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The structure of hiring costs in Germany - evidence from firm-level data*

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Abstract

This paper analyzes the structure of hiring costs of skilled workers in Germany. Using detailed and representative firm-level data on recruitment and adaptation costs of new hires, we find that average hiring costs amount to more than 8 weeks of wage payments (4,700 Euros). The structure of hiring costs is convex, as an increase in the number of hires by 1% increases hiring costs by 1.3%. We find moderate effects of labor market institutions on the magnitude but none on the structure of hiring costs. Furthermore, we provide evidence in favor of monopsony power in the German labor market.

JEL Classification: J32, J63.
Keywords: Labor adjustment costs, hiring costs, search costs, adaptation costs

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1 Introduction

A firm continuously needs to hire new workers so that it can maintain or expand its production capacities. Hiring a new worker, however, may require a firm to spend considerable time and effort so that a new hire matches the specific job requirements. To fill a vacancy, a firm typically posts an advertisement in newspapers and on online job platforms or uses external advisors or placement agencies. Before making a final hiring decision, a firm needs to screen applications and invite a number of suitable job candidates for an interview. After signing a contract, new hires often need time to adapt to the specific environment of the firm. Thus a firm incurs adaptation costs resulting from a temporarily lower productivity. In addition, new hires may also take part in external firm-financed training activities during this adaptation period.

This paper analyzes the hiring costs of skilled workers in Germany, thereby adding to the literature in two ways: First, we quantitatively determine the size and structure of hiring costs. Second, we analyze the role of labor market institutions on hiring costs in Germany. We distinguish between the institution of worker representation at the firm level (i.e., works councils or other forms of representation) and the firm's coverage of collective bargaining agreements.

Our results show that the average hiring costs per new worker are substantial, averaging around 4700 Euros, and that they increase strongly by firm size. Furthermore, the structure of hiring costs is convex in the number of new hires. We find an elasticity of hiring costs with respect to the number of new hires equal to 1.33 (i.e., a 10% increase in hires increases average hiring costs by about 13.3%). We further find that worker representation in the firm is associated with a 33% increase in average hiring costs but with no effect on the degree of convexity of hiring costs. We also find no statistically significant effect on hiring costs for collective bargaining agreements.

Following Manning (2006), we can use our estimates to test for monopsony power in the German labor market. We provide empirical evidence in favor of monopsonistic labor markets, as a firm's labor cost function is positively associated with employment. Our results further allow us to obtain a rough estimate of an important benefit-component short-time

work policies (*Kurzarbeit*), a widely used instrument by German firms during the financial crisis to avoid extensive lay-offs of skilled workers. Our estimates suggest that the total value of firms' saved future hiring costs due to short-time work policies is estimated in the range of € 2 billion.

The remainder of the paper is structured as follows. Section 2 provides an illustrative model of hiring costs and discusses the relevant literature. Section 3 outlines the different labor market institutions in Germany. Section 4 describes our data sources and discusses the calculation of hiring costs. Section 5 presents the estimation strategy, the main empirical results and discusses the implications of our results for monopsonistic labor markets and the evaluation of short-time work policies. Section 6 concludes.

2 Relevant literature

Manning (2011) highlights the importance of understanding the structure of hiring costs in modeling labor market frictions in matching models (Mortensen and Pissarides 1994; Pissarides 2009). Convex hiring costs can explain why firms do not immediately adjust their workforce after experiencing a (positive or negative) productivity shock. However, the shape of hiring costs is still the focus of current debates in the literature. While many studies use indirect inference from hiring costs based worker flows (e.g., Caballero et al. 1997; Caballero and Engel 2004; Cooper and Willis 2004; Davis et al. 2006; Cooper and Willis 2009), direct empirical evidence is relatively scarce. Moreover, comparing the results of the empirical studies is difficult because the data are from different countries at different times, and estimated hiring costs are not based on the same methodology. Some studies find concave hiring costs with a fixed component (Abowd and Kramarz 2003 for France) or linear hiring costs (Kramarz and Michaud 2010 for France). Conversely, Dube et al. (2010) for the United States, Manning (2006) for the United Kingdom and Blatter et al. (2012) for Switzerland report evidence of a convex structure of hiring costs.

The shape of the hiring costs function depends potentially on both variable and fixed costs. While a large fixed cost component typically results in economies of scales in hiring,

diseconomies of scale arise if marginal hiring costs increase.[1]

Yashiv (2000) defines the hiring decision as an investment under uncertainty:

Firms maximize

$$\max_{N_t} \Pi = E_t \left\{ \sum_{k=0}^{\infty} \theta^k \left[F(N_{t+k}) - w_{t+k} N_{t+k} - f(H_{t+k}, N_{t+k}, w_{t+1}, I_{t+k}) \right] \right\} \tag{1}$$

subject to $N_{t+1} = (1 - s_t)N_t + H_t$. The firm's production function $F(N)$ depends on the number of employees N. We denote the wage w and the separation rate s, which is the percentage of employees leaving the firm every period. Future profits are discounted by the factor θ. The hiring costs function is $f(H_{t+i}, N_{t+i}, w_{t+1}, I_{t+i})$, depending on the number of hires H, on the number of employees N, the wage w and on labor market institutions I (which include collective bargaining agreements and worker representation at the firm level).

Following Manning (2011), we assume that total hiring costs C take the form

$$f(H_{t+k}, N_{t+k}, w_{t+1}, I_{t+k}) = C = H^{\alpha} N^{\beta} w^{\gamma} I^{\delta} \tag{2}$$

thereby accounting for the interdependence of hiring costs on the number of hires and the number of workers employed (i.e., the size of the firm). Hiring costs further depend on wages, because high-wage firms may be more attractive to job applicants (reducing hiring costs) and because interview costs and adaptation costs strongly depend on wages (increasing hiring costs). Finally, hiring costs depend on institutional arrangements in the firm, such as collective bargaining coverage or the presence of works councils.

While we are interested in the magnitude of the average hiring costs for filling a vacancy, another objective is to determine whether average hiring costs in Germany are increasing or decreasing in the number of hires.

Marginal hiring costs are given by

$$\frac{\partial C}{\partial H} = \alpha H^{\alpha - 1} N^{\beta} w^{\gamma} I^{\delta}. \tag{3}$$

As noted in Manning (2011), marginal hiring costs can be written in terms of average hiring costs.

[1] See Hamermesh and Pfann (1996) for a more detailed discussion of the literature.

