

Did Recruitment Problems Account for the German Job Miracle?

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The debate on the reasons for the robust response of the German labour market to the crisis includes the argument that those establishments that suffered the most from the crisis had experienced recruitment problems during the expansion before. Thus, they had an incentive to hoard labour, thereby avoiding the risk of re-hiring dismissed workers at very high costs after the crisis. This paper aims at testing the labour shortage – labour hoarding hypothesis empirically. We use a unique survey data set on German establishments and apply the propensity score matching approach to identify statistical twins that only differ with respect to their appreciation of labour shortage in the year 2008. We then compare the behaviour of firms with recruitment problems and their matched controls with respect to labour hoarding strategies such as the use of short-time work and other measures to reduce working time and wage costs. However, our results suggest that after matching there are no significant differences in the response of the statistical twins to the crisis. Thus, we have to reject the hypothesis that recruitment problems were a major reason for the moderate response of German firms to the crisis.

Field of Research: Labour Market Economics

1 Introduction

International comparison reveals an astonishingly moderate response of the German labour market to the world-wide economic crisis. Although GDP shrunk by 4.7 percent in 2009, the labour market remained stable. Econometric forecasts would have suggested a decrease of employment by 1.5 million persons (Möller 2010a). In reality, employment decreased by only 5,000 persons. Obviously, the labour market response to the crisis differed completely from its response to previous recessions although these were by far not as severe as this crisis: Establishments in the most affected export sectors did not dismiss people as they would have done in the past. Instead, they hoarded labour in a dimension that has not been observed ever before: Flexible working time arrangement, among them publicly funded short-time work, allowed for a reduction of working hours per employee by 3.2 percent in 2009. Moreover, productivity per working hour was reduced for the first time in German economic history.

What were the reasons for this unique response to the crisis? Why did employers change their opinion on dismissing workers? Or, macroeconomically speaking, why did labour demand behave differently from previous recessions?

Two main strands of argumentation arise so far. Both of them focus on the situation within the companies at the onset of the crisis. The first argument underlines that

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especially the export branches had profited from the economic expansion that took place before the crisis. They had raised productivity per hour enormously and had already expressed difficulties in finding enough qualified workers (Möller 2010b). Thus, they had space to relax productivity and they feared high costs of re-hiring people as soon as the next expansion would approach. The second argument relies on the longer-lasting overlay of structural and business cycle effects on the labour market (Blanchard 1997; Landmann & Jerger 1993). According to this view, the starting conditions of companies into the crisis were different than in previous recessions because the largest social and labour market reforms in German post-war history had been implemented between 2003 and 2005 (for a short overview see Klinger & Rothe 2010). The change of labour market institutions contributed to a wage moderation and higher readiness of the unemployed to make concessions. This has led to higher labour market dynamics (Fahr & Sunde 2009) and a lower NAIRU (SVR 2008). The German labour market is still adjusting to its new equilibrium (Boysen-Hogrefe et al. 2010; Gartner & Klinger 2010). Thus, as another explanation for the moderate labour market response to the crisis, the structural improvement on the labour market has buffered the business cycle drop.

This paper contributes to a microfoundation of the macroeconomic debate on the reasons for the German job miracle. We concentrate on one aspect of the above mentioned arguments and investigate whether recruitment difficulties faced at the onset of the crisis can be identified as an important reason for labour hoarding.

To answer this question is interesting from the entrepreneurial as well as the political point of view: If labour shortage was an important determinant of labour hoarding, a few conclusions and new questions arise: First, the mismatch in the German labour market would have reached a severe dimension. If so, the public employment service would have to improve close-to-the-market training and re-placement of the unemployed. Second, firms would have to re-think their hiring-and-firing decisions generally and provide more on-the-job-training. Third, public policy would have to re-arrange the educational system. Fourth, it is not clear how far the public promotion of short-time work prompted employers to keep workers. Moreover, the verification or falsification of the labour shortage – labour hoarding hypothesis gives a hint on the future reaction of the labour market to a comparable crisis. The demographic development rather indicates a decrease in labour supply – thus making the experience of labour shortage even more probable in the future. If labour shortage has already been an important reason for labour hoarding, one could hope the labour market will survive the next recession similarly well. If other explanations hold, mainly the institutional change to which the labour market will have adjusted one day, one must not misconceive that the business cycle component of (un)employment will still be overlapped during the next recession.

The remainder of the paper is organized as follows: The next section goes through the literature of labour hoarding to find out about labour shortage as one reason from the theoretical point of view. The third section presents some descriptive results from the German Job Vacancy Survey that can be interpreted either in fond of or against the labour shortage – labour hoarding hypothesis. After a description of our sample from the German Job Vacancy Survey in the fourth section we introduce our analytical tool in the fifth section: We use a propensity score matching approach to identify statistical twins that differ with respect recruitment problems. Afterwards, the

results of the econometric analysis are presented and interpreted. The final section summarizes and draws some conclusions.

2 The Theoretical Basis of Labour Hoarding

In principle, labour hoarding comes into play through two channels: the reduction of working hours per employee and / or the reduction of productivity per hour. Hamermesh (1993), for instance, defines labour hoarding “a less than proportionate decrease in worker hours in response to a negative demand shock”. Thus, despite a downturn in economic activity, companies adjust their workforce less than proportionately but the staff works less hours and / or less intensively.

As an explanation, Bentolila & Bertola (1990) apply the real options theory of investment under uncertainty and irreversibility to the firing decision of the firms. When firms face a downturn in economic activity but are uncertain about its duration and size, there is a value of waiting before exerting the option and downsizing the workforce. In other words: Firms decide to keep workers as long as the expected discounted present value of the costs of keeping is lower than the sum of lay-off costs and the expected discounted present value of future hiring and training costs. Due to uncertainty, this decision is not trivial, and it pays for the firm to wait and see.

