Micro-components of aggregate wage dynamics

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Growth of Aggregate Wages

- Aggregate wages (i.e. wage bill per total hours worked) in Finnish manufacturing rose 2.7% in 2011

- Where did this growth come from?
  - Wage growth of job stayers (worked in the same firm and occupation)
  - Worker restructuring (changes in worker composition in labor market)
  - Job (firm/occupation) restructuring (changes in job compositions)

- Contribution of these effects/mechanisms
  - In the long-run (increase in quality/productivity of jobs)
  - In the short-run (cyclical variation)

- Economic questions
  - Wage inflation, productivity of labor input and competitiveness (in the long run)
  - Cyclical flexibility of wage formation (in the short run)

This paper

- We decompose standard measure of aggregate wage growth
  - Job stayers
  - Restructuring
    - Jobs
    - Workers
  - "Cross terms"
- Allows deeper analysis of micro-level mechanisms and their cyclicality
- All components of the decomposition have a clear interpretation
- Allows several questions to be analyzed in the same framework

Main findings

- Finnish manufacturing 1985-2009
1. <u>Wages of job stayers increase more rapidly than aggregate wages</u>
2. <u>Changes in job composition increase aggregate wage growth by 0.5 % points per year</u>
3. Aggregate wages are clearly less cyclical than wages of job stayers
   - <u>Worker composition strongly countercyclical</u>
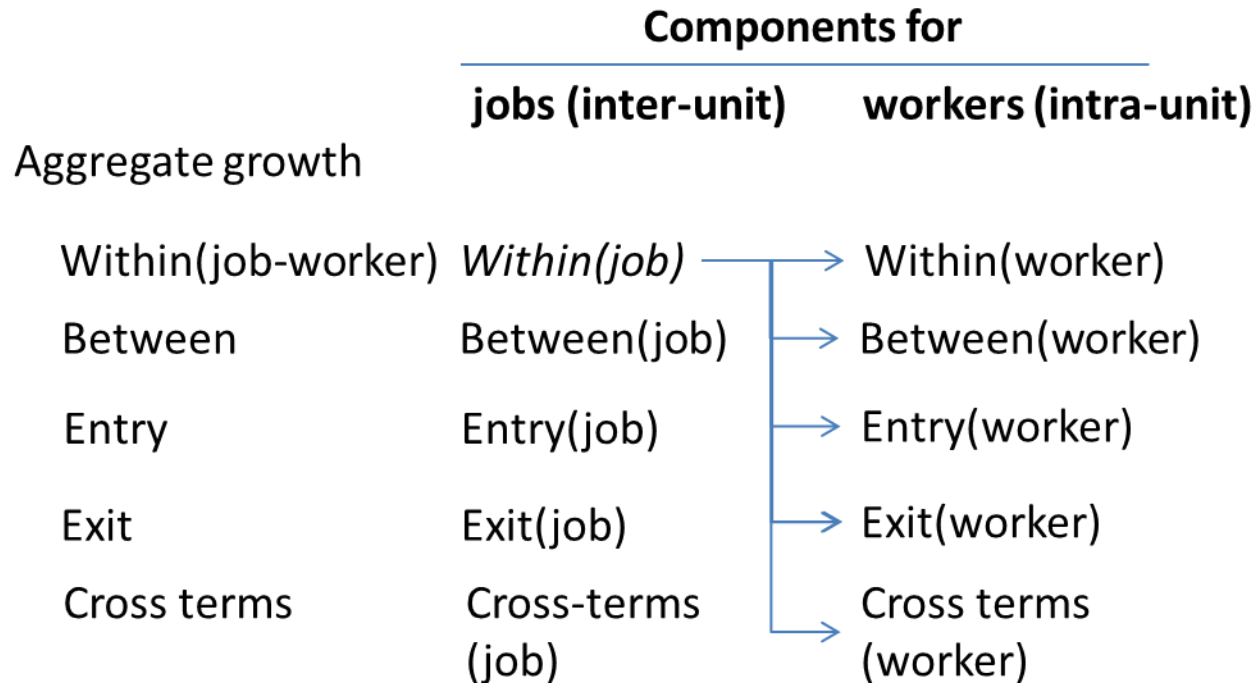4. Wages of job stayers are clearly procyclical

Related literature

- Micro-level productivity studies
  - Decomposition methods (Baily et al 1992, Balk 2003, Foster et al. 2001)
- Cyclicality of aggregate wages
  - Composition bias (Bils 1985, Solon et al. 1994, Shin 1994)
  - Cyclicality of job changers (Devereux 2001, Devereux & Hart 2006, Solon et al. 1994)
  - Cyclicality of job movements (Solon et al. 1997, Devereux & Hart 2006)
  - Daly et al. (2011) framework to study aggregate wages and worker restructuring
- Growth accounting
  - Labor quality and productivity (Ho & Jorgenson 1999)

Decompositions

- Version 1: Job-worker restructuring
- Version 2: Worker restructuring by worker-flow type

Decomposition (Version 1)

	Components for	
	jobs (inter-unit)	workers (intra-unit)
Aggregate growth		
Within(job-worker)	*Within(job)* →	Within(worker)
Between	Between(job) →	Between(worker)
Entry	Entry(job) →	Entry(worker)
Exit	Exit(job) →	Exit(worker)
Cross terms	Cross-terms (job) →	Cross terms (worker)

