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Division of labour

Tasks, technology and trade

Measuring and interpreting trends in the division of labour in the Netherlands

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Observations

- Division of labour seems to have changed …
  - Blinder: “>25 percent of all jobs offshorable”
  - Grossman and Rossi-Hansberg: “trade in tasks”
  - Baldwin: “second unbundling”
  - Policy makers: “what is the threat of offshoring?”

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Aim

- Measuring and understanding trends in the division of labour
  - How does “(un)bundling” work?
  - What are the employment effects?
  - Who is affected? Is my job safe?

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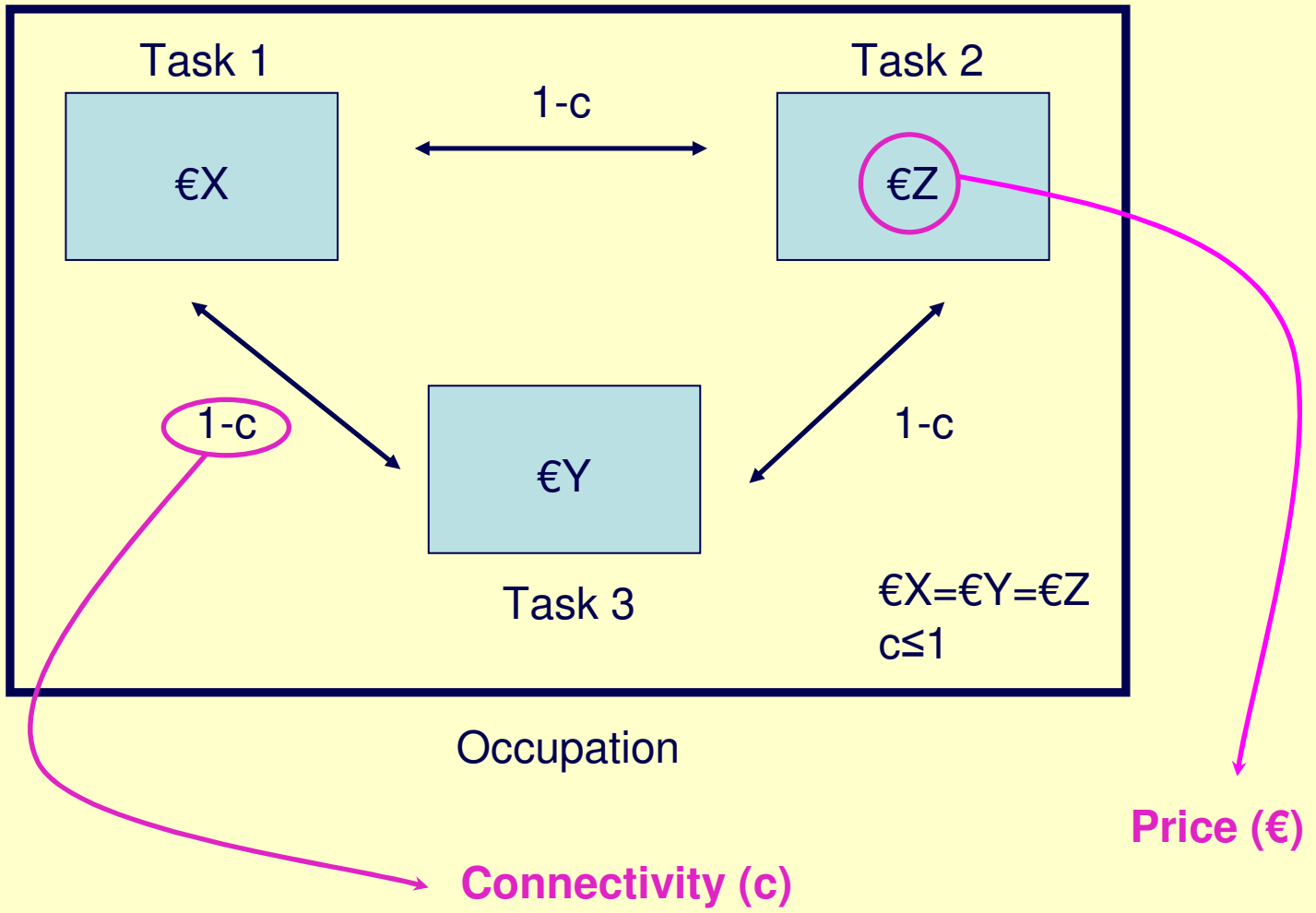
Approach

- Develop measures to understand changes in division of labour
- Three dimensions and issues

Dimension	Issues
Occupation	Separate tasks into different jobs
Industry	Outsource tasks to other firms
Space	Offshore tasks

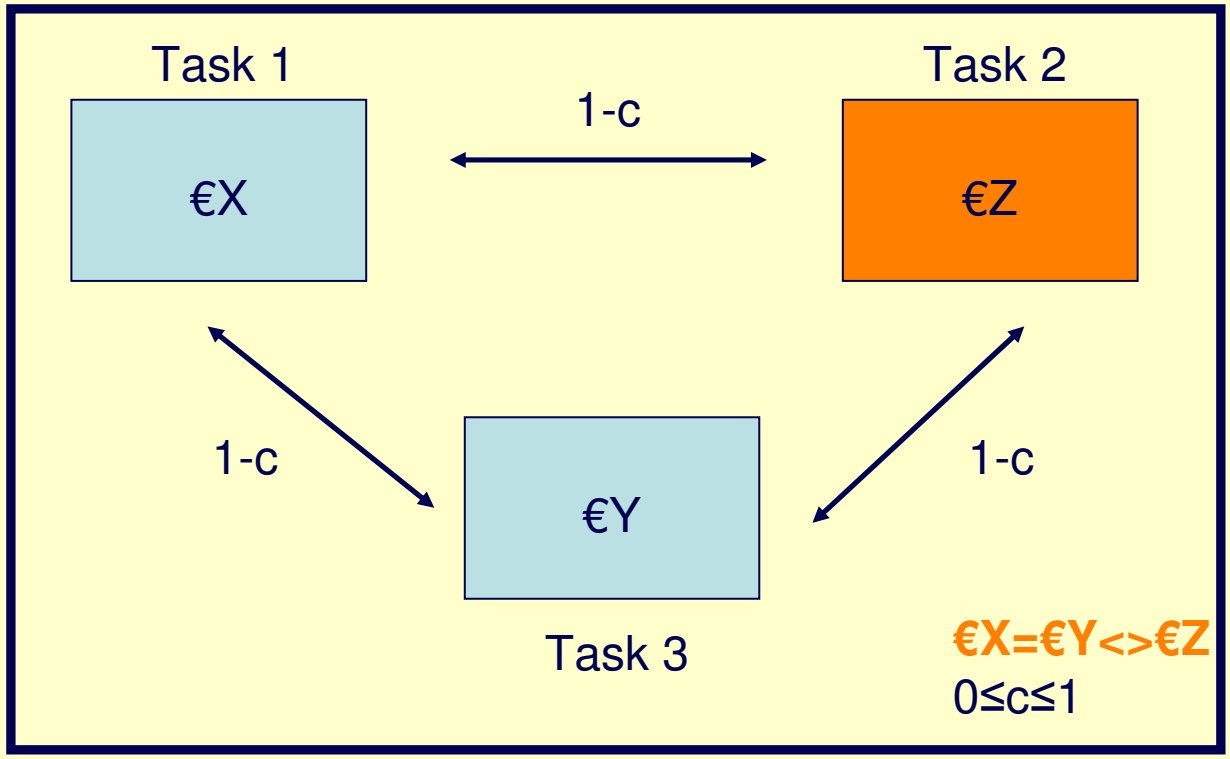
Division of labour and tasks



Division of labour and tasks

Division of labour

Price of tasks changes



Occupation

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Division of labour and tasks