From equation 2 we can derive average hiring costs to be

$$\frac{C}{H} = H^{\alpha-1} N^{\beta} w^{\gamma} I^{\delta}. \tag{4}$$

Thus, the relation between marginal and average hiring costs is given by

$$\frac{\partial C}{\partial H} = \alpha \frac{C}{H}. \tag{5}$$

In the following, we define average hiring costs $HC \equiv \frac{C}{H}$.

In equation 5, α determines whether average hiring costs increase or decrease in the number of new hires: if α is larger than 1, then that average costs for hiring increase, while for $\alpha < 1$, average hiring costs decrease in the number of hires. Before turning to the description of our data and the empirical analysis, we describe the relevant labor market institutions in Germany.

3 Labor market institutions

Unlike other countries, Germany has a specific framework for labor market institutions. Worker representation and collective bargaining agreements are embedded in an extensive legal framework, outlining the rights and duties of the particular institution. While the social partners in collective agreements usually focus on issues such as wages and working conditions, work councils handle both employment issues and individual grievances, and monitor the implementation of and compliance with collective bargaining agreements for the individual firm. Collective agreements are usually binding for firms that are members of employers' associations.[2] In contrast, worker representation in the form of a works council is initiated by the employees.[3] Only firms with five or more employees have the legal right

[2]Collective bargaining agreements are also binding for employees who are union members. However, in most cases, all employees are covered in a firm that is also subject to collective bargaining agreements. In a number of cases, collective bargaining agreements are binding for all firms in a certain industry, regardless of their membership in an employer's association.

[3]The establishment of works councils is often supported by members of unions inside or outside the firm.

to form a works council.[4]

A works council is a firm-specific entity of employees whose function is to represent - to the management - the interests of all employees in the firm. Works councils may affect hiring costs because employers must seek the approval of works councils in each hiring case. Works councils may review all job applications and may object if (a) the hiring procedure is not in accordance with legal or collective bargaining agreements, (b) the hiring may lead to a layoff of current firm employees, or (c) the person to be hired may be harmful to the business climate of the firm. When the works council raises an objection, the employer must appeal to a court to formally approve the hiring decision.[5]

A number of previous studies have analyzed the impact of worker representation and collective bargaining agreements on employment related indicators.Addison et al. (2004) and Frege (2002) provide assessments of theory and the early literature on the general economic consequences of works councils. More recently, Addison and Teixeira (2006) find a negative effect of works councils on employment growth, while Jirjahn (2010) reports positive employment effects when taking into account the endogeneity of works councils. Our aim is to analyze the relationship between labor market institutions and the costs of hiring skilled workers. We expect that worker representation at the firm level increases hiring costs because works councils have the right to participate in the hiring process and can object to the hiring of workers from the external labor market. Thus worker representation could directly or indirectly prolong the hiring process, making it in turn more costly for the firm. In addition, firms with works councils typically have lower labor turnover than firms without such institutions (Hirsch et al. 2010). Lower labor turnover increases a firm's training incentives and therefore the training costs for new hires, as the expected payoff period is longer compared to a firm without a works council.

We further expect that firms bound by collective bargaining agreements may have lower hiring costs due to a lower recruitment effort because wages are determined collectively, thereby making pay and safety negotiations redundant. As in the case of works councils,

[4]The *Works Constitution Act* (Betriebsverfassungsgesetz, 1972) formulates the conditions and procedures for the implementation of a works council.

[5]These rules, however, apply only to firms with more than 20 employees. We thus also present the results of our analysis for a subsample of firms with 21 to 100 employees.

employers may have stronger incentives to invest in formal training and on-the-job training for new hires (Gerlach and Stephan 2008), thereby increasing the adaptation costs of a new hire. As both recruitment and adaptation costs are components of the overall hiring costs, determining which of the two opposing effects of collective bargaining agreements is stronger remains an empirical question.

In the following section we first describe the data sources for our analysis and then provide some descriptive statistics on hiring costs.

4 Data and descriptive statistics

4.1 Data

For our analysis we use information on the hiring costs for skilled workers, that are part of the 2007 BIBB Cost-Benefit Survey data (BIBB CBS). The field work of the BIBB CBS was conducted by *infas* Institute for Applied Social Sciences in Bonn (Germany) in the period of April to August 2008.[6] The survey contains detailed questions on the recruitment and adaptation component of the hiring process. Recruitment costs include costs associated with advertising vacancies, and preparing, conducting, and evaluating interviews with job applicants. Adaptation costs arise because newly hired workers are initially less productive than the more experienced workers in the firm. Moreover, the survey measures training costs for newly hired workers, accounting for both direct and indirect (time away from workplace) training costs.[7]

The sample of the BIBB CBS was drawn from the administrative register for all German firms subject to social benefit contributions for at least one employee. As such, the data are representative of German firms with at least one employee. Self-employed workers and sole proprietorships are not part of the register and are consequently excluded. However, for our analysis, we exclude firms that have fewer than five workers because we are interested in analyzing the potential effects of labor market institutions on the structure of hiring

[6]For more information about methods of data collection, see Schröder and Schiel (2008).

[7]For the exact phrasing of the questions, see Table A.11.

costs.[8] Because employees in firms with fewer than five employees have no legal right to establish a works council, we do not include observations of these firms.[9] Thus, our final sample consists of 1001 firms that recruited skilled workers in the previous three years. The descriptive statistics for the sample is provided in Table A.1.

4.2 Calculation of hiring costs

The hiring costs of a skilled worker for firm i are given by the sum of recruitment and adaptation costs, which are measured in the survey as an average over all skilled workers hired in the period of the last three years. First, average recruitment costs RC_i are given by

$$RC_i = v_i + j_i + e_i \tag{6}$$

where v_i are the average costs for job postings and j_i are average costs to prepare, conduct, and evaluate interviews with job candidates. Finally, we denote the costs for external advisors or placement agencies by e_i.

Second, we consider average adaptation costs AC_i that arise because a new hire is not initially fully productive. AC_i is given by

$$AC_i = \sum_{m=1}^{M_i} w_i(1 - p_{mi}) + (DC_i + IC_i) \tag{7}$$

where the first term on the right-hand side corresponds with the value of the production loss during the adaptation period. The survey contains information about the relative productivity p_i $(0 \leq p_i \leq 1)$ of a new hire compared to an average skilled worker in the firm (same occupation) and the duration of the productivity gap (M_i).[10] Thus, the difference in relative productivity is $1 - p_i$. To calculate adaptation costs for each month m_i

[8] Even if we use the full sample, our main results remain qualitatively similar. Results are available upon request.