Bentolila & Bertola (1990) primarily focus on lay-off costs in sclerotic labour markets. However, in the context of labour hoarding during the economic crisis lay-off costs do not seem to be the most important factor because (1) institutions have changed meanwhile and (2) the dimension of labour hoarding is extraordinary in comparison to previous recessions when the German labour market was sclerotic indeed (Möller 2010a). In our case, the potential costs related to (delayed) hiring after the crisis seem to be more relevant, among them search costs, opportunity costs in case of lack production because of too few workers, especially with firm- or product-specific human capital that the firm lost when it dismissed people, and training costs (Horning 1994; Seth & Aggarwal 2001).

These issues gain even more importance as the potential labour force has been shrinking since 2006 for demographic reasons. In 2008 alone, labour supply decreased by 100,000 people (Fuchs et al. 2010). Within the next ten years, the reduction of labour supply will substantially speed up as the baby-boomers will retire. Firms surely know about this development but their expectations on future labour shortage due to a lower labour supply cannot be included into the analysis because we are lacking data on expectations. However, the experienced difficulties at the end of the previous expansion might also have prompted employers to re-assess the costs of re-hiring persons, especially those who are high-qualified and offer firm-specific knowledge and skills.

Although labour shortage might induce adjustment costs that justify labour hoarding from a theoretical point of view, one should bear in mind that labour shortage is usually not considered a permanent consequence of labour supply decreasing due to demographic reasons (Freeman 2007). In the medium run, firms will adjust to recruitment problems by re-shaping their organizational and production processes. This strategy will also include a change in the wage structure. However, in the short run – which is the perspective of this paper – labour shortage can occur if firms do

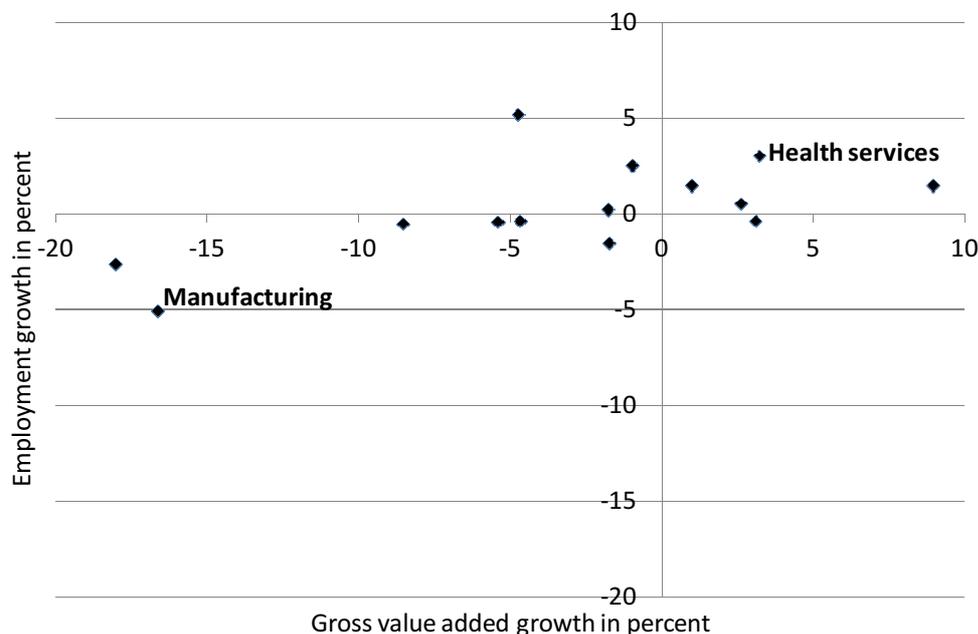
not properly anticipate duration and costs of recruitment, especially in an economic expansion when competition for workers is tight.

Thus, from the theoretical perspective, there are arguments in fond of and against the labour shortage – labour hoarding hypthesis. The next chapter reveals that the same is true empirically when we take a first look at the data.

3 Labour shortage and labour hoarding – a first look at the data

A first idea of the driving forces for the moderate response of the German labour market to the crisis is given by an analysis on the sectoral, or branch, level. On the one hand, service sectors such as health services and education were hardly affected by the crisis. They went on hiring people, usually female part-time workers. On the other hand, export industries were affected severely. Real gross value added in the manufacturing sector including the metal industry, machinery, or chemical products had shrunk by more than 20 percent between the second quarter of 2008 and the first quarter of 2009 (the yearly average in 2009 is given in Figure 1). However, employment in those sectors was far less down-sized than the drop in production would have suggested. Thus, those sectors are most promising to be the ones where labour hoarding was a widely used strategy.

Figure 1: The development of gross value added and employment by sector in 2009

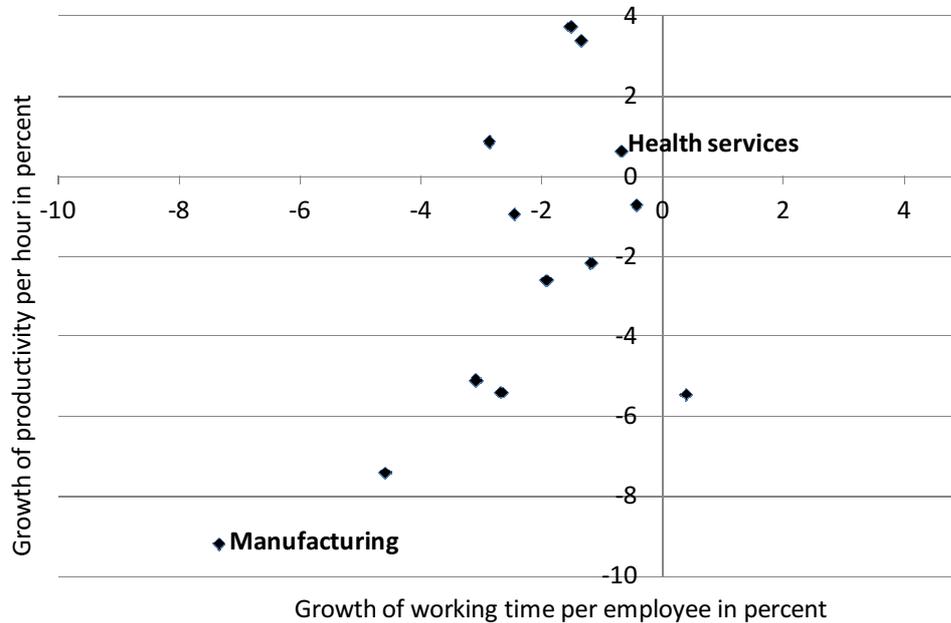


Source: Destatis.