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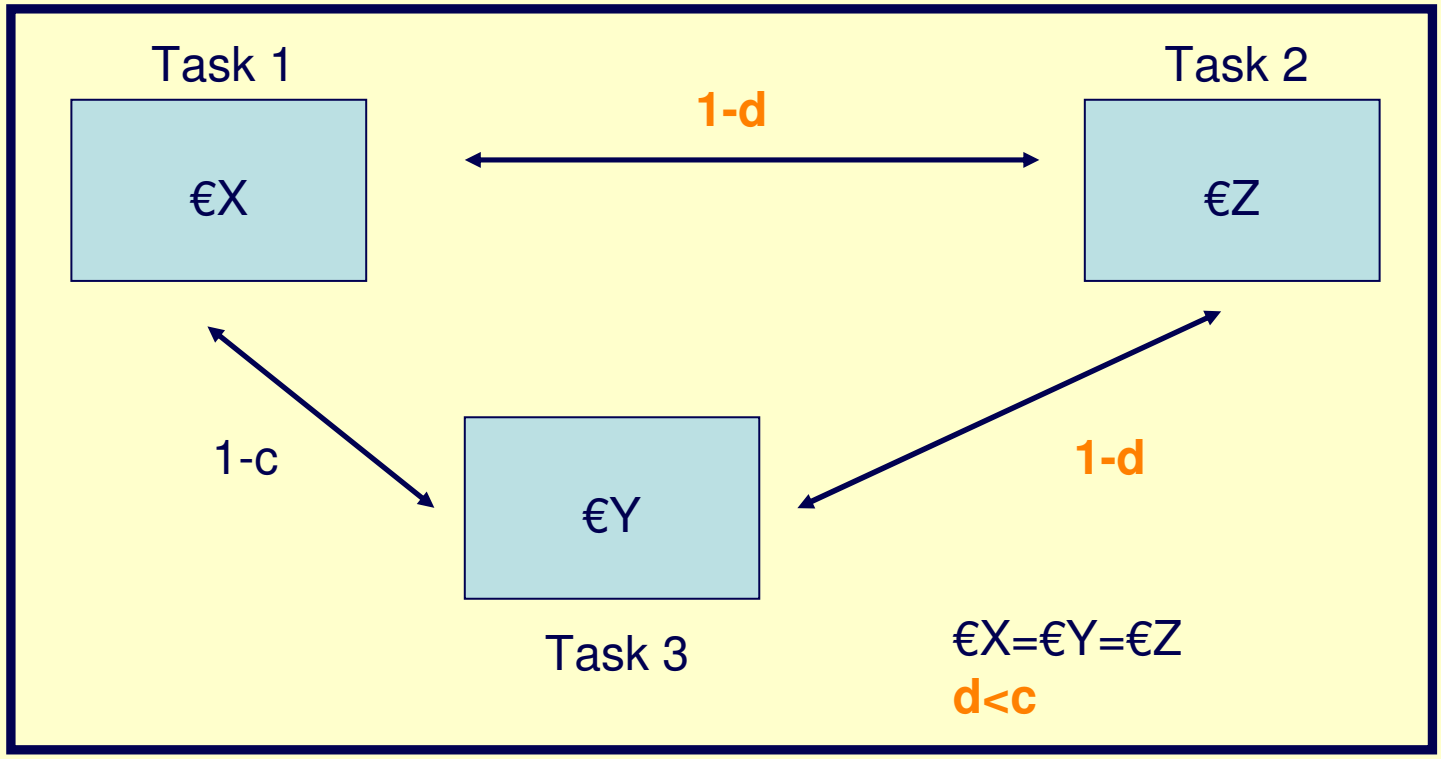
Connectedness changes



Occupation

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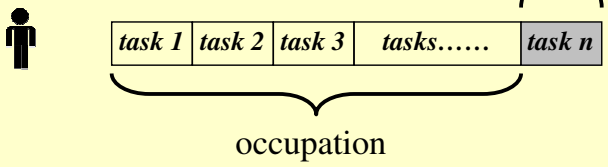
Framework

Production	Trade-off	Measures
	Coordination costs vs. production costs	• task-occupation connectivity • task-occupation wage differential

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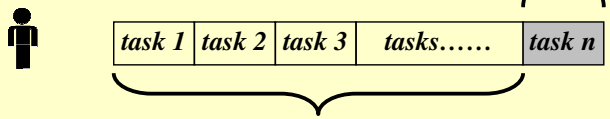
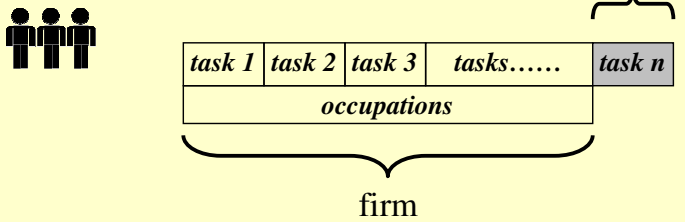
Framework

Production	Trade-off	Measures
	Coordination costs vs. production costs	• task-occupation connectivity • task-occupation wage differential
	Make vs. buy	• task-industry connectivity

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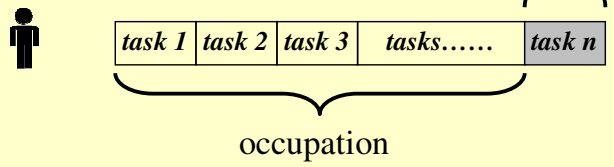
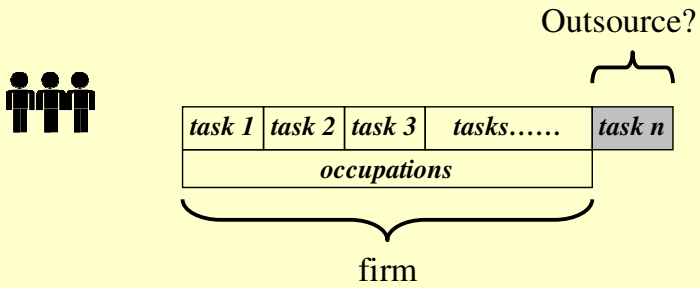
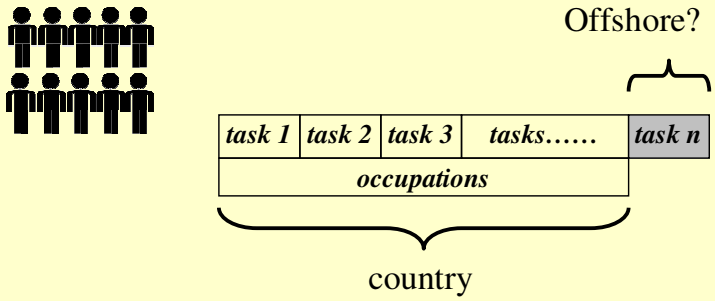
Framework

Production	Trade-off	Measures
	Coordination costs vs. production costs	• task-occupation connectivity • task-occupation wage differential
	Make vs. buy	• task-industry connectivity
	Proximity vs. cost advantages	• Occupation-space connectivity • Spatial-occupation concentration

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Data

- Goal
  - Data set 1996-2005 with education, wages, task measures, specialisation and offshoring
- Input
  - Dutch labour force survey 1996-2005
  - Tasks from UK (BSS)
  - IO industry classification
  - Spatial employment information
- Result
  - occupation-task-year
  - industry-task-year
  - occupation-space-year

Task-occupation connectivity

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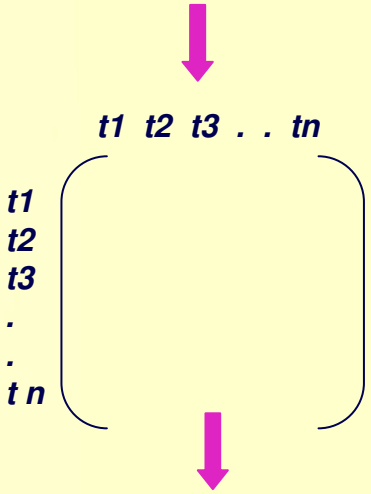
Obtain correlation matrix of tasks (*n*n* matrix) *c*