[9] In principle, the possibility exists that small firms choose less than 5 employees in order to avoid the creation of a works council, which might result in a biased sample. However, the share of firms having a works council increases only slowly from zero percent upwards instead of jumping to a higher level at the size of 5 employees.

[10] For the exact phrasing of the questions, see Table A.11.

during the adaption period M_i, we then use information about the wage of the externally recruited worker w_i.[11] All of the above variables on the adaptation period and productivity are firm-level averages.

The second term captures direct and indirect training costs. Direct costs DC_i consist of course fees and other direct expenses borne by the firm. Indirect training costs IC_i are the opportunity costs (productivity loss) for the time that new hires are away from their workplace to attend training. Average hiring costs to fill a vacancy in firm i are then given by the sum of average recruitment and average adaptation costs

$$HC_i = RC_i + AC_i. \tag{8}$$

Finally, the survey supplies information about labor market institutions. In particular, we observe worker representation at the firm level, such as works councils and other forms of employee representation (e.g., round tables or employee-speakers).[12]

We also have information on whether a firm is bound by a collective bargaining agreement.[13] Table 1 summarizes the average hiring costs per newly hired skilled worker both by type of labor market institution and in total. Average hiring costs amount to 4700 Euros to fill a single vacancy, of which about one-third corresponds to recruitment costs and the remaining two-thirds can be attributed to adaptation costs.

[11] We assume that the productivity of new hires increases linearly during the adaptation period. Thus, $p_{mi} = p_{1i} + (m_1 - 1) \cdot (1 - p_{1i})/M$, whereas p_1, i is the starting value as given in the survey and $1 - p_{1i}$ is the adjustment over the period M.

[12] The variable is coded 1 if a works council or other form of representation is present. The exact phrasing of the question is given in Table A.11.

[13] The exact phrasing of the question is given in Table A.11.

Table 1: Summary statistics by labor market institutions

	Worker representation		No worker representation		Total
	CBA	No CBA	CBA	No CBA	
Average hiring costs per hired worker (Euro)	6718	5985	3291	4435	4733
	(4690)	(5049)	(3219.5)	(4402)	(4461)
Average recruitment costs per hired worker (Euro)	1828	2284	931	1713	1638
	(2170)	(2813)	(1583)	(2191)	(2231)
Average adaptation costs per hired worker (Euro)	4890	3701	2360	2723	3095
	(3665)	(3528)	(2421)	(3428)	(3360)
Number of skilled workers in firm	76	27	14	13	24
	(164)	(68)	(20)	(27)	(72)
Number of other workers in firm	37	13	6	5	11
	(232)	(45)	(10)	(13)	(87)
Average skilled worker wage in firm (Euro)	2523	2450	2350	2292	2365
	(684)	(623)	(1054)	(734)	(805)
Observations	263	149	257	332	1001

Note: Displayed are means of firm-level averages with standard deviation in parentheses.

CBA=Collective bargaining agreement.

Average hiring costs are higher for firms with worker representation than for firms that solely have a collective bargaining agreement or firms that have none of the two institutional arrangements. While firms with worker representation are typically larger than firms without worker representation, Figure A.1 shows that the difference in the level of hiring costs persists when we restrict the sample to firms with 21 to 100 employees (where the proportion of firms with and without worker representation is similar). Average hiring costs are lowest for firms only having a collective bargaining agreement and highest for firms having both institutions. Thus, the cost-reducing effect of bargaining agreements is more than offset by the additional presence of worker representation. A possible reason for this result may be that worker representation is more effective when collective bargaining agreements already solve the bargaining issues, so that more resources can be dedicated to the hiring procedures. Table A.2 in the appendix provides descriptive statistics of all other variables. Further, Table A.3 provides the mean values of hiring costs for economic sectors and occupational fields.

So far, there is little empirical evidence that allows for a comparison of hiring costs across countries. Manning (2011) summarizes the existing evidence in terms of hiring costs as percentage of the total wage bill (thereby accounting for labor turnover) and as percentage of monthly pay. We add to the literature by providing representative information about hiring costs for skilled workers in Germany. The share of hiring costs as a percentage of the wage bill in Germany is rather low and amounts to 1.9% compared to 3.3% in Switzerland (Blatter et al. 2012), 1.5% in California (Dube et al. 2010), or 4.5% in the UK (Manning 2006), whereas hiring costs in terms of monthly pay are 200%, compared to 244% in Switzerland, and 34%-156% in California. Thus, while the costs of filling a vacancy are substantial in Germany, hiring costs in terms of total labor costs are rather low because labor turnover is low. In contrast, hiring costs as a percentage of the wage bill are only slightly lower in the US even though filling a vacancy is relatively less expensive (because labor turnover is higher). Finally, the adaptation period, i.e., the time it takes for a new hire to become fully productive, is quite comparable across countries and equals 3.75 months in Germany and Switzerland, and about 3.25 months in the US (California).

5 Estimation strategy and results

5.1 Estimation strategy

As discussed in the previous section, our data provides information about average hiring costs to fill a vacancy, which takes the form

$$HC = H^{\alpha-1} N^{\beta} w^{\gamma} I^{\delta} \tag{9}$$

where we denote the number of hired skilled workers by H, the number of employees by N, and the wage by w. I represents institutions at the firm level, in our case worker representation and collective bargaining agreements.

Taking natural logs on both sides of the equation, we regress $\ln HC$ on $\ln H$, $\ln N$, $\ln w$ and $\ln I$, whereas the term $\ln I$ is replaced a dummy variable I that takes on the value of 1 in case the respective institution is present in the firm and 0 in case it is not. In addition, we include control variables in a vector x to take account of the local unemployment rate, region, occupation, and economic sector.

Thus, we estimate the following model by ordinary least squares:

$$\ln HC_i = (\alpha - 1) \ln H_i + \beta \ln N_i + \gamma \ln w_i + \delta I_i + \zeta x_i + \eta_i. \tag{10}$$

In the subsequent empirical analysis, we thus estimate the coefficient $(\alpha - 1)$. As discussed in section 2, average hiring costs increase with the number of hires if $\alpha > 1$ and decrease if $\alpha < 1$.

5.2 Estimation results

We first regress the natural logarithm of average hiring costs on the natural logarithm of the number of hires and occupational and sector controls (model 1, table 2). Model 2 additionally controls for firm size (natural logarithm), while model 3 includes also skilled worker wage (natural logarithm), local unemployment rate and the region of the firm. Finally, the regression in model 4 also includes labor market institutions, i.e., collective bargaining and worker representation at the firm level. The coefficients on hires, number of employees, and the monthly skilled worker wage can be interpreted as elasticities.