Step :1 Unit level decomposition

$$\ln \frac{W_t}{W_s} \cong \frac{W_t - W_s}{\overline{\overline{W}}_t} =$$

$$\sum_{i \in C(i)} \overline{s}_{it}^{C(i)} \frac{w_{it} - w_{is}}{\overline{w}_{it}} +$$

$$\sum_{i \in C(i)} \left(s_{it}^{C(i)} - s_{is}^{C(i)} \right) \frac{\overline{w}_{it}}{\overline{W}_t^{C(i)}} +$$

$$\sum_{i \in N(i)} s_{it} \frac{w_{it} - W_t^{C(i)}}{W_t^{C(i)}} +$$

$$\sum_{i \in X(i)} s_{is} \frac{W_s^{C(i)} - w_{is}}{W_s^{C(i)}} +$$

cross terms of units

Step 2: Worker level decomposition

$$\sum_{i \in C(i)} \overline{s}_{it}^{C(i)} \frac{w_{it} - w_{is}}{\overline{w}_{it}} =$$

$$\sum_{i \in C(i)} \overline{s}_{it}^{C(i)} \sum_{j \in C(j)} \overline{s}_{ijt}^{C(j)} \frac{w_{ijt} - w_{ijs}}{\overline{w}_{ijt}} +$$

$$\sum_{i \in C(i)} \overline{s}_{it}^{C(i)} \sum_{j \in C(j)} \left(s_{ijt}^{C(j)} - s_{ijs}^{C(j)} \right) \frac{\overline{w}_{ijt}}{\overline{w}_{it}^{C(j)}} +$$

$$\sum_{i \in C(i)} \overline{s}_{it}^{C(i)} \sum_{j \in N(j)} s_{ijt} \frac{w_{ijt} - w_{it}^{C(j)}}{w_{it}^{C(j)}} +$$

$$\sum_{i \in C(i)} \overline{s}_{it}^{C(i)} \sum_{j \in X(j)} s_{ijs} \frac{w_{is}^{C(j)} - w_{ijs}}{w_{is}^{C(j)}} +$$

cross terms of workers

Decomposition with a breakdown by worker type (Version 2)

$$\ln \frac{W_t}{W_s} \cong \frac{W_t - W_s}{\overline{W}_t} =$$

$$\sum_{j \in C(j)} \overline{s}_{jt}^{C(j)} \frac{w_{jt} - w_{js}}{\overline{w}_{jt}} +$$

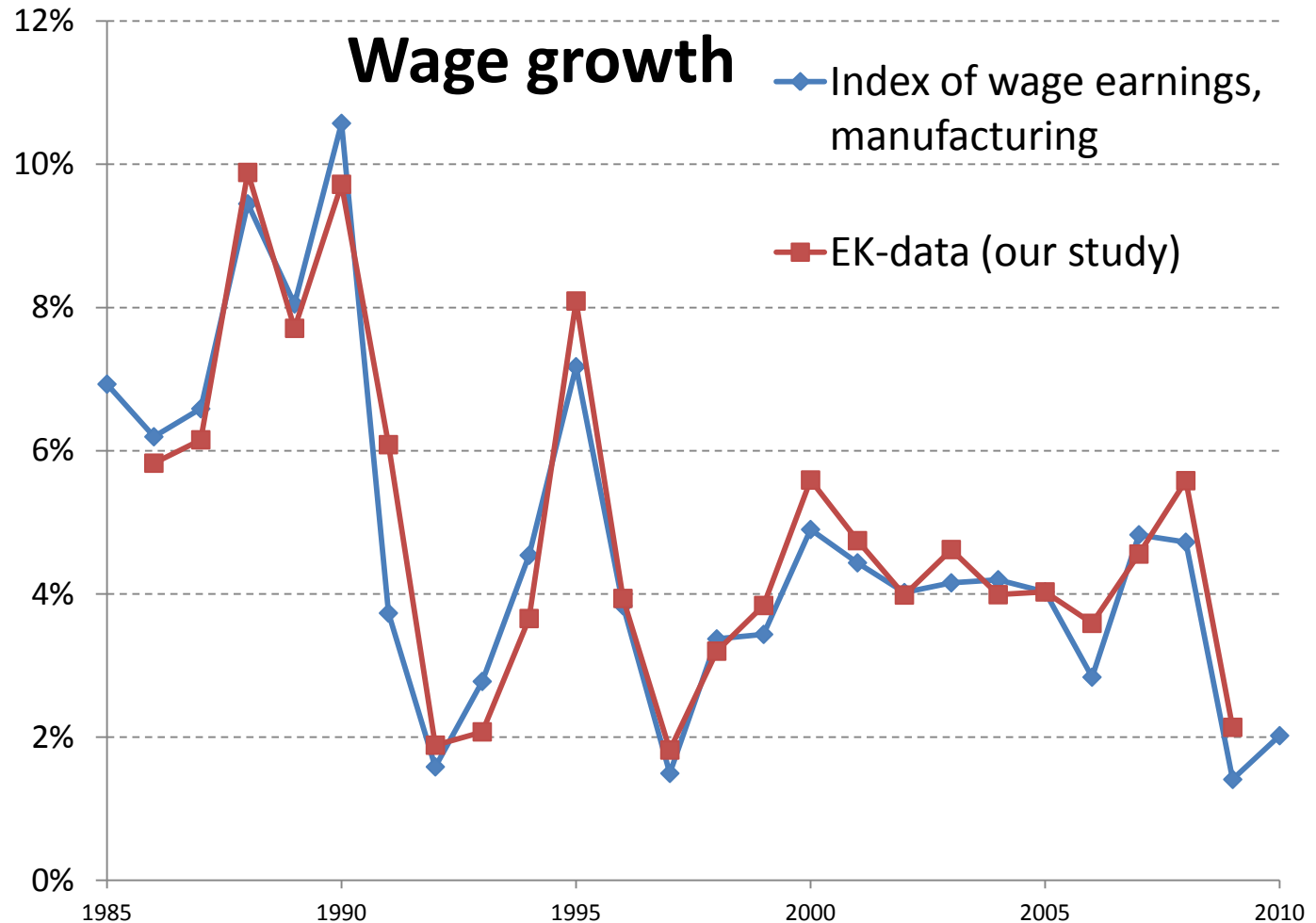$$\sum_{j \in C(j)} \left(s_{jt}^{C(i)} - s_{js}^{C(i)} \right) \frac{\overline{w}_{jt}}{\overline{W}_t^{C(j)}} +$$

$$\sum_{j \in N(j) \cap \Omega_{JM}} s_{jt} \frac{w_{jt} - W_t^{C(j)}}{W_t^{C(j)}} + \sum_{j \in N(j) \cap \Omega_{NM}} s_{jt} \frac{w_{jt} - W_t^{C(j)}}{W_t^{C(j)}} +$$

$$\sum_{j \in X(j) \cap \Omega_{JM}} s_{js} \frac{W_s^{C(j)} - w_{js}}{W_s^{C(j)}} + \sum_{j \in X(j) \cap \Omega_{NM}} s_{js} \frac{W_s^{C(j)} - w_{js}}{W_s^{C(j)}} +$$