Figure 2 gives an overview of the development of working time per employee and productivity per working hour – which have been outlined as the two channels of labour hoarding before. Indeed, the sector of manufacturing lies in the lower left corner of Figure 2. Thus, firms in those sectors took advantage of both channels at the same time. Moreover, the share of short-time workers in all employees was highest in manufacturing: In 2009, on average 12.1 percent of employees in

manufacturing worked short-time, whereas this ratio was only 0.7 percent in service sectors and 3.2 percent on average.

Figure 2: The development of working time per employee and productivity per hour by sector in 2009



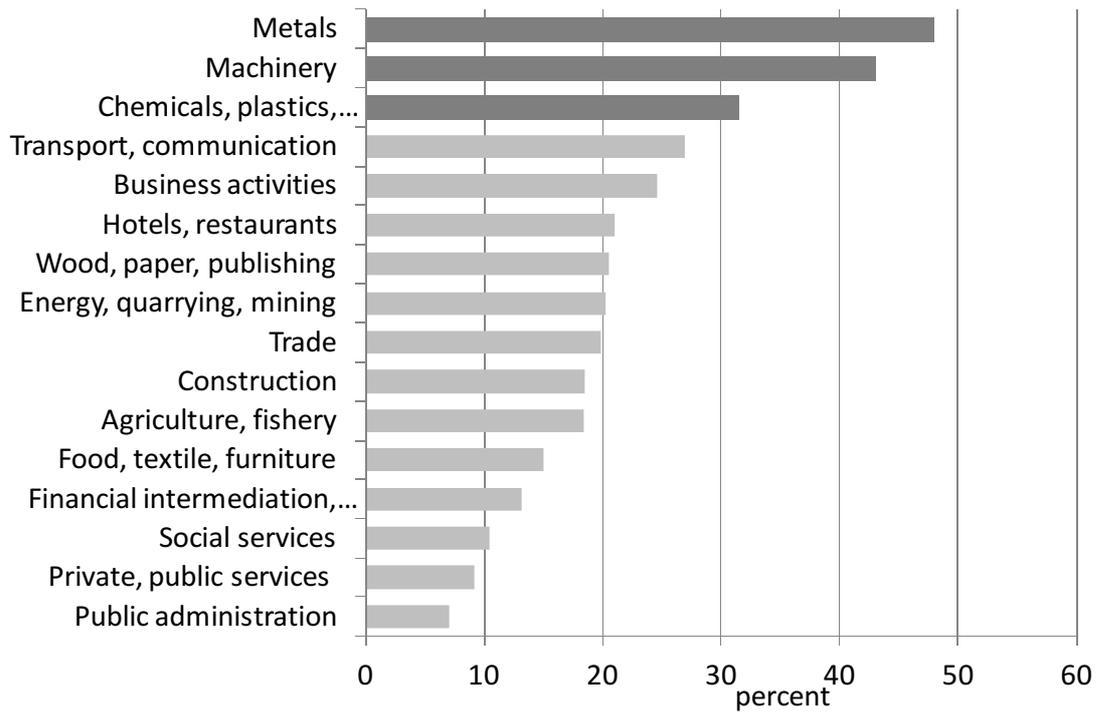
Source: Destatis, IAB, own calculations.

To observe whether or not exactly the sectors that hoarded labour were the sectors that were plagued by recruitment problems we may employ a unique dataset, the German Job Vacancy Survey that is described in the next section. Establishments report the channels and duration of staff search and whether they faced problems while recruiting. The answers can be used to gain information about experienced labour shortage although no question directly deals with the word and none of the indicators perfectly mirrors all facets of labour shortage.

For the purpose of this paper we focus on four indicators: the share of hard-to-fill vacancies, the share of firms that could not exploit their economic opportunities due to lacking qualified staff, the share of firms that had difficulties with filling a vacancy, and the share of qualified applicants on a vacancy. Figures 3 to 6 show that again the sectors of metal, machinery and chemical products rank first in the categories that shall reflect labour shortage.¹

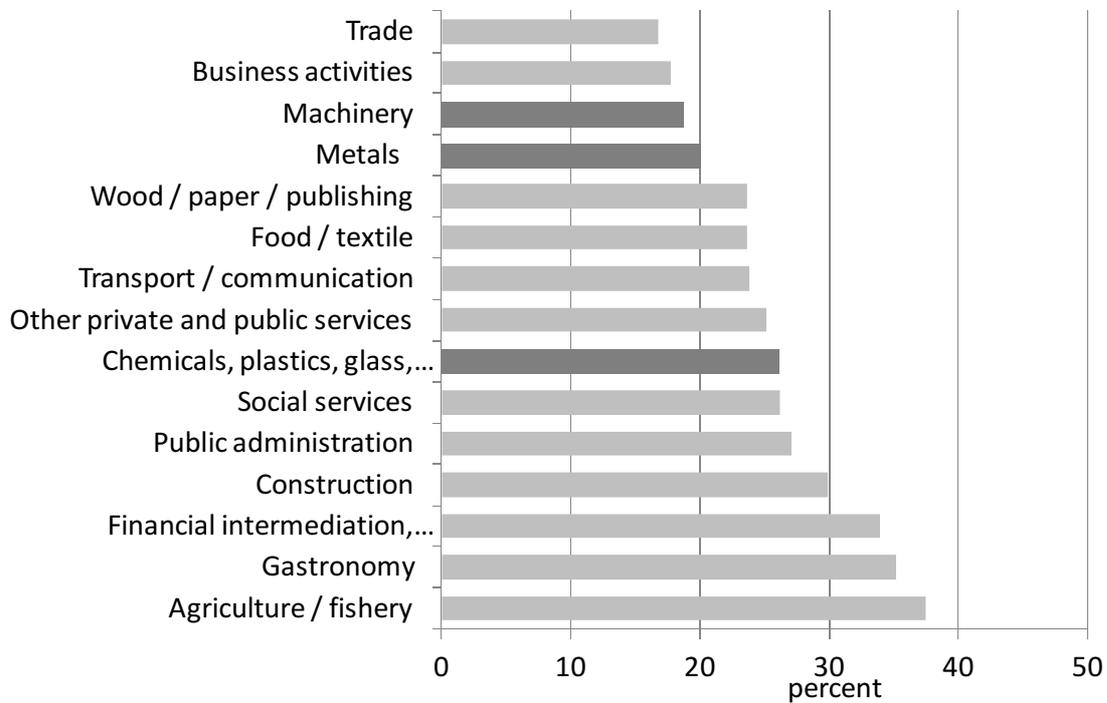
In summary, the coincidence of labour shortage within some sectors and labour hoarding within the same sectors is the empirical basis to suggest that the two form a relationship and recruitment problems might have prompted firms to hoard labour during the crisis – given that they anticipated the comparatively short duration of economic downsizing.

