Institute for Employment Research
The Research Institute of the Federal Employment Agency

How important are regional and plant characteristics for labor demand? Plant-level evidence for Germany

3rd SEEK Conference

26 April 2013,
ZEW Mannheim

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Introduction

- Plant-level analyses on labor demand are often carried out without detailed references to plant characteristics or to the plant‘s local environment (Blanchflower et al. 1991, Bellmann/Pahnke 2006, Kölling 2009)
- Empirical research in industrial organization: role of plant age, innovation activities or the presence in foreign markets for plant-level employment growth (Evans 1987, Audretsch/Dohse 2007, Buch/Lipponer 2010)
- Empirical research in regional science: role of agglomeration effects for regional employment growth (Glaeser et al. 1992, Henderson et al. 1995, Combes et al. 2004, Blien et al. 2004, Fuchs 2011)
- These relationships should foremost hold on the micro level (Hoogstra/van Dijk 2004, Beugelsdijk 2007, Raaspe/van Oort 2008)!

Introduction

- **Central question:** How important are plant and regional characteristics - specifically the way the regional economic structure is set out - for the employment decisions of individual plants?

- **Strategy:** Consideration of research in regional and industrial economics within the framework of neoclassical labor demand

Theory

1. Minimize the cost function

$$C = C(w, r, Y)$$

2. Shepard's Lemma

$$L^* = C_w = \frac{\partial C(.)}{\partial w}$$

3. Conditional demand for labor (with CES production function)

$$L = \frac{\partial C}{\partial w} = \alpha^{\alpha} w^{-\sigma} Y$$

4. Taking logs yields

$$\ln L = \alpha'' - \sigma \ln w + \ln Y$$

Empirical approach

- Basis: static labor demand (OLS, FE)

$$l_{it} = \alpha + \beta_1 w_{it} + \beta_2 y_{it} + \mu_i + v_{it}$$

- Extension by plant (B_{it}) and regional (R_t) characteristics

$$l_{it} = \alpha + \beta_1 w_{it} + \beta_2 y_{it} + \gamma B_{it} + \delta R_t + \mu_i + v_{it}$$

- Dynamic labor demand accounting for endogeneity (system GMM)

$$l_{it} = \alpha + \beta_0 l_{i,t-1} + \beta_1 w_{it} + \beta_2 y_{it} + \gamma B_{it} + \delta R_t + \mu_i + v_{it}$$