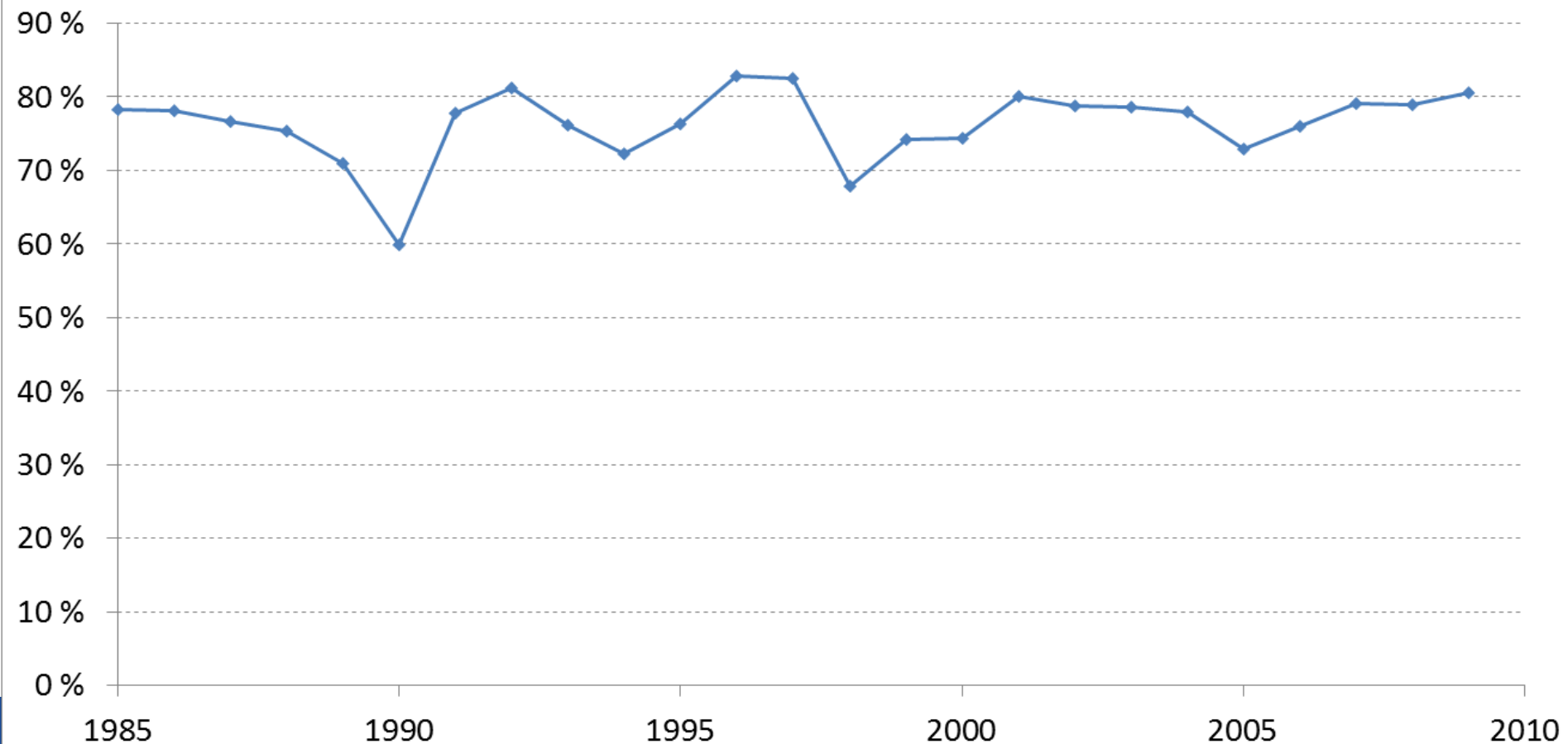*cross terms of workers*

Data

EK wage records 1985-2009

- Manufacturing

- Firm and person indentifiers

- Wages
  - We use earnings-bonuses

- Job titles (tasks)

Wage growth

Legend:
- Index of wage earnings, manufacturing
- EK-data (our study)

Share of job stayers

Share of those who work in the same firm and sama task (job)

Results: Job-Worker restructuring

	Total	Restructuring	
		Jobs	Workers
	(1)	(2)	(3)
Aggregate	3.97		
Within/job stayers	4.24		
Restructuring	-0.22	0.57	-0.79
between	0.48	0.50	-0.02
entry	-1.07	-0.02	-1.05
exit	0.37	0.09	0.28
net entry	-0.70	0.07	-0.77
Cross-terms	-0.05	0.00	-0.05
within	0.00	0.00	0.00
between	0.00	0.00	0.00
entry	-0.11	0.00	-0.11
exit	0.07	0.00	0.06

Years 1995-2009

Results: Worker restructuring by type

	Years 1995-2009			
	Total	Job stayers	Job movers	
			job-to-job	non-job
	(1)	(2)	(3)	(4)
Aggregate	3.97			
Within/job stayers	4.15			
Restructuring	-0.19	0.15	0.14	-0.47
between	0.15	0.15		
entry	-0.66		0.58	-1.24
exit	0.33		-0.44	0.77
net entry	-0.33		0.14	-0.47
Cross-terms	0.01		0.02	-0.04
within	0.03	0.03		
between	0.00	0.00		
entry	-0.02		0.01	-0.03
exit	0.00		0.01	-0.01

