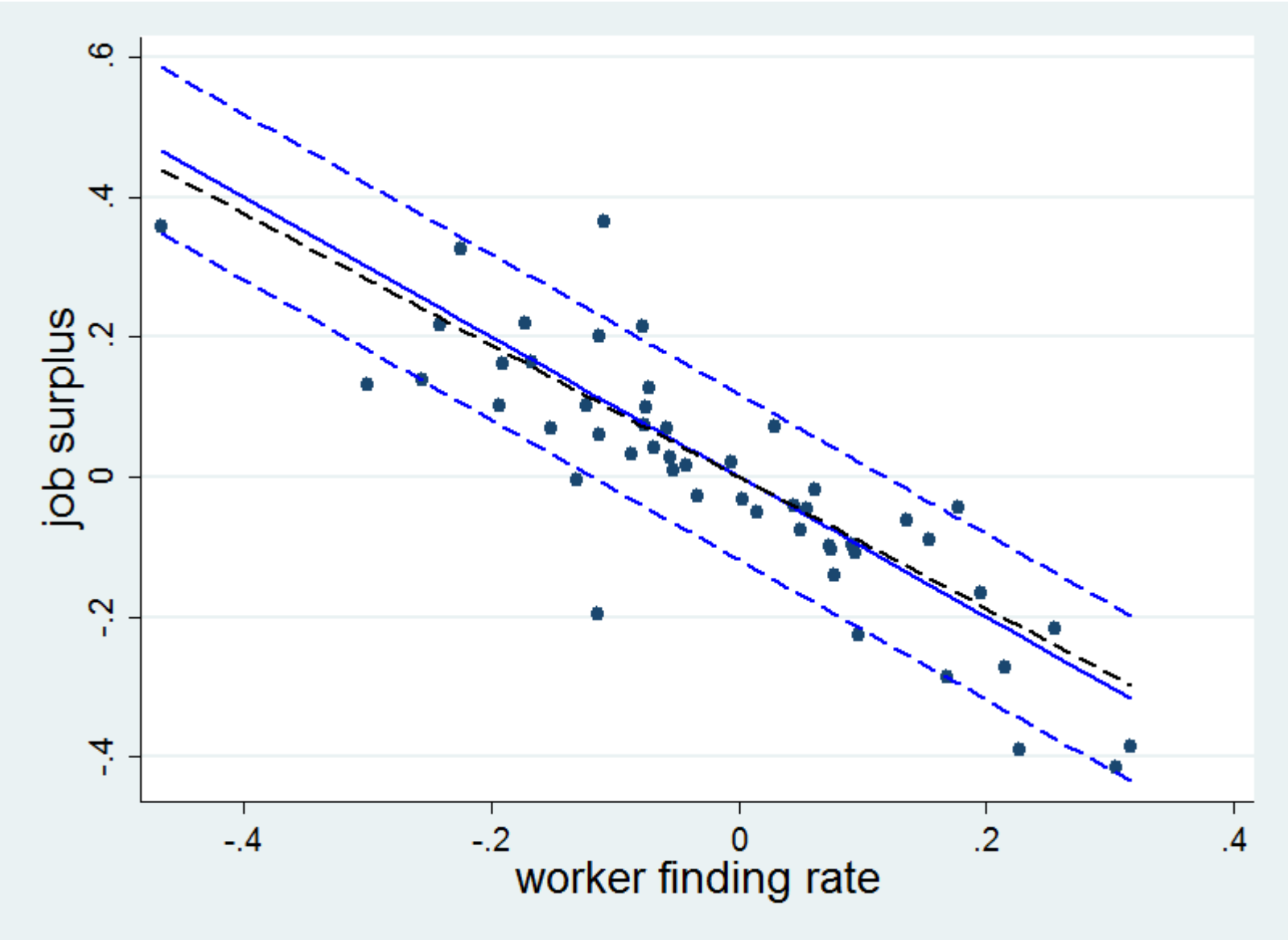
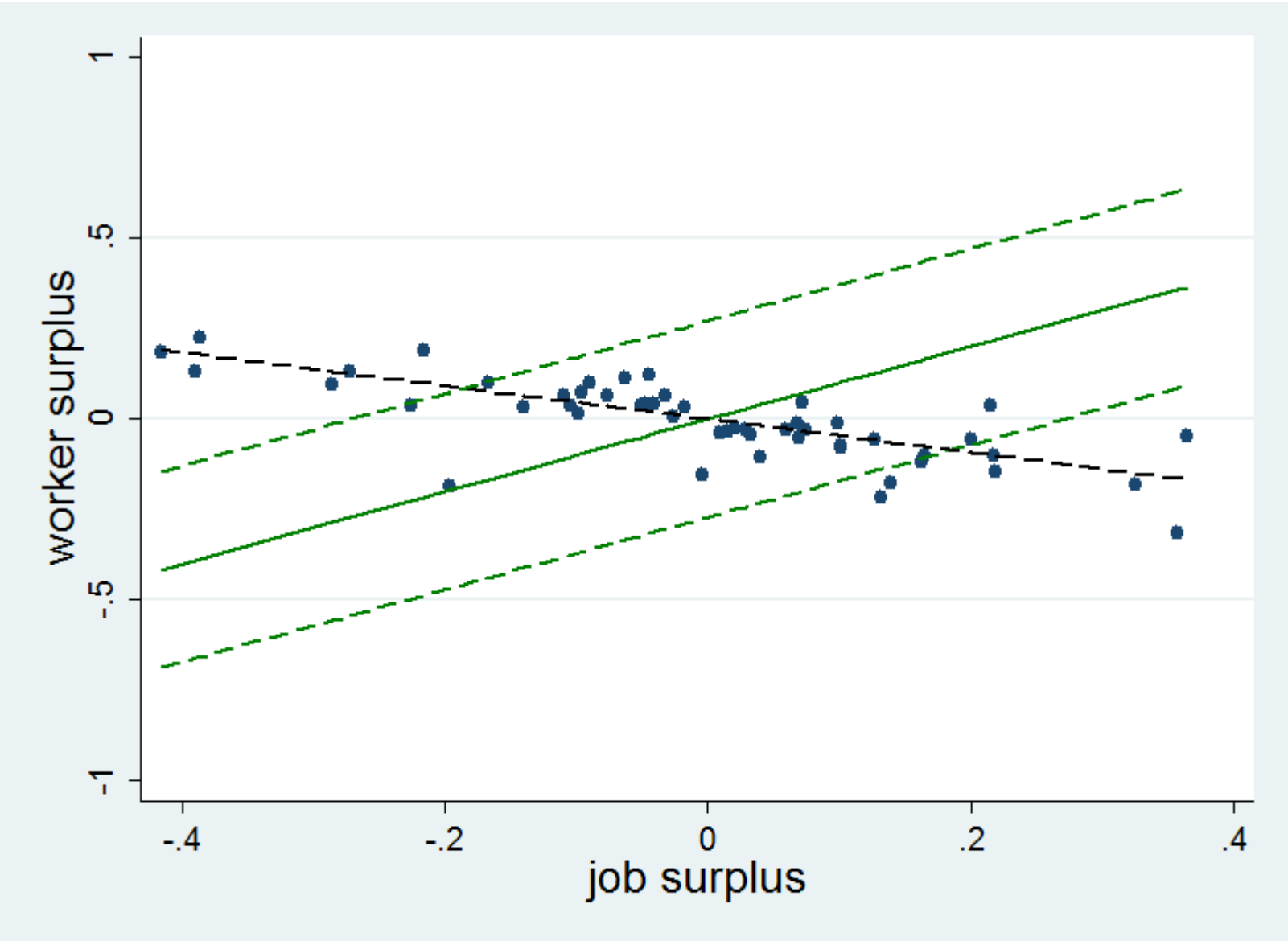
Worker mobility