Figure 3: The share of hard-to-fill vacancies by sector in 2008



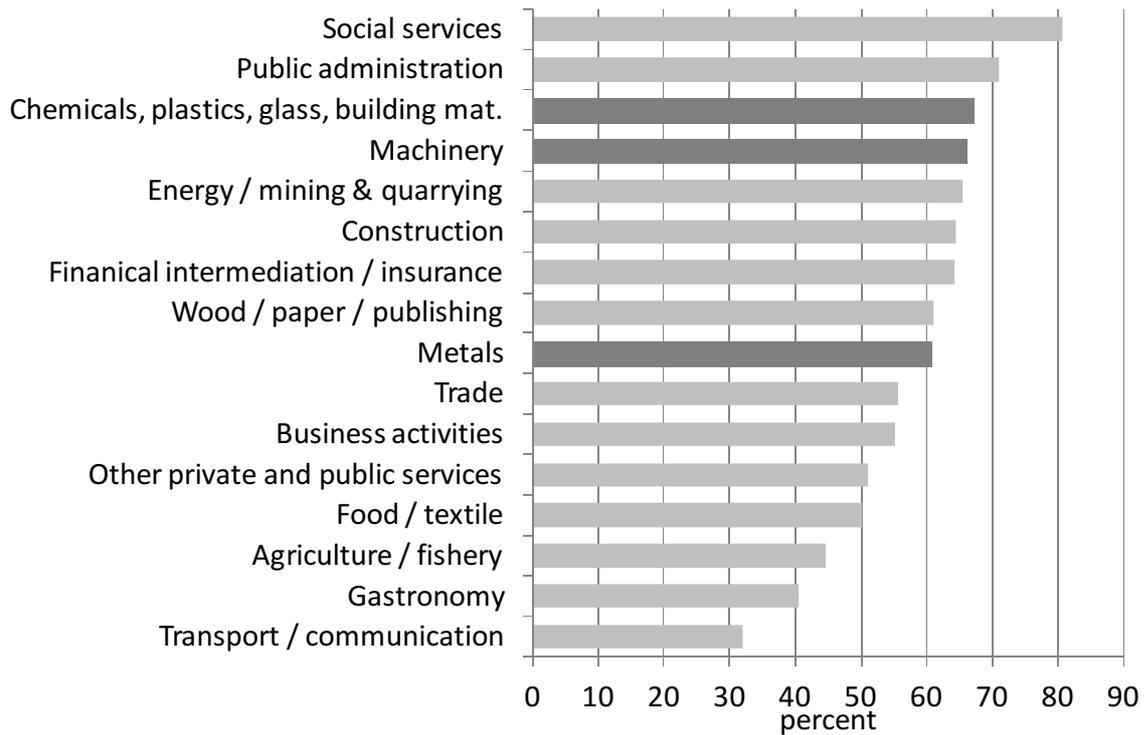
Source: German Job Vacancy Survey, 2008.

Figure 4: The share of suitable applicants on a vacancy by sector in 2008



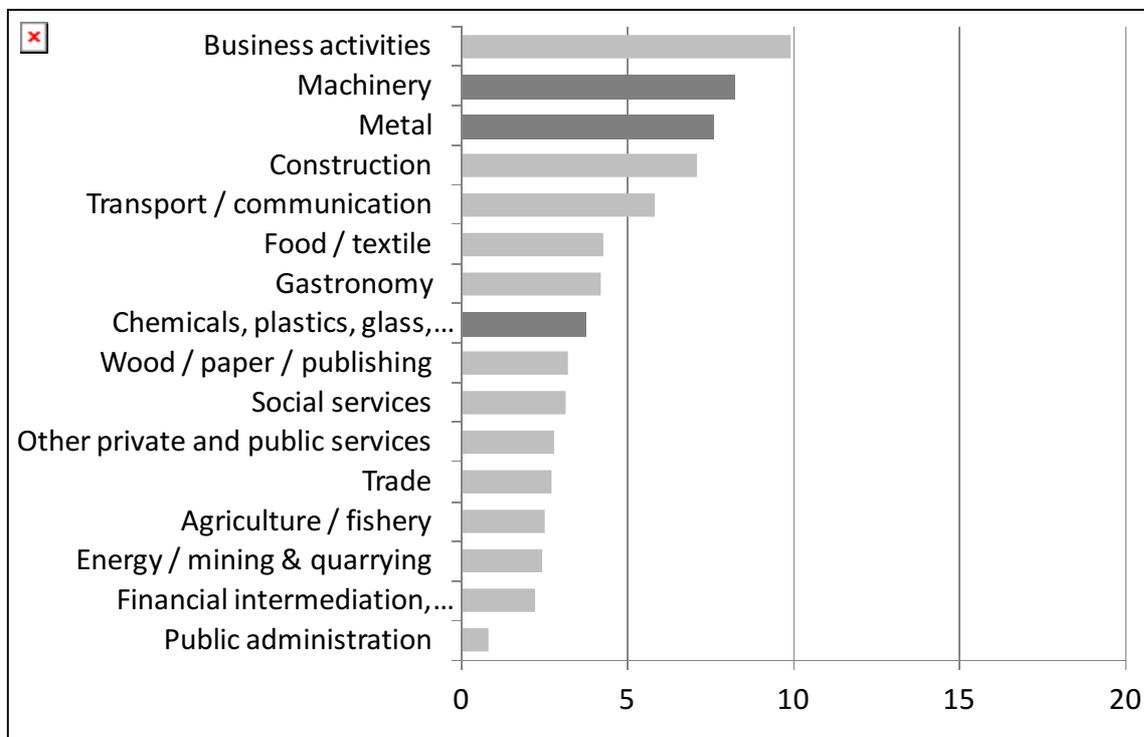
Source: German Job Vacancy Survey, 2008.