Cyclicality of the micro-components

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	PANEL A: GDP of the economy				PANEL B: Hours worked in the manufacturing			
	Total	Job stayers	Job movers		Total	Job stayers	Job movers	
			job-to-job	non-job			job-to-job	non-job
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Aggregate	0.117				0.096			
Within	0.286***	0.286***			0.221***	0.221***		
Restructuring	-0.168***	-0.016	0.005	-0.156***	-0.123***	-0.008	0.004	-0.119***
between	-0.016	-0.016			-0.008	-0.008		
entry	-0.045		0.019	-0.064**	-0.031		0.020	-0.051**
exit	-0.106**		-0.014	-0.092***	-0.084**		-0.016	-0.068***
net entry	-0.151***		0.005	-0.156***	-0.115***		0.004	-0.119***
Cross-terms	-0.002				-0.002			
within	0.001	0.001			-0.001	-0.001		
between	-0.000**	-0.000**			-0.000*	-0.000*		
entry	-0.003		0.001	-0.003*	-0.002		0.001	-0.002*
exit	0.000		0.001	-0.001	0.000		0.001	-0.000

Cyclicality of wage growth among job stayers and job-to-job movers

	Δ wage among job stayers	Δ wage among job movers	Δ wage among job stayers	Δ wage among job movers	Δ wage among job stayers	Δ wage among job movers
ΔlnGDP	0.270***	0.366***				
	0.093	0.106				
ΔlnHours			0.213***	0.288***		
			0.069	0.078		
ΔUnemployment					-0.711***	-0.976***
					0.165	0.171
ΔlnCPI	0.747***	0.879***	0.837***	1.001***	0.668***	0.770***
	0.236	0.270	0.233	0.265	0.203	0.210
Observations	23	23	23	23	23	23
R-squared	0.604	0.625	0.619	0.644	0.710	0.776
P-value		0.00413		0.00135		2.97e-08

