

Skill Shortage before, during and after the Great Recession

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1. Introduction

- Public and scientific debate on skill shortage in Germany
- Long- and short-term perspective
- Differences between regions, occupations and industries
- Arguments on the supply and the demand side
- Different definitions of skilled workers
- Empirical investigations are focused on aggregate data
- Worker shortages during times of high national unemployment, during the Great Recession - a paradox?

2. Reasons, measures and previous empirical evidence

Sources of skill shortages:

- Demographic, education and labor market developments
 - decline in population, late entrance on the labor market, early retirement
 - higher female labor market participation, better education, higher share of graduates, more training
- Advanced technology and organizational changes
- Educational system - misqualification, long period of education
- Mismatch between unemployed and requirements in vacancies, between regions and industries
- Cyclical fluctuations

Suggested measures to counter skill shortages:

- Bertelsmann Foundation (2002): elimination of repressive rules in social laws, adoption of company-level pacts, enhancement of wage differences, anticipatory personal management,
- Chamber of Commerce and Industry (2011): intensify the MINT education, remove barriers to transfer between vocational training and the university
- German Trades Union Confederation (2011): reform of the education system, required standards are too high
- Kolodziej (2011), Stahl (2013): better education and training, extension of the working time, longer working lifetime, better regulated immigration, increasing wages, family friendly working time, enhancement of firms' attractiveness, detailed information about the labor market.

Previous empirical investigations on skill shortages:

- Klinger et al. (2011): firms with labor shortage did not use significantly more short-time work.
- Zagelmeyer et al. (2012): experience with shortage of skilled labor is positively associated with the exploration of new markets.
- Bechmann/Dahms (2012): the number of hired skilled employees fluctuates from year to year since 2006.
- Bechmann et al. (2012): 49 percent of all establishments have never looked for skilled employees during the period 2007-2010.
- Federation of German Industry (2013): more than 50 percent of the German industry companies assess skill shortage as important for the business prospects.

3. Data and descriptive results

IAB establishment panel 2007-2012, around 15,000 establishments are included in the survey, information on many labor market topics, including employment, wages, sales, investment, bargaining levels, works councils, profit sharing.

Information on skill shortages, structural firm-specific characteristics and measures are available. It is asked whether establishments have problems to fill qualified jobs. Wave 2011 provides some details regarding skill shortage. 12 strategies are offered with which the firms can possibly cover the demand for skilled workers in future.

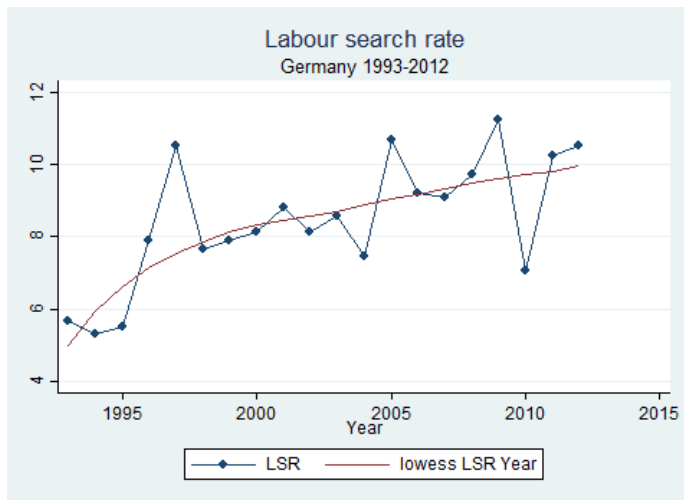
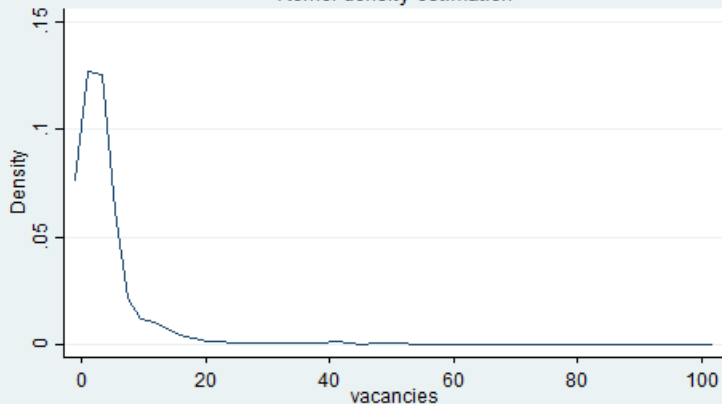