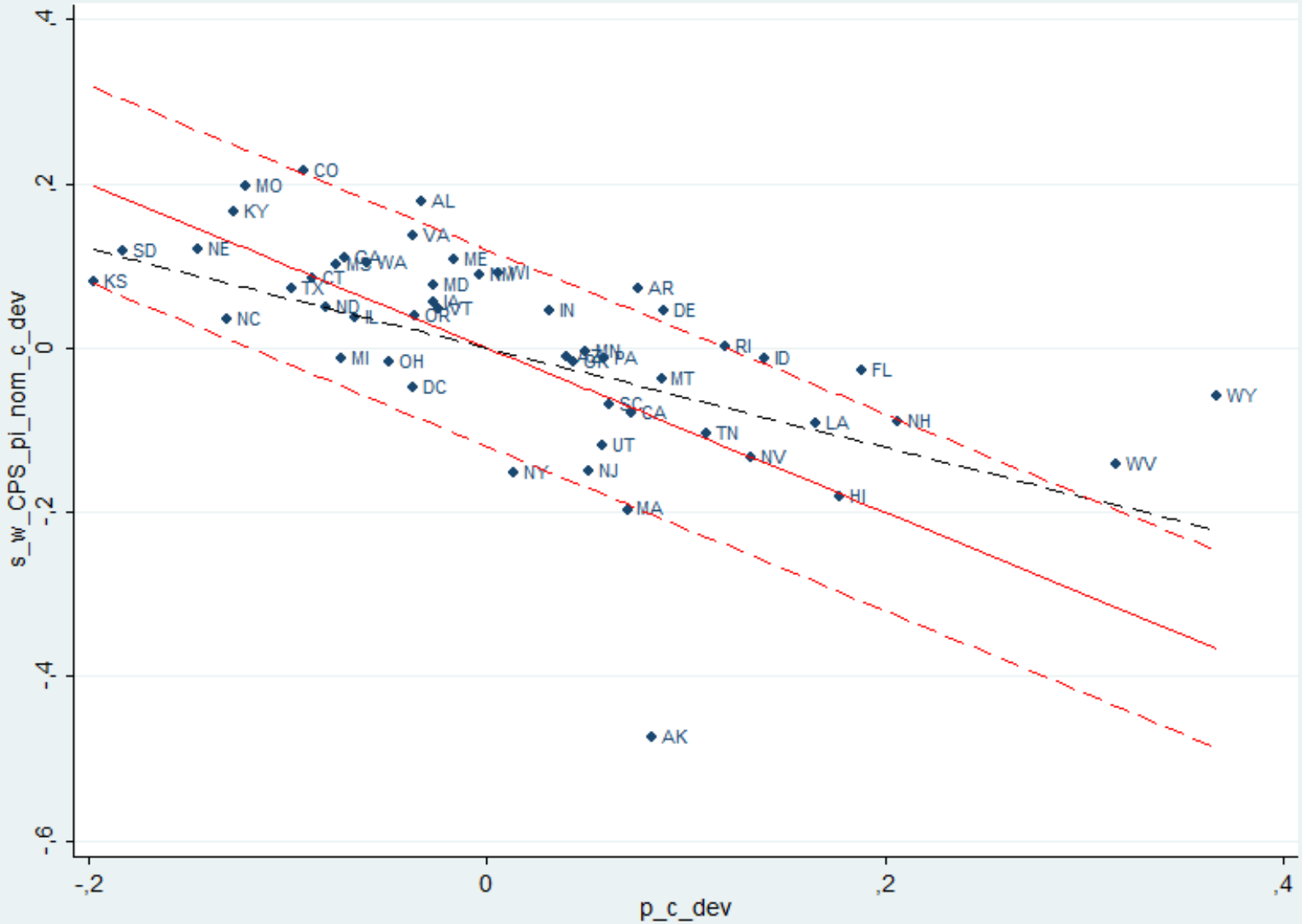
Job mobility



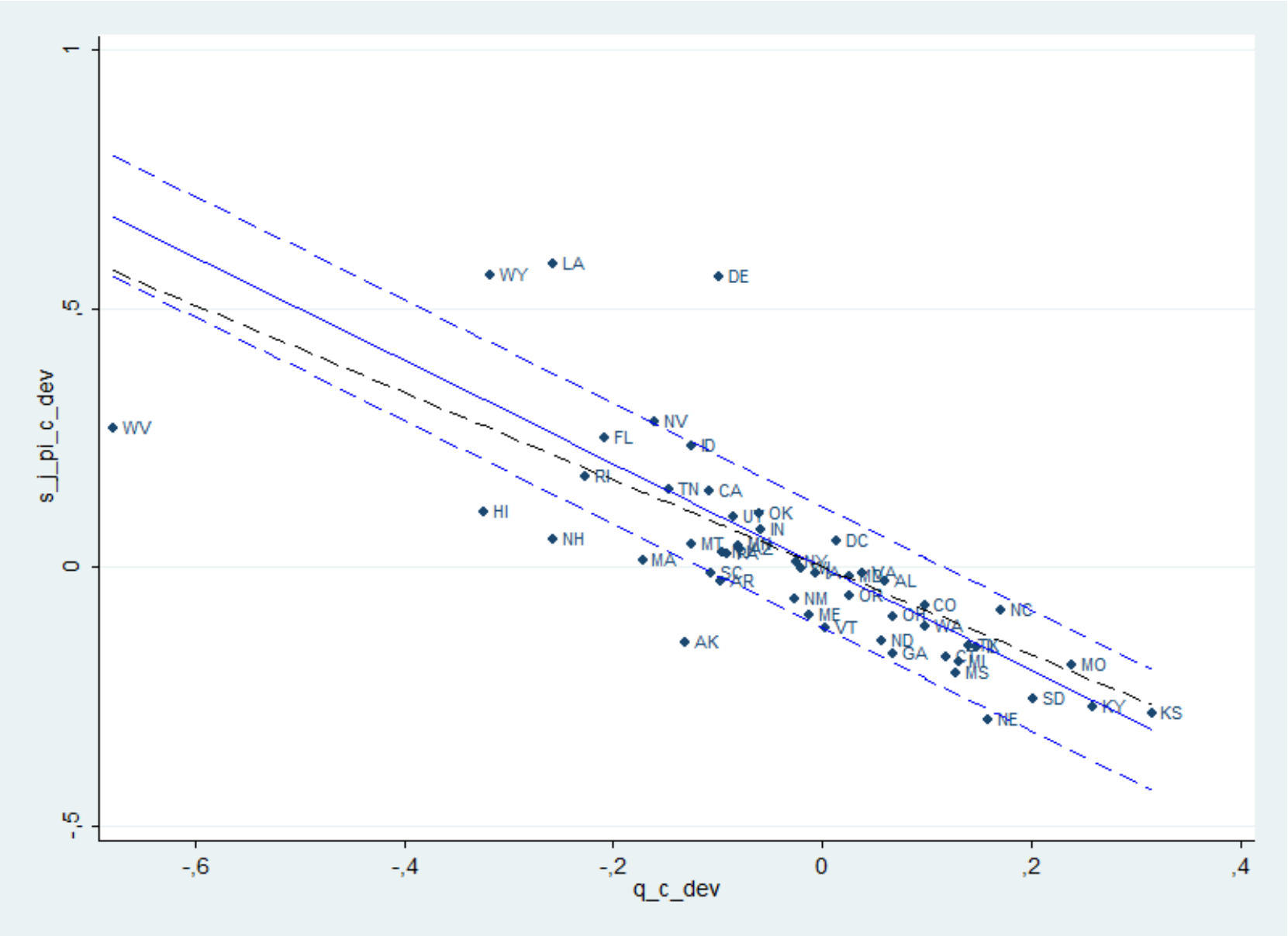
Wage setting



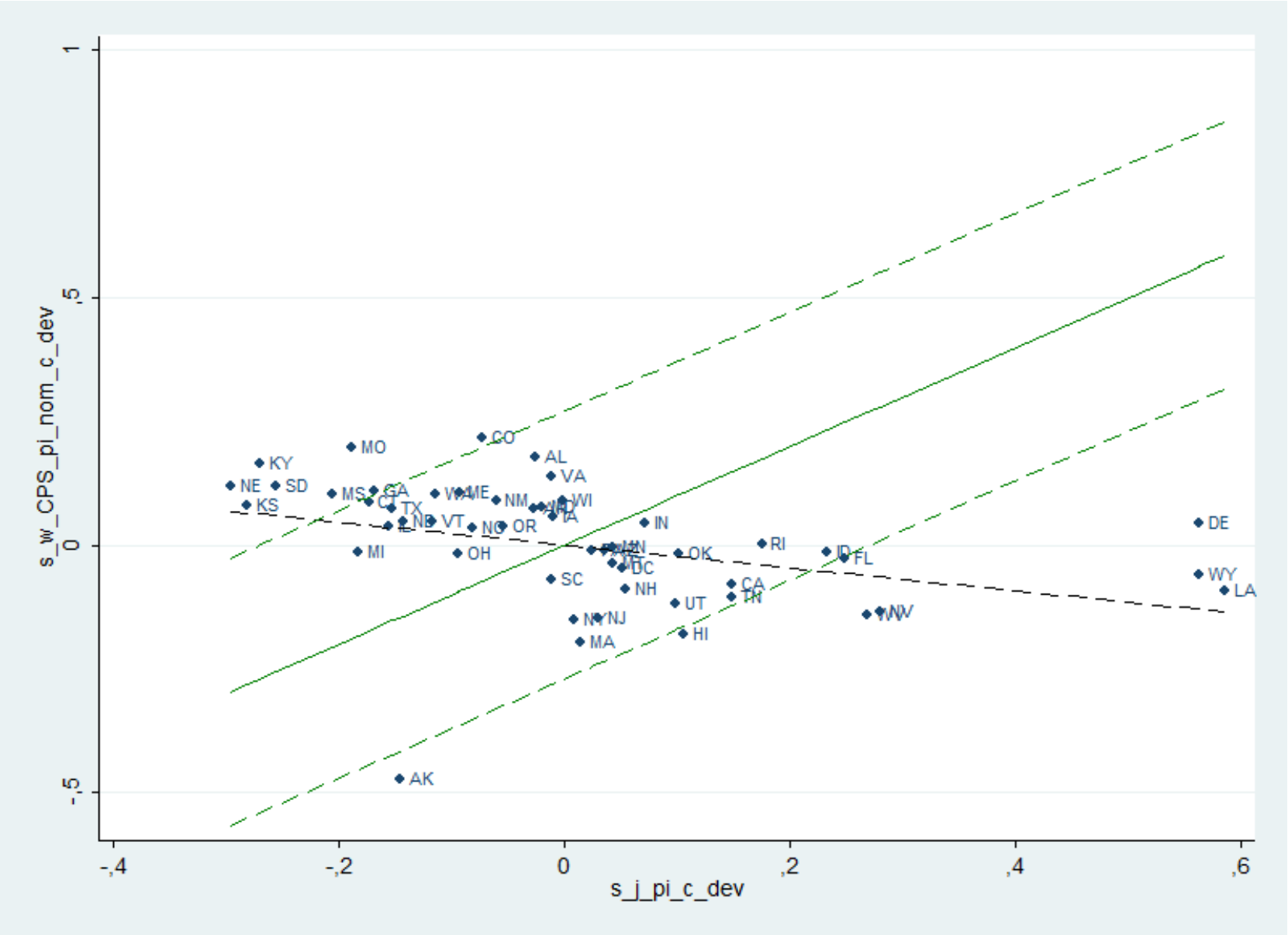
Worker mobility



Job mobility



Wage setting



Deviations from worker mobility curve

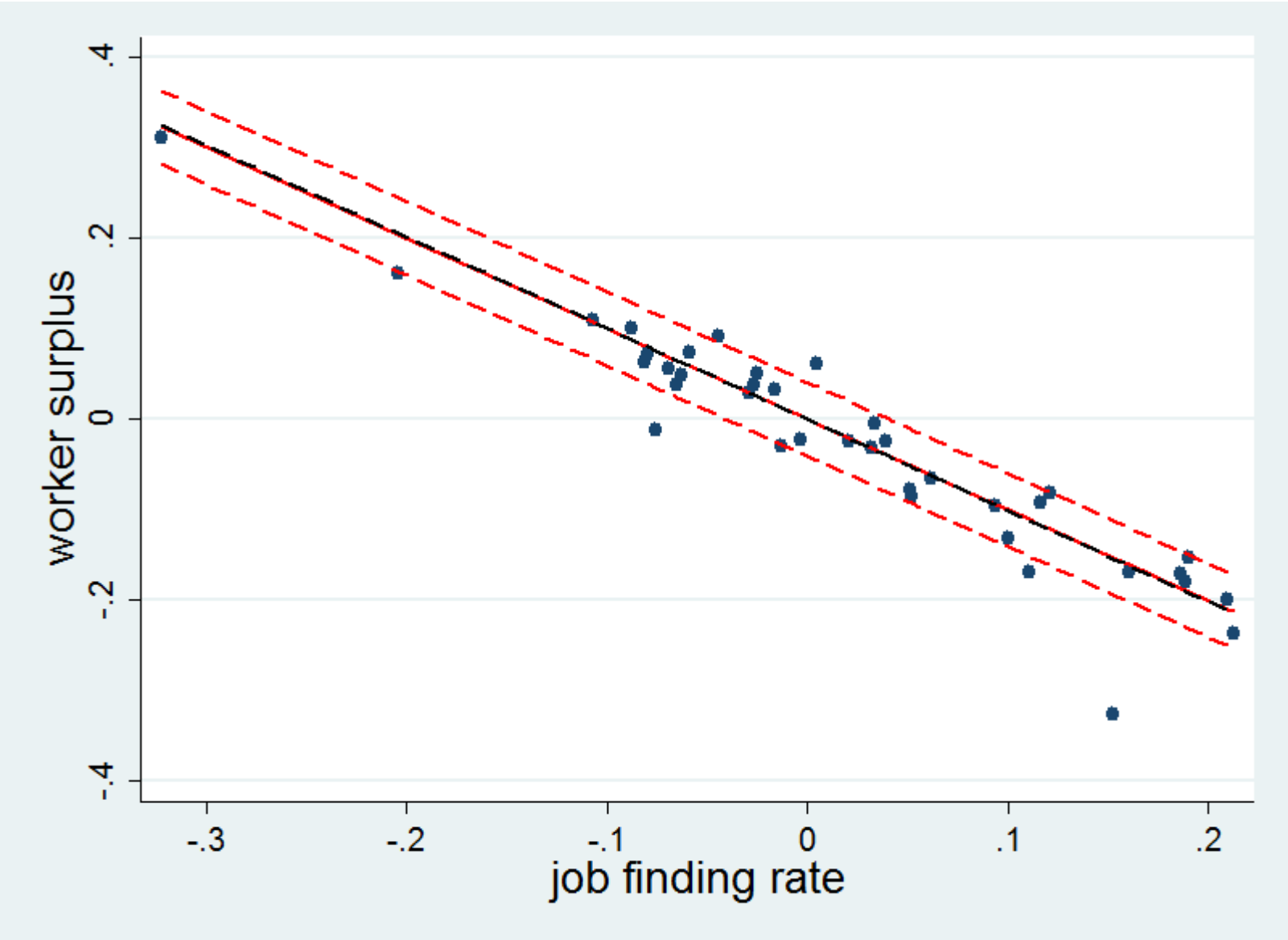
States with largest difference		$\lvert\alpha_i^{WM} - \alpha_j^{WM}\rvert$	distance (miles)
Wyoming	Alaska	0.86	2297
Wyoming	Massachusetts	0.61	1798
Wyoming	New York	0.61	1565
Alaska	Florida	0.59	3840
Wyoming	Kansas	0.57	552
Average distance			2010

States with smallest difference		$\lvert\alpha_i^{WM} - \alpha_j^{WM}\rvert$	distance (miles)