Use the importance level of each task for each occupation as weights (*m*)

Individial level task data				
	importance	importance	importance	importance
person	task 1	task 2	.....	task n
1	0	3	.....	4
2	1	1	.....	4
3	3	4	.....	3
4	4	4	.....	2
5	4	2	.....	1
6	4	2	.....	2
7	3	1	.....	1
8	3	3	.....	2
9	2	3	.....	3
10	2	4	.....	4
.				
.				
.				
.				
n				

Calculate *c*m* for each occupation-task combination (multiply rows by task importance and sum by occ

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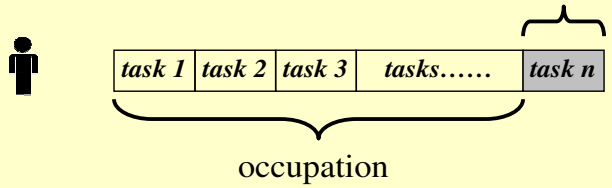
Data set

occupation	task	task importance 1997	task importance 2006	task-occupation connectivity	
basic jobs	strength	3,53	3,63	0,0651141	
11	analysing	2,04	2,16	0,2913167	
11	planning	1,79	2,06	0,2339934	
11	writing	1,86	1,88	0,2662569	
…	…	…	…	…	
…	…	…	…	…	
technical (low)	8	3,32	3,54	0,0657298	
26	18	2,57	3,02	0,2970032	
26	22	2,20	2,50	0,2331954	
26	30	2,02	2,20	0,2673084	
…	…	…	…	…	
…	…	…	…	…	
econ, admin etc.	8	1,94	2,07	0,0412927	
51	18	3,03	3,46	0,3123539	
51	22	2,61	2,85	0,2511243	
51	30	2,53	3,06	0,2917716	
…	…	…	…	…	
…	…	…	…	…	
managers	8	2,32	2,03	0,0411967	
98	18	3,77	4,14	0,3154723	
98	22	4,11	3,94	0,2528255	
98	30	3,13	3,36	0,2943714	
…	…				
…	…				

Workers

Production	Trade-off	Measure
	Coordination vs. production	• task-occupation connectivity • task-occupation wage differential

Task-occupation connectivity

Presence of task X given presence task Y

$$toc_{ij} = \sum_{j=1}^{j=33} c_{jj} m_{ij}$$

Task-occupation wage differential

Absolute difference between occupation and task wage

$$towd_{ij} = \left| w_i - w_j \right|$$

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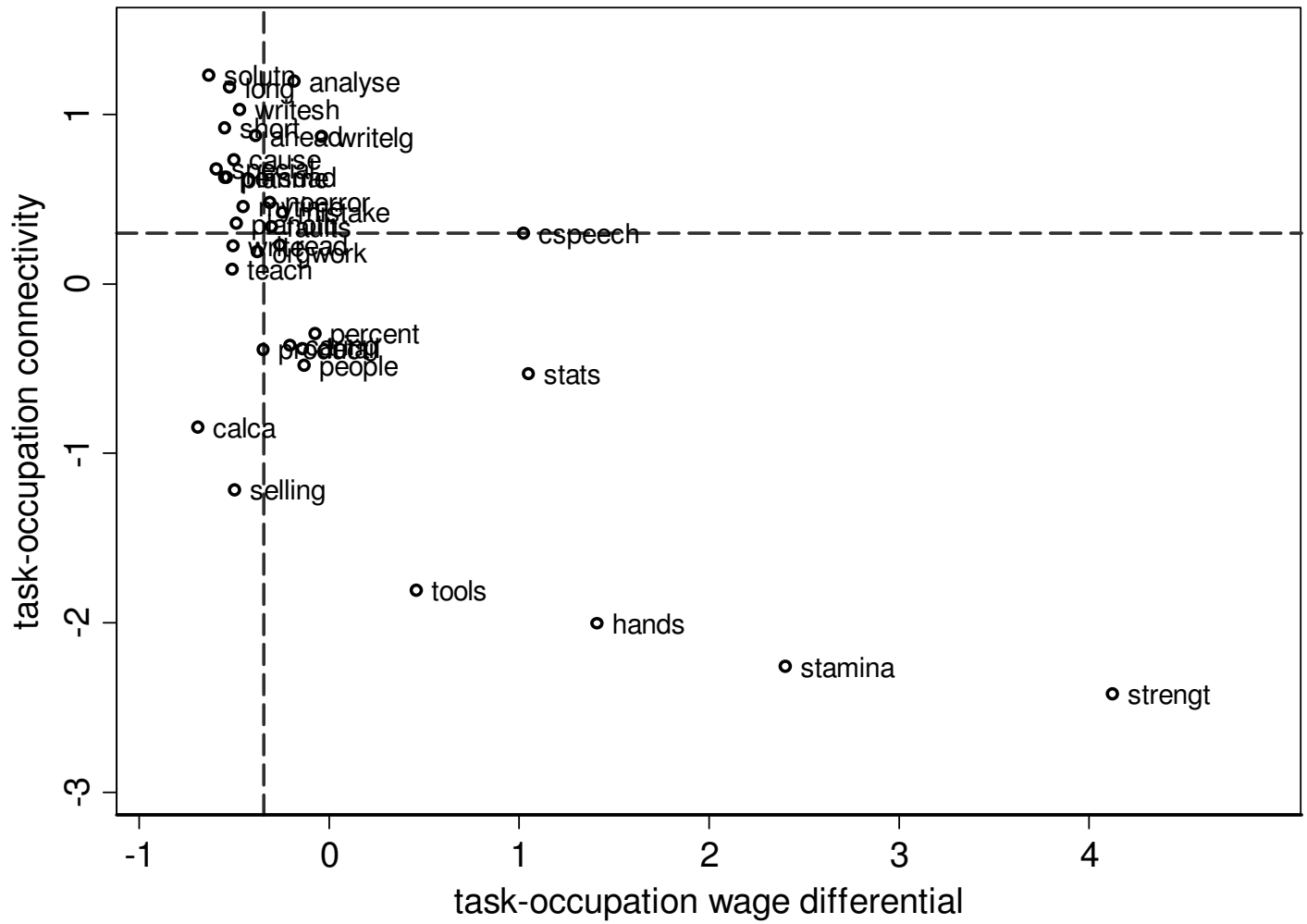
Connectivity and wage differential



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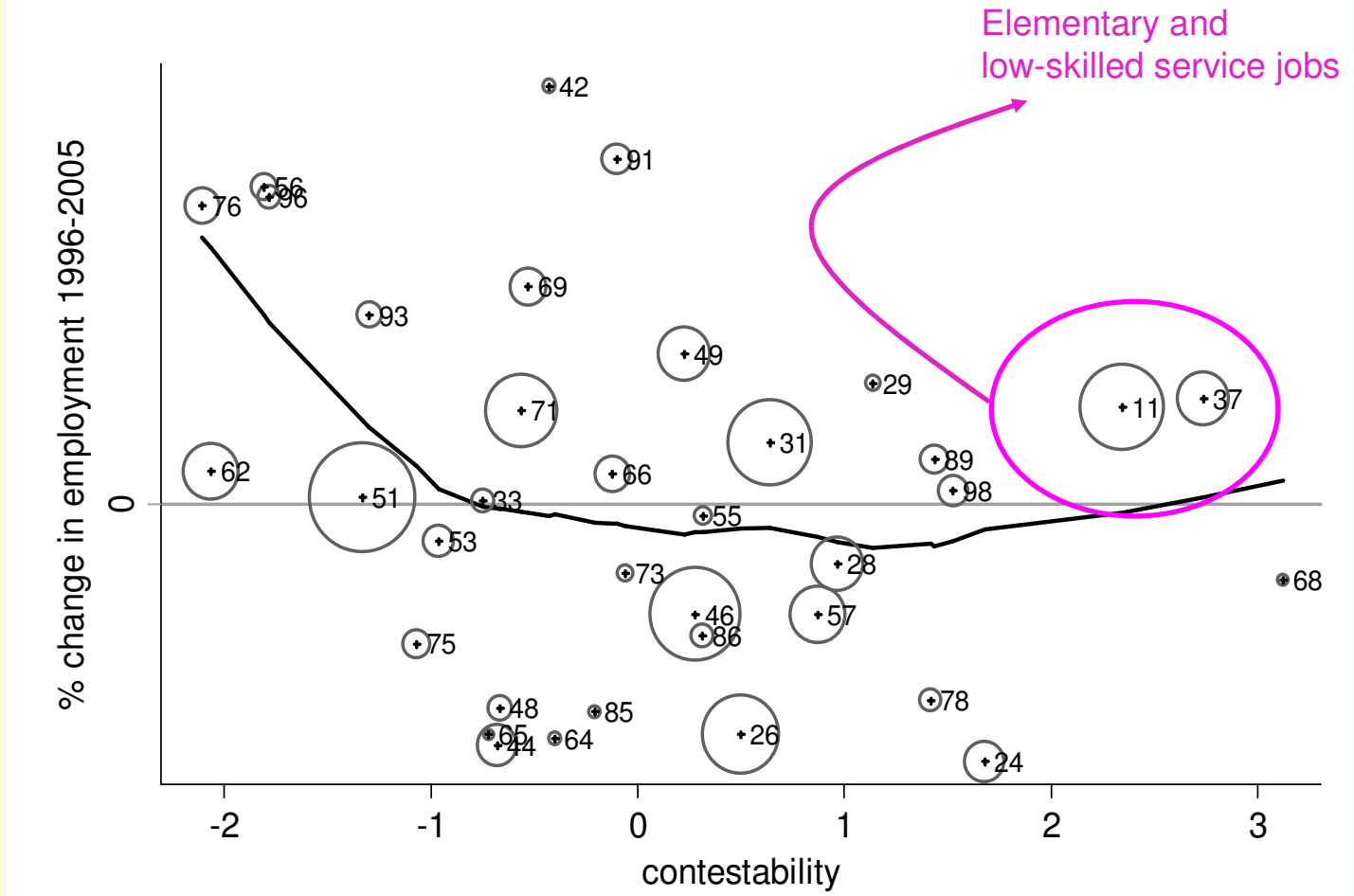
Contestability



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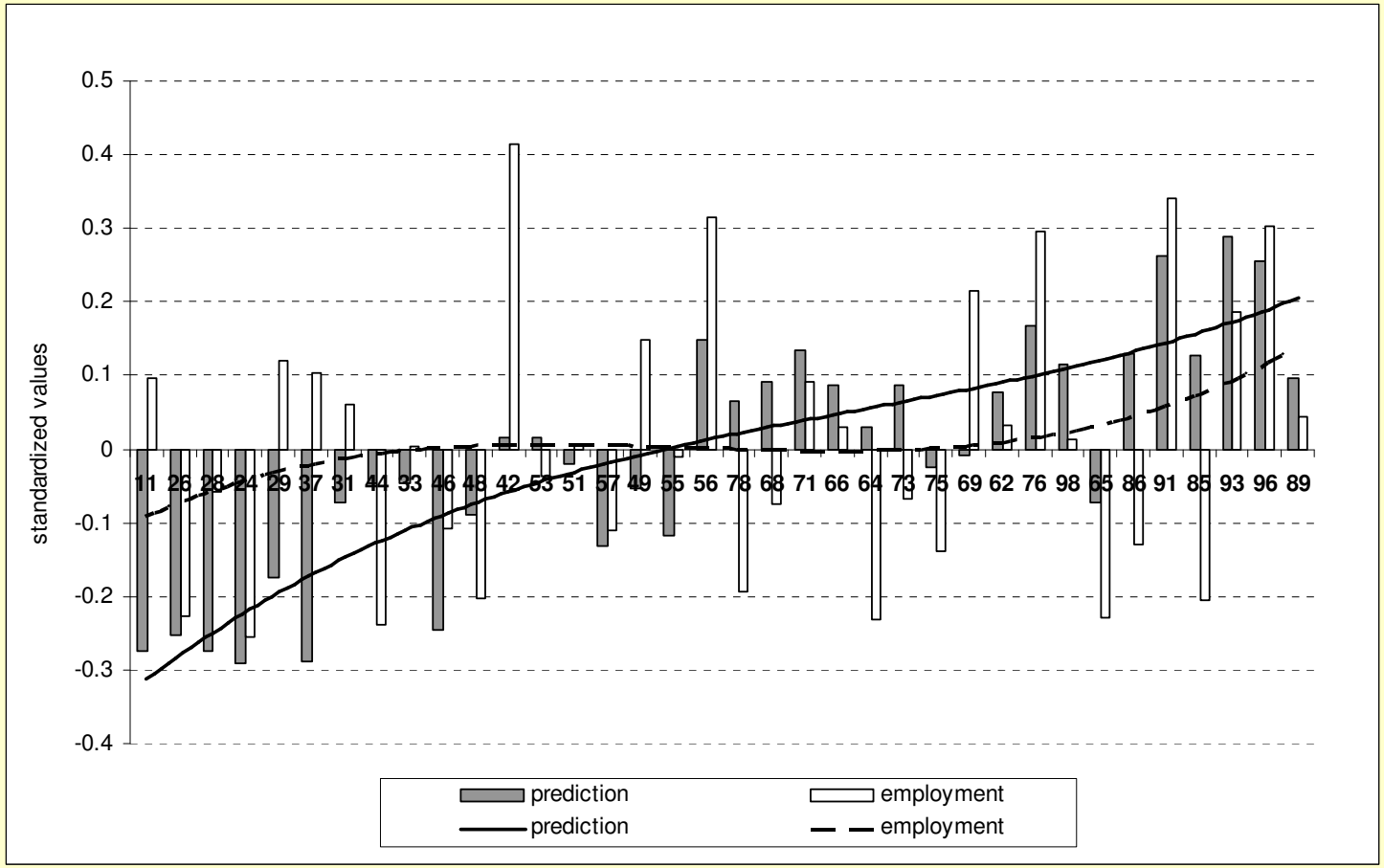
Employment changes

Dependent variable: Change in employment, 1996-2005	(1) OLS	(2) OLS	(3) WLS	(4) WLS
task-occupation connectivity	0.075**	0.153***	0.058**	0.075**
	(0.030)	(0.048)	(0.023)	(0.032)
task-occupation wage differential	0.003	0.032	0.067**	0.083***
	(0.024)	(0.026)	(0.026)	(0.028)
education 1996		-0.084		-0.011
		(0.059)		(0.044)
log employment 1996		0.029		0.031
		(0.027)		(0.022)
Constant	0.012	-0.173	0.053**	-0.183
	(0.029)	(0.189)	(0.021)	(0.176)
Observations	36	36	36	36
R-squared	0.168	0.273	0.329	0.370