Table 1: Descriptive statistics to indicators of skill shortage

Indicator	mean (sd)	mean (sd)	mean (sd)
	2007	2008	2009
(1) <i>D_UQJ</i>	0.091 (0.287)	0.111 (0.315)	0.071 (0.256)
(2) <i>UQJ</i>	5.426(13.426)	6.400 (37.916)	5.129 (17.942)
(3) <i>UQJ/N_J</i>	0.089 (0.152)	0.082 (0.114)	0.087 (0.132)
(4) <i>UQJ/N_QJ</i>	0.141 (0.280)	0.141 (0.290)	0.135 (0.245)
	2010	2011	2012
(1) <i>D_UQJ</i>	0.098 (0.298)	0.135 (0.342)	0.137 (0.344)
(2) <i>UQJ</i>	3.712 (6.777)	4.920(19.593)	4.713(16.465)
(3) <i>UQJ/N_J</i>	0.073 (0.095)	0.079 (0.105)	0.079 (0.117)
(4) <i>UQJ/N_QJ</i>	0.122 (0.221)	0.125 (0.245)	0.131 (0.249)

Source: IAB Establishment Panel 2007-2012.

Number of unfilled qualified jobs Kernel density estimation



kernel = epanechnikov, bandwidth = 2.0000

Source: IAB Establishment Panel 2009

Table 2: Frequency distribution of number of years with a skill shortage (*N_YUQJ*)

<i>N_YUQJ</i>	Freq.	Percent	Cum.
0	4,726	67.74	67.74
1	1,156	16.57	84.31
2	490	7.02	91.33
3	288	4.13	95.46
4	165	2.36	97.82
5	85	1.22	99.04
6	67	0.96	100.00
Total	6,977	100.00	

Source: IAB Establishment Panel 2007-2012

4. Methods and econometric estimates

4.1. Empirical strategy

- Selection of firms' characteristics by least angle regression
- Probit estimates of the dummy D_{UQJ} (=1 if the firm has notified unfilled qualified jobs) - yearly and pooled as panel - based on
 - firms' characteristics
 - direct and indirect measures in order to reduce skill shortage.

- Ordered probit estimates based on three categories
 - never skill shortage
 - skill shortage only in one year
 - skill shortage in more than one year
- Negative binomial estimates based on the number of years with skill shortage (N_YUQJ)
- Instrumental variables estimates of the share of unfilled qualified jobs (UQJ/N_J) - yearly and pooled as panel - in relation to effects of measures and restricted to firms with skill shortages.

4.2. Econometric results

4.2.1. Firms' characteristics as determinants of skill shortage

- In southern Germany shortage is usually more pronounced, however in 2010 significantly lower.
- Lack of qualified workers larger in the service sector except in 2011.
- No influence could be found in respect of exports after 2010.
- Usually, we find no statistical effects of works councils on the number of vacancies. One exception is observed in 2010.
- Older firms have fewer problems than younger firms.
- Firms with many mini-jobs and a high percentage of female workers reveal less vacancy problems. In 2009, no differences compared with other firms were observed.

- If the management is not in the hands of its owners skill shortage is reported more often.
- Positive expectations go hand in hand with skill-shortage vacancies. The relationship was strongest in 2008 and weakest in 2009.
- Working time accounts and skill shortages are positively correlated with a stronger tendency in 2010-2012.
- High wages, profit sharing and further training are also positively correlated with skill shortage.
- Labor hoarding helps to reduce skill shortage problems. The effects decrease in the post-recession period.

- An explicit incorporation of specific policy measures to eliminate bottlenecks of qualified workers does not show the expected effects.
- The higher the productivity the lower was the risk of a skill shortage in 2007, 2008 and 2011, while in 2009 and 2011 only insignificant effects were displayed.
- The hypothesis that firms with a high percentage of IT investments have more problems to hire skilled workers is not confirmed.
- The majority of firms has not experienced a bottleneck in more than one year.