South Dakota	DC	0.0001	1239
North Dakota	Ohio	0.0005	994
Louisiana	Kentucky	0.0005	589
New Mexico	Indiana	0.0011	1138
North Dakota	Utah	0.0011	797
Average distance			952

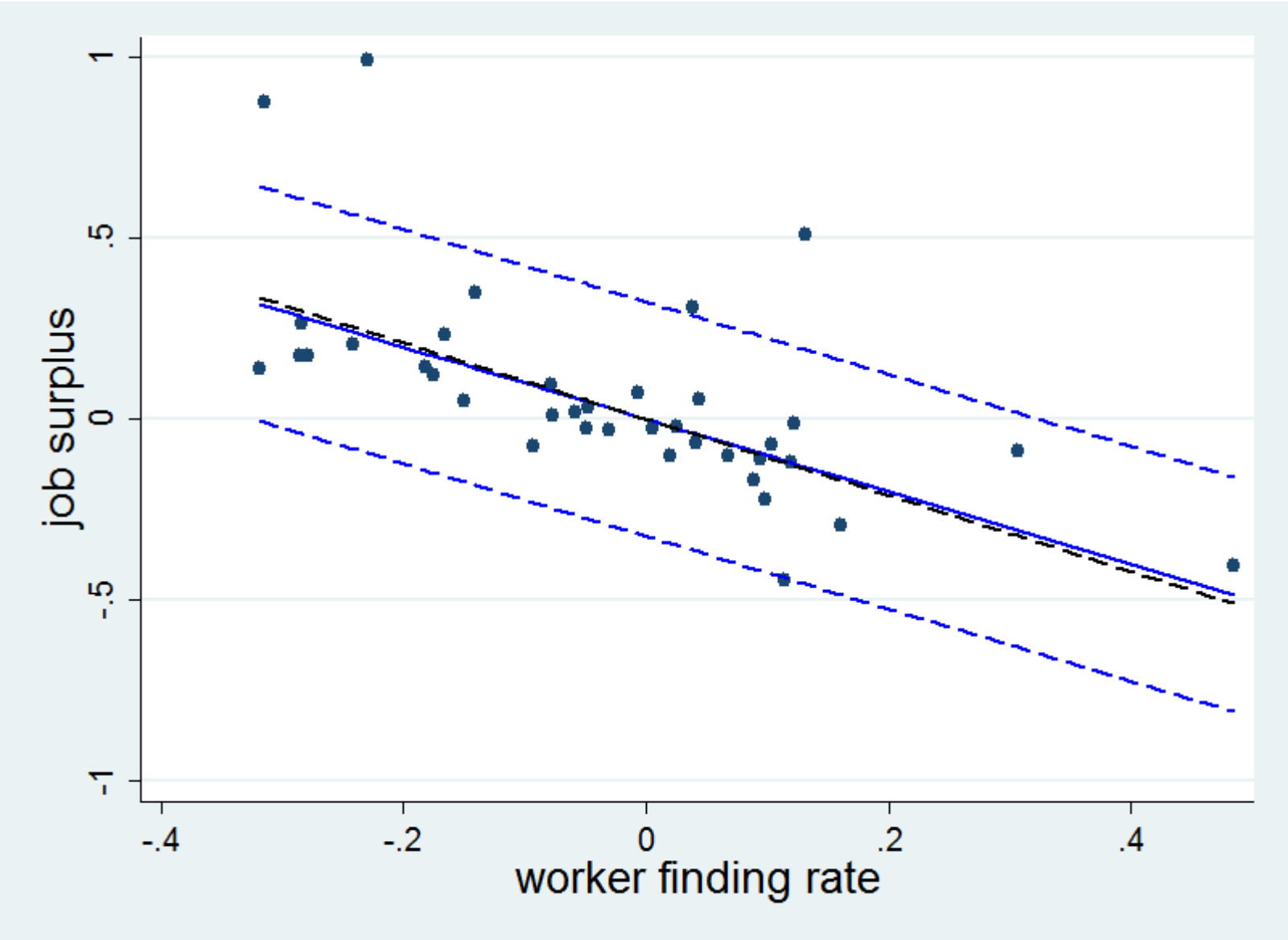
Adjustment costs across industries

- Level of disaggregation
  - 37 industries, SIC, 1979-2002
  - 35 industries, NAICS, 1997-2009
- Job finding rate by industries
  Where do unemployed workers search?
  - Industry where they last held a job (BLS)
  - In industry where they find a job (robustness)
- Everything else same as for states