Conclusion

1. Wages of job stayers increase more rapidly than aggregate wages
    – Restructuring has a negative influence
2. Restructuring is a sum of two opposing mechanisms
    1. Worker restructuring (-)
    2. Job restructuring (+)
3. Aggregate wages are less cyclical than wages of job stayers
    – Worker composition strongly counter cyclical
4. Wages of job stayers are procyclical
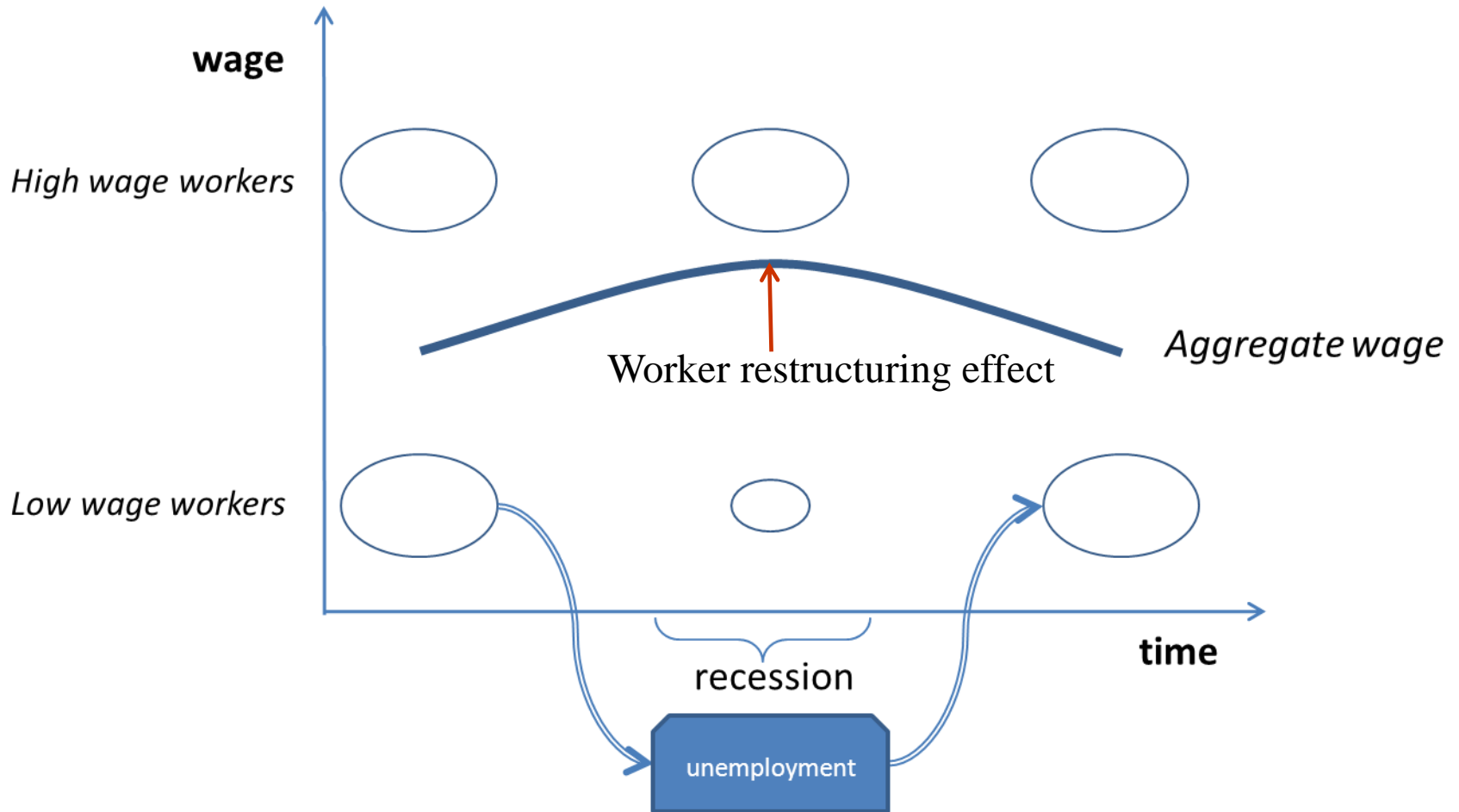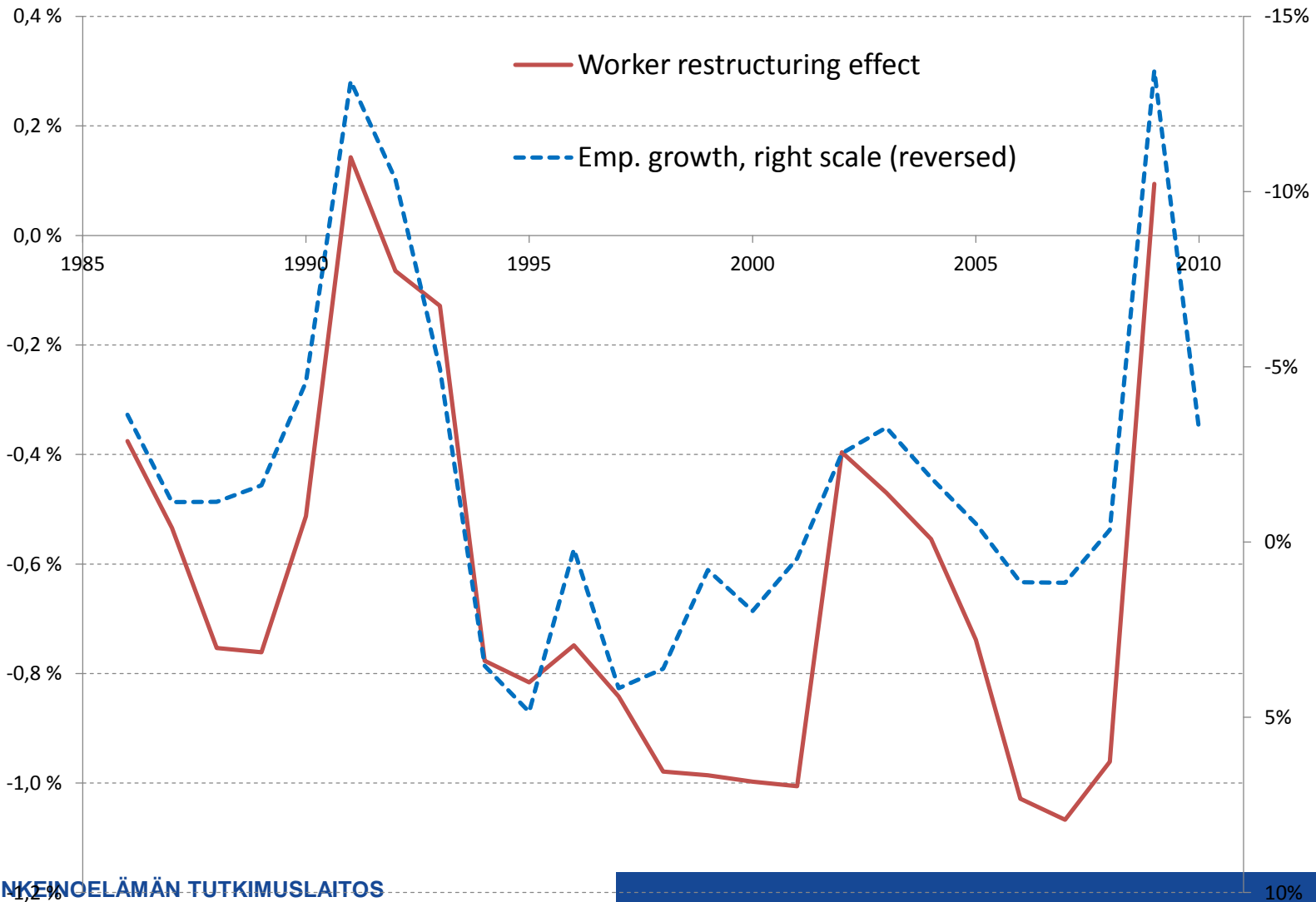5. Wage of job switchers are even more procyclical