Table 2: Hiring costs OLS regressions

Dependent variable: ln Average hiring costs	(1)	(2)	(3)	(4)
ln Number of hires	0.41***	0.32***	0.33***	0.33***
	(0.12)	(0.12)	(0.10)	(0.10)
ln Number of employees		0.15**	0.03	-0.02
		(0.07)	(0.06)	(0.06)
ln Monthly wage of skilled workers			1.11***	1.08***
			(0.23)	(0.23)
Local unemployment rate			-2.91	-3.53
			(2.75)	(2.75)
Firm located in western Germany			-0.19	-0.14
			(0.22)	(0.22)
Works council/other representation form				0.33**
				(0.14)
Collective bargaining agreement				-0.00
				(0.15)
Occupational controls	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes
Constant	7.57***	7.23***	-0.63	-0.36
	(0.14)	(0.26)	(1.83)	(1.87)
R^2	0.05	0.06	0.32	0.33
Observations	1001	1001	1001	1001

Standard deviation in parenthesis. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

We find a statistically significant and positive association of the number of hires and average hiring costs. As the estimated coefficient for the number of hires is $(\alpha - 1)$ (see equation 10), α – our first parameter of interest – equals 1.33. Thus a 10% increase in the number of hires increases hiring costs by 13.3%, which is an economically substantial effect. This result implies that the structure of hiring costs is convex, meaning that it becomes increasingly expensive to hire additional workers in a given period.[14] Figure A.2 in the appendix illustrates the magnitude of marginal hiring costs, taking into account all the coefficients of the OLS regression coefficients (model 4). Marginal hiring costs are economically substantial and amount up to 7000 Euros for hiring 20 or more workers.

While larger firms have higher hiring costs, we find that this correlation is no longer statistically significant once we control for the wage of skilled workers (model 3). However, considering that the models in columns 3 and 4 include wages on both sides of the equation (i.e., in the calculation of hiring costs on the left hand side due to the time value that

[14]Our results are very similar to those obtained by Blatter et al. (2012), who use comparable survey data for Switzerland.

Table 3: Recruitment costs OLS regressions

Dependent variable: ln Average recruitment costs	(1)	(2)	(3)	(4)
ln Number of hires	0.48***	0.37***	0.38***	0.34***
	(0.12)	(0.11)	(0.08)	(0.08)
ln Number of employees		0.16**	0.11*	0.12**
		(0.08)	(0.06)	(0.06)
ln Monthly wage of skilled workers			0.80***	0.71***
			(0.21)	(0.22)
Local unemployment rate			-3.93	-4.70*
			(2.55)	(2.48)
Firm located in western Germany			-0.08	-0.10
			(0.26)	(0.24)
Works council/other representation form				0.28*
				(0.15)
Collective bargaining agreement				-0.51***
				(0.13)
Occupational controls	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes
Constant	6.31***	5.94***	0.07	0.92
	(0.12)	(0.26)	(1.69)	(1.75)
R^2	0.06	0.07	0.30	0.33
Observations	1001	1001	1001	1001

Standard deviation in parenthesis. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

workers in the firm spend to prepare and conduct interviews, and as an explanatory variable on the right hand side), we need to address this potential problem. We therefore present a number of robustness checks treating this issue in the subsequent section and analyze various subcomponents of hiring costs that do not include wages.

To gain further insight on the relation of the number of hires and the two components of hiring costs (i.e., recruitment costs RC_i and adaptation costs AC), we provide additional regression in Tables 3 and Table 4.

The recruitment cost elasticity with respect to the number of hires is somewhat larger than for hiring costs, as a 10% increase in the number of hires leads to a 13.4% increase in the total recruitment costs (table 3, model 4). However, we find not significant association between the number of hires and adaptation costs, even though the coefficient on the number of hires is of similar magnitude (table 4).

The local unemployment rate, a proxy for the tightness of the local labor market, is negatively associated with average recruitment costs, implying that recruiting new workers is more expensive if the local availability of skilled workers is limited. A 1%-point increase in

Table 4: Adaptation costs OLS regressions

Dependent variable: ln Average adaptation costs	(1)	(2)	(3)	(4)
ln Number of hires	0.46	0.23	0.32	0.40
	(0.38)	(0.38)	(0.36)	(0.36)
ln Number of employees		0.38	0.09	-0.14
		(0.24)	(0.20)	(0.22)
ln Monthly wage of skilled workers			1.87**	2.00**
			(0.78)	(0.78)
Local unemployment rate			-0.22	-0.46
			(9.54)	(8.79)
Firm located in western Germany			-0.81	-0.53
			(0.80)	(0.80)
Works council/other representation form				0.52
				(0.56)
Collective bargaining agreement				1.60***
				(0.45)
Occupational controls	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes
Constant	5.48***	4.63***	-8.27	-9.75
	(0.47)	(0.87)	(6.52)	(6.53)
R^2	0.01	0.02	0.16	0.20
Observations	1001	1001	1001	1001

Standard deviation in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

the local unemployment rate is associated with a 4.7% decrease in average recruitment costs (significant at the 10%-level, table 3). Firm size has a statistically significant and positive effect on recruitment costs, even when controlling for the skilled-worker wage. Adaptation costs do not significantly depend on the local unemployment rate, but instead depend strongly on the skilled worker wage, and they vary by occupation and economic sector (table table 4).[15]

With respect to labor market institutions, Table 5 summarizes the main results from

[15]Unemployed workers in Germany may receive training that is subsidized by the government to increase their chances of finding a job, thereby potentially reducing a firm's training costs. However, much of the training associated with hiring new workers is firm-specific, as firms in our sample hire workers with nationally certified skills (i.e., workers that previously completed an apprenticeship program). While we cannot account for the fraction of workers hired out of unemployment, training that is provided by unemployment agencies is typically intended to facilitate career changes of individuals to improve their future career opportunities. Moreover, we control for the share of local unemployment in our regression analysis. As we find no effects of local unemployment for a firm's adaptation costs (Table 4), subsidized training for previously unemployed individuals does not seem to play a major role in explaining hiring costs.

Table 5: Firm-level institutions and hiring costs

Dependent Variable:	ln Average hiring costs	ln Average recruitment costs	ln Average adaptation costs
Works council or other representation	+***	+*	+
Collective bargaining agreement	0	-***	+***

Table summarizes results from tables 2 to 4.

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

tables 2 to 4. We find that worker representation at the firm level is associated with a 33% increase in average hiring costs of skilled labor. This result is due to both higher recruitment and adaptation costs, although the latter is not statistically significant.