Worker mobility



Job mobility



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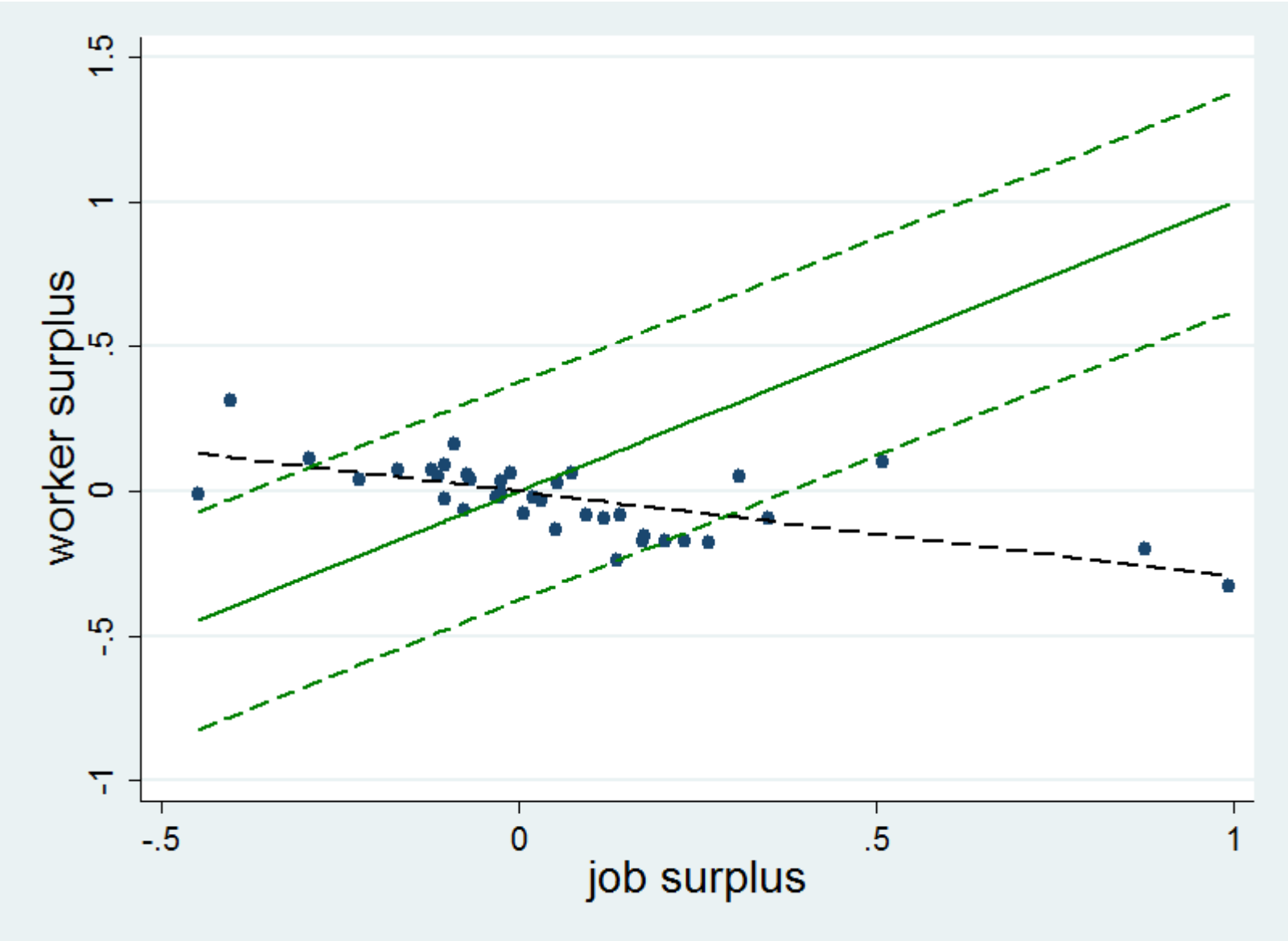


Deviations from worker mobility curve

Industries with largest difference		$\left\lvert \alpha_i^{WM} - \alpha_j^{WM} \right\rvert$
Broadcasting and telecom	Machinery manufacturing	1.07
Broadcasting and telecom	Chemical manufacturing	1.03
Broadcasting and telecom	Publishing (except internet)	0.99
Broadcasting and telecom	Furniture and fixtures manufacturing	0.97
Broadcasting and telecom	Textile, apparel, and leather manuf.	0.90

Industries with smallest difference		$\left\lvert \alpha_i^{WM} - \alpha_j^{WM} \right\rvert$
Transportation and warehousing	Motion picture and sound recording	0.00017
Wholesale trade	Nonmetallic mineral product manuf.	0.0008
Accommodation	Computer and electronic product manuf.	0.00116
Retail trade	Food services and drinking places	0.00133
Miscellaneous manufacturing	Arts, entertainment, and recreation	0.00138

Adjustment costs across states and industries

	across states			across industries		
	WM costs	JM costs	WB costs	WM costs	JM costs	WB costs
baseline	0.15	0.18	0.33	0.31	0.29	0.61
no comp diff	0.35	0.29	0.53	0.98	0.92	1.41
$\mu = 0.5$	0.15	0.16	0.26	0.30	0.26	0.55
$\mu = 0.7$	0.17	0.21	0.46	0.33	0.36	0.70
$b_{it}/w_{it} = 0.4$	0.10	0.18	0.34	0.21	0.29	0.55
$b_{it}/w_{it} = 0.95$	0.69	0.18	0.60	1.83	0.29	1.85
$\tilde{\tau}_{it} = \bar{\tau}_t$	0.21	0.28	0.14	0.17	0.30	0.27

Mismatch unemployment

- Adjustment costs $\Rightarrow$ dispersion in job finding rates

$$\hat{p}_i = (1-\mu)\left(\alpha_i^{WM} - \alpha_i^{JM} - \alpha_i^{WB}\right)$$

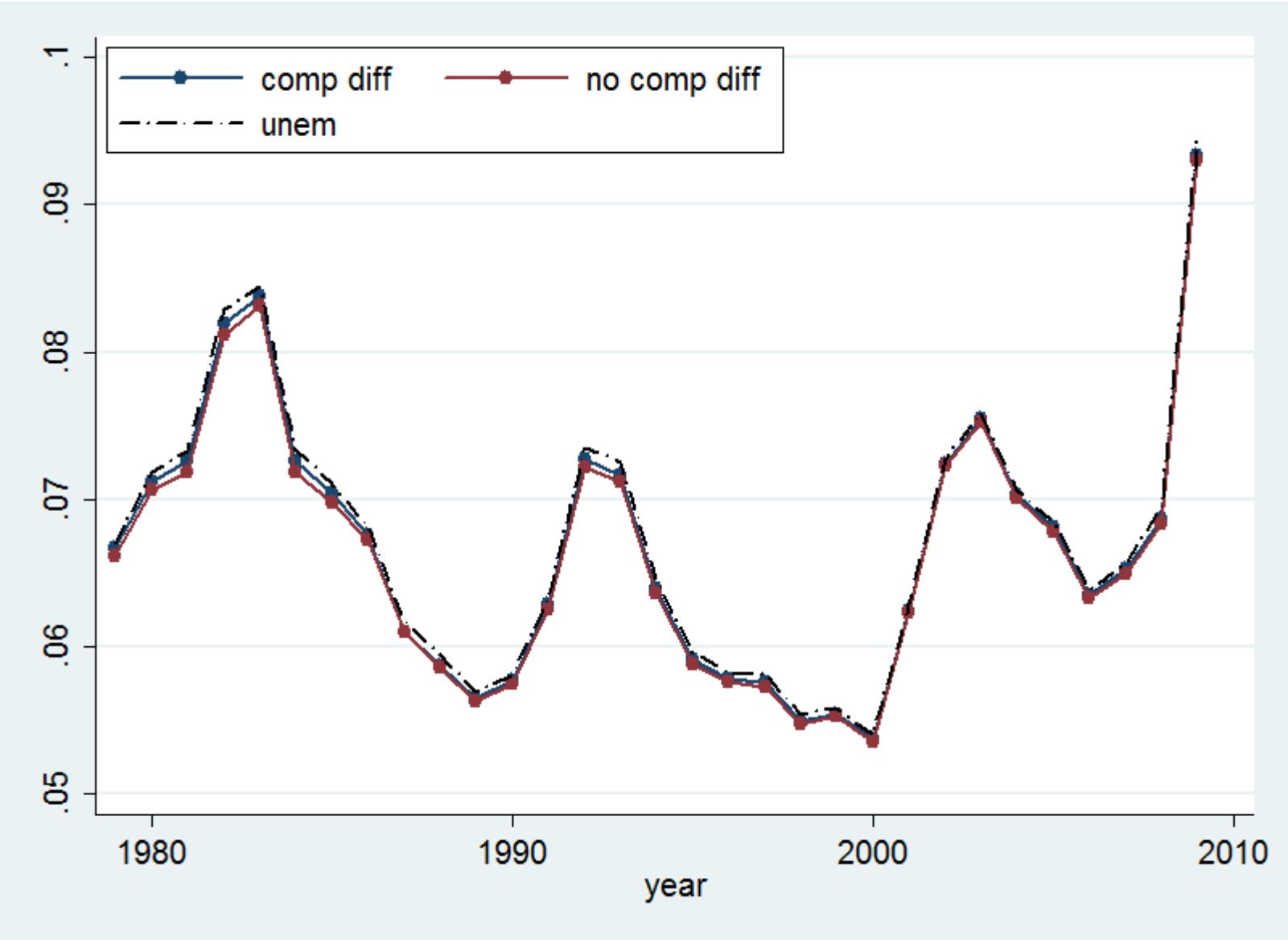
- Dispersion $\Rightarrow$ lower average job finding rate

$$\frac{\bar{p}'}{\bar{p}} = \left(\frac{E\left[(1+\hat{p}_i)^{\frac{1}{1-\mu}}\right]}{E\left[(1+\hat{p}_i')^{\frac{1}{1-\mu}}\right]}\right)^{1-\mu}$$

  - $\bar{p}' < \bar{p} \Leftrightarrow \theta_i$ mean-preserving spread of θ_i'
  - Concavity job finding rate in θ_i determines size effect

- Counterfactual unemployment rate: $\bar{u} = \frac{\bar{\lambda}}{\bar{\lambda}+\bar{p}}$