Figure 5: The share of firms that experienced difficulties in the recruitment process due to a lack of suitable applicants by sector in 2008



Source: German Job Vacancy Survey, 2008.

Figure 6: The share of firms that could not fully exploit their economic opportunities due to a lack of qualified workers by sector in 2008



Source: German Job Vacancy Survey, 2008.

However, a longitudinal analysis (Gartner & Klinger 2010) raises doubt regarding any causal relationship of labour shortage and labour hoarding: Indicators that can be observed back to the end of the new-economy-boom in 2001 reveal that firms did not face more recruitment problems during the last expansion at the onset of the crisis than during the expansion before in the onset of a normal recession. The share of firms that could not exploit their opportunities due to a lack of qualified workers was not only lower on average but also in the sectors relevant for this study, namely metals and machinery. However, it almost doubled in the chemical branch. In other words: although GDP fell much sharper and experienced labour shortage was probably not higher than a business cycle before, we observed labour hoarding in a previously unknown dimension during the economic crisis. The following econometric analysis shall disentangle the contradictory descriptive results. To do so, we first have to take a closer look at the data from the German Job Vacancy Survey.

4 The sample from the German Job Vacancy Survey

The main purpose of the German Job Vacancy Survey is to provide quarterly data on the number and structure of vacancies. Since 1989, up to 15,000 establishments take part in the survey. A stratified random sample of establishments is drawn in the fourth quarter of each year. The strata are defined by plant-size, region, and sector. A sub-sample of these firms is drawn to give information in every of the subsequent three quarters, that is quarters 1 to 3 of the following year. For the number of firms that answer in every quarter, we observe a balanced panel of $T=4$. In the following fourth quarter a new sample is drawn.

For the purpose of this study we use the panel between 2008q4 and 2009q3 because this time span covers the economic crisis best. During these four quarters, $N=8,000$ establishments took part in the survey.

In the fourth quarter questionnaire, establishments are registered with their information on the economic sector, firm size, or location of the firm. Moreover, all information on recruitment problems is collected in the fourth quarter. The related questions (see again Figures 3 to 6) were answered by $N=3,475$ establishments. They refer to the previous 12 months. Thus, the indicator of labour shortage refers at least to the whole year of 2008 when the economic upswing turned into the crisis. In the estimations we even considered that labour shortage in 2008 might have been a result of labour market developments during the upswing. We therefore control for covariates some of which refer to the years 2005 to 2008.

Whether or not an establishment faced recruitment problems is coded by a dummy variable LS . It takes the value of one if the firm fulfills one of the four criteria given in Figures 3 to 6:

$$LS = \begin{cases} 1, & \text{if} \\ & \text{or} \\ & \text{or} \\ & \text{or} \\ 0, & \text{else} \end{cases} \begin{cases} \text{there were hard-to-fill vacancies (dummy} = 1) \\ \text{firm could not exploit all economic opportunities due to lack of qualified workers} \\ \text{firm had difficulties to fill the last vacancy} \\ \text{share of suitable applicants to the last vacancy} < 10 \text{ percent} \end{cases}$$

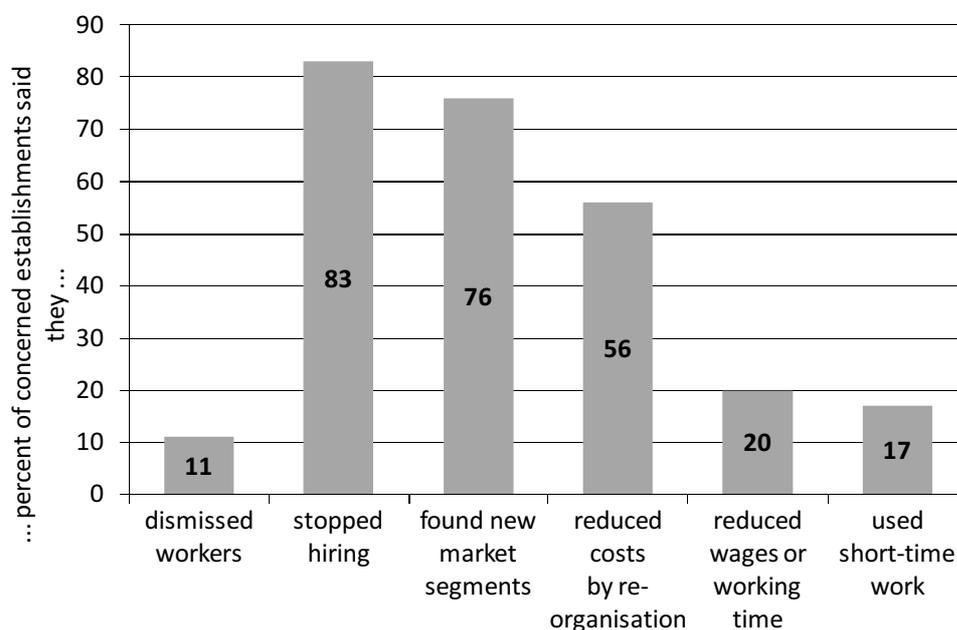
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The “or”-combination offers a very broad definition of labour shortage. However, even the combination of two criteria would have reduced the number of firms facing recruitment problems from $N_{LS}=825$ to $N_{LS}=78$. The shares of just 23.7 or 2.2 percent of firms facing labour shortage in our sample reveal that it might have been not wide-spread enough to explain labour hoarding of a macroeconomic dimension. However, in order to have enough variance in the econometric analysis, we stick to the broad definition.