Aggregate wage and growth of individual wages

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wage

Wage of job stayer

Aggregate wage

time
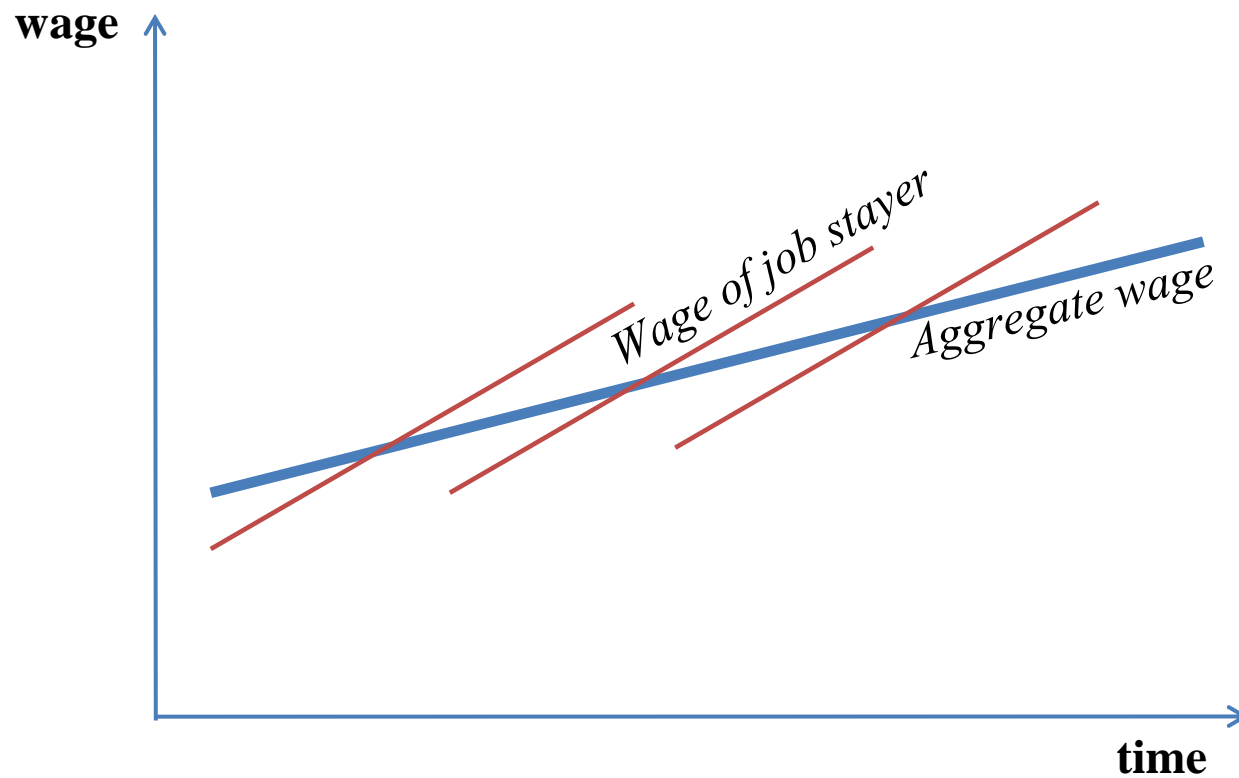