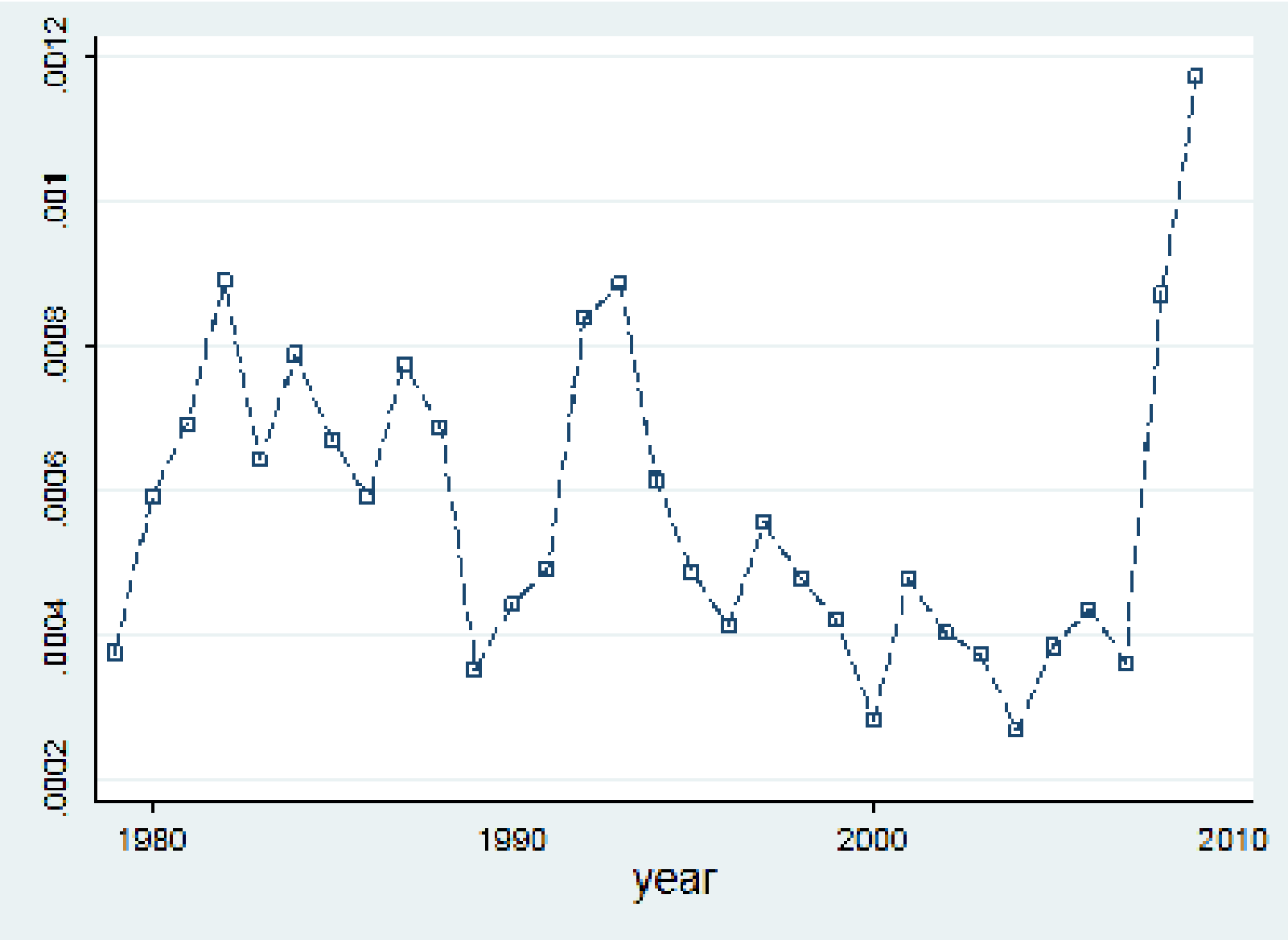
Contribution mismatch to unemployment: across states



Results

1. Mismatch is large, but contributes little to unemployment
    - Defining submarkets (level disaggregation) is crucial
    - 50 states, 40 industries
2. A structural increase in mismatch unemployment?

Unemployment due to mismatch across states



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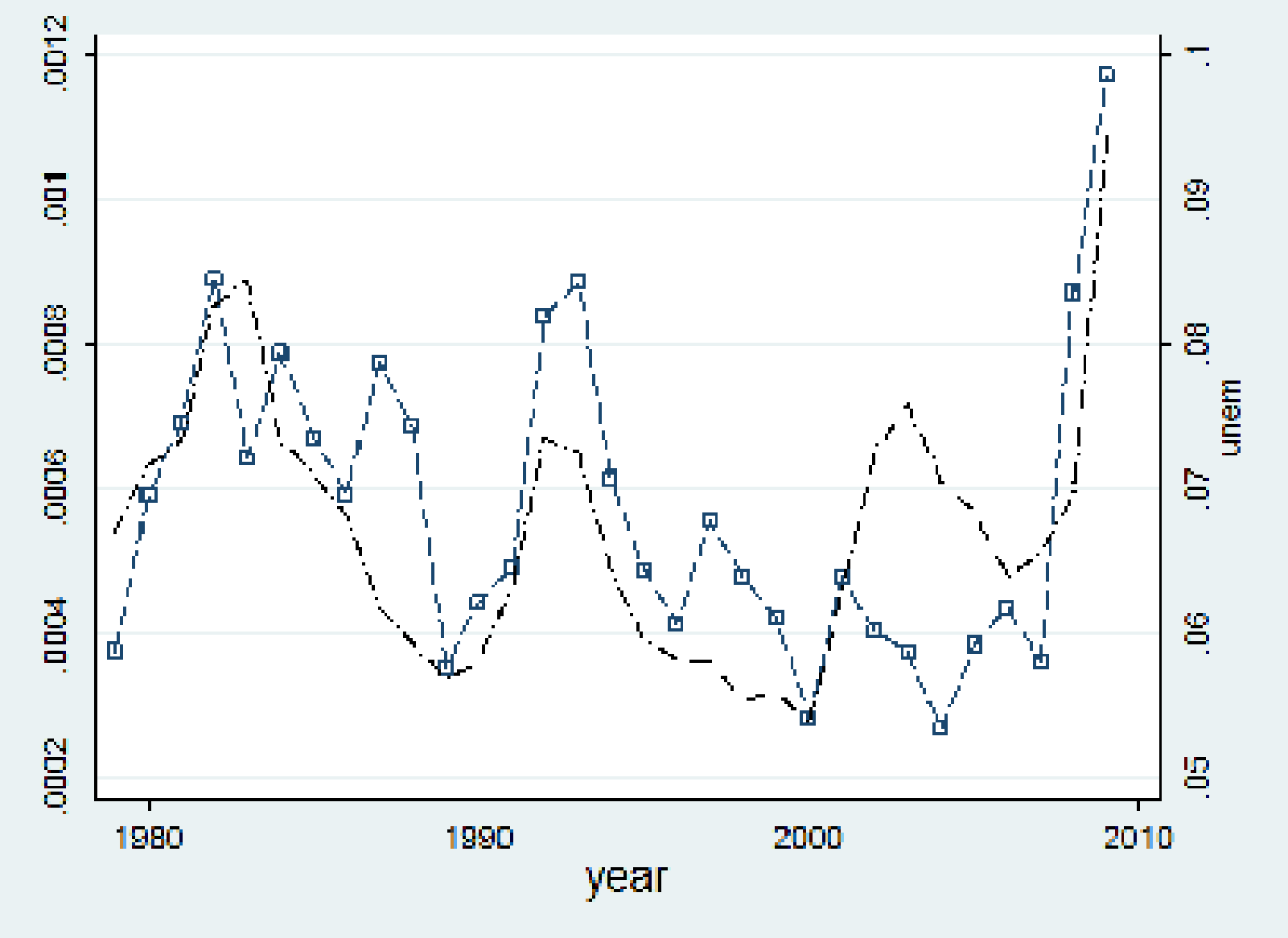

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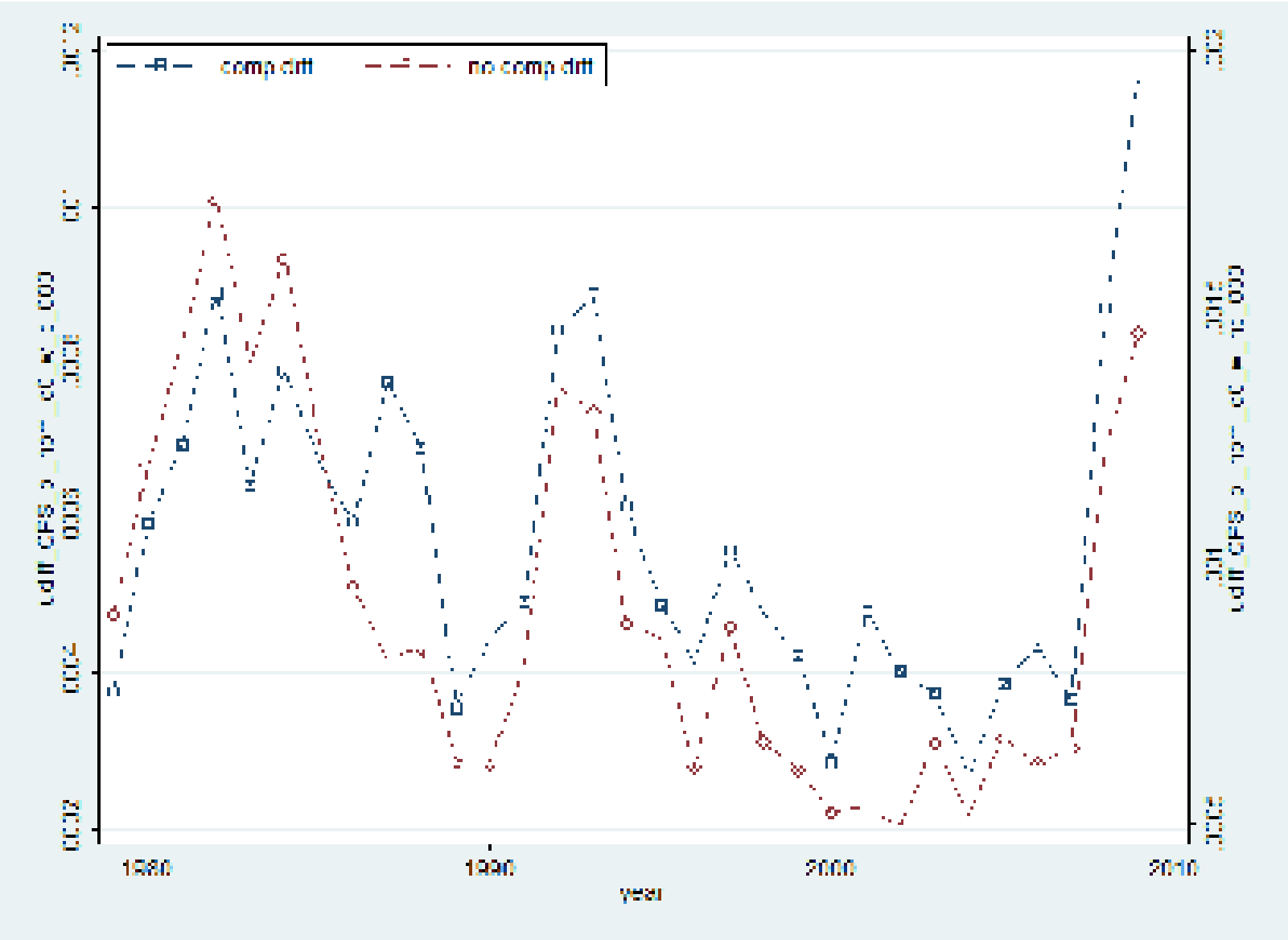
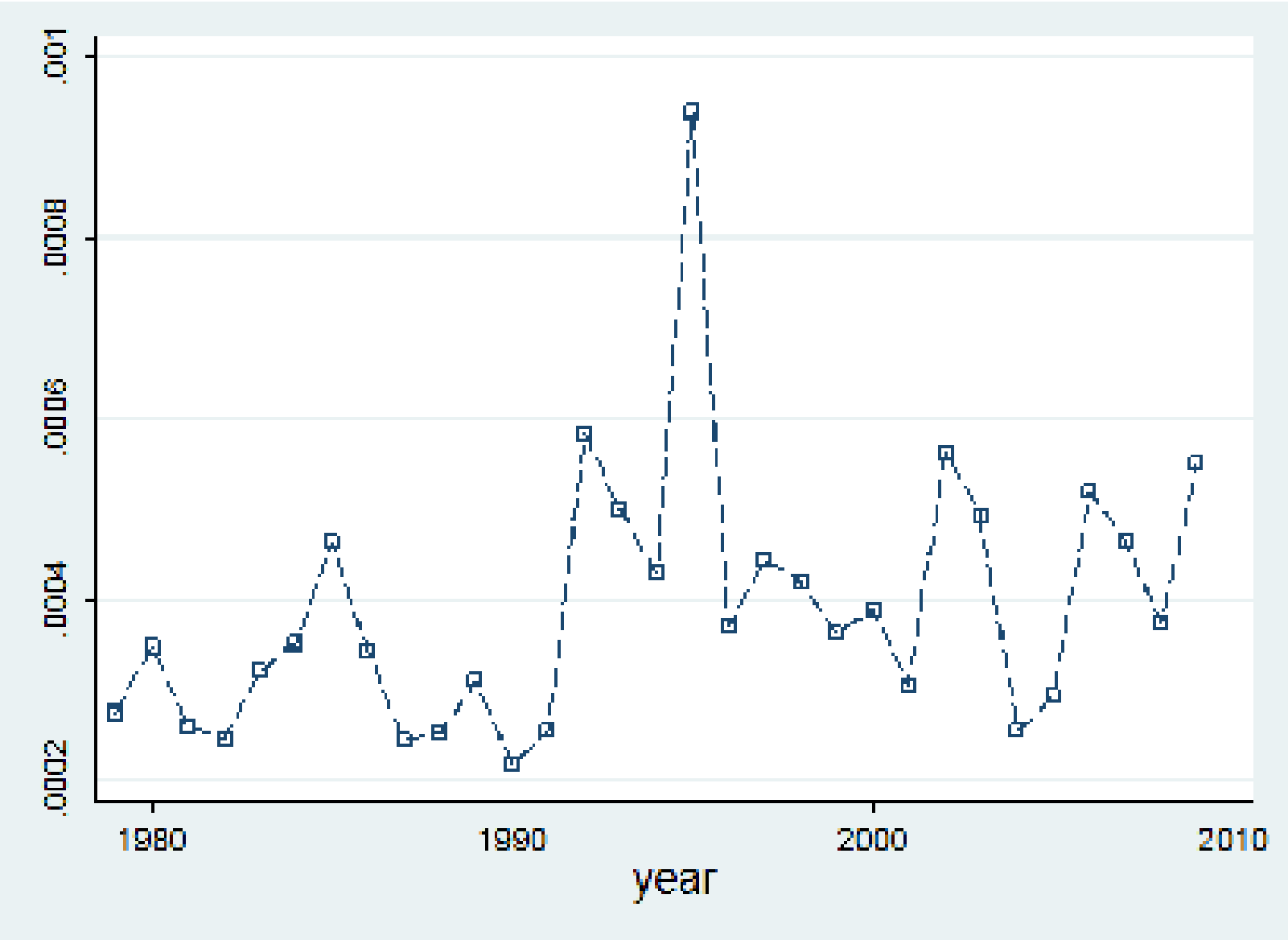


Unemployment due to mismatch across industries



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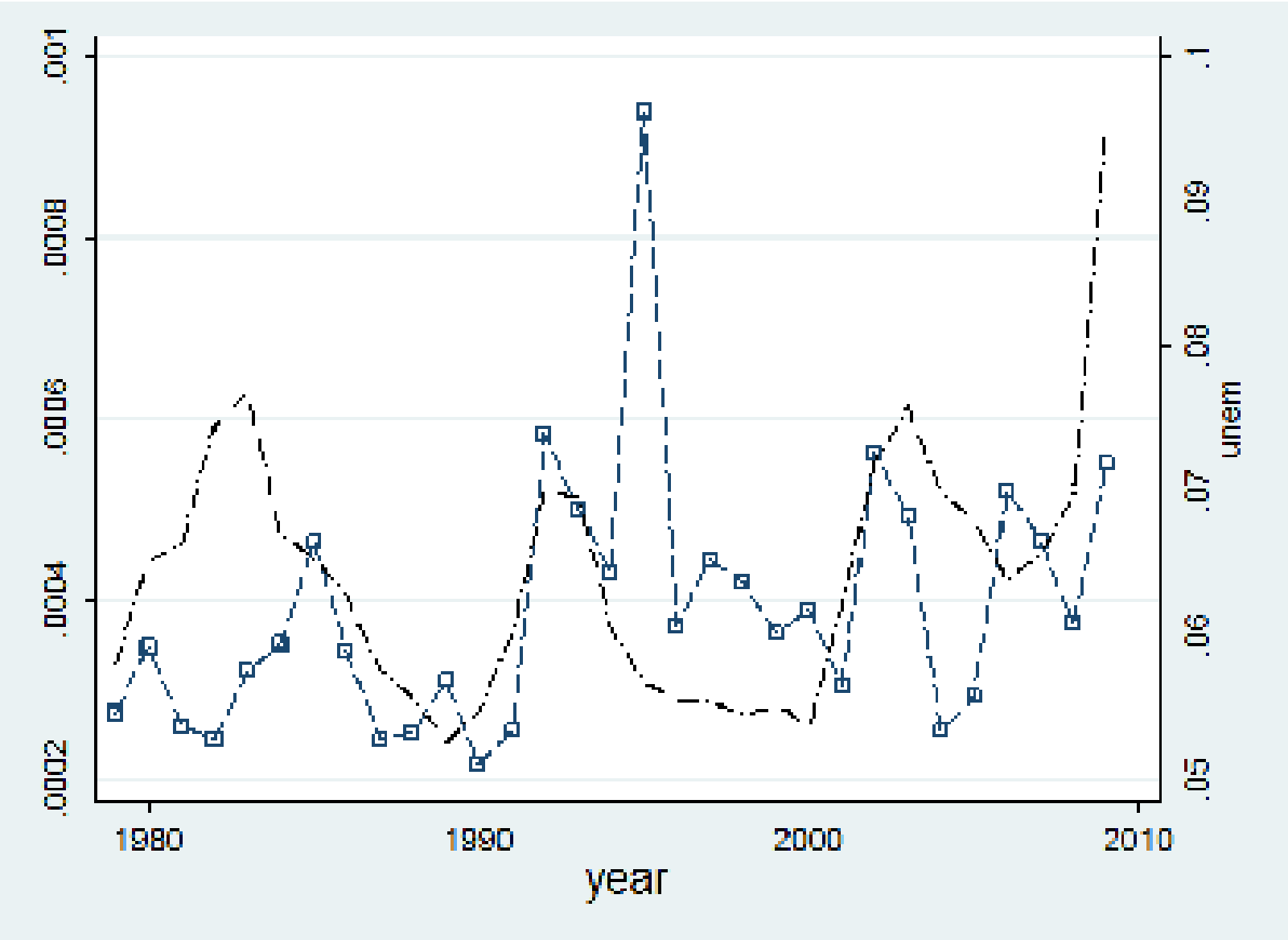

