Duration dependence and returns to scale in job vacancies in Germany, 2000–2013

Steven J. Davis*, Christof Röttger[#], Andreas Moczall[#], Anja Warning (née Kettner)[#], Enzo Weber[##]

* University of Chicago Booth School of Business, U.S.A.

[#] Institute for Employment Research (IAB), Nuremberg, Germany

[##] Institute for Employment Research (IAB), Nuremberg, and University of Regensburg, Germany

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Abstract

We present new evidence from the employers' perspective on aspects of matching jobseekers to vacancies using rich micro data on new hires from the German Job Vacancy Survey. We find positive duration dependence at the beginning of the job-filling hazard curve when a vacancy was advertized externally, