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The Costs of Hiring Skilled Workers

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The Costs of Hiring Skilled Workers*

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Abstract

Hiring workers is costly and therefore influences the firm's labor demand. We make use of Swiss administrative survey data on directly measured hiring costs in order to quantify both their magnitude and determinants at the firm-level. Our results show that hiring costs are substantial, as average hiring costs amount to more than one-quarter of wage payments. However, the level of hiring costs differs sharply by industry, occupation and the economic environment of the firm. Furthermore, our findings indicate that marginal hiring costs increase in the number of hires.

JEL Classification: J32, J63

Keywords: Hiring costs, labor adjustment costs

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1 Introduction

Hiring workers is costly for the firm. In order to hire workers, firms typically have to post a vacancy and then process interviews with the applicants they are interested in. In addition, newly hired workers may require training and need some time in order to adapt to the new job.

The existence of hiring costs influences the firm's demand for labor, since hiring costs are a component of total labor costs. Furthermore, the firm's hiring behavior depends on the specific structure of hiring costs. In particular, hiring costs may consist of both a fixed and a variable cost component, with the latter depending on the number of hires. If fixed costs are substantial and marginal hiring costs are constant or decreasing, the firm will find it optimal to group hires, which implies lumpy adjustment over time. In contrast, if there are no fixed costs and marginal hiring costs are increasing, hiring a large number of workers at once is relatively more expensive. In this case, the optimal hiring strategy for the firm is to adjust its labor demand smoothly over time.

The importance of hiring costs is reflected in a large theoretical literature. The corresponding empirical studies are mainly based on indirect inference of labor adjustment costs based on the observation of worker flows, whereas empirical evidence based on directly observed hiring costs is limited. The purpose of this paper is to use directly measured hiring costs in order to shed light on the characteristics of these costs, in particular, their magnitude, composition and functional form with respect to the number of hires.

For our empirical analysis, we make use of a large-scale representative administrative data set providing detailed measures of hiring costs for Swiss firms. Hiring costs are observed for a specific occupation, which is a novelty in the literature. The data therefore allows us to make statements about hiring costs incurred by firms to hire skilled workers in a given occupation, rather than having a single measure of hiring costs across all worker categories within a firm. Our results indicate that average hiring costs are substantial and correspond to roughly one-quarter of wage payments. Furthermore, we find that hiring costs differ rather strongly by industry and

occupation and that they are influenced by the economic environment, such as the unemployment rate. With respect to the functional form of hiring costs, we find that marginal hiring costs are increasing in the number of hires. Fixed costs, in turn, do not seem to be an important component of total hiring costs. As our inference is based on a cross-sectional analysis, the results concerning the functional form have to be interpreted with some caution, because the data in general does not allow to account for unobserved firm heterogeneity. However, we can observe a small sub-sample of firms in two time periods, which allows to estimate hiring costs in first-differences. The results support the inference from the cross-sectional analysis.
The paper is organized as follows: In the next section, we provide a summary of the relevant literature. Section 3 presents alternative specifications of the hiring cost function and shows how hiring costs enter the profit maximization problem of the firm. Section 4 describes the data used for the analysis. Section 5 contains the empirical analysis and section 6 concludes.

2 Related literature

The literature on labor adjustment costs can roughly be divided into two parts. The first strain of the literature uses dynamic labor demand models to indirectly estimate the functional form of labor adjustment costs. The other strain of the literature studies labor adjustment costs based on direct empirical evidence. The following discussion of the literature is structured according to this distinction.[1]

2.1 Indirect inference of labor adjustment costs

In the early literature on employment adjustment, the functional form of labor adjustment costs has often been assumed to be quadratic (see, e.g., Sargent (1978) for a seminal contribution). This assumption has subsequently been challenged by Nickell (1986) who argued that average variable costs of adjustment may not be strictly convex. Hamermesh (1989) provides

[1] Firms also face capital adjustment costs (see, e.g., Cooper and Haltiwanger (2006) for a recent contribution). In this paper, however, the focus is on labor adjustment only.

empirical evidence in favor of fixed adjustment costs, whereas Hamermesh (1992) estimates a model with both fixed and variable costs.[2]

In contrast to the literature studying the structure of adjustment costs, Hamermesh (1995) and Hamermesh and Pfann (1996b) consider the sources of adjustment costs. Adjustment costs are classified as gross and net costs. Gross costs are incurred when a worker is hired (or fired), whereas net costs are associated with the movement from one employment level to another. The evidence suggests that gross costs account for the larger share of total adjustment costs. Using time series data of manufacturing firms, Pfann and Palm (1993) find that hiring costs exceed firing costs of production workers, whereas the converse holds for non-production workers.

Caballero and Engel (1993) and Caballero et al. (1997) argue that adjustment costs are crucial to explain aggregate employment fluctuations. They assume that manufacturing establishments adjust employment probabilistically, i.e., adjustment is lumpy. Adjustment probabilities are modeled as a function of the deviation between the desired and the actual level of employment (*gap approach*).[3] King and Thomas (2006) develop a generalized partial adjustment model where firms adjust labor in a discrete manner due to plant-specific fixed costs, which is consistent with smooth adjustment at the aggregate level. Cooper and Willis (2009a) use a dynamic model that allows for both convex and non-convex adjustment costs. They find that a model with non-convex adjustment costs matches aggregate moments better than quadratic labor adjustment costs. Varejão and Portugal (2007) report the presence of non-convexities, estimating a duration model of employment adjustment.[4]

Merz and Yashiv (2007) let adjustment costs for labor interact with those for capital. The firm's market value is determined both by its optimal hiring and

[2]For a survey of the literature on the costs of labor adjustment, see Hamermesh and Pfann (1996a).

[3]This procedure has lead to a vivid discussion in the literature (see Cooper and Willis, 2004; Caballero and Engel, 2004; Bayer, 2008; Cooper and Willis, 2009b).

[4]However, Ejarque and Øivind A. Nilsen (2008), using a sub-sample of the same Portuguese data, find evidence for a mainly quadratic component of adjustment costs based on a structural model of dynamic labor demand.

investment decisions. With aggregate time-series data for the US corporate sector, they find that a generalized convex adjustment costs function performs better than the traditional quadratic cost specification. The estimates imply marginal hiring costs which are roughly equivalent to two-quarters of wage payments. Applying a similar procedure, Nilsen et al. (2007), using Norwegian data, estimate a q-model of labor demand and find a quadratic as well as a fixed component of adjustment costs. In contrast to the literature above, Hall (2004) estimates Euler equations and concludes that labor adjusts freely.

2.2 Direct inference of labor adjustment costs

In an early study, Oi (1962) reports direct estimates of hiring costs, implying average hiring and training costs of roughly three weeks wage payments. Based on US data, Barron et al. (1985) find hiring costs in the size of a little over a week's pay in total. Using the same data, Holzer (1990) finds that firms posting higher wages can save up to 50% of the costs associated with higher wages due to reduced labor turnover rates. Barron et al. (1987) point out that large firms search more, invest more in on-the-job training and pay higher wages to avoid costly quits.

Pfann and Verspagen (1989) find that the size of hiring costs exceeds the size of firing costs, based on evidence from personnel interviews in large firms in the Dutch manufacturing sector. They find increasing marginal hiring costs only for firms which have increased their labor force significantly.