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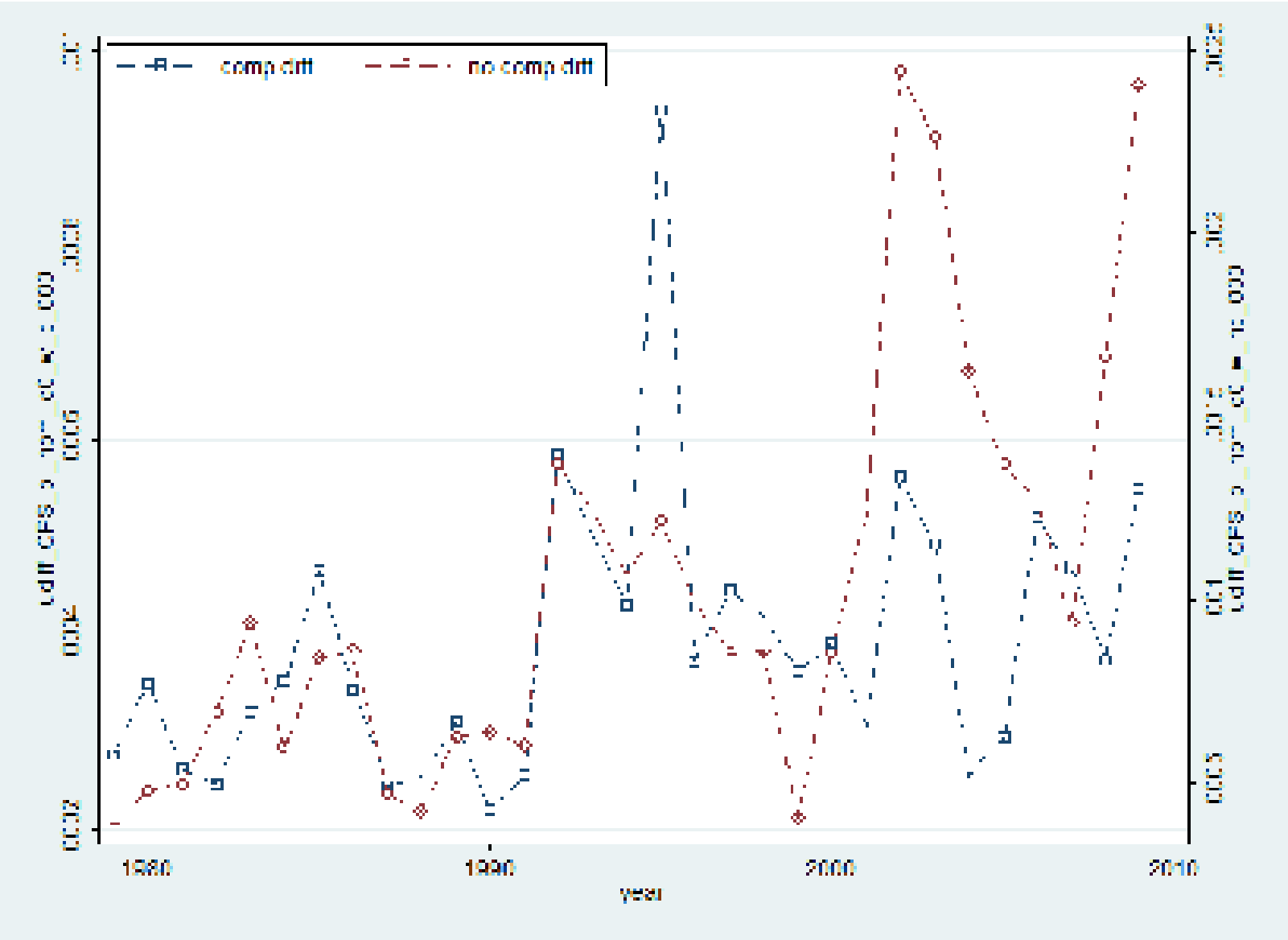

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1. Mismatch is large, but contributes little to unemployment
   - Defining submarkets (level disaggregation) is crucial
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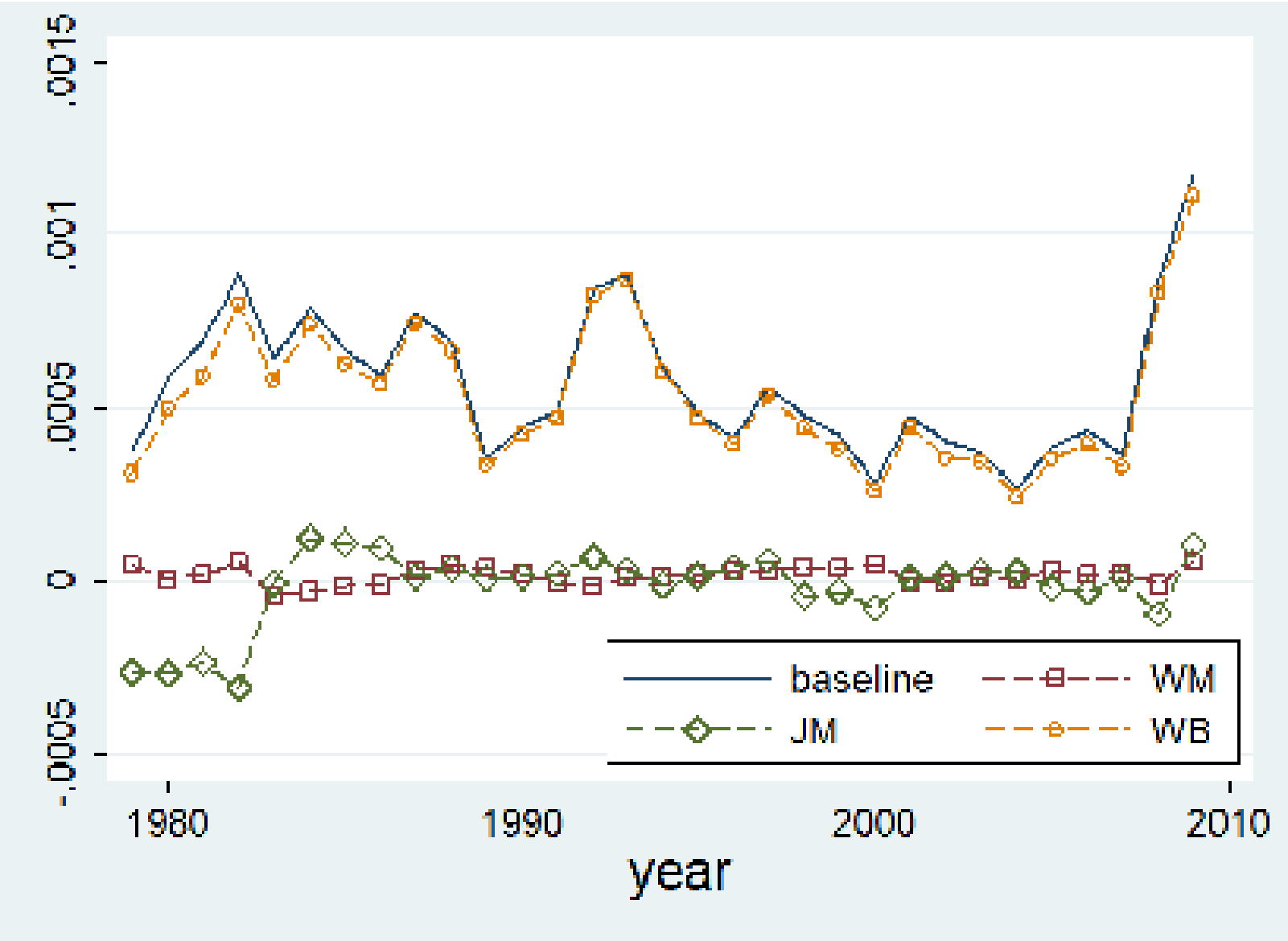
   - Equally cyclical, no more persistent
   - Great Recession similar to previous recessions
3. Sources of mismatch unemployment