Employment changes



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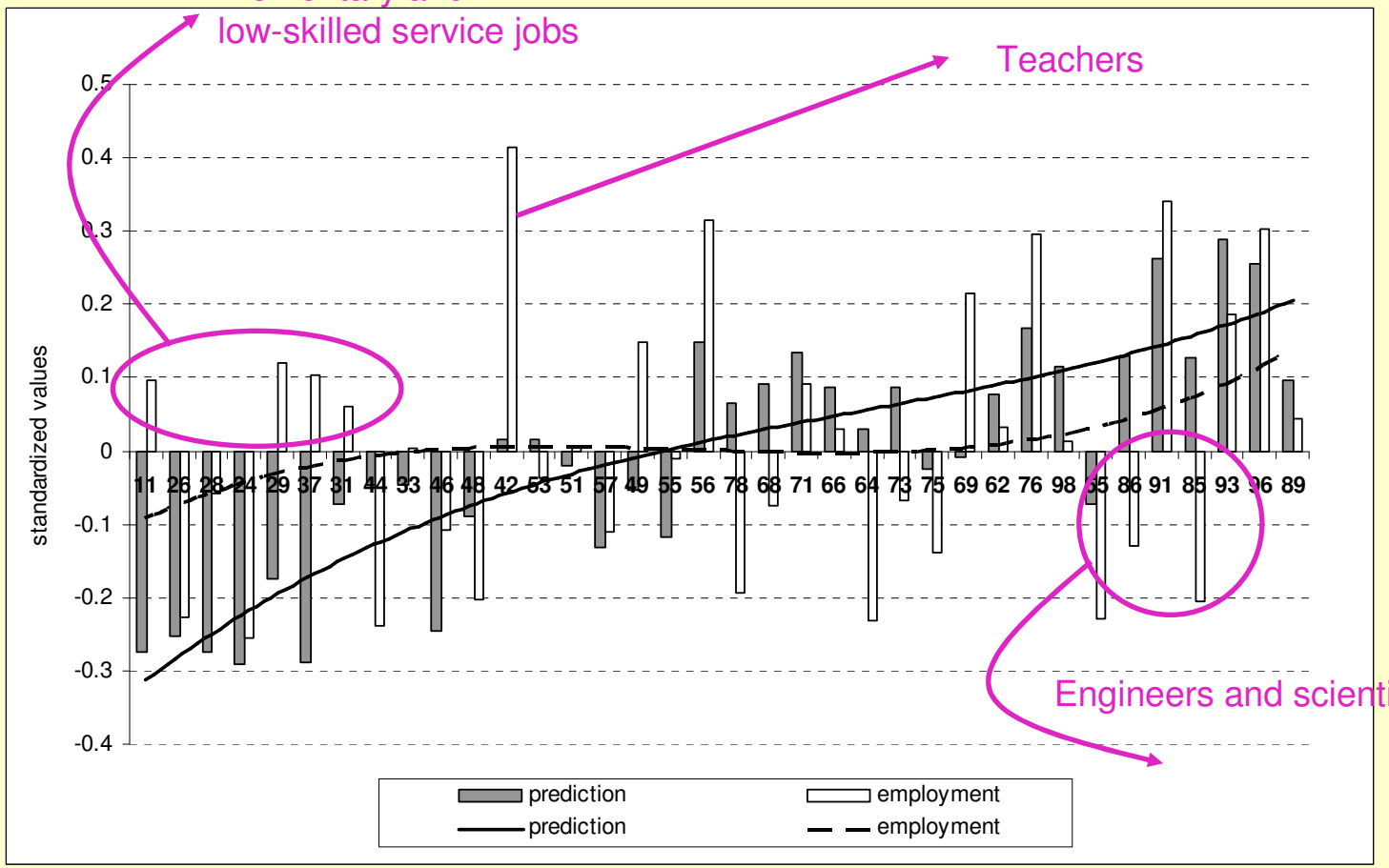
Employment changes



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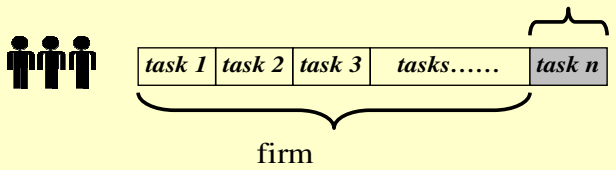
Industry

Production	Trade-off	Measure
	Make vs. buy	• task-industry connectivity

Task-industry connectivity

Presence of task X given presence task Y

$$tic_{jr} = \sum_{j=1}^{j=33} c_{jj} m_{jr}$$

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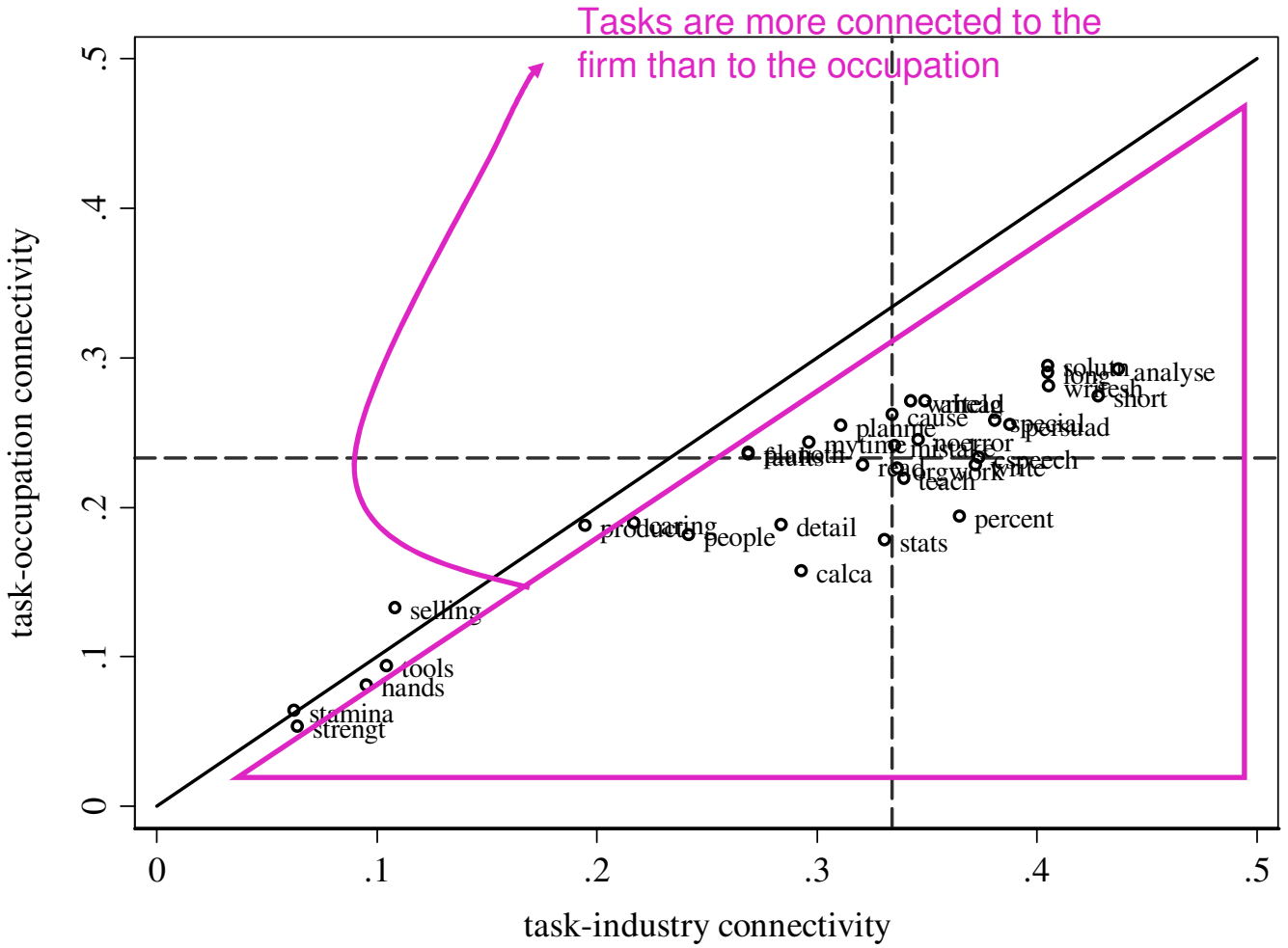
Connectivity: occ vs. ind