For the number of 3,475 establishments including those 825 with some experience of labour shortage we can observe the development of employment during the first three quarters of 2009. We compare – other things being equal – whether employment in establishments that already suffered from labour shortage was significantly more stable than employment in other establishments.

Moreover, in the second quarter of 2009 firms were additionally asked whether they are affected by the crisis ($N_{affected}=1,447$) and how they react to this challenge. The answer categories and their occurrence are given in Figure 7. Thereby, the categories “reduction of wages” and “reduction of working time” do not only include establishments that had already reduced wages or working time by the second quarter 2009 but also those establishments that were planning or negotiating accordant reductions.

Figure 7: Establishments' reactions to the crisis, in percent



Source: German Job Vacancy Survey, 2009q2. Multiple answers possible.

Among these categories, the most comprehensible indicators of labour hoarding are not to dismiss workers but to reduce working hours (independent of short-time work) and / or wages, and to use short-time work. The aim of the econometric analysis is to compare firms that differ only with respect to their experience of labour shortage with regard to their behaviour in the crisis. If firms suffering from labour shortage

dismissed workers with a significantly lower probability or used short-time work or other ways of reducing working time with a significantly higher probability than firms lacking labour shortage experience, then those recruitment problems could be assumed to have been an important reason for labour hoarding.

5 Methodology of Propensity Score Matching

In order to test the labour shortage – labour hoarding hypothesis empirically, we ought to compare firms that actually are comparable. Therefore, we use a two-step procedure which is widely known as a micro-econometric evaluation technique. Very often, treatment effects of measures of active labour market policy are estimated (e. g. Heckman, Ichimura & Todd 1997). However, empirical examples can be found elsewhere, too, since the nature of treatment can be diverse. Davies & Kim (2009), for example, apply the methodology to firms, taking a certain stock exchange listing status as treatment.

In our study, treatment is the experience of recruitment problems in 2008. This qualitative variable is expressed as a (0,1)-dummy variable LS . Thus, predicted values should lie within the range of 0 and 1. To ensure this restriction, in the first step one can either apply a probit or a logit model that determines the probability of a firm to have experienced labour shortage. Whereas probit models rely on a cumulative normal distribution, logit models are based on a logistic distribution function. Both approaches are similar, but logit models are more common because they are easier to estimate and the logistic probability distribution has larger probability masses at its margins than the normal distribution, which assists robust statistics (Kennedy 2003)

In the second step, we estimate treatment effects of labour shortage. In our case, a treatment effect is the labour hoarding decision of a firm in 2009 which can be seen in the usage of short-time work, wage or working time reductions, dismissals, and employment change. We use a matching approach here in order to find groups of firms with and without recruitment problems that are similar in all other relevant characteristics. Afterwards we compare their outcomes, Y , with respect to labour hoarding. This approach controls for selection on observables, X . Thus, differences between the outcomes of those firms with recruitment problems and the matched controls are not due to differences in observed characteristics that affect outcomes.

Our target variable, the average treatment effect on the treated (ATT) is defined as

$$(1) \tau_{ATT} = E(\tau|LS = 1) = E[Y(1)|LS = 1] - E[Y(0)|LS = 1]$$

$Y(1)$ represents the outcome with labour shortage and $Y(0)$ without labour shortage. As written above, $LS=1$ and $LS=0$ indicate whether labour shortage occurred or not. The ATT is the difference between the expected outcome of labour shortage firms when they experienced labour shortage and the expected outcome of the same firms when they did not experience labour shortage (the counterfactual). However, the latter outcome is not observable since each firm either did or did not experience labour shortage. Consequently, we have to match such a firm to a control group.

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We use propensity score matching proposed by Rosenbaum & Rubin (1983). Our propensity score $p(X)$ is the probability of having experienced labour shortage, predicted from the estimation of the logit model in step 1.

The use of a control group for the counterfactual outcome is denoted by $E[Y(0)|LS=0]$. It is only permissible if the assumption of unconfoundedness (Rosenbaum & Rubin 1983) or, in other words, the Conditional Independence Assumption (CIA: Lechner 1999) holds. The idea is that the treated group and the control group are interchangeable only if – conditional on appropriate covariates – it is random which group a firm actually belongs to. In technical words: after controlling for the covariates, the potential outcome must be independent from the assignment to the treatment. Since we are only interested in estimating the ATT, the weak version suffices (Caliendo & Kopeinig 2008). Then outcome without treatment must not depend on the assignment to treatment given the propensity score.

$$(2) Y(0) \perp LS | p(X)$$

For the CIA to hold it is important to control for the relevant factors that simultaneously influence the treatment (LS) and the outcome (Y) in the logit model of step 1. Since the market environment plays an important role for the firms' decisions, it is much harder to control for all potential factors than in matching models for participants of active labour market policy. Davies & Kim (2009) suggest matching by market capitalization and share prices. However, neither does our treatment effect merely belong to the financial sphere nor does the German Job Vacancy Survey provide financial information about the firms. We therefore focus on the following variables to capture as much of a firm's situation as possible (Table 1). After all, we are confident that the assumption of unconfoundedness holds.

Table 1: CIA control variables in the logit model

Variable shall characterize	Variable	Comment
situation of the firm	dummy variables by firm size group	firm size
	share of temporary agency workers	potential to adjust externally
	full-time ratio	potential to adjust internally
	share of workers doing qualified tasks	potential to lose human capital when firing
	churning rate	re-structuring / re-organizing --> dynamic firm
situation of sector and region	R&D expenditure between 2006 and 2008	innovative branch
	dummy variables by sector	
labour supply in the region	trainees per 100,000 inhabitants	easiness to find appropriate candidates
	students (mostly university and university of applied sciences) per 100,000 inhabitants	
business cycle by region	GDP growth by region, 2008	degree of concernment by upswing - crisis
	unemployment rate (change 2005 on 2008)	
	labour market tightness (change 2005 on 2008)	

Source: own selection.

Beyond unconfoundedness, common support or overlap has to be ensured: Firms of the same characteristics have to have a positive probability to belong to both groups,

the treated and the non-treated. If a set of characteristics would exclusively assign a firm to just one of the groups, the matching process would never succeed as statistical twins would never be found. The common support assumption was proved graphically for our model.