Sources of mismatch across states



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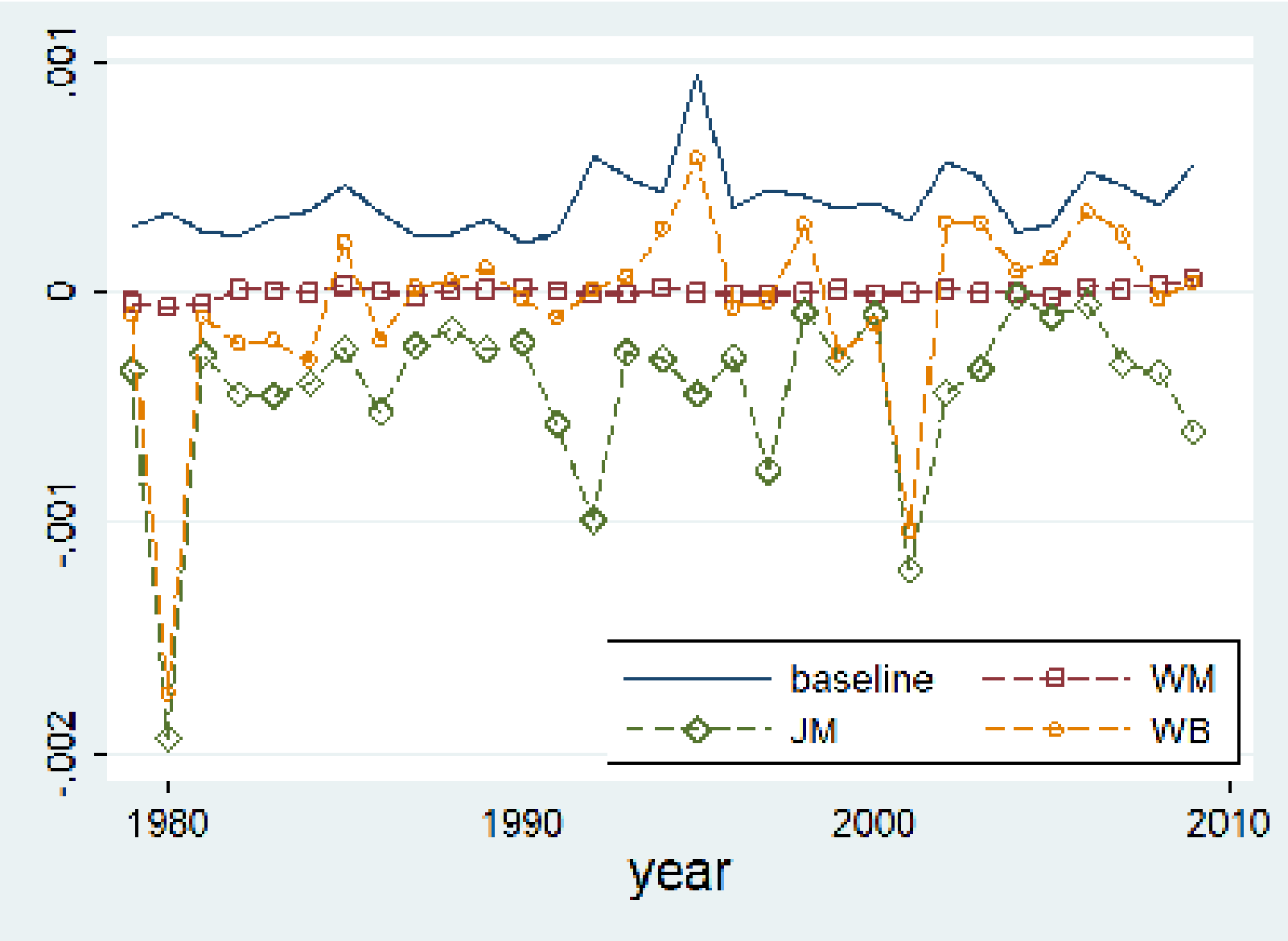

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   - Wage adjustment costs most important source
   - Encouraging worker mobility likely to have small effects

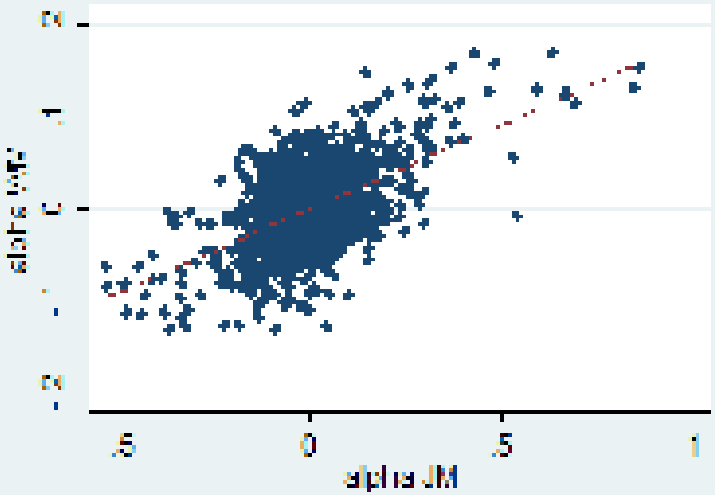
Adjustment costs may offset each other

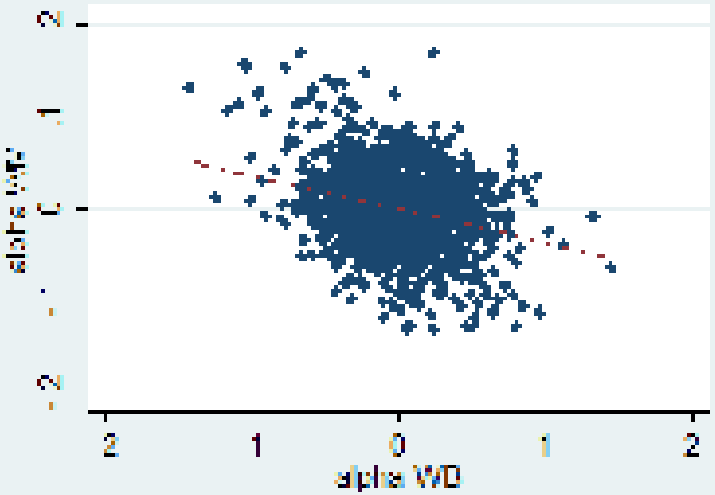
- Total effect depends on correlation

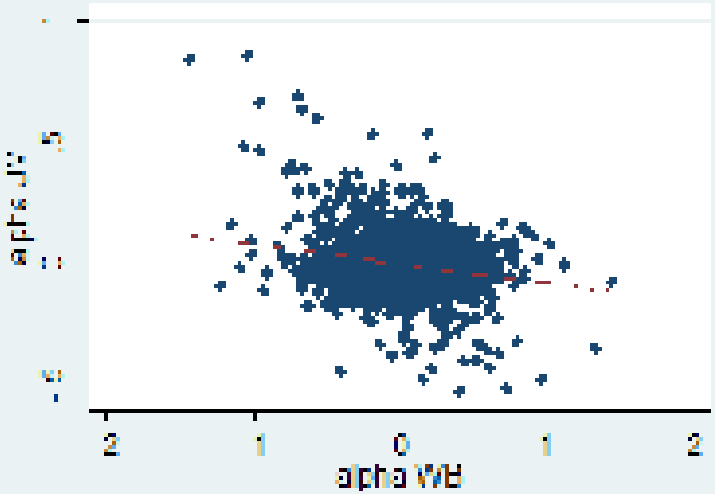
$$\hat{p}_i = (1-\mu)\left(\alpha_i^{WM} - \alpha_i^{JM} - \alpha_i^{WB}\right)$$

- High α_i^{WB} states (industries) have high wages, all else equal
  - Attractive to workers $\Rightarrow$ want to move in
  - Unattractive to firms $\Rightarrow$ want to move vacancies out
  - Worker and job mobility costs prevent this from happening
- Removing mobility costs may *increase* unemployment
  - High α_i^{WM} states (industries) have relatively many unemployed workers
  - High α_i^{JM} states (industries) have relatively many vacancies

Adjustment costs across states







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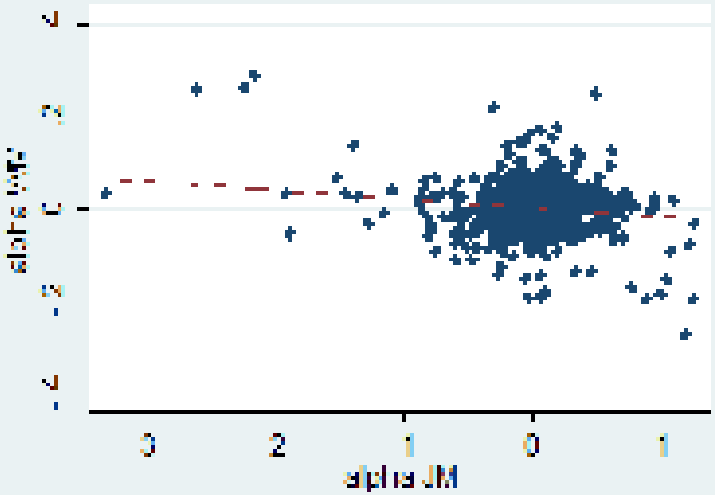

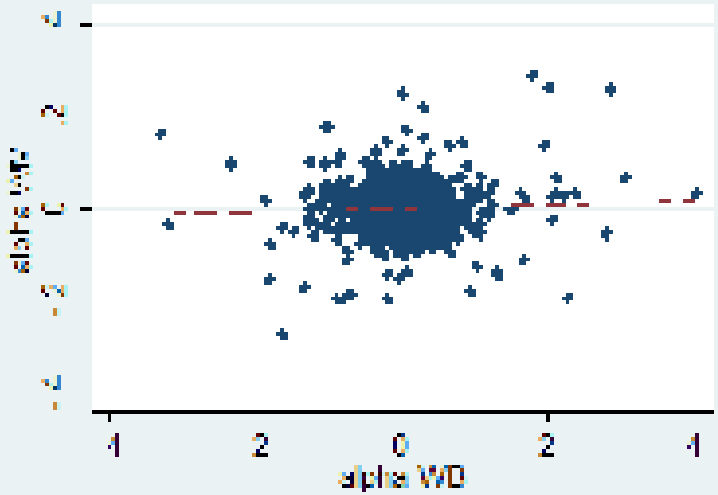

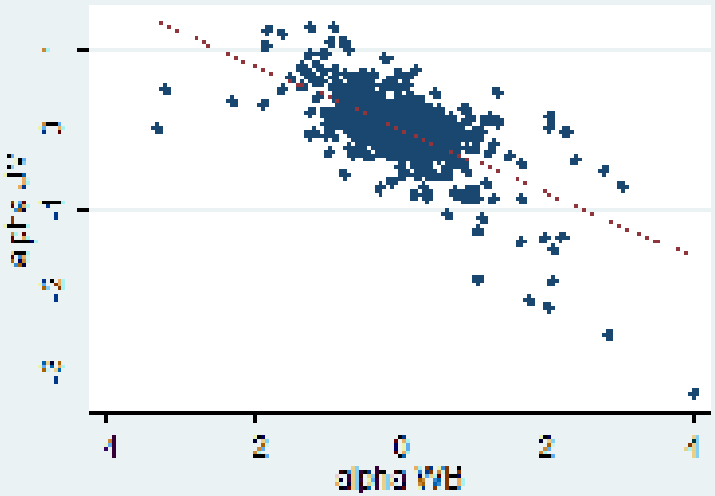

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