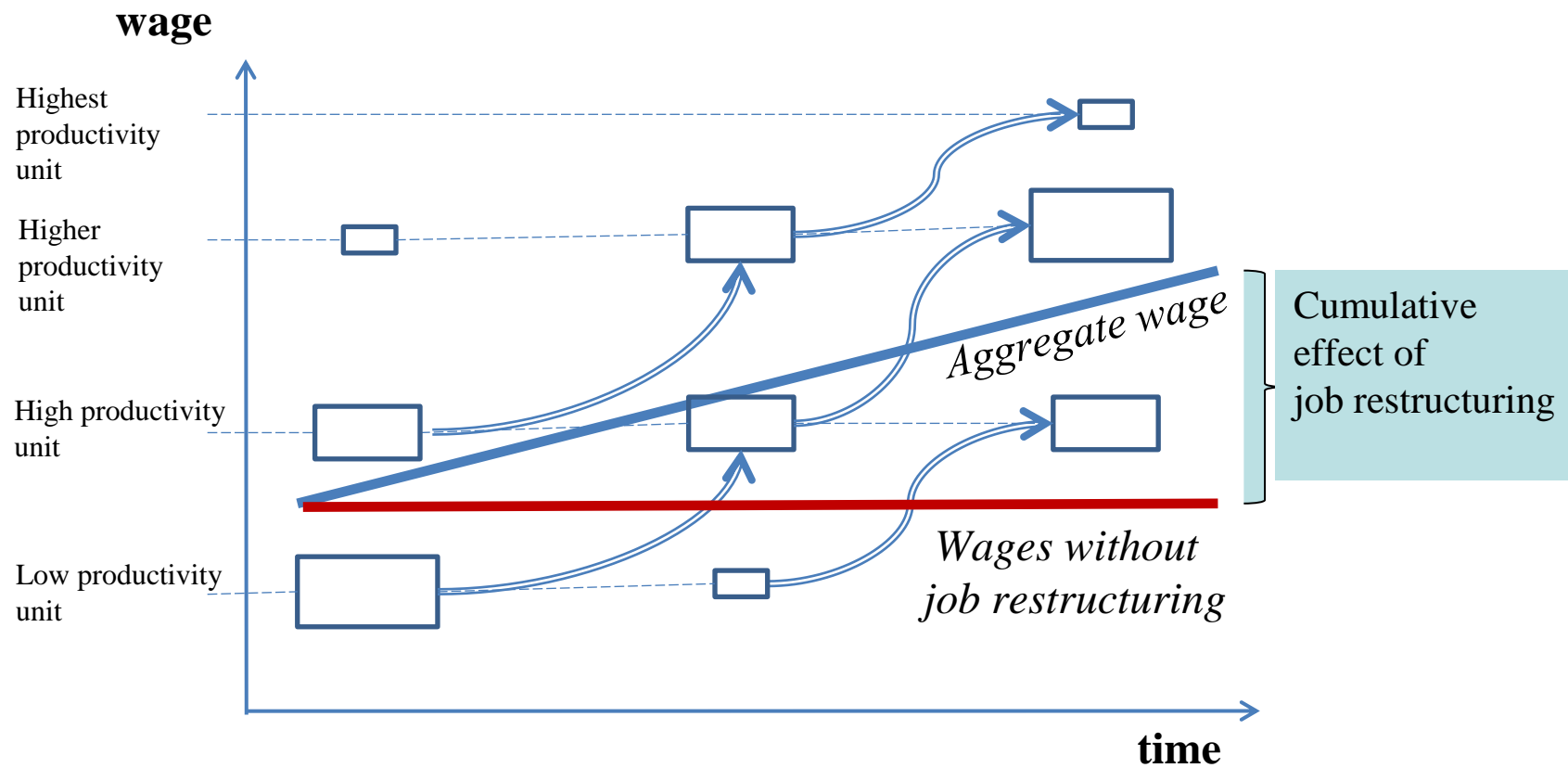
Real wages in Finnish manufacturing
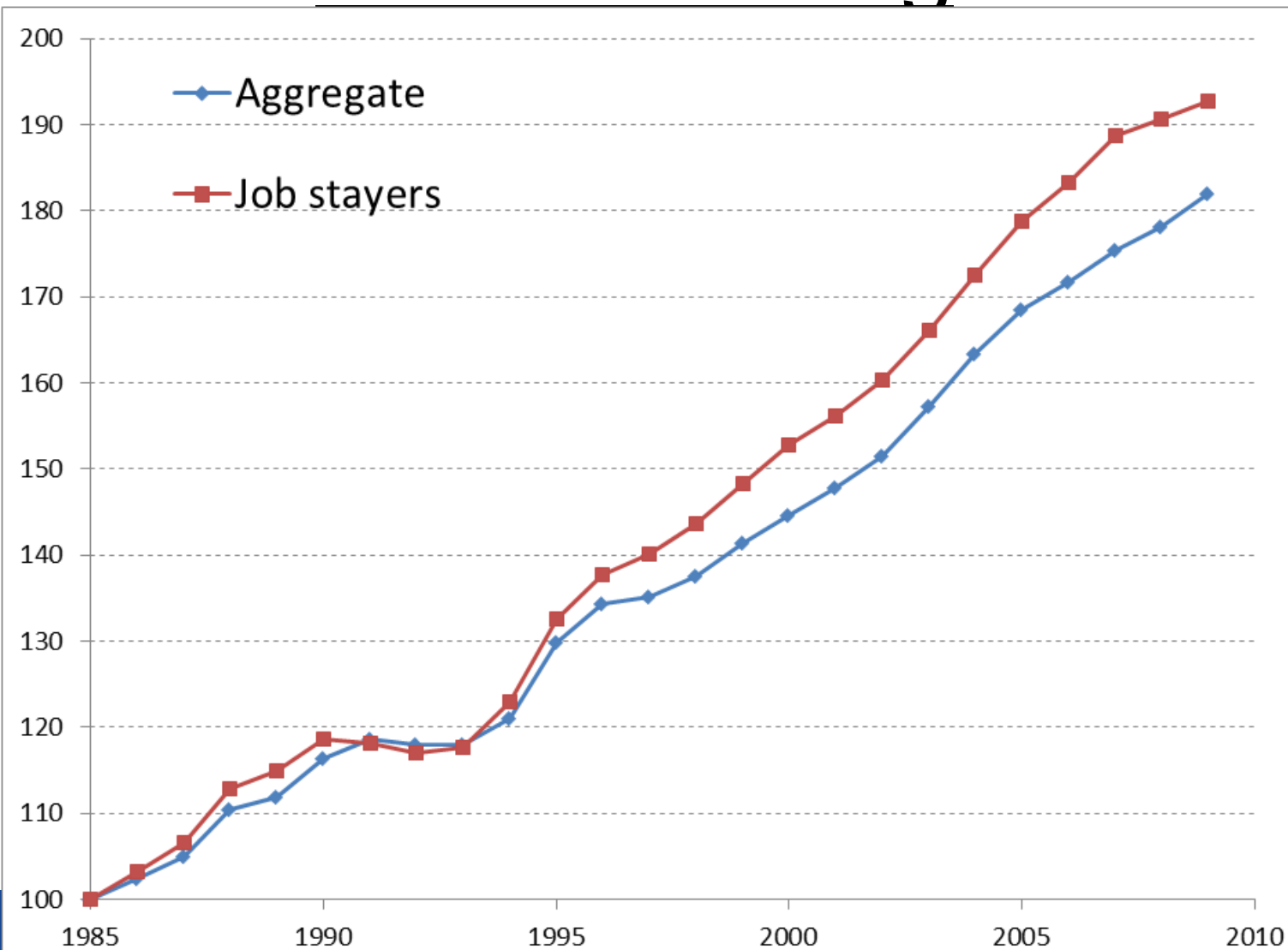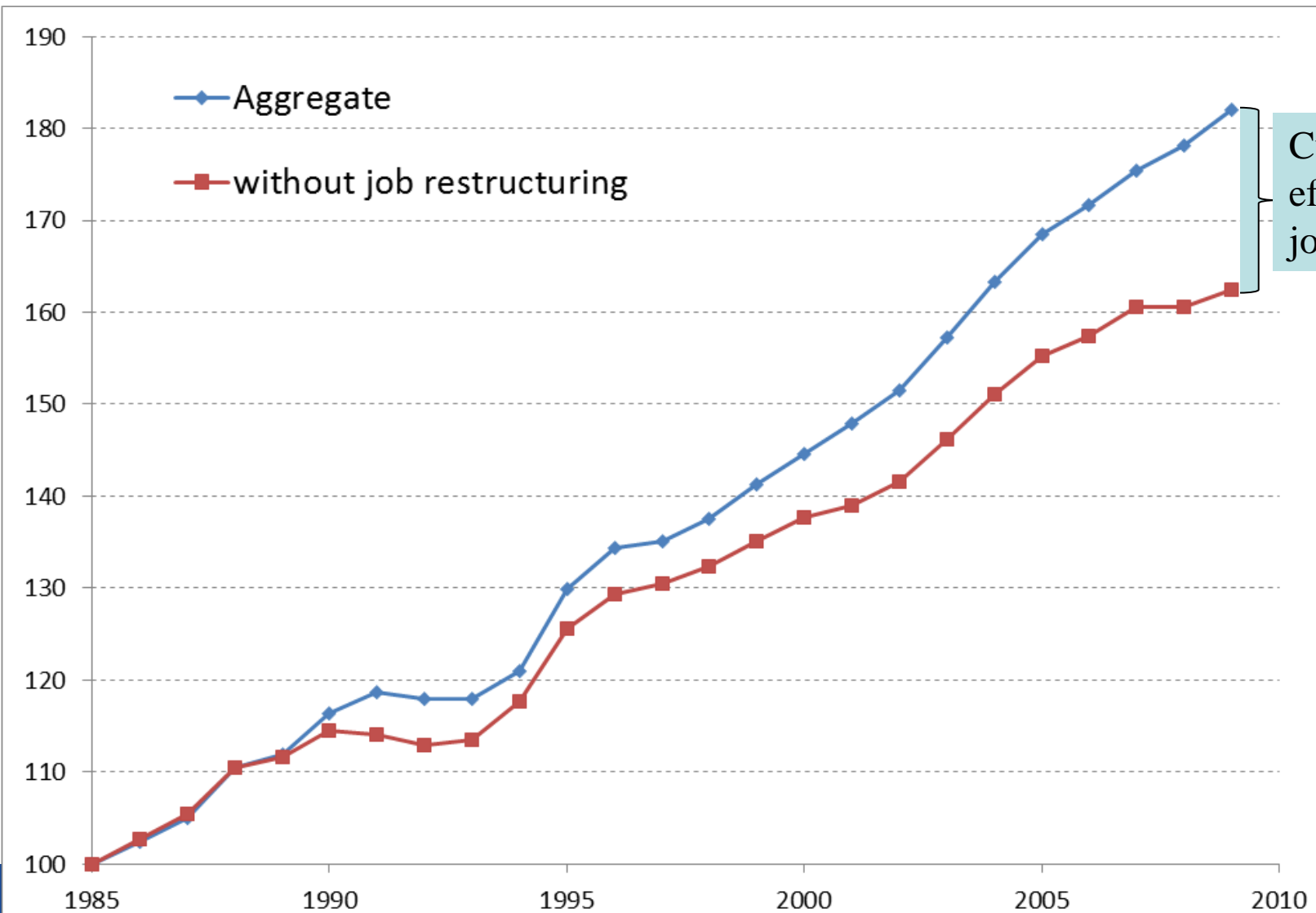
Aggregate wage and business cycles