Collective bargaining coverage has no significant effect on overall hiring costs. However, firms with collective bargaining agreements have lower recruitment costs but higher adaptation costs. The former result may arise because individual wage bargaining does not take place in such firms (the wage is already set prior to signing the contract), whereas the latter may be due to higher expected tenure in firms with collective bargaining agreements. Investments in informal and formal training have a longer expected pay-off period, providing an incentive for a higher investment in a new hire during the adaptation period.

5.3 Robustness analysis

The effects of institutions on hiring costs have no strictly causal interpretation, as firms can choose whether to agree to worker representation or participate in collective bargaining agreements. As very small firms almost never have works councils and very large firms almost always do, we provide separate results for a sample of medium-sized firms employing 21 to 100 workers. We do so because in this firm size category we find similar shares of firms with and without works councils (Addison et al. 2010). Table A.4 shows that the association between worker representation and hiring costs remains strong and positive for

medium-sized firms. The respective coefficient, however, is significant only at the 10% level. The individual coefficients on recruitment and adaptation costs remain positive, but they are not significantly different from zero (possibly due to the smaller sample size).

As in any non-experimental study, our results may be driven by unobserved heterogeneity. While observing hiring costs across time would enable us to account for time-invariant factors at the firm level, we have to rely on cross-sectional information. To validate the findings in this paper, we carry out a number of further robustness checks similar to Blatter et al. (2012).

First, we regress hiring costs on the number of hires (table A.5), rather than estimating an iso-elastic cost function. The results confirm the convex structure of hiring costs. Larger firms find it cheaper to hire a given number of new workers per period, as the interaction term of firms size and the number of hires ($H \times N$) has a statistically significant and negative coefficient. However, hiring costs increase for firms hiring a high number of new workers, as the coefficient on the interaction term ($H^2 \times N$) is positive and statistically significant. To explicitly test for a fixed component, we also estimate a version including a term $1/H$. However, as the coefficient is not statistically significant from zero (and even negative), we find no evidence for fixed costs.[16]

Second, to account more directly for large firms hiring more new workers in a given period, we regress hiring costs on hiring rates (H/N) (table A.6). We find that an increase in the hiring rate is associated with a significant increase in average hiring costs. Consequently, firms hiring more workers relative to their level of employment incur higher average hiring costs, which confirms a convex structure of hiring costs. The effects are economically substantial, as a one-standard-deviation increase in the hiring rate is associated with a 0.34 standard-deviation increase in marginal hiring costs.

Third, due to the possibility that differences in the composition of the work force have an influence on the level and structure of hiring cost in a firm, we added the share of skilled workers as an additional control variable to model 4 in Table 2. The corresponding estimates are presented in Table A.7 in the appendix. Compared to the results from our reference model, the coefficient of the number of hires on average hiring costs is only slightly

[16]Results on the fixed component are available upon request.

smaller (0.30 instead of 0.33). The coefficient on the share of skilled workers itself is positive but not significantly different from 0.

Finally, we consider that hiring costs are to a large degree determined by wages (e.g. for personnel participating in the interviews or when calculating productivity loss in the adaptation period). Thus, regressing hiring costs on wages may lead to biased results. We thus estimate alternative specifications of equation 10, leaving out the wage component on the right hand side of the equation and substituting it by the deviation from the average wage in the occupational field. Neither alternative estimate changes the main results significantly.[17][18]

We further provide a set of regressions on the non-wage components of both recruitment and adaptation costs (as discussed in section 2) to show that wage correlations are not the driving force behind the relation between hiring costs and the number of hires. Table A.8 displays the results when regressing the average costs of posting vacancies on the number of hires, both in natural logarithms. For both the full sample (5 and more employees) and medium-sized firms (21 to 100 employees), we find that average job posting costs are increasing in the number of hires. Regressing the average interview time on the number of hires likewise suggests a negative relation to hiring costs for medium-sized firms, however, the respective coefficients are not significant in neither of the two samples (table A.9). With respect to components of adaptation costs, we find a positive association between the number of new hires and the productivity difference between newly hired and established skilled workers in the firm (column 1, table A.10). Likewise, the coefficient on training time is positive and significant at the 10%-level (column 3). However, the number of hires has no significant impact on the length of the adaptation period (column 2).

Concerning the relation between collective bargaining and the non-wage components of hiring costs, we find support for the hypothesis that collective bargaining reduces the costs associated with the recruitment process. Collective bargaining agreements already define important aspects of the working contract (such as wages and safety issues) and thereby

[17]Results are not shown but are available upon request.

[18]While wages directly impact hiring costs, higher wages also reduce turnover (Dube et al. (2013) shows that increases in the minimum wage lower separation rates), thereby lowering the share of hiring expenditures on the total wage bill. Thus high-wage firms do not necessarily face increased hiring costs as a percentage of total labor costs.

reduce the time to prepare and conduct interviews. In contrast, Table A.10 gives no clear indication of a positive effect on adaptation costs. For works council firms in the full sample, the number of hires relates positively to job posting costs. However, the respective coefficient turns insignificant using the reduced sample. Column 3 in Table A.10 supports the hypothesis that firms invest more into the training of new hires if a works council is present.

Summing up the results of robustness exercises, we in general find support for the main result of the previous subsection that hiring costs increase in the number of hires and differ according to the specific institutional arrangements on the firm level. However, to better understand the potential benefits of investing in the hiring process, future research should also analyze hiring costs in a dynamic context to account for unobserved effects at the establishment level (panel data), or at the worker level (by linking establishment-level survey information with administrative data on workers).

5.4 Hiring costs and monopsonistic labor markets

Manning (2006) introduced the labor cost function to test for monopsonistic labor markets. The basic idea of the labor cost function is that firms can increase employment not only through wages, but also through investments in the recruitment process. Assuming that employment N is constant in the steady state, the costs per worker to keep employment at this level are given by the labor cost function $LC = s \times HC$. Thus, the level of hiring costs HC is not the only determinant of the labor cost function LC. Given the employment level N, the fluctuation rate s determines the number of new hires H that a firm needs to recruit in a given period, since $H = sN$.

As noted in Manning (2006), we can directly test for economies or diseconomies of scale in recruitment given our information on total hiring costs C, wages w, the number of new hires H, and the level of employment N. Assuming

$$\ln HC_i = \alpha \ln H_i - \beta \ln N_i + \gamma \ln w_i, \tag{11}$$

there are diseconomies of scale in recruitment, as long as $\xi \equiv \alpha - \beta > 0$, which is supported by our estimates (Table 2).

Manning (2011), p.1016-1017 further discusses the role of the shape of hiring costs and

how the parameter α relates to the elasticity of the labor supply curve to the firm, ε. He shows that the optimal recruitment expenditure per worker can be described as $\frac{C}{N} = \delta[F'(N) - w]$, where $\delta = 1/\alpha$, and given the wage $w = \frac{\varepsilon}{1+\varepsilon}F'(N)$, so that $\frac{C}{wN} = \frac{\delta}{\varepsilon}$. This equation implies that the elasticity will be lower if yearly hiring expenditures C are important in relation to a firm's yearly wage bill for all its employees (in our case, within a certain occupation). Similarly, the elasticity will be lower if recruitment costs exhibit strong diseconomies of scale (i.e., marginal recruitment costs strongly increase with hires).

As we have estimates on C, w, N, δ we can back out $\varepsilon = \frac{\delta}{C/w \times N} = \frac{0.752}{0.019} \cong 40$, implying a high elasticity. A main reason for this result is the low turnover rate in Germany that leads to relatively low total hiring expenditures in relation to wage costs (even though costs to fill an individual vacancy are moderately high). However, Manning (2011) notes the need for a different modeling if recruitment costs are proportional to the wage – which is what we find. Thus, an area for future research is to explicitly model the structure of hiring costs, accounting for their key determinants as found in establishment-level surveys, so that information on hiring costs can provide more insightful estimates on the elasticity of a firm's labor supply curve.

5.5 Hiring costs and short-time work

Germany has been seen as particularly successful in avoiding high levels of unemployment during the financial crisis (Rinne and Zimmermann 2012). Short-time work (*Kurzarbeit*) allows firms to employ workers at reduced hours and reduced salary during a recession, thereby providing incentives for firms not to lay off workers immediately when the business outlook is bad.

Boeri and Bruecker (2011) find that short-term work policies prevented unemployment in Germany from doubling, and saved an expected full-time equivalent of 400,000 jobs (see also Brenke et al. 2011 for more details on the German short-time work policy and its extensions during the financial crisis). Firms also have some flexibility in creating working-time accounts, so that workers obtain their regular salary during a crisis while working reduced hours, and conversely work more hours without extra pay during boom periods. In Germany, it appears that short-time work policies were used more extensively and also

contributed more towards stabilizing employment than working-time accounts. Boeri and Bruecker (2011) estimate that working time accounts saved about 320,000 jobs, which is somewhat less than their corresponding estimate for short-time work policies. However, while working time accounts do not require any public subsidies, short-time work policies required substantial public funding.

The knowledge about hiring costs enables us to quantify possible benefits of such policy instruments, i.e., the saved resources for firms from not having to re-hire and train new personnel during the next economic upturn. Even though hiring costs vary by skill-level, our data are useful to obtain a rough estimate: at average hiring costs of € 4,700, saved resources for the future hiring of 400,000 skilled workers would result in total savings of nearly € 2 billion (about 0.08% of German GDP), not including a firm's firing costs, or public expenses for unemployment benefits. Furthermore, our results indicate that average hiring costs for re-hiring workers after a crisis may increase, particularly if many firms want to recruit at the same time (i.e., local skilled workers may become scarce), and for those firms that would like to recruit several skilled workers at once (increased marginal hiring costs).

However, another factor that may affect labor hoarding is the expected time until a vacancy will be filled – and during which a firm may not be able to produce at full capacity and thus forgoes possible profits. While we cannot calculate a monetary value of these costs, we have information on the difference between the desired and the actual vacancy duration, which corresponds to 5.5 weeks on average. We find that the time to fill a vacancy increases with the number of hires per period, and decreases with the skilled worker wage (although not statistically significant). Moreover, we find that a longer interview time per applicant reduces the gap between desired and actual vacancy duration.[19]

6 Conclusions

We provide evidence that the costs for filling a vacancy for skilled labor in Germany are substantial, ranging on average from 4,000 to 6,000 Euros. Moreover, our results show that the structure of hiring costs is convex, implying that hiring additional workers in a given

[19] Results are available upon request.

period becomes increasingly expensive. We find that an increase in the number of hires by 10% increases total hiring costs by about 13.3% and lead to marginal hiring costs of up to 7,000 Euros. Labor market institutions are also related to hiring costs. While hiring costs in firms with collective bargaining coverage do not significantly differ from other firms, we find that worker representation at the firm level increases average hiring costs by more than 33%.

The structure of hiring costs in Germany is similar to that obtained from a comparable study for Switzerland (Blatter et al., 2012) and the United States (Dube et al., 2010), two countries with a relatively low degree of employment protection legislation. Thus, our findings suggest the existence of a general structure of hiring costs across countries with varying degrees of labor market regulations. Moreover, results can also be interpreted as evidence for monopsony in the German labor market, as the labor cost function (as defined by Manning 2006) is positively associated with employment.

Our results are also relevant for recent policies aimed at reducing unemployment. In Germany, short-time work (*Kurzarbeit*) is a widely used policy instrument for preventing firms to lay off workers, enabling a firm to employ workers at reduced working hours. Under this program, the government covers part of the wage bill, thereby providing financial incentives for a firm not to lay off employees. Our findings imply that rational firms already have incentives to retain workers when the business outlook is bad, because re-hiring skilled workers in the future is costly, particularly when a firm needs to hire a number of workers at once. Thus, while our findings help to explain why a firm hoards labor, our results also allow to quantify possible benefits of short-time work policies (i.e., saved resources on future hiring costs). Nonetheless, such policies may also generate substantial windfall gains for firms that had no intention to lay off workers in the first place.