Anderson (1993) analyzes the effect of the US unemployment insurance system, where layoffs of workers lead to increased future taxes. She finds that these measurable linear adjustment costs play an important role in dampening the firm's employment response to fluctuations in labor demand.

Abowd and Kramarz (2003) directly estimate hiring costs using a detailed cross-sectional matched employer-employee data set for France. They find concave adjustment costs with a strong fixed component for highly skilled workers, but no effect of hires on adjustment costs for other skill groups. In contrast to our data, their study does not contain information on the productivity of newly hired workers, which may be reduced during the adaption

period. Kramarz and Michaud (2004) estimate the functional form of hiring costs, using longitudinal matched employer-employee data from France. Their results show that hiring costs are small and concave with a negligible fixed component.

Using British data, Manning (2006) presents evidence in favor of diseconomies of scale in recruitment. In contrast to our data, firms were asked to report their estimated total hiring costs in previously specified intervals.

3 The model

The functional form of total hiring costs is not a priori clear. In general, cost functions can consist of (i) purely fixed costs, (ii) purely variable costs or (iii) a combination of both fixed and variable costs.

If we represent the hiring costs function by $C(H_t)$, where H_t denotes the number of hires per period, a general hiring cost function has the form

$$C(H_t) = I[H_t]C_F + f(H_t)$$

where I is an indicator function with $I = 1$ if $H > 0$ and $I = 0$ if $H = 0$.[5] $C_F \geq 0$ indicates the size of the fixed component of hiring costs and $f(H_t)$ denotes a generalized form of variable hiring costs.[6]

With purely variable hiring costs, the role of hiring costs in the decision-making process of the firm can be illustrated by the following intertemporal profit maximization problem:

[5] To keep our exposition simple, we do not include firm size in the functional form of hiring costs. However, we will consider the possible interaction between firm size and the number of hires in our empirical specification, as large firms typically hire more workers than smaller firms.

[6] Fixed costs have been in the focus of a number of contributions in the labor adjustment costs literature. While some studies assume fixed costs of labor adjustment (e.g. Caballero et al., 1997), other studies conclude that firms face fixed adjustment costs based on the observation of worker flows, e.g, Hamermesh (1989, 1992), Lapatinas (2009) or Abowd and Kramarz (2003) based on directly observable hiring costs.

$$\max_{H_t, N_t} \Pi = \sum_{t=0}^{\infty} \beta^t \left[F(N_t) - w_t N_t - f(H_t) \right]$$

subject to the constraint representing the law of motion for the firm's number of employees

$$N_{t+1} = (1 - s_t) N_t + H_t$$

where $F(N_t)$ represents the firm's revenue function, which depends on the number of skilled workers N_t. The wage is denoted by w_t and s_t is the separation rate, i.e., the percentage of skilled workers that leave the firm per period, with $0 \leq s_t \leq 1$. β is the discount factor.
Common specifications of variable hiring costs $f(H)$ are (i) linear, (ii) quadratic and (iii) cubic. A general cost function can then be characterized by the following polynomial function

$$f(H_t) = \alpha_1 H_t + \alpha_2 H_t^2 + ... + \alpha_n H_t^n$$

where $n > 0$ is a non-negative integer. This general form captures, e.g., a cubic (n=3), quadratic (n=2) and purely linear (n=1) specification. We will test for these different specifications of hiring costs as well as for the existence of a fixed component in section 5.2.

4 Data

4.1 Survey design and data

For our analysis, we make use of administrative data on hiring costs which are part of two establishment-level surveys conducted by the Swiss Federal Statistical Office and the Centre for Research in Economics of Education at the University of Bern in Swiss firms in the years 2000 and 2004.[7] The

[7] The surveys have originally been conducted to carry out a comprehensive cost-benefit analysis of the Swiss vocational education and training system, which is part of the official OECD statistics on private-sector expenditures on education (OECD (2009)).

establishments in our sample are representative for the entire population of establishments in Switzerland, as they have been chosen from the Swiss Business and Enterprise Register (BER), which contains all establishments that exercise an economic activity. The population of firms in our sample includes all Swiss establishments with the exception of one-person businesses and firms in the agricultural sector. Our sample includes all establishments with 50 or more employees and a stratified random sample of establishments with less than 50 employees.[8] This procedure has been chosen in order to account for the fact that 87% of Swiss establishments employ less than 9 workers and only 2.4% of all establishments occupy 50 or more employees (Swiss Federal Statistical Office, 2007). Therefore, a random sampling independent of firm size might have resulted in too few observations of large firms. However, it is very important to include these firms, as they employ 53.4% of the Swiss labor force.

A paper-based questionnaire has been sent to the selected firms by the Federal Statistical Office. With respect to hiring costs, firms were asked several questions relating to their hiring activities in the previous three years. For example, firms were asked about the number of hires, number of applicants, advertising costs, the time spent for interviews as well as training costs and reduced productivity of newly hired workers during the adaption period. [9] The questionnaires were filled out either by management or the human resources department. The firms were asked to fill out hiring costs for a specific occupation, which makes it easier to compare hiring costs across firms, since the comparisons can be made within a homogenous occupation rather than across different occupations only.[10]

For the empirical analysis, we pool the two data sets, which provides in-

[8]The sample has been stratified by firm size and the two-digit-industry level, which corresponds to the nomenclature of economic activities in the European Community (NACE). Sampling weights have been computed by the Swiss Federal Statistical Office in order to account for non-response as well as the stratified structure of the sample. Further details on the sampling procedure and the construction of the survey weights are provided in Potterat (2006).

[9]The questions related to the firm's hiring behavior are provided in appendix A.

[10]Firms were asked to fill out the questionnaire for a randomly assigned occupation if they employ skilled workers in more than one occupation.

formation on hiring costs for a total of 4032 firms that have hired skilled workers in the corresponding occupation within the last three years. It should be noted that we do not have information about hiring costs that a firm might have incurred in other occupations. However, as the assigned occupations have been chosen at random before the questionnaires have been sent out, our data should project an unbiased picture of hiring costs in a given occupation. Similarly, firms that reported no hiring activity in the assigned occupation may well have hired workers in a different occupation, but we do not have any corresponding information in our data. Therefore, our data is limited in the sense that we cannot determine the population share of establishments that did not hire any workers in the period of interest. Furthermore, it should be noted that our data only corresponds to employees which have obtained a vocational degree at the upper secondary level. Therefore, we cannot make statements about hiring costs of management, employees with a tertiary degree as well as unskilled workers with no post-compulsory schooling degree. However, our data is representative for roughly two thirds of the Swiss workforce, which are employed in more than 200 different occupations (Federal Office for Professional Education and Technology, 2008). We can therefore infer hiring costs for the most important worker group in Switzerland.

As an alternative, instead of restricting the questionnaire to one occupation per firm only, hiring costs could be surveyed for an average hire within a firm. This would result in a figure of hiring costs that accounts for all types of worker categories. Nevertheless, we believe that it is an advantage of our data to obtain hiring costs for a specific occupation, as these costs differ substantially across occupations (which is what we find in our data). It should also be noted that the number of hires reported by firms is lower if they correspond to a specific occupation only.