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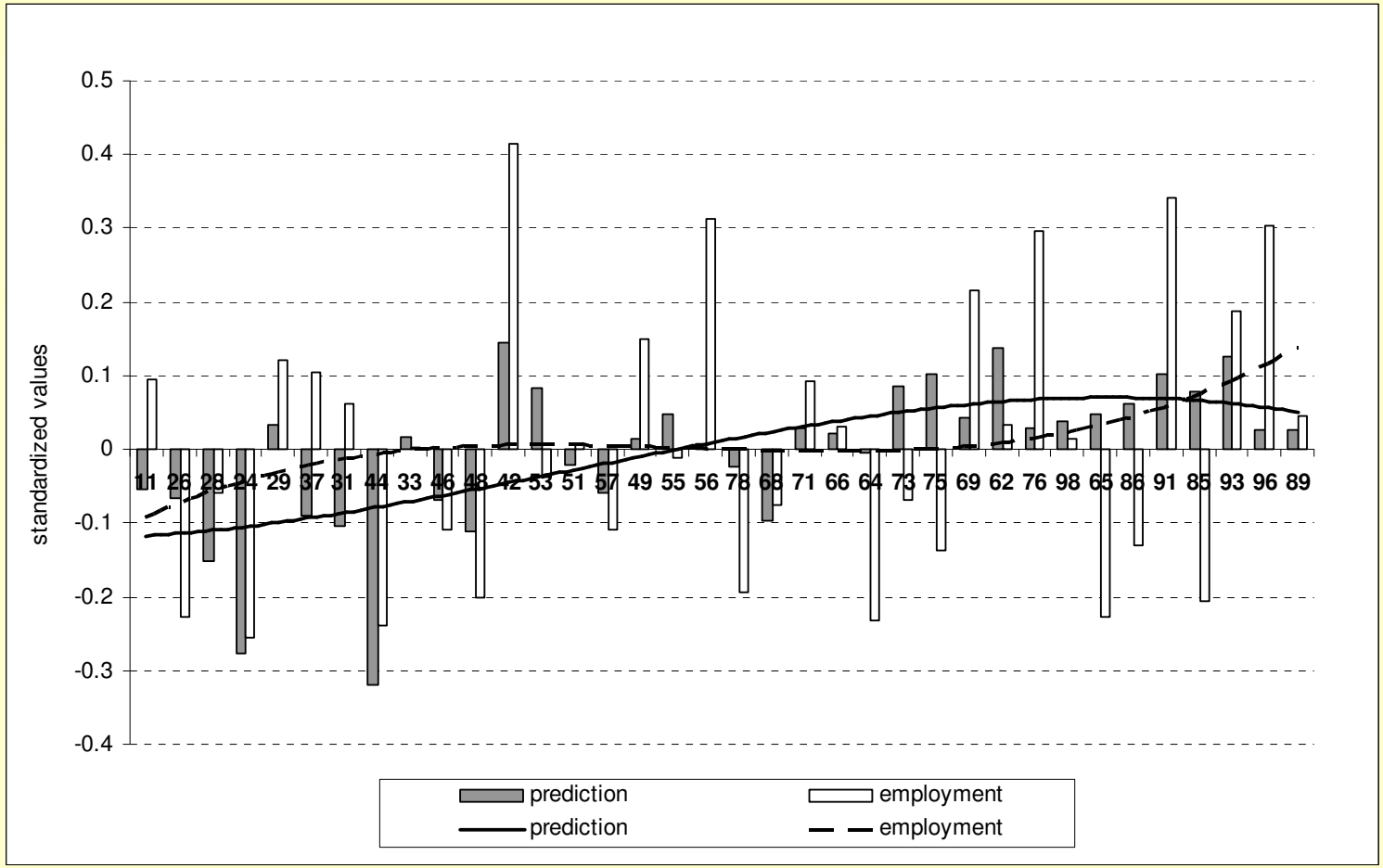
Employment changes

Dependent variable: Change in employment, 1996-2005	(1) OLS	(2) OLS	(3) WLS	(4) WLS
task-industry connectivity	0.084***	0.102***	0.081***	0.074**
	(0.022)	(0.032)	(0.021)	(0.033)
education 1996		-0.006		0.011
		(0.043)		(0.053)
log employment 1996		0.034		0.003
		(0.024)		(0.019)
constant	0.012	-0.212	0.031	0.014
	(0.028)	(0.163)	(0.026)	(0.152)
Observations	36	36	36	36
R-squared	0.208	0.259	0.246	0.248

Employment changes



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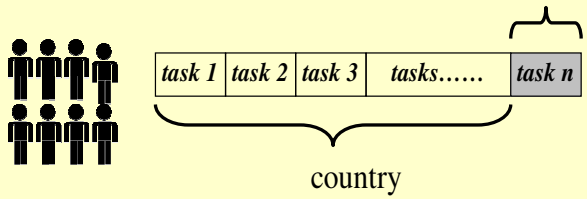
Space

Production	Trade-off	Measure
	Proximity vs. cost advantages	• Occupation-space connectivity • Spatial occupation concentration

Occupation-space connectivity

Presence of occ X given presence occ Y

$$osc_i = \sum_{i=1}^{i=36} c_{ii} m_i$$

Spatial occupation concentration

Tradability of jobs: difference between the occupation and population share

$$soc_v = \sum_{v=1}^{v=17} \left| occ_v - ps_v \right|$$

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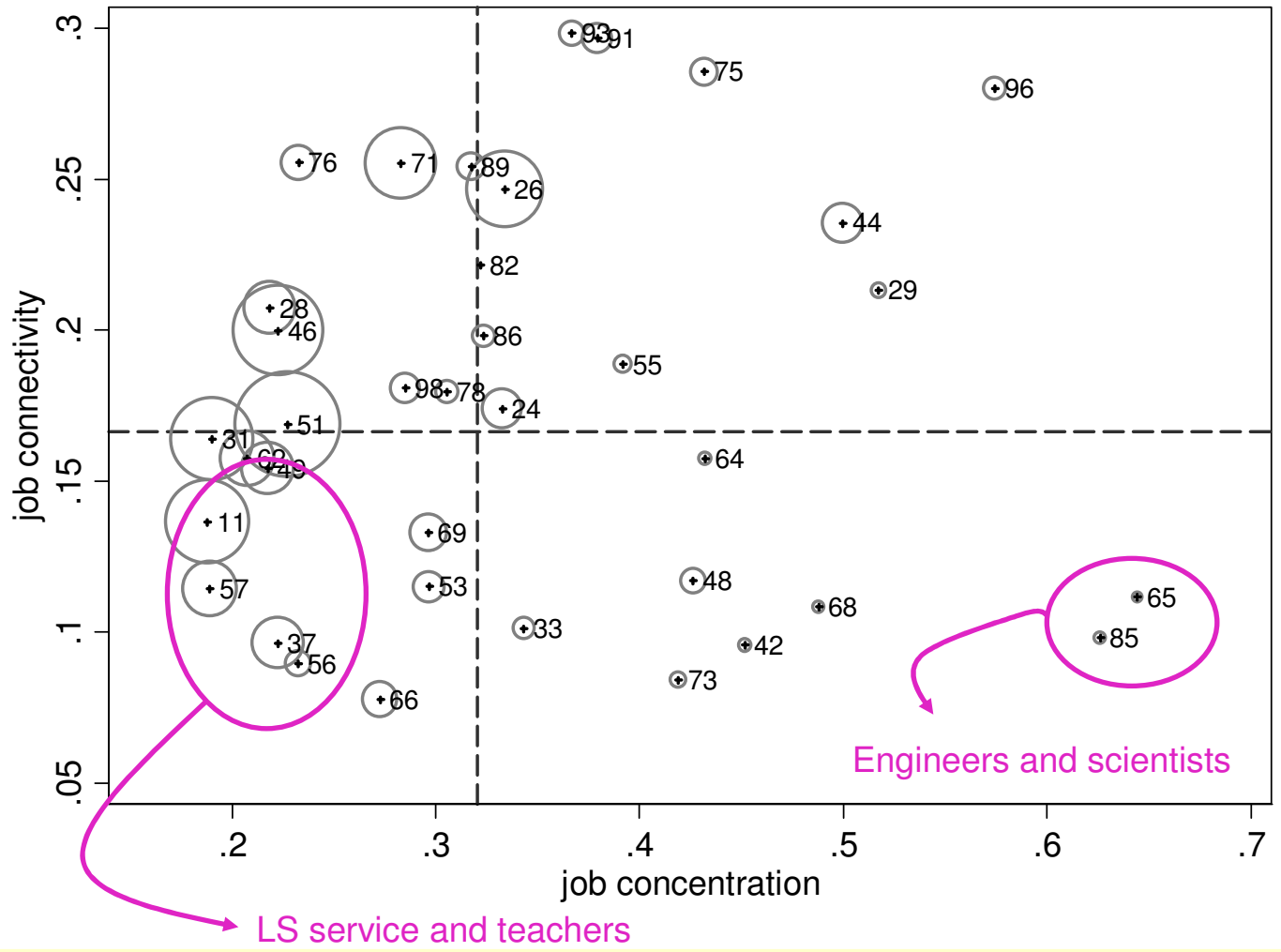
Concentration and connectivity