Counter-cyclicality of the effect of worker restructuring

Aggregate wage and job restructuring via worker mobility

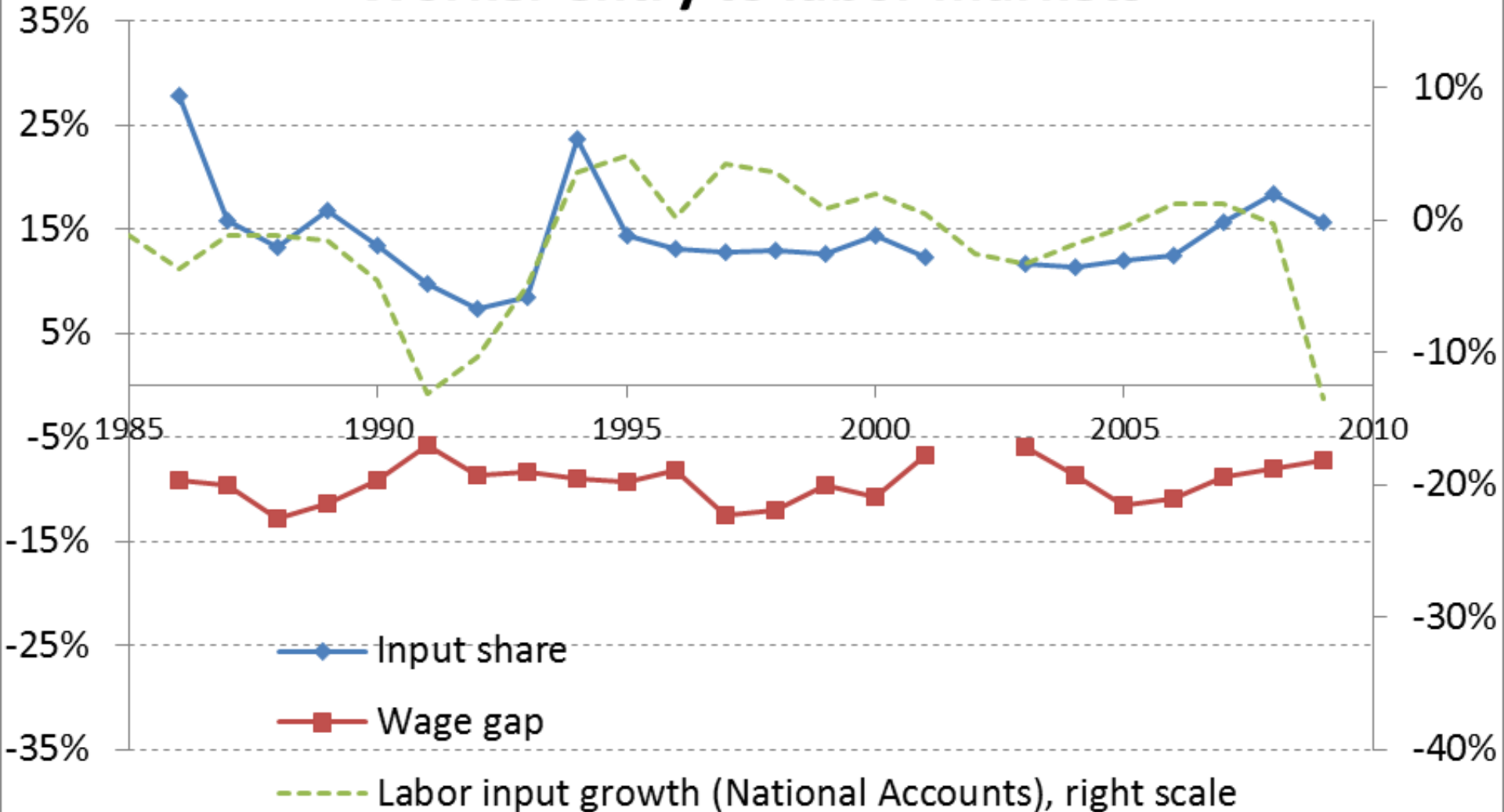# Wage growth with and without productivity-enhancing job restructuring

Worker entry

Worker entry to labor markets

Worker exit

Worker exit from labor markets