4.2 Calculation of hiring costs

The calculation of hiring costs for firm i consists of two parts, the costs of recruiting a worker, subsequently denoted by r_i, and the costs associated with reduced productivity and training during the adaption period, subsequently

denoted by a_i.
First, recruitment costs can be written as

$$r_i = v_i + J_i c_{ai} + e_i$$

where v_i are the costs for posting a vacancy, J_i is the number of applicants per vacancy that are invited for an interview, and c_{ai} denotes the costs to conduct a single interview, which is the product of the time spent (in hours per worker) to interview an applicant and the corresponding wage of the workers involved in the interview process.[11] Furthermore, the costs for external advisors or placement agencies are denoted by e_i.
Second, there are costs that arise because a newly appointed skilled worker will not immediately be fully productive. In the questionnaire, firms were asked for how many days d_{ai} a newly hired worker is less productive than an average skilled worker within the firm. The relative productivity is denoted by p_i. There are several reasons why a newly hired worker is less productive initially. A possible explanation is firm specific human capital, which first has to be accrued before a worker can be fully productive, such as getting to know the firm environment, production processes and colleagues. Other reasons for lower productivity might be that newly hired workers receive training away from the workplace. This is costly to the firm in two ways: first, the firm has to pay the worker the daily salary w_{di} during the number of training days d_{ti}, and second, there are direct training costs c_{ti} for internal or external training personnel, travel costs or course fees. As a result, adaptation costs a_i can be written as

$$a_i = d_{ai}(1 - p_i)w_i + d_{ti}w_i + c_{ti}$$

Overall hiring costs to fill a vacancy in firm i are then given by

$$C_i = r_i + a_i$$

As an alternative to the calculation of hiring costs described above, one could directly ask firms about the total monetary costs of hiring skilled workers.

[11] There are five different job categories for interviewers: management, skilled workers with a vocational degree (by subcategories: administration, technical or social, crafts) and workers with no vocational degree.

A problem with this approach would be that firms might use different accounting procedures to calculate their costs. In our case, hiring costs are calculated in exactly the same way for every firm, which makes the comparison across different firms more reliable. Even though we break down the components of hiring costs such that the survey respondents might find it easier to provide accurate information, we cannot rule out that the presence of measurement error could potentially influence our results. However, measurement error does not bias the results if it is "classical", i.e., the error is independent of the *true value* of the underlying variable. Furthermore, measurement error does also not lead to biased results if the individuals responding to the survey provide a best estimate given their information set. In this case, the measurement error is not predictable by the *reported value*, which is referred to as "optimal prediction error" in the literature (Hyslop and Imbens, 2001). In order to minimize potential measurement error, we asked the person in charge of human resources to provide information on our variables of interest, which is probably the firm's most competent source of information with respect to our survey questions.

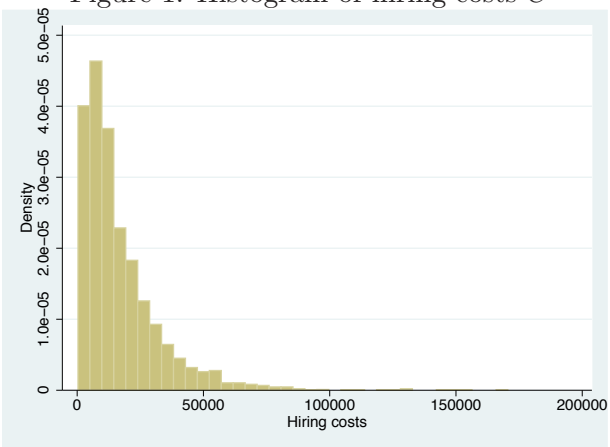
4.3 Descriptive Statistics

The descriptive statistics in the appendix (Table C1) show that on average hiring costs C to fill vacancy are equal to CHF 13,500. There is considerable variation, as maximum hiring costs are above CHF 170,000, which equals about two years of a worker's salary, while some firms face hiring costs of practically zero.[12] Adaption costs, on average, account for about 70% of total hiring costs, mainly due to costs associated with lower productivity during the adaption period. The remaining share of hiring costs can be attributed to recruitment costs. About half of recruitment costs are caused by processing interviews with job-applicants. While a single interview costs on average only slightly less than CHF 400, total interview costs are considerably higher, because on average, a firm interviews about five applicants to

[12] The model of Mortensen (2003) predicts marginal hiring costs of two years salary for a firm paying the median wage in Denmark.

fill a single vacancy.[13] The costs for external advisors or placement agencies are quite low on average, and amount to about 10% of recruitment costs, but can still be large for a single firm that uses such services, since the maximum amount paid for external placement agencies is equal to CHF 30,000.
Figure 1 shows a histogram of hiring costs. The distribution of C is skewed to the right with about 50% of the observations lying between 5,000 and 17,000 CHF.

Figure 1: Histogram of hiring costs C



While overall averages give a first indication about hiring costs, we need to explore the data in more detail. In a first step, the descriptive statistics are presented by firm size categories (Table 1). Total hiring costs C are increasing rather strongly in firm size. Very small firms with less than 10 employees spend on average 12,000 CHF to fill a vacancy, while large firms with 100 or more employees have to bear hiring costs that are almost twice as high.

Recruitment costs r also increase strongly in firm size. Firms with 100 and more employees face recruitment costs that are on average almost four times

[13] This figure is similar to the findings of Barron et al. (1985) for the US; they report 6.3 interviewed applicants on average to fill a vacancy.

Table 1: Descriptive statistics by firm size

Number of employees:	1-9	10-49	50-99	100+
Costs for job postings v	724	1571	2300	3235
Costs for interview per applicant c_a	317	505	565	770
No. of interviewed applicants J	4.7	4.9	4.7	5.4
Personnel costs for interviews Jc_a	1603	2560	2785	4388
Costs for external advisors e	246	584	1125	1516
Recruitment costs $r = v + Jc_a + e$	2744	5225	7852	10329
	(325)	(455)	(720)	(588)
Adaption period in days d_a	81	77	82	82
Decline in productivity $(1-p)$(in %)	28	30	31	33
Daily wage w of a skilled worker	338	365	378	394
Training courses in days d_t	1.4	1.7	2.6	2.5
Direct training costs c_t	454	627	1030	1302
Adaption costs $a = d_a(1-p)w + d_t w + c_t$	9098	10406	11875	12736
	(124)	(187)	(383)	(345)
Average hiring costs	11847	15633	19727	23065
	(325)	(455)	(720)	(588)
Observations	1481	1054	682	815

Standard errors of mean values in parentheses.

higher than those of the smallest firms. This is mainly due to higher costs for posting vacancies and higher per-applicant interview costs.[14]

There are two reasons why interview costs are higher for larger firms. First, they spend more time interviewing an applicant than smaller firms (Table C2). On average, the smallest firms spend about 6.4 hours per applicant.[15] Large firms with 100 or more employees spend twice as much time to interview a single job-applicant. Second, interview costs are higher for large firms because the salary of the workers conducting the interview is higher (Table

[14]These results are different from Barron et al. (1985), who find that larger firms interview more applicants to fill a vacancy, but do not exert more effort. While the authors are surprised by this finding, they argue that large firms can screen applicants more efficiently due to specialization gains.