Under the assumptions of unconfoundedness and common support the estimator of the ATT can be written as the difference in expected mean outcomes of the groups that were found by propensity score matching:

$$(3) \tau_{ATT}^{PSM} = E_{p(X)|LS=1} \{E[Y(1)|LS=1, p(X)] - E[Y(0)|LS=0, p(X)]\}$$

6 Results

6.1 The Experience of Labour Shortage in a Logit Model

The logit model was clustered by regions (Federal States) to account for regional specialties. Moreover, the data was filtered: Only establishments that said they were affected by the crisis were included into the estimation. This restriction, too, shall ensure that we do not disturb the comparison of firms by external factors: If firms were not even hit by the crisis they certainly have a higher probability of a stable employment development. The results of the estimation of the logit model are given in Table 2.

Table 2: Logit results for the probability of having faced recruitment problems

Logistic regression				
dependent variable: labour shortage (Dummy=1)				
N = 832				
		coefficient	standard error	prob
firm characteristics	establishment size 1-9	-1.1916	0.2677	0.000
	establishment size 10-49	-1.1114	0.1853	0.000
	establishment size 50-249	-0.9126	0.1821	0.000
	establishment size 250-	(omitted - reference category)		
	share of temporary agency workers	0.0020	0.0012	0.097
	full-time ratio	-4.1296	1.6198	0.011
	full-time ratio squared	3.3486	1.1430	0.003
	share of workers doing qualified tasks	0.0062	0.0022	0.005
	churning rate	0.5375	0.2443	0.028
sector characteristics	R&D expenditure growth	-0.0011	0.0003	0.000
	sector agriculture & fishery	0.5173	0.5229	0.322
	sector manufacturing	0.3632	0.3905	0.352
	sector construction	0.3857	0.5492	0.483
	sector trade, gastronomy, transport	0.5192	0.4427	0.241
	sector financial intermediation / insurance	0.9512	0.3729	0.011
	sector private, public, social services	(omitted - reference category)		
labour supply	trainees	0.0005	0.0002	0.014
	students	-0.0159	0.0119	0.176
economic situation by region	GDP growth	-0.5029	0.1172	0.000
	unemployment rate growth	-0.0006	0.0127	0.960
	labour market tightness growth	-0.0040	0.0013	0.003

Source: own estimations.

The firm-specific variables reveal which firms actually faced the problem of labour shortage: First, large firms were probable to experience labour shortage. The smaller the establishment, the less likely labour shortage was in comparison to the reference category of firms with more than 250 employees. Second, firms with a higher share of temporary agency workers were probably more affluent firms and thus were affected more by labour shortage. Third, firms with a high share of qualified tasks ran into recruitment problems. Fourth, establishments that had a high churning rate and, thus, were very dynamic regarding labour market transactions, had a higher probability of difficulties. Finally, firms with a higher full-time ratio faced less labour shortage although one could have expected that these firms would have less potential to adjust working time as soon as recruitment problems occur. Leastwise, the negative effect diminishes when we consider the square of the full-time ratio.

Regarding economic sectors, the financial branch is the only one that has a significantly higher probability of labour shortage experience than the reference

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category private, public & social services. This result is not straightforward since the descriptive results depicted larger problems in the export industries. This finding raises doubt whether the labour shortage – labour hoarding hypothesis will hold.

Variables on labour supply have only limited influence. The fewer students there are in a region, the more probable labour shortage will be. However, this influence would only be significant at the 17 percent level. The relationship between trainees and labour shortage is significant but only very slight and negative.

Among the business cycle variables GDP growth and labour market tightness play an important role. Both of them show a negative sign: A relaxation of GDP growth and labour market tightness would increase the probability of labour shortage. This might account for the dynamics and time lags between the upswing, labour shortage experience according to the data, and the crisis.

6.2 Estimated Effects of Having Faced Recruitment Problems on the Labour Hoarding Behavior

Based on the results of the logit estimations a propensity score is predicted and establishments are matched to each other on the basis of the nearest propensity score. The matching of the firms works appropriately. In most cases, the matching bias for each single variable is lower than 10 percent and very often lower than 5 percent. Thus, it lies in the range recommended by Caliendo & Kopeinig (2008).

The estimated average treatment effects on the treated, however, mainly reject the labour shortage – labour hoarding hypothesis (Table 3). Firms that suffered from labour shortage in 2008 used short-time work, other working-time reductions as well as wage reductions more often to respond to the economic crisis. However, none of the differences to the control group is significant. Thus, recruitment problems cannot be appreciated as having been an important reason for labour hoarding.

Unexpectedly, firms that suffered from labour shortage were more likely to dismiss workers and, consequently, had a less stable employment development than controls – even though we have controlled for being affected by the crisis. These findings are not significant at the 5 percent level either, still they contradict the idea of the labour shortage – labour hoarding hypothesis. Maybe, the explanation is in a gradual concernment by the crisis which we cannot control for. Firms that suffered from labour shortage might have been hit by the crisis very intensively. As a consequence, they could not only rely on internal adjustment strategies but also had to lay-off workers.

Table 3: Average treatment effects on the treated: effects of recruitment problems on labour hoarding

indicator of labour hoarding	mean of treated	difference to mean of controls	standard error	t-value
short-time work	0.4473	0.0084	0.0457	0.18
other working time reductions	0.1139	0.0084	0.0288	0.29
wage reductions	0.1737	0.0212	0.0341	0.62
dismissals	0.2236	0.0633	0.0361	1.75
employment change	0.0042	-0.0250	0.0212	-1.17

Source: own estimations.

7 Summary and Conclusions

The export-oriented German economy was severely affected by the world-wide economic crisis. However, employment remained stable not only because service sectors kept on hiring but also because manufacturing firms did not lay-off workers in the same dimensions as production decreased. Instead, working time and labor productivity were reduced heavily.

This paper contributed to the micro-foundation of the labour hoarding observed at the macroeconomic level. We focus on one aspect under discussion, namely that experienced labour shortage might have prompted firms not to dismiss workers because they fear high recruitment, training and opportunity costs once the economy recovers. Using a unique representative establishment survey, we test the labour shortage – labour hoarding hypothesis empirically. Our econometric basis is a propensity score matching approach which allows us to compare statistical twins that only differ with respect to recruitment problems in 2008.