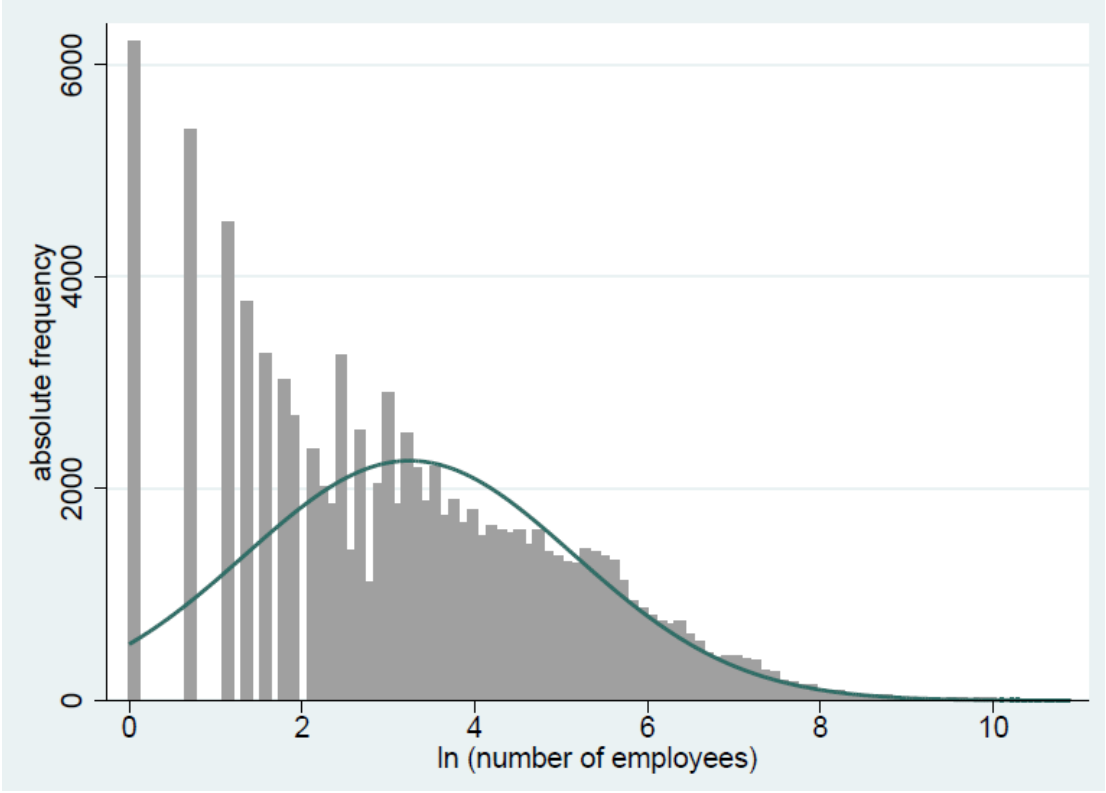
Data

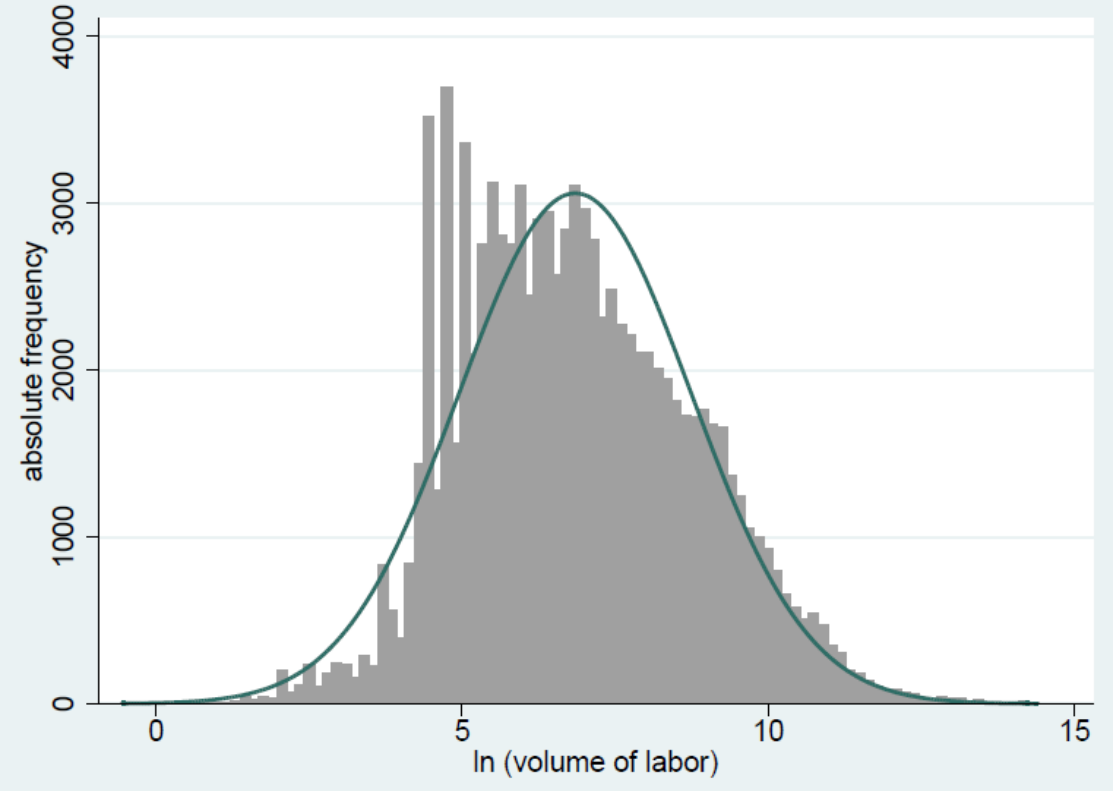
- IAB Establishment Panel
  - Annual representative employer survey in Germany
  - Roughly 16,000 plants from all sectors and sizes are questioned on employment-related subjects (employment development, business, policy, innovations, salaries, working times,…)
  - Start in Western Germany in 1993, in Eastern Germany in 1996
- LIAB - Linked Employer-Employee Data from the IAB (employees)
- IAB Establishment Panel (plants)
- Information entering the analysis
  - Only market-oriented sectors without primary sector
  - Exclusion of mergers, acquisitions, and outsourcing
- The final panel data set covers the years from 1996 to 2008 and comprises a total of 37,905 observations on 9,391 plants