[15]This includes time for preparation of the interview, the interview itself, time for review and time necessary for administrative work.

C3). The largest difference in median salary across the different firm size categories is observed for management positions. Small firms pay a median hourly wage of CHF 56.3, while firms in the largest firm size group pay a corresponding wage of CHF 73.3, which amounts to a wage differential of 30%. Skilled workers with a vocational degree in the largest firm size category earn 20% more than their colleagues in the smallest firms. The differences in wages for workers with no vocational degree are not as pronounced. As a conclusion, the main reason why large firms have higher interview costs per applicant is that they spend more time interviewing applicants and that the workers who conduct the interviews earn higher wages, which makes interview time itself more costly.
While larger firms spend significantly more time interviewing job-applicants, they interview only slightly more applicants to fill a vacancy. This indicates that larger firms select their applicants more carefully, since they spend more time on a given number of applicants. Furthermore, large firms make use of external advisors or headhunters to fill a vacancy more frequently than small firms.

While recruitment costs differ substantially by firm size, adaption costs increase only slightly for larger firms (Table 1). During the adaption period, newly hired workers are less productive compared to an average skilled worker in the corresponding firm. This period usually lasts about 80 days and does not differ significantly by firm size. During this time, the average productivity-loss compared to an average skilled worker within a firm is on average about 30%, and increases only slightly in firm size. The main reason why adaption costs are higher for large firms are higher wage costs of skilled workers. The daily wage costs for a skilled worker with a vocational degree in a small firm are CHF 338, while they are CHF 394 for a firm with 100 or more employees. As well, newly hired workers in large firms spend more time in training courses. The direct costs for training are quite low and amount to about CHF 1300 in the largest firm size category.
Average hiring costs also differ substantially with respect to industry (Table C4), sector (Table C5) and occupation in which a worker is hired (Table C6). For example, average hiring costs in the banking and insurance industry are

equal to CHF 25,000, whereas hiring costs in the textile industry are below CHF 8,000 on average. Considering different occupations, hiring costs for an IT specialist are about four times the hiring costs of a cook. However, the respective shares of the recruitment and adaption costs do not differ as much.
Detailed descriptive statistics of all other variables used in the analysis are given in Table C7.

5 Econometric models and empirical analysis

In this section, we want to empirically estimate the functional form of hiring costs C with respect to the number of hires H. First, we estimate a bivariate nonparametric regression without making any assumptions about the functional form of C. This provides first insights concerning the relationship between hiring costs and the number of hires and motivates the parametric specification of the multivariate regression model.

5.1 Nonparametric analysis

In this subsection, we estimate the functional form of average hiring costs, using local polynomial regression estimators. The regression model is of the form

$$y_i = m(x_i) + \varepsilon_i, \qquad i = 1, ..., N$$

In our case, y_i denotes hiring costs and x_i denotes the number of hires. We are interested in the functional form $m(x)$, which is linear in the neighborhood of x_0, such that $m(x) = a_0 + b_0(x - x_0)$ in the neighborhood of x_0.[16] The local linear regression estimator minimizes

$$\sum_{i=1}^{N} K\left(\frac{x_i - x_0}{h}\right)(y_i - a_0 - b_0(x_i - x_0))^2,$$

w.r.t. to the parameters a_0 and b_0, where K denotes the Kernel weighting function. As a result, $\hat{m}(x) = \hat{a}_0 + \hat{b}_0(x - x_0)$ in the neighborhood of x_0.

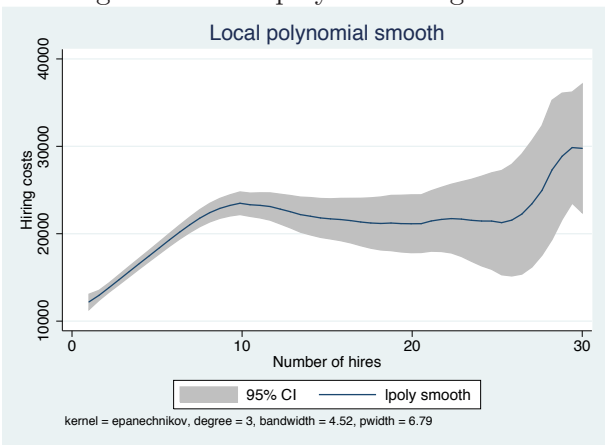
[16] See Cameron and Trivedi (2006), p. 320.

We have applied an Epanechnikov Kernel with third degree polynomial in the regressions displayed in the following subsections.[17]

5.1.1 Hiring costs

Empirically, we find that hiring costs C to fill a vacancy are an increasing function of the number of hires H, but the effect diminishes as H becomes large (see Figure 2). Increasing average costs in turn imply that marginal costs are increasing in H. This indicates that on average, it becomes increasingly expensive for a firm to hire additional workers. Average hiring costs

Figure 2: Local polynomial regression



also increase in the number of skilled workers N (see Figure B1). However, as large firms typically hire more new workers, it is necessary to carry out a multivariate analysis in order to separate the effects of H and N on C. This will be provided in the next section.

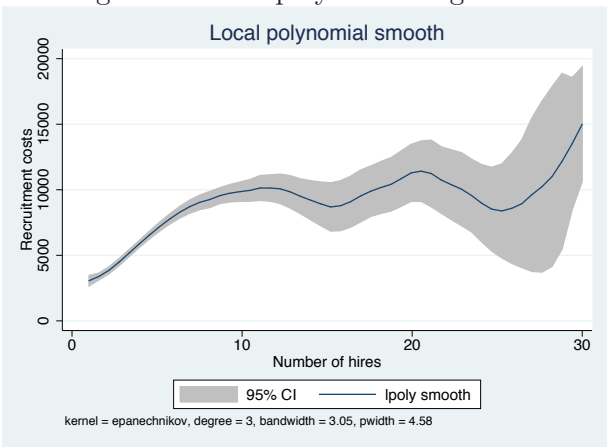
5.1.2 Recruitment costs

To get a better understanding of how the number of hires H hired in a given time period and the number of skilled workers N employed by a firm affect

[17] It should be noted that 95% of the firms have a value of $H < 10$. The estimations were carried out in Stata using the -lpoly- command.

hiring costs C, we estimate the non-parametric regressions shown above for the different components of hiring costs. Figure 3 shows that the effect of the number of hires on average recruitment costs is similar to the effect on overall hiring costs. Both average and marginal recruitment costs increase in the number of hires.

Figure 3: Local polynomial regression

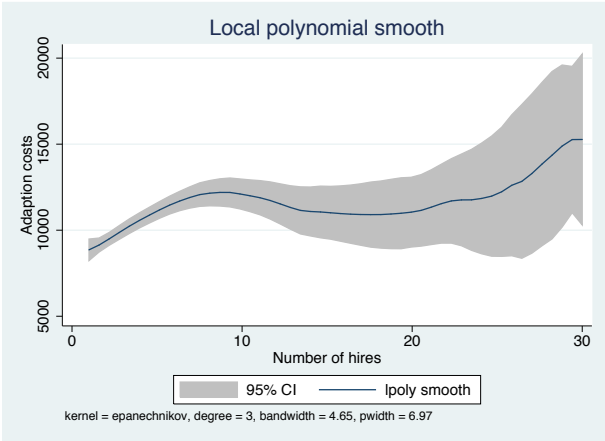


The same is true for the effect of the number of skilled workers N on recruitment costs; firms with a higher N face higher recruitment costs (see Figure B2).