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A Appendix

Figure A.1: Density of hiring costs, 21 to 100 employees

Figure A.2: Marginal hiring costs (in Euros)

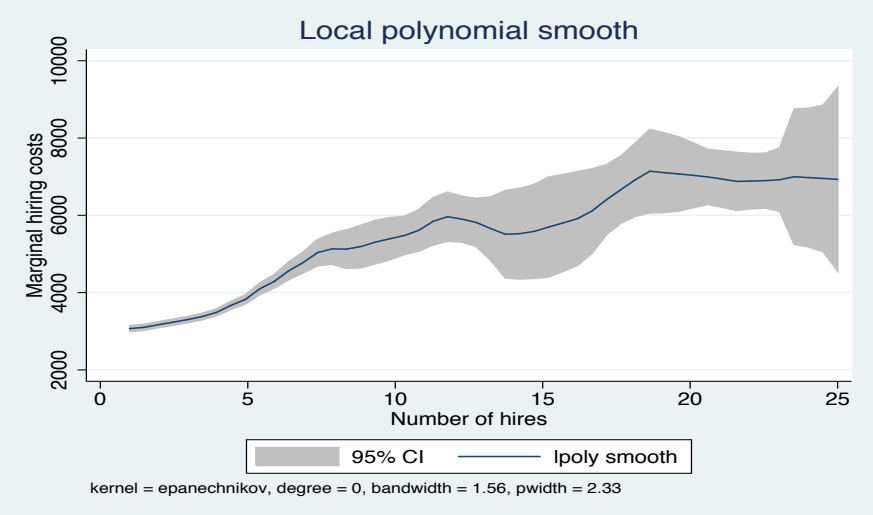

Table A.1: Summary statistics

Variable	Mean
Economic sector	
Crafts	0.32
Trade	0.17
Services I	0.19
Services II	0.17
Public services, education, health	0.16
Occupational field	
Metalworking	0.08
Electrical engineering	0.07
Information technology	0.04
Chemicals	0.01
Accommodation and food	0.09
Construction	0.1
Print and media	0.04
Health	0.12
Administrative: sales and distribution	0.14
Administrative: headquarters	0.25
Administrative: banks/insurance	0.01
Other occupations	0.06
Region	
Firm located in West Germany	0.8
Firm located in East Germany	0.2
Institutional factors	
Works council or other form of representation	0.31
No worker representation	0.69
Collective bargaining agreement	0.38
No collective bargaining agreement	0.62
Other variables	
Number of hires	2.85
Standard deviation (Number of hires)	(2.75)
Observations	1001

Standard deviation in parenthesis.
Services 1: Hotels and restaurants, Transport and telecommunication, Energy and water supply. Services 2: Banking and insurance, Real estate, Renting and business activities.

Table A.2: Summary statistics of hiring costs variables

Variable	**Mean**	**Std. Dev.**
Average costs for posting vacancy	563	(828)
Average costs for job interview process	626	(700)
Average costs for external consultants	449	(1620)
Average recruitment costs	1638	(2231)
Average skilled worker wage in firm	2365	(805)
Adaptation period (in months)	3.8	(2.8)
Productivity difference newly hired vs established worker (%)	42.2	(21.2)
Continuing training: wage costs	514	(949)
Continuing training: fees and traveling expenses	606	(1177)
Average costs of productivity difference	1975	(2197)
Average adaptation costs	3095	(3360)
Average hiring costs per hire	**4733**	**(4461)**
Observations	1001	

Standard deviation in parenthesis.

Table A.3: Hiring costs by economic sector and occupational field

Variable	Mean	Std. Dev.
Economic sector		
Crafts	3909	(4572)
Trade	4762	(3281)
Services I	5474	(4881)
Services II	6149	(5164)
Public services, education, health	3922	(3337)
Occupational field		
Metalworking	4408	(3939)
Electrical engineering	5116	(5237)
Information technology	6963	(5874)
Chemicals	7236	(4497)
Accommodation and food	2265	(1835)
Construction	2324	(3202)
Print and media	7605	(4397)
Health	3779	(3297)
Administrative: sales and distribution	4552	(3947)
Administrative: headquarters	6204	(5060)
Administrative: banks/insurance	9650	(5746)
Other occupations	4329	(3558)
Total	4733	(4461)
Observations	1001	

Standard deviation in parenthesis.

Services 1: Hotels and restaurants, Transport and telecommunication, Energy and water supply. Services 2: Banking and insurance, Real estate, Renting and business activities.

Table A.4: Hiring, recruitment and adaptation costs: 21-100 employees

Dependent Variable:	ln Average hiring costs	ln Average recruitment costs	ln Average adaptation costs
ln Number of hires	0.23*	0.35***	0.31
	(0.14)	(0.12)	(0.43)
ln Number of employees	-0.01	-0.22	0.60
	(0.27)	(0.22)	(0.87)
ln Monthly wage of skilled workers	0.55	0.51**	0.19
	(0.36)	(0.26)	(1.03)
Firm located in western Germany	0.28	0.00	0.24
	(0.29)	(0.26)	(0.95)
Local unemployment rate	-5.02	-4.90*	-7.21
	(3.07)	(2.85)	(10.64)
Works council/other representation form	0.49*	0.31	1.20
	(0.27)	(0.24)	(0.81)
Collective bargaining agreement	-0.12	-0.71***	1.57**
	(0.26)	(0.21)	(0.71)
Occupational controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Constant	3.00	2.67	1.54
	(2.93)	(2.09)	(7.77)
Observations	356	356	356

Standard deviation in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table A.5: Hiring level OLS regressions

Dependent Variable:	Average hiring costs	Average recruitment costs	Average adaptation costs
New hires H	817.05***	386.22***	430.81**
	(201.25)	(141.39)	(170.53)
H^2	-26.60***	-13.57**	-13.03
	(9.01)	(6.42)	(8.50)
Number of employees N	7.77***	4.05**	3.72*
	(2.89)	(1.72)	(1.99)
$H \times N$	-1.95***	-0.74	-1.21**
	(0.72)	(0.47)	(0.54)
$H^2 \times N$	0.08***	0.03	0.05**
	(0.03)	(0.02)	(0.02)
Firm located in West Germany	253.83	239.66	14.27
	(638.00)	(372.22)	(504.12)
Monthly wage of skilled worker	1.62***	0.80***	0.82**
	(0.30)	(0.19)	(0.34)
Local unemployment rate	-12368.49	-3457.47	-8911.24
	(7829.76)	(4553.51)	(5745.35)
Works council/other representation form	985.73**	236.58	749.12*
	(493.25)	(272.57)	(430.66)
Collective bargaining agreement	-410.47	-510.91**	100.23
	(486.00)	(220.26)	(410.06)
Occupational controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Constant	2281.61*	151.72	2130.29
	(1348.07)	(567.35)	(1156.22)
Observations	1001	1001	1001

Standard deviation in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table A.6: Hiring rate OLS regressions