Dependent variable

- We use the volume of labor instead of the number of employees for two reasons:
  - Huge differences between plants regarding the number of hours worked per time period (full-time vs. part-time employment)
  - In the short run, plants might react to changes in product demand with overtime or short time rather than hiring or firing new staff
- Calculation:
  - Basis: total number of employees as on June 30 of the respective year
  - Information on the agreed working hours per week for full-time employees
  - Part-time workers: <15 hours/week, 15-25 hours/week, >25 hours/week
- Dependent variable: number of hours worked per week by the full-time equivalents in a plant

Number of employees vs. volume of labor





Independent variables

$$l_{it} = \alpha + \beta_0 l_{i,t-1} + \beta_1 w_{it} + \beta_2 y_{it} + \gamma B_{it} + \delta R_t + \mu_i + \nu_{it}$$

‚basic' labor demand	plant characteristics	regional characteristics
- wages - output	- exports - technical state - dependency - property - qualification - wage agrement - works council - plant age - staff age - sector	- concentration - specialization - diversity - competition - monopoly

variables	description
	dependent variable
volume of labor	employees (in full-time equivalents) times working hours
	basic explanatory variables
wages	gross pay divided by full-time equivalents (in Euro)
output	value added (in mill. Euro)
	plant variables
export	share of sales abroad on total sales in percent
technical state	dummy: 1 = modern
dependency	dummy: 1= independent
property	dummy: 1= foreign property
qualification	share of unqualified workers in percent
	share of qualified workers in percent
wage agreement	dummy: 1= yes
works council	dummy: 1= yes
plant age	plant age in years
staff age	median of the staff age in years
sector	dummies for the 2-digit sectors
	regional variables
concentration	localization quotient
specialization	Krugman specialization index
diversity	Hirshman-Herfindahl index across sectors
competition	Hirshman-Herfindahl index across plants
monopoly	dummy: 1= monopoly per region and sector
East	dummy: 1= East

Results I: static labor demand (OLS, FE)

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	Basic model		Complete model	
	OLS	FE	OLS	FE
wages	-0.177 ***	-0.146 ***	-0.171 ***	-0.142 ***
output	0.756 ***	0.113 ***	0.667 ***	0.108 ***
exports			0.001	0.000
technical state			0.024 *	0.027 ***
dependency			-0.075 ***	-0.024 **
property			0.012 **	-0.015 ***
unqualified			0.004 ***	0.001 **
qualified			0.001 ***	-0.000
wage agreement			0.087 ***	0.011 *
works council			0.423 ***	0.065 ***
plant age			0.008 ***	-0.008 ***
staff age			-0.004 ***	-0.008 ***
concentration			0.003 *	0.007 ***
specialization			0.227 *	-0.108
diversity			-0.666	-0.081
competition			0.215 ***	0.092
monopoly			-0.090 **	0.016
East	0.037 ***		0.136 ***	
No. obs.	33,868	33,868	33,868	33,868
R^2	0.85	0.67	0.86	0.57
R^2 within		0.11		0.13
R^2 between		0.70		0.57

Results II: dynamic labor demand

	Basic model	Complete model
$labor_{t-1}$	0.658 ***	0.652 ***
wages	-0.338 ***	-0.247 ***
output	0.338 ***	0.264 ***
exports		0.001 **
technical state		-0.007
dependency		0.008
property		-0.004
unqualified		0.001 *
qualified		-0.001
wage agreement		0.007
works council		0.023
plant age		-0.004 ***
staff age		-0.005 ***

	Basic model	Complete model
concentration		0.002
specialization		-0.403 **
diversity		0.619
competition		0.140 **
monopoly		-0.030
East	0.123	-0.028
No. obs.	33,868	33,868
Sargan	737.808	1,449.61
	(0.000)	(0.000)
AC(1)	-18.614 ***	-17.163 ***
	(0.000)	(0.000)
AC(2)	-1.072	-0.983
	(0.284)	(0.326)
No. instr.	196	436

Conclusions

- The fundamental determinants are wages and output
- Large positive path dependency in labor demand
- Some hints towards the impact of plant characteristics
- Among the regional characteristics there are two important determinants:
  - the smaller the degree of regional specialization, the larger is labor demand

    ➡ positive impact of diversified economic structure
  - the more employment is spread evenly across the plants in a sector, the larger is labor demand

    ➡ positive impact of competition within a sector and region

- Still a lot of work to be done…

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Thank you for your attention!

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