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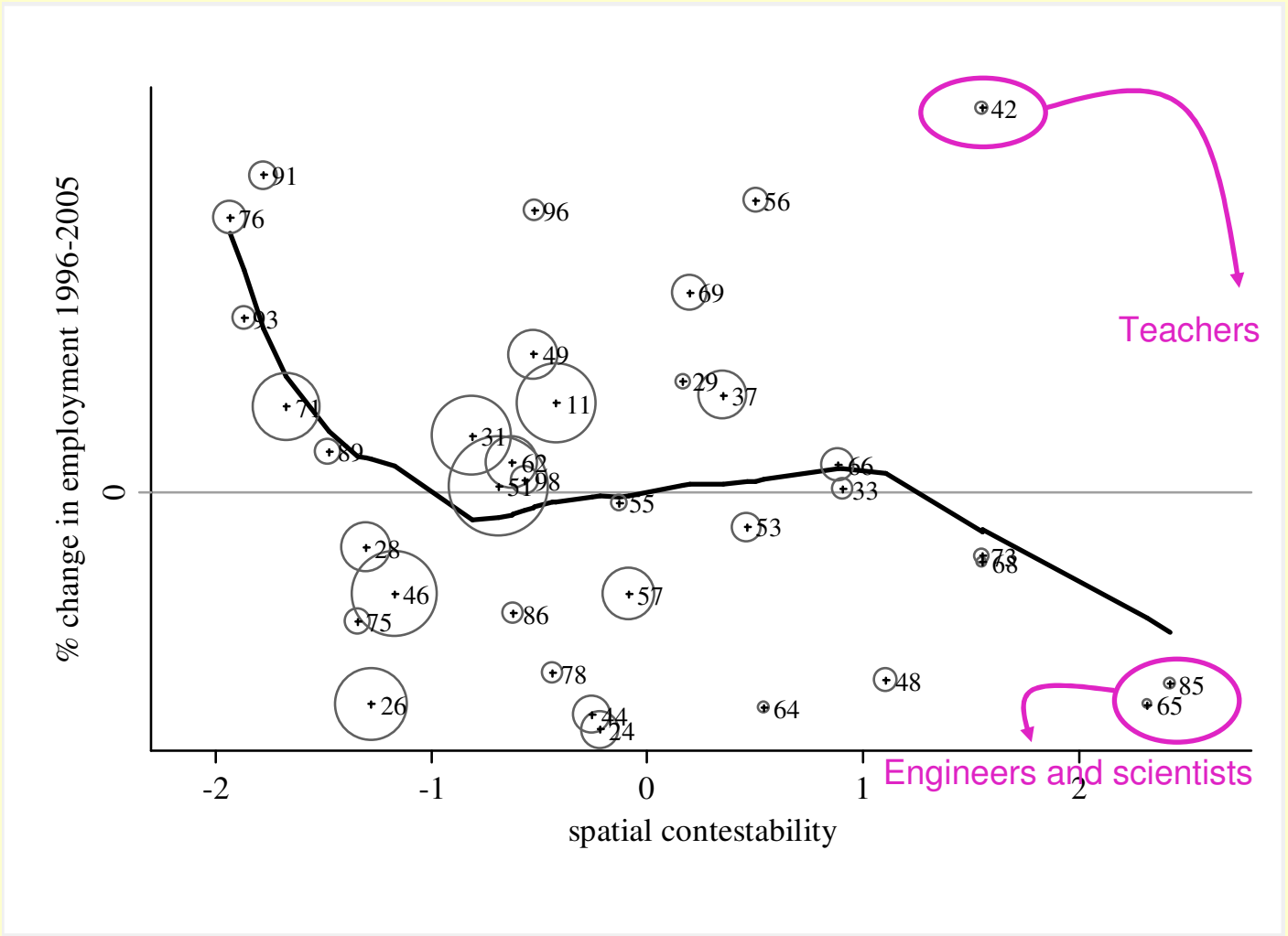
Contestability



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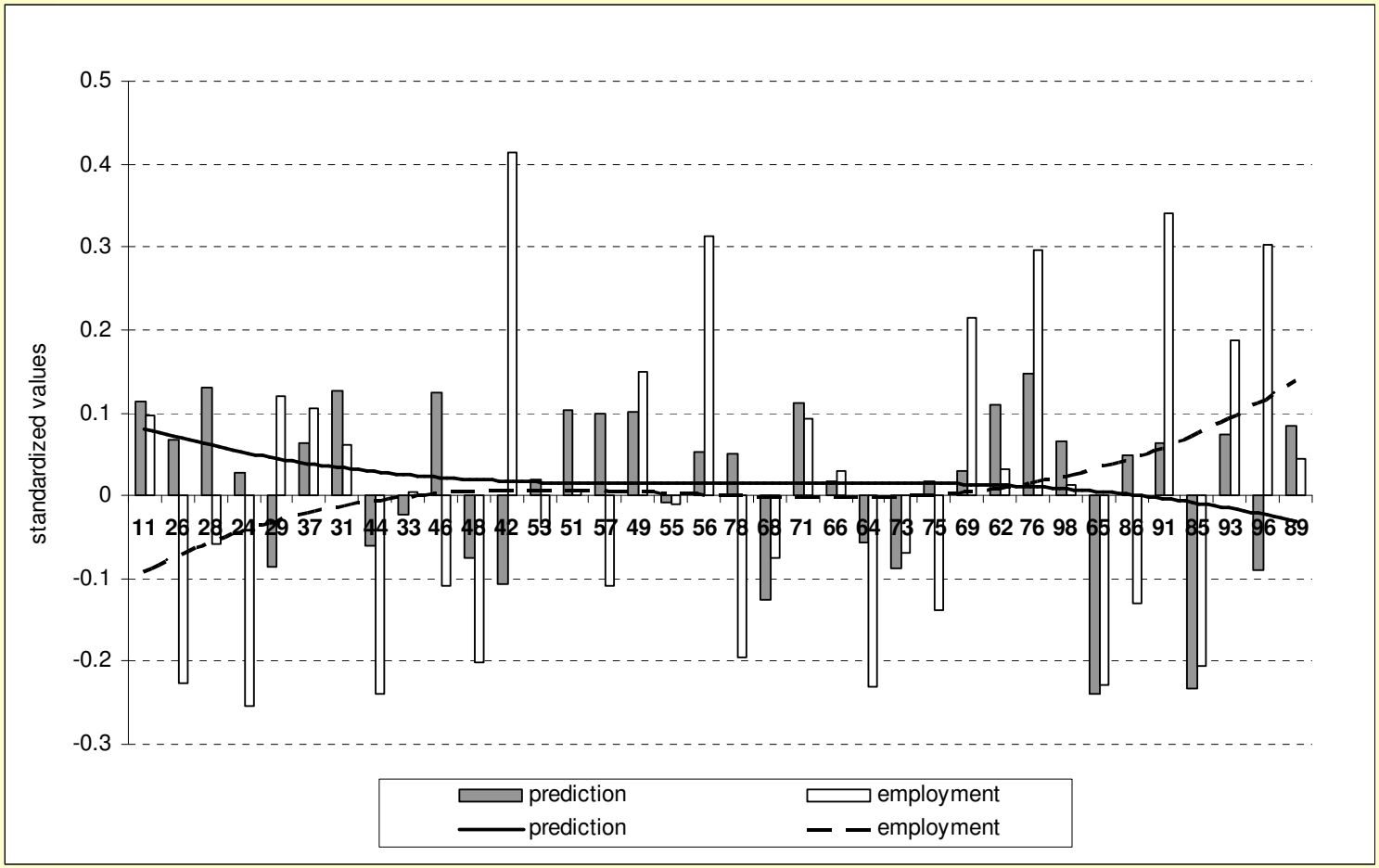
Employment changes