According to the empirical results, we have to reject the labour shortage – labour hoarding hypothesis. Labour shortage firms and their matched controls did not differ significantly with respect to their response to the crisis: Establishments that had experienced labour shortage in 2008 were not significantly more likely to use short-time work and implement, plan or negotiate on other working time or wage reductions than their non-labour shortage counterparts. Neither did those firms lay-off workers with a significantly lower probability. And their employment was approximately as stable over the crisis as that of the non-labour shortage firms.

The concurrence of the results regarding different labour hoarding strategies underlines the robustness of rejecting the hypothesis that recruitment problems might have induced the use of short-time work and other adjustment policies. Nevertheless, there are some limitations to our study that might have influenced the results. For instance, the data structure does only allow for information on the establishments and their recruitment experience in 2008 even though the upswing and recruitment problems might have been more pronounced in the years 2006 and 2007. Moreover, firms might take into account expectations on future recruitment costs. Expectations, however, cannot be controlled for in our study.

As a consequence of the rejection of the labour shortage – labour hoarding hypothesis, other arguments to explain the massive labour hoarding in the crisis gain more importance. For instance, labour market institutions might have been underexposed so far. It seems to be more plausible that the German miracle was caused by a uniquely German event: the implementation of severe labour market reforms between 2003 and 2005 that induced an adjustment process of the capital stock and labour demand which is still under way.

Endnotes

¹ Latest data according to the System of National Accounts is only available at the level of manufacturing but not further detailed as for the production/preparation of metals, machinery, chemicals, automobiles. Those four subdivisions account for nearly 60 percent of total gross value added in manufacturing. In the Job Vacancy Survey these sectors are well represented but other sectors have to be observed as aggregates if there are too few observations to analyse them separately.

References

- Blanchard, OJ 1997, 'The medium run', *Brookings Papers on Economic Activity*, vol. 28, no. 2, pp. 89-158.
- Boysen-Hogrefe, J, Groll, D, Lechthaler, W & Merkl, C 2010, 'The role of labor market institutions in the great recession', *Applied Economics Quarterly Supplement*, vol. 56, no. 61, pp. 65-88.
- Caliendo, M & Kopeinig, S 2008, 'Some practical guidance for the implementation of propensity score matching', *Journal of Economic Surveys*, vol. 22, no. 1, pp. 31-72.
- Davies, RJ & Kim, SS 2009, 'Using Matched Samples to Test for Differences in Trade Execution Costs', *Journal of Financial Markets*, vol. 12, no. 2, pp. 173-202.
- Fahr, R & Sunde, U 2009, 'Did the Hartz Reforms speed-up the matching process? A macro-evaluation using empirical matching functions', *German Economic Review*, vol. 10, no. 3, pp. 284-316.
- Fuchs, J, Hummel, M, Klinger, S, Spitznagel, E, Wanger, S & Zika, G 2010, 'Prognose 2010/2011: Der Arbeitsmarkt schließt an den vorherigen Aufschwung an', *IAB-Kurzbericht 18/2010*, Nürnberg.
- Freeman, RB 2007, 'Is a great labor shortage coming? Replacement demand in the global economy', in Holzer, HJ & Nightingale, DS (Eds.), *Reshaping the American Workforce in a Changing Economy*, Urban Institute Press, Washington D. C, pp. 3-23.
- Gartner, H & Klinger, S 2010, 'Verbesserte Institutionen für den Arbeitsmarkt in der Wirtschaftskrise', *Wirtschaftsdienst*, vol. 90, no. 11, pp. 728-734.
- Hamermesh, D 1993, *Labour demand*, Princeton Univ Press, Princeton.
- Heckman, J, Ichimura, H & Todd, P 1997, 'Matching as an econometric evaluation estimator: evidence from evaluating a job training programme', *Review of Economic Studies*, vol. 65, no. 2, pp. 216-294.
- Horning, B 1994, 'Labour hoarding and the business cycle', *International Economic Review*, vol. 35, no. 1, pp. 87-100.

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- Jacobi, L & Kluge, J 2007, 'Before and after the Hartz Reforms: The performance of active labour market policy in Germany', *Zeitschrift für ArbeitsmarktForschung*, vol. 40, no. 1, pp. 45-64.
- Kennedy, P 2003, *A Guide to Econometrics*, Blackwell Publishing, Malden & Oxford.
- Klinger, S & Rothe, T 2010, 'The impact of labour market reforms and economic performance on the matching of short-term and long-term unemployed', *IAB Discussion Paper 13/2010*, Nürnberg.
- Landmann O & Jerger, J 1993, 'Unemployment and the real wage gap: A reappraisal of the German experience', *Weltwirtschaftliches Archiv*, vol. 129, no. 4, pp. 689-717.
- Lechner, M 1999, 'Earnings and employment effects of continuous off-the-job training in east Germany after unification', *Journal of Business Economic Statistics*, vol. 17, no. 1, pp. 74-90.
- Seth, VK & Aggarwal, SC 2001, 'Redundancy or labour hoarding: The experience of the Indian manufacturing sector', *Indian Journal of Labour Economics*, vol. 44, no. 4, pp. 709-726.
- Möller, J 2010a, 'The German labour market response to the crisis – de-mystifying a miracle', *Zeitschrift für Arbeitsmarkt- und Berufsforschung*, vol. 42, no. 4, pp. 325-336.
- Möller, J 2010b, 'Germany's job miracle in the world recession – shock-absorbing institutions in the manufacturing sector', *Applied Economics Quarterly Supplement*, vol. 56, no. 61, pp. 9-28.
- Rosenbaum, P & Rubin, D 1983, 'The central role of the propensity score in observational studies for causal effects', *Biometrika*, vol. 70, no. 1, pp. 41-55.
- SVR (Sachverständigenrat, Council of Economic Advisors) 2008, *Die Finanzkrise meistern - Wachstumskräfte stärken*, Jahresgutachten 2008/2009, Wiesbaden.