Variable	2007	2008	2009
SOUTH	0.098*	0.043	0.016
SERVICES	0.139**	0.179***	0.358***
TRADE	-0.186**	-0.294***	-0.209**
EXPORT	0.195***	0.065	-0.114**
SKILL	0.137	0.172*	0.258**
FEMALE	-0.488***	-0.469***	-0.003
WOCO	0.016	-0.051	-0.074
FOUND	-0.209***	-0.160***	-0.203***
MINI-J	-0.574***	-0.318*	-0.497**
MANAG	0.107*	0.139**	0.142**
COMP	0.206***	0.210***	0.039
PEXS	0.335***	0.393***	0.233***
WTA	0.224***	0.303***	0.296***
HWAGE	0.276***	0.203***	0.223***
PS	0.275***	0.265***	0.270***
TRAIN	0.145**	0.241***	0.266***
HOARD		-0.333***	-0.293***

Variable	2010	2011	2012
SOUTH	-0.115**	-0.012	0.093**
SERVICES	0.235***	-0.033	0.124**
TRADE	-0.173**	-0.276***	-0.239***
EXPORT	-0.009	-0.048	-0.048
SKILL	0.179*	0.361***	0.297***
FEMALE	-0.033	-0.168*	-0.287***
WOCO	-0.162***	-0.033	-0.098*
FOUND	-0.163***	-0.171***	-0.108**
MINI-J	-0.737***	-0.148	-0.098
MANAG	0.127**	0.085	0.026
COMP	0.107**	0.160***	0.143***
PEXS	0.351***	0.368***	0.320***
WTA	0.397***	0.399***	0.368***
HWAGE	0.346***	0.233***	0.225***
PS	0.276***	0.215***	0.227***
TRAIN	0.277***	0.358***	0.281***
HOARD	-0.225***	-0.268***	-0.242***

4.2.2. Effects of measures on skill shortage

- Apprenticeship contracts in the past contribute to a reduction of skill shortage. This effect holds over the entire period 2007-2012.
- The absolute effect was higher in the pre-recession period.
- Further training induces similar effects with smaller but significant coefficients.
- In 2010 we do not find any training effect, in 2009 many hoarded employees with reduced working time were trained.
- The only further reduction effect is found by a requirements plan for the personnel. This result is only significant in the pre-recession year 2008.
- Other measures like leasing of workers, hiring of foreign workers, incentives by high wages, retention of older workers, supply of attractive working conditions do not reveal significant effects.

Table 4: Instrumental variables estimation of the ratio of unfilled skilled jobs to the entire number of employees among firms with skill shortage

Measure	2007	2008	2009
Appren	-0.084***	-0.059***	-0.044***
Train	-0.045***	-0.031**	-0.062***
RPlan	-0.013	-0.042**	-0.021
OldW	-0.009	-0.031	-0.016
Leasing	0.006	-0.023	-0.023
Foreign	-0.014	0.022	-0.009
HWage	0.009	0.005	0.002
FamW	0.001	-0.058	-0.016
AttrWC	-0.004	0.170	0.042
N	554	671	405

Table 4: continuation

Measure	2010	2011	2012
Appren	-0.037***	-0.045***	-0.041***
Train	-0.018	-0.046***	-0.038***
RPlan	-0.033	-0.017	-0.022
OldW	-0.045	-0.006	-0.010
Leasing	-0.036	-0.009	-0.008
Foreign	-0.013	-0.003	-0.013
HWage	0.007	0.009	0.005
FamW	-0.037	0.009	0.004
AttrWC	0.141	0.012	0.014
N	583	818	810

5. Conclusion

- Skill shortage is an increasing long-run phenomenon with a break during the Great Recession.
- Firms have often only in one year skill shortage problems and less often over a longer period of time.
- Young firms in the service sector with competitive pressure, high wages, profit sharing and working time accounts that have not hoarded skilled workers in the past report more often skill shortage.

- Firms with a large share of female workers have fewer problems with skill shortage. This correlation diminishes from 2007 to 2012.
- Working time accounts and problems to fill qualified vacancies go hand in hand. This relationship is strengthened in the considered period.
- During the Great Recession it was easier to find qualified workers.
- Recession effects works on also in the following years.
- The firms have benefited from labor hoarding and short-time work during the recession in the following years.

- Firms measures can partially reduce the number of unfilled qualified jobs.
- Apprenticeship training is effective in preventing skill shortages.
- Further training and plans of needs for skilled workers are also successful instruments.
- The influence of further training during the Great Recession was stronger than in the pre- and post-recession period.
- The coefficients of the strategies "Hiring of foreign workers" and "retention of older workers" are negative in five and six years, respectively, but insignificant.