5.1.3 Adaption costs

In contrast to recruitment costs, adaption costs are less affected by both the number of hires and the number of skilled workers. Nevertheless, adaption costs are still increasing at low numbers of H and N, but remain roughly constant for higher values of H and N (see Figure 4 and Figure B3).
Non-parametric estimates provide first insights about the relationship between hiring costs and the number of hires as well as the number of skilled workers. However, for a meaningful interpretation of the results we need to go beyond a simple bivariate analysis.

Figure 4: Local polynomial regression



5.2 Parametric analysis

5.2.1 Hiring costs function

We now test the various specifications of the total hiring costs function, as discussed in section 3. Total hiring costs are given by

$$C_T = \alpha_0 + \alpha_1 H + \alpha_2 H^2 + ... + \alpha_n H^n \tag{1}$$

where α_0 corresponds to the fixed costs component of hiring costs.
Given our data, we estimate average hiring costs of the form

$$C = \frac{C_T}{H} = a_0 \frac{1}{H} + a_1 + a_2 H + ... + a_n H^{n-1} + \upsilon \tag{2}$$

To test for different specifications of the functional form of *total* hiring costs (equation 1), it is necessary to multiply the regressors in equation (2) by the number of hires H. In order to test for the presence of fixed costs, we therefore have to consider the coefficient a_0 on the regressor $\frac{1}{H}$. We are interested in testing the hypothesis whether the coefficient a_0 in equation (2) is positive and significantly different from zero. The results in Table 2 suggest that fixed costs are not an important component of hiring costs in our data, as a_0 is non-positive and not statistically different from zero

Table 2: Average hiring cost regressions

	(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{H}$	-1375.422	-1534.335	-1499.105			
	(1731.429)	(2034.848)	(1681.647)			
1	11460.800	11315.88	11860.260	9531.283	9672.903	10335.720
	(1917.752)	2411.659	(2514.177)	(611.669)	(710.713)	(1747.610)
Number of new hires H	1492.986	1005.145	634.464	1714.699	1390.463	1009.904
	(480.327)	(677.482)	(533.278)	(275.327)	(348.177)	(285.730)
H^2	-42.413	-34.986	-21.368	-50.774	-51.969	-37.891
	(20.426)	(29.477)	(23.704)	(13.592)	(17.278)	(14.876)
$H^3 \cdot 10^3$	317.767	320.379	204.525	391.179	492.413	371.755
	(183.829)	(280.563)	(227.988)	(131.259)	(194.885)	(171.387)
Number of skilled workers N		304.704	41.005		311.145	47.809
		(95.511)	(76.355)		(95.905)	(76.864)
$H \cdot N$		-25.792	-5.525		-29.003	-8.682
		(9.334)	(7.387)		(8.913)	(7.147)
$H^2 \cdot N$		0.844	0.284		0.995	0.432
		(0.311)	(0.251)		(0.281)	(0.232)
$H^3 \cdot N \cdot 10^3$		-7.132	-2.980		-8.665	-4.475
		(2.925)	(2.393)		(2.690)	(2.269)
Employees other than N		28.934	15.037		28.617	14.739
		(7.843)	(7.620)		(7.838)	(7.610)
$H \cdot$(Employees other than N)		-1.463	-0.734		-1.465	-0.738
		(0.533)	(0.477)		(0.537)	(0.477)
Daily wage of a skilled worker			59.198			59.330
			(5.833)			(5.837)
Aggregate regional income $\cdot 10^3$			67.075			66.740
			(27.522)			(27.489)
Regional unemployment rate			-755.2981			-760.621
			(265.712)			(265.970)
Industry controls	No	No	Yes	No	No	Yes
Job controls	No	No	Yes	No	No	Yes
R^2	0.037	0.0513	0.307	0.034	0.051	0.307
Observations	4032	4032	4032	4032	4032	4032

Robust standard errors in parentheses.

throughout the various model specifications.[18] Therefore, we also estimate different regression models without explicitly allowing for fixed costs.[19]

We can also test whether total hiring costs feature a substantial linear component, which is the case if the coefficient a_1 in equation (2) is positive and significantly different from zero. The results in models (4)-(6) in Table 2 show that a_1 is indeed positive and significantly different from zero, ranging between CHF 9,500 and CHF 10,500.

In order to test whether total hiring costs have a quadratic component, we consider the coefficient a_2 on new hires H. The results show that average hiring costs are indeed significantly increasing in the number of hires, which implies that the total hiring cost function has a quadratic component.[20]

Furthermore, we included H^2 and H^3 in our regression models, and both regressors are different from zero at the 5%-significance level. The coefficient a_3 from equation (2) is negative, which suggests a cubic function of total hiring costs. Conversely, the coefficient a_4 is again positive and corresponds to the fourth-order polynomial in the total hiring cost function.[21] To get some intuition about the magnitude of these results, we compute marginal hiring costs at average values.

Since total hiring costs $C_T = \alpha_1 H + \alpha_2 H^2 + \alpha_3 H^3 + \alpha_4 H^4$, marginal hiring costs are given by $\frac{\partial C_T}{\partial H} = a_1 + 2a_2 H + 3a_3 H^2 + 4a_4 H^3$. As reported in the descriptive statistics, the average number of hires $\bar{H}$ is equal to 2.79. Therefore, using the results in model (4) without any further control variables, marginal hiring costs are equal to CHF 18,000. Including all other control variables (last column in Table 2) yields slightly lower marginal hiring costs of roughly CHF 15,000 at average values. Even though the cubic component of total hiring costs is negative, we find that based on the estimated

[18] Notice that the coefficients are negative, though none by as much as one standard error. The true value of fixed costs, however, cannot be negative.

[19] The reason is that the regressor $\frac{1}{H}$ is significantly correlated with the other regressors H, H^2 and H^3, which might explain the less precise estimates of the latter regressors in models (1)-(3) compared to (4)-(6).

[20] It should be noted that theoretically the coefficient could be negative, which would correspond to decreasing marginal hiring costs.

[21] We also estimated regressions with higher order polynomials, however, polynomials with $n > 4$ are not significantly different from zero at the 5%-level.

parameter values, marginal hiring costs increase over the whole range of H. Summing up, our tests on the functional form of total hiring costs indicate the importance of higher-order terms of H, but they do not support the presence of a substantial fixed costs component in the firm's total hiring costs. Our preferred specification in model (6) suggests that total hiring costs exhibit a linear, a quadratic and a cubic component as well as a fourth order polynomial in the number of hires.