Dependent Variable:	Average hiring costs	Average recruitment costs	Average adaptation costs
Hiring rate (hires/skilled workers)	8984.21***	3416.14***	5568.22*
	(3258.73)	(1167.73)	(3313.79)
Monthly skilled worker wage W	1.74***	0.79***	0.95***
	(0.36)	(0.19)	(0.35)
10-49 employees	1009.49*	852.14***	157.35
	(544.81)	(285.98)	(452.16)
50-99 employees	1739.64	842.98*	896.72
	(1241.82)	(460.76)	(1008.44)
100-249 employees	3067.64***	2240.70***	826.92
	(1153.53)	(595.96)	(842.62)
250-499 employees	2947.37***	1987.53***	959.78
	(948.56)	(588.43)	(706.58)
500-999 employees	1999.84**	2144.35***	-144.62
	(842.52)	(459.83)	(707.82)
1000+ employees	4234.87***	2616.25***	1618.52
	(1440.38)	(754.58)	(1183.02)
Local unemployment rate	-12682.87*	-3088.51	-9594.59*
	(7462.55)	(4178.02)	(5606.05)
Works council/other representation form	1147.33**	178.60	968.71**
	(541.08)	(293.32)	(452.39)
Collective bargaining agreement	-459.35	-598.15***	138.59
	(444.36)	(203.72)	(387.88)
Occupational controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Constant	6323.41***	1696.17	4627.44***
	(1344.66)	(615.30)	(1130.39)
Observations	1001	1001	1001

Standard deviation in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table A.7: Hiring costs OLS regressions incl. share of skilled workers

Dependent variable: ln Average hiring costs	(1)	(2)	(3)	(4)
ln Number of hires	0.41***	0.26**	0.30***	0.30***
	(0.12)	(0.12)	(0.11)	(0.11)
ln Number of employees		0.19***	0.05	0.01
		(0.07)	(0.06)	(0.06)
Share of skilled workers in firm		0.93**	0.43	0.43
		(0.36)	(0.32)	(0.31)
ln Monthly wage of skilled workers			1.11***	1.07***
			(0.23)	(0.23)
Local unemployment rate			-2.70	-3.32
			(2.81)	(2.81)
Firm located in Western Germany			-0.20	-0.15
			(0.22)	(0.22)
Works council/other representation form				0.33**
				(0.14)
Collective bargaining agreement				-0.01
				(0.15)
Occupational controls	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes
Constant	7.57***	6.49***	-0.94	-0.66
	(0.14)	(0.33)	(1.85)	(1.88)
R^2	0.03	0.05	0.32	0.33
Observations	1001	1001	1001	1001

Standard deviation in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table A.8: Job posting costs OLS regressions

Dependent variable: ln Average job posting costs				
	5+ employees		21-100 employees	
ln Number of hires	0.75***	0.76***	0.72***	0.68***
	(0.23)	(0.23)	(0.23)	(0.23)
ln Number of employees	0.00	-0.10	-0.21	-0.11
	(0.15)	(0.15)	(0.48)	(0.49)
ln Monthly wage of skilled workers	1.07*	1.07*	0.66	0.65
	(0.58)	(0.57)	(0.73)	(0.75)
Firm located in western Germany	-0.37	-0.45	-0.76	-0.81
	(0.53)	(0.51)	(0.52)	(0.52)
Works council/other representation form		0.90***		0.01
		(0.33)		(0.57)
Collective bargaining agreement		-0.71*		-0.71
		(0.37)		(0.59)
Occupational controls	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes
Constant	-4.95	-4.43	-0.37	-0.08
	(4.89)	(4.81)	(6.34)	(6.46)
R^2	0.17	0.20	0.16	0.16
Observations	1001	1001	356	356

Standard deviation in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table A.9: Interview time OLS regressions

Dependent variable: ln Average interview time (hours)				
	5+ employees		21-100 employees	
ln Number of hires	0.04	0.02	0.18	0.17
	(0.09)	(0.08)	(0.11)	(0.11)
ln Number of employees	0.09	0.13**	-0.15	-0.09
	(0.06)	(0.06)	(0.18)	(0.18)
ln Monthly wage of skilled workers	0.43**	0.40**	-0.05	-0.12
	(0.20)	(0.20)	(0.26)	(0.27)
Firm located in western Germany	0.01	-0.05	-0.07	-0.06
	(0.16)	(0.15)	(0.23)	(0.22)
Works council/other representation form		-0.08		0.02
		(0.17)		(0.19)
Collective bargaining agreement		-0.32**		-0.43**
		(0.13)		(0.18)
Constant	-1.16	-0.85	3.37	3.69*
	(1.59)	(1.54)	(2.14)	(2.22)
R^2	0.11	0.13	0.11	0.14
Observations	1001	1001	356	356

Standard deviation in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table A.10: Adaptation cost components regressions

Dependent Variable:	Productivity difference (percent)	Adaptation period (months)	Training time (days)
Number of hires	0.83**	0.03	0.45*
	(0.36)	(0.04)	(0.27)
Number of employees	0.00	0.00	-.004*
	(0.00)	(0.00)	(0.00)
Monthly wage of skilled workers	0.00	0.00	0.01
	(0.00)	(0.00)	(0.00)
Local unemployment rate	28.55	-1.98	-18.72
	(45.21)	(4.76)	(18.56)
Firm located in western Germany	0.83	0.31	0.06
	(4.38)	(0.44)	(2.24)
Works council/other representation form	0.06	0.25	3.79**
	(2.66)	(0.39)	(1.49)
Collective bargaining agreement	1.37	-0.26	-1.77
	(2.44)	(0.32)	(1.39)
Constant	33.82***	2.96***	-4.69
	(7.25)	(0.87)	(7.04)
R^2	0.08	0.06	0.05
Observations	1001	1001	1001

Standard deviation in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.
Model 1 and model 3 are tobit regression models with lower limit = 0
and upper limit = 100 (only model 1)

Table A.11: Survey questions on hiring costs

Recruitment costs: "Did your firm hire skilled workers in [occupation] in the last three years from the labor market?" "If yes, how many workers in [occupation] did your firm hire?" "How high are the average costs for posting a vacancy in newspapers, at the employment agency, or in internal postings in your firm?" "How many hours did your employees [unskilled employees, skilled employees, management] spend on the hiring process?" - Please consider the entire hiring process, including time for scanning job applications preparing for and conducting the job interviews. "Do you also make use of external consultants in the hiring of skilled workers?" "If yes, how high are the costs for external consultants?"
Adaptation costs: "On average, how many months does it take in your firm for newly hired workers to adapt?" "On average, how much lower (percentage) is the productivity of a newly hired worker compared to an established worker in your firm?" "Does your firm organize and pay for special training courses to facilitate the adaptation of newly hired workers?" "How many working days do these training measures last on average?" "In your firm, what is the cost of training with respect to course fees and travel expenses?"
Wage information: "What is the average monthly wage of a worker in [occupation]?" "What is the average difference in wage (percentage) between a newly hired worker and an established worker?"