Dependent variable: Changes in employment, 1996-2005	(1) OLS	(2) WLS	(3) OLS	(4) WLS
job concentration	-0.142**	-0.135**		
	(0.069)	(0.058)		
job connectivity	0.039	0.029		
	(0.034)	(0.029)		
education 1996	0.102***	0.133***	0.118***	0.154***
	(0.037)	(0.031)	(0.034)	(0.034)
log employment 1996	-0.049	-0.017	0.020	0.025
	(0.043)	(0.027)	(0.025)	(0.019)
log wage 1996	-0.326***	-0.285***	-0.326***	-0.333***
	(0.113)	(0.091)	(0.102)	(0.093)
constant	3.078***	2.276***	2.373**	2.390***
	(0.966)	(0.720)	(0.880)	(0.717)
Observations	36	36	36	36
R-squared	0.364	0.472	0.270	0.411

Employment changes



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Offshoring

- Relative amount of all imported intermediate output

$$offshoring_i = \sum_{j=1}^{j=70} imp_j c_{ji}$$

c_{ji} is an element of the Leontieff inverse matrix *(I-A)-1*

A is a 70×70 matrix with input-output information about Intermediate purchases

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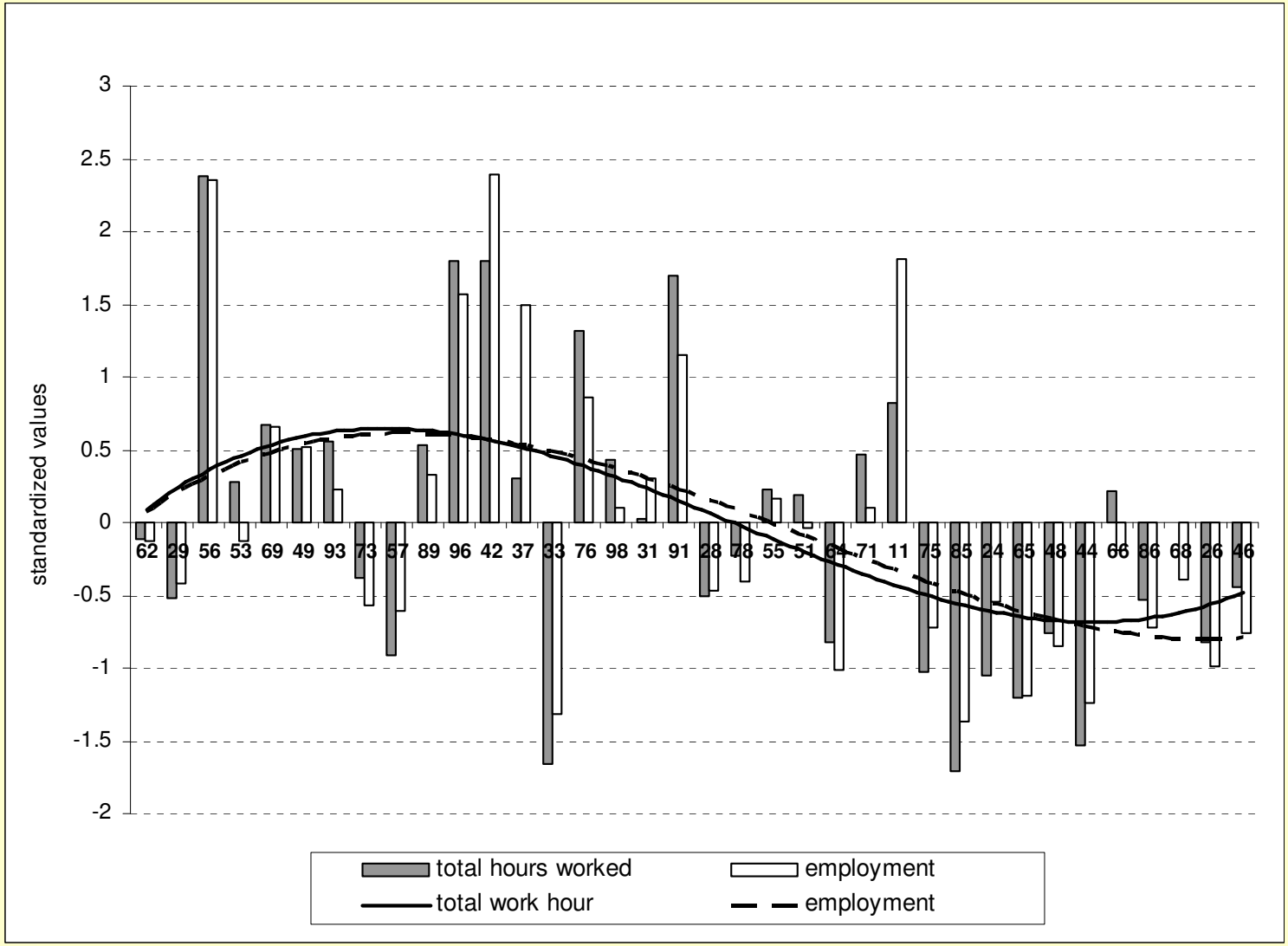
Offshoring and employment



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Offshoring and employment

	(1)	(2)	(3)
Dependent variable: Changes in offshoring, 1996-2005	OLS	OLS	OLS
task-occupation wage differential	0.001		
	(0.001)		
task-occupation connectivity	0.016		
	(0.012)		
task-industry connectivity		0.018	
		(0.014)	
spatial occupation concentration			0.060**
			(0.023)
occupation-space connectivity			-0.021
			(0.013)
Observations	36	36	36
R-squared	0.089	0.076	0.317

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Will my job be offshored?

- It depends …
  - How well connected are the tasks within your job?
  - How large is the price differential in your job?
  - When tasks are separated from your job, to what extent will they be outsourced by the firm?
  - How well connected is your job to other jobs?
  - How concentrated is your job in space?

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Will my job be offshored?

- High school teacher – no
  - Worker – no
  - Firm – no
  - Space – no
- Low-skilled (service) jobs – yes, but no
  - Worker – yes
  - Firm – yes
  - Space – no
- High skilled technical jobs – yes
  - Worker – yes
  - Firm – ?
  - Space – yes

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Conclusion

- Framework
- Empirical measures for division of labour
- Data
- Policy