However, it should be noted that we use cross-sectional data for our analysis, and therefore the estimations are based on variance *across* firms. Ideally, we would test variations in the number of hires *within* firms in order to account for unobserved heterogeneity. Nevertheless, while most firms in our data are observed in one time period only, we can identify a small sub-sample of 142 firms reporting hiring costs for the same occupation in both periods. We can therefore estimate first-differences of hiring costs, which eliminates unobserved firm-specific effects. The results are in line with the estimates reported above, i.e., hiring costs feature a quadratic and a cubic component (Table B). Even though we cannot draw strong conclusions from these estimations due to the small number of observations, they may be regarded as some additional support for the validity of our main results.

As already discussed in the bivariate analysis in the previous section, hiring costs are increasing in the number of skilled workers N as well. In model (5) we therefore include the number of skilled workers N and the variable "other workers employed by the firm". The results show that hiring costs are increasing both in skilled workers N and in the number of other employees, indicating that marginal hiring costs are higher for large firms. In addition, we include interaction terms of both variables with H, because large firms might recruit more workers in a given time period than small firms. We find that the interaction terms of N and H as well as the interaction of "employees other than N" and H are indeed negative and significant in model (5) in Table 2. This indicates that for large firms, marginal hiring costs diminish in the number of hires. However, if we include the wage costs as an additional regressor, the effects related to firm size are no longer statistically significant (model 6). Hence, the firm size effects appear to be only significant due to

the fact that large firms pay higher wages to their employees. The results show that the wage of a skilled worker positively influences hiring costs. This is not surprising, because a higher wage directly increases adaption costs. In addition, wages of different worker groups within a firm are typically correlated. Hence, a high wage for skilled workers often comes along with high wages of the persons conducting job interviews, which in turn increases recruitment costs.

The economic environment is likely to affect hiring costs as well. For instance, in a period of economic boom, it might be more difficult, and hence more costly, to find suitable skilled workers on the labor market. To control for this, we included the regional unemployment rate in the estimations. The coefficient can be interpreted as the effect of the unemployment rate on marginal hiring costs. A 1%-point increase in the regional unemployment rate reduces average hiring costs by CHF 760, which is equal to a decrease of more than 5%. We also added the aggregate per-capita income of the region in which the firm is operating. The coefficient is positive and significant, indicating that skilled labor may be more scarce in such regions.

5.2.2 Recruitment costs function

We can test for the functional form of recruitment costs with respect to the number of hires in a similar way as for hiring costs above. The results in Table 3 show that the coefficients on $\frac{1}{H}$ are again not statistically different from zero, implying that fixed costs can also be neglected if we analyze recruitment costs separately. The linear component of recruitment costs is much smaller compared to hiring costs, which reflects that recruitment costs account for less than 30% of hiring costs, as reported in the descriptive statistics. After including all control variables in model (6), the linear component is not statistically different from zero. It should be noted that the interaction terms of H and firm size are (marginally) significant in model (6).

In contrast to the results for hiring costs, we find that the effect of firm size does not disappear if we include the wage for skilled workers in the regression model. This can be interpreted in the sense that large firms put

Table 3: Average recruitment cost regressions

	(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{H}$	15.322	-371.731	-246.860			
	(759.004)	(844.921)	(759.566)			
1	1729.857	2070.308	1456.476	1930.257	1493.015	1205.427
	(920.291)	(1071.190)	(1278.543)	(285.471)	(792.562)	(830.903)
Number of new hires H	1040.686	655.885	536.437	1037.734	749.238	598.261
	(236.413)	(284.561)	(252.152)	(125.878)	(138.416)	(127.169)
H^2	-29.919	-19.686	-14.973	-29.805	-23.800	-17.694
	(9.954)	(12.801)	(11.514)	(6.276)	(7.722)	(7.493)
$H^3 \cdot 10^3$	227.491	136.868	99.537	226.498	178.547	127.076
	(90.043)	(123.734)	(113.816)	(61.502)	(86.768)	(86.830)
Number of skilled workers N		146.998	92.878		148.558	93.998
		(41.127)	(36.233)		(40.460)	(35.675)
$H \cdot N$		-10.597	-6.275		-11.375	-6.794
		(4.404)	(4.043)		(3.917)	(3.667)
$H^2 \cdot N$		0.326	0.202		0.363	0.227
		(0.151)	(0.143)		(0.128)	(0.126)
$H^3 \cdot N \cdot 10^3$		-2.452	-1.547		-2.824	-1.793
		(1.417)	(1.357)		(1.241)	(1.239)
Employees other than N		18.943	14.213		18.866	14.164
		(4.103)	(3.492)		(4.093)	(3.480)
$H \cdot$(Employees other than N)		-0.887	-0.712		-0.888	-0.713
		(0.321)	(0.277)		(0.322)	(0.277)
Daily wage of a skilled worker			16.293			16.314
			(2.141)			(2.142)
Aggregate regional income $\cdot 10^3$			36.377			36.321
			(9.600)			(9.601)
Regional unemployment rate			-233.8914			-234.768
			(101.771)			(101.996)
Industry controls	No	No	Yes	No	No	Yes
Job controls	No	No	Yes	No	No	Yes
R^2	0.074	0.100	0.218	0.070	0.100	0.218
Observations	4032	4032	4032	4032	4032	4032

Robust standard errors in parentheses.

Table 4: Average adaption cost regressions

	(1)	(2)	(3)	(4)	(5)	(6)
$\frac{1}{H}$	-1401.982	-1176.247	-1267.433			
	(1347.381)	(1626.311)	(1395.289)			
1	9737.338	9254.851	10412.250	8376.500	7995.316	9123.312
	(1418.722)	(1869.098)	(2059.389)	(507.589)	(582.103)	(1535.661)
Number of new hires H	450.282	345.757	94.171	720.436	641.148	411.590
	(346.274)	(530.302)	(433.257)	(207.611)	(277.880)	(235.090)
H^2	-12.428	-15.185	-6.268	-22.854	-28.204	-20.238
	(14.138)	(22.689)	(18.726)	(9.535)	(13.427)	(11.626)
$H^3 \cdot 10^3$	89.775	182.689	104.063	180.608	314.573	245.449
	(124.593)	(218.909)	(180.447)	(89.357)	(153.216)	(133.742)
Number of skilled workers N		158.036	-51.561		162.974	-45.809
		(77.235)	(67.467)		(77.980)	(68.301)
$H \cdot N$		-15.209	0.739		-17.670	-1.930
		(7.366)	(6.079)		(7.207)	(6.080)
$H^2 \cdot N$		0.517	0.082		0.633	0.206
		(0.242)	(0.194)		(0.224)	(0.184)
$H^3 \cdot N \cdot 10^3$		-4.680	-1.433		-5.856	-2.697
		(2.246)	(1.789)		(2.089)	(1.732)
Employees other than N		10.015	0.837		9.772	0.585
		(5.583)	(6.425)		(5.569)	(6.402)
H·(Employees other than N)		-0.575	-0.022		-0.577	-0.025
		(0.308)	(0.342)		(0.311)	(0.342)
Daily wage of a skilled worker			42.908			43.020
			(4.995)			(5.000)
Aggregate regional income $\cdot 10^3$			30.745			30.461
			(25.265)			(25.234)
Regional unemployment rate			-522.2508			-526.751
			(231.097)			(231.467)
Industry controls	No	No	Yes	No	No	Yes
Job controls	No	No	Yes	No	No	Yes
R^2	0.010	0.014	0.235	0.010	0.014	0.235
Observations	4032	4032	4032	4032	4032	4032

Robust standard errors in parentheses.

relatively more effort in their search and recruitment activities compared to small firms. The coefficient on N can be interpreted as marginal recruitment costs with respect to the number of skilled workers, i.e., a marginal increase in N increases marginal recruitment costs by CHF 94, as reported in model (6). However, marginal costs again decrease for large firms with a large number of hires, as shown by the negative coefficient on $H \cdot N$.

Another effect worth mentioning is the regional unemployment rate. It has a stronger effect on recruitment costs than on hiring costs. A 1%-point increase in the regional unemployment rate leads to a decrease in average recruitment costs of roughly 6%, which is slightly higher than the effect on overall hiring costs. This underlines the importance of labor market conditions, as firms find it easier to fill a vacancy if skilled workers are readily available on the external labor market.

5.2.3 Adaption costs function

The results in Table 4 indicate that adaption costs do not feature a fixed component, as the coefficient on $\frac{1}{H}$ is not significantly different from zero across different model specifications. However, we find a substantial and significant linear component of roughly CHF 9,000 in model (6). While the effects of higher order terms of hires on total adaption costs are qualitatively similar as on recruitment costs without the inclusion of control variables in model (4), they are only significant at the 10%-level in model (6). This suggests that total adaption costs are predominantly linear in the number of hires. However, the marginally significant higher order terms indicate that hiring many new workers in a given time period may result in a lower average match quality between the worker and the firm, which in turn could prolong the adaption period. In addition, a firm's resources to train newly hired workers are limited. Hence, if many workers are hired at once, adaption could become increasingly costly.

It should be noted that firm size does not seem to have an influence on adaption costs once we control for the wage of skilled workers, which is in contrast to the results on recruitment costs above. The regional unemployment rate, however, still has a negative effect on adaption costs, as a 1%-point increase

in the regional unemployment rate decreases average adaption costs by more than CHF 500, which is equal to a decrease of roughly 5%.

6 Conclusions

This paper analyzes the structure of the firm's costs associated with hiring skilled workers. We make use of detailed and representative administrative data on directly observed hiring costs in Switzerland. The data allow to capture the underlying components of hiring costs, such as search and recruitment costs as well as costs associated with reduced productivity and training during the adaption period of a newly hired worker.

Our empirical results show that the size of hiring costs is equal to roughly one-quarter of wage payments. However, we find substantial variations with respect to different occupations, industries, firm characteristics and macroeconomic conditions. Furthermore, we find that hiring costs increase in the number of hires, whereas we do not find any evidence in favor of a substantial fixed costs component. As our analysis is based on two independent cross-sectional data sets, we cannot in general control for unobserved heterogeneity. However, we find support for our results based on estimating first-differences for a sub-sample of firms that can be observed in both time periods.

Knowledge about structure of hiring costs is important in order to understand the firm's hiring behavior. Firms may prefer to group hirings in the presence of non-convexities in hiring costs, whereas a smooth adjustment path is favorable in a setting with convex hiring costs. However, future research based on large-scale panel data with detailed information on hiring costs at the firm-level is necessary in order to gain further insights on the structure of hiring costs and how this affects the firm's dynamic labor demand.

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A Survey questions on the firm's hiring behavior

1. How many employees have been hired in your establishment in the last three years within the corresponding occupation?[22]

2. How high are average advertising costs (newspaper ad's, requests from employment agencies, internal job ad's, etc.) to fill a vacancy in the corresponding occupation?

3. How many applicants are usually invited for an job interview in order to successfully fill a vacancy in the corresponding occupation?

4. How high to you estimate the average time spent (in hours) per applicant in total (preparation of the interview, conduct the interview, reflection time, administrative effort) for those employees who take part in the interview process of a new applicant?
   Please specify by worker category (if applicable):[23] (a) Management, (b) Skilled workers with vocational degree (administrative/technical/social/crafts), (c) Unskilled workers

5. How high are the costs for services of external placement agencies to successfully fill a vacancy (if applicable).

6. How much time does it take for a newly hired skilled worker to reach the same productivity level as an average skilled worker in your establishment in the corresponding occupation (in months)?

7. During this adaption time, how much lower is the productivity of a newly hired worker compared to an average skilled worker in the corresponding occupation (in percent)?

8. Do newly hired workers participate in special training courses during the adaption time in order to adjust to the new job? If yes, for how many days on average? How much are the cost borne by the firm (per day of training, including travel costs)?

[22] The occupation has been indicated on the front page of the questionnaire.
[23] Notice that wage costs for different worker categories have also been surveyed.

B Figures

Figure B1: Local polynomial regression

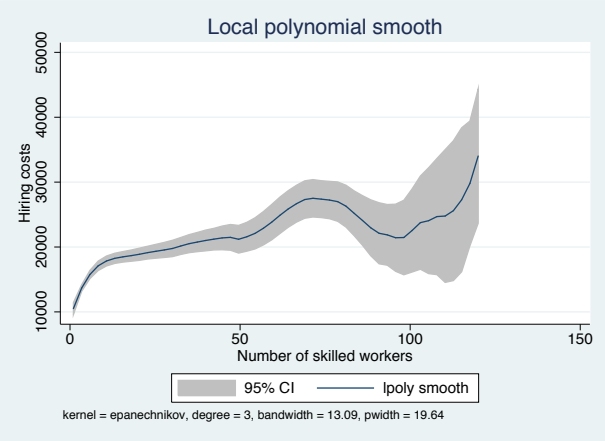


Figure B2: Local polynomial regression

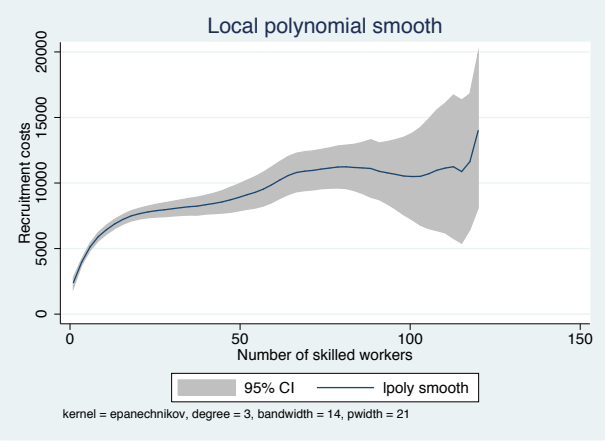
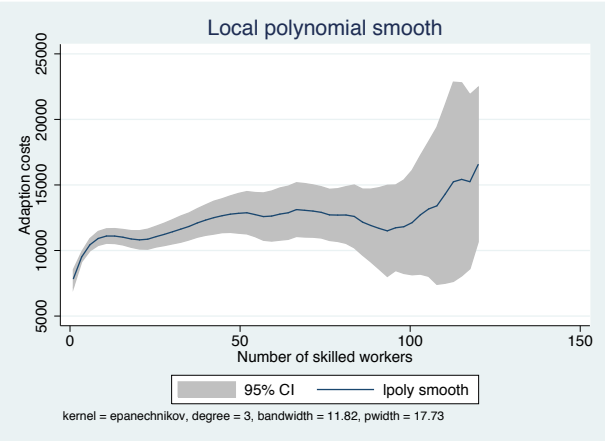


Figure B3: Local polynomial regression



C Tables

Table C1: Descriptive statistics

Variable	Mean	Std.Dev.	Minimum	Maximum	Obs.
Costs for job postings v (in CHF)	1103	1889	0	50000	4032
Costs for interview per applicant c_a (in CHF)	395	495	0	8844	4032
Number of interviewed applicants J per vacancy	5	4	1	30	4032
Personnel costs for interviews $J * c_a$	2009	3877	0	83586	4032
Costs for external advisors/headhunters e (in CHF)	414	1881	0	30000	4032
Recruitment costs $r = v + J * c_a + e$ (in CHF)	3878	5894	0	116117	4032
Duration of adaption period in days d_a	80	60	0	756	4032
Average decline in productivity $(1 - p)$ during adaption period (in %)	29	14	0	90	4032
Daily wage w of a skilled worker with vocational degree (in CHF)	349	79	125	784	4032
Duration of training courses in days d_t	2	4	0	90	4032
Direct training costs c_t (in CHF)	550	1805	0	60000	4032
Adaption costs $a = d_a * (1 - p)w + d_t * w + c_t$ (in CHF)	9688	11005	0	147779	4032
Average hiring costs $C = r + a$ to fill a vacancy (in CHF)	13570	13862	320	170575	4032

Table C2: Average time spent by different worker categories to interview job-applicants to fill a vacancy (in hours)

	1-9 employees	10-49 employees	50-99 employees	100+ employees
Management	2.6	4.0	3.9	5.2
Skilled workers with vocational degree	3.1	4.7	5.0	6.6
Workers with no vocational degree	0.6	0.7	0.9	1.0
Total time to interview an applicant (in hours)	6.4	9.4	9.8	12.9
Observations	1481	1054	682	815

Table C3: Median hourly wage of workers that interview job-applicants (in CHF)

	1-9 employees	10-49 employees	50-99 employees	100+ employees
Management	56.3	64.4	68.9	73.3
Skilled workers with vocational degree	39.7	42.9	44.5	46.7
Workers with no vocational degree	29.3	31.4	31.8	32.2
Observations	1481	1054	682	815

Table C4: Hiring costs by industry

Variable:	Average hiring costs	Share of average hiring costs	
		Recruitment costs	Adaption costs
Banking, insurance	25159	31%	69%
	(1706)		
Machine, automotive manufact.	23734	35%	65%
	(1210)		
Paper, print, media	22978	30%	70%
	(1175)		
Metal manufacturing	22856	34%	66%
	(1051)		
Real estate, IT, research	18624	28%	72%
	(644)		
Education	17287	31%	69%
	(1171)		
Food,beverages, tobacco	17093	33%	67%
	(2088)		
Chemical, oil	16378	20%	80%
	(969)		
Hotel, restaurant	13464	28%	72%
	(512)		
other services, culture, sport	13387	23%	77%
	(945)		
Crafts (Wood)	13295	48%	52%
	(1025)		
Transport, communication	12205	29%	71%
	(861)		
other manufacturing	11698	23%	77%
	(935)		
Construction	8666	32%	68%
	(1088)		
Health, social institutions	7844	22%	78%
	(1171)		
Textiles, leather, shoes	7828	20%	80%
	(754)		
Trade and repair of automobiles	7445	40%	60%
	(346)		

Standard errors in parentheses.

Table C5: Hiring costs by sector

Variable:	Average hiring costs	Share of average hiring costs	
		Recruitment costs	Adaption costs
Industrial	16124	29%	71%
	(418)		
Services	13946	29%	71%
	(294)		
Construction	8514	26%	74%
	(377)		

Standard errors in parentheses.

Table C6: Hiring costs by occupations

Variable:	Average hiring costs	Share of average hiring costs	
		Recruitment costs	Adaption costs
Automatician	29344	23%	77%
	(2529)		
IT specialist	29059	23%	77%
	(1801)		
Polymechanics technician	21662	23%	77%
	(1015)		
Electronics technician	19729	45%	55%
	(1779)		
Administrative assistant	19202	31%	69%
	(493)		
Electrician	13125	26%	74%
	(1330)		
Car mechanic	12332	21%	79%
	(1575)		
Sales clerk (3 years)	11598	29%	71%
	(1030)		
Hairdresser	11521	17%	83%
	(1556)		
Draftsman	9820	28%	72%
	(617)		
Sales clerk (2 years)	9442	21%	79%
	(702)		
Mason	7608	29%	71%
	(536)		
Joiner	7336	22%	78%
	(612)		
Cook	7302	42%	58%
	(426)		
Medical assistant	5932	24%	76%
	(688)		

Standard errors in parentheses.

Table C7: Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
Number of new hires H	2.79	3.11	1	90	4032
Number of skilled workers N	5.89	11.33	1	290	4032
Employees other than N	12.17	44.70	0	956	4032
Separation rate s	13.33	19.09	0	99	4032
Aggregate cantonal income	49152.14	10392.86	33699	82415	4032
Regional unemployment rate	3.18	1.22	0.70	6.30	4032
Industry dummies:					
Construction	0.013	0.112	0	1	4032
Food,beverages, tobacco	0.004	0.062	0	1	4032
Textiles, leather, shoes	0.019	0.138	0	1	4032
Crafts (Wood)	0.010	0.098	0	1	4032
Paper, print, media	0.011	0.105	0	1	4032
Chemical, oil	0.031	0.173	0	1	4032
Metal manufacturing	0.015	0.122	0	1	4032
Machine, automotive manufact.	0.018	0.133	0	1	4032
Manufacturing, other	0.009	0.097	0	1	4032
Trade and repair of automobiles	0.263	0.440	0	1	4032
Hotel, restaurant	0.109	0.312	0	1	4032
Transport, communication	0.042	0.200	0	1	4032
Banking, insurance	0.034	0.181	0	1	4032
Real estate, IT, research	0.177	0.382	0	1	4032
Education	0.021	0.144	0	1	4032
Health, social institutions	0.057	0.232	0	1	4032
Other services	0.043	0.203	0	1	4032
Occupation dummies:					
Administrative assistant	0.237	0.425	0	1	4032
Electrician	0.026	0.160	0	1	4032
IT specialist	0.035	0.183	0	1	4032
Polymechanics technician	0.023	0.149	0	1	4032
Sales Clerk (2 years of education)	0.045	0.206	0	1	4032
Sales Clerk (3 years of education)	0.041	0.199	0	1	4032
Cook	0.065	0.246	0	1	4032
Year of data (1=2000, 0=2004)	0.478	0.500	0	1	4032

Table C8: First-differences estimations

Dependent variable: Δ Hiring costs C	
Δ Number of hires H	905.856
	(454.004)
ΔH^2	-24.596
	(14.311)
Δ Wage of skilled workers	65.171
	(16.848)
Constant	-475.323
	(1345.617)
Observations	142
R^2	0.108

Robust standard errors in parentheses. Average hiring costs $\bar{C} = \text{CHF}16,200$, average number of hires $\bar{H} = 6.6$. The change in the wage level of skilled workers is included to control for nominal wage increases between 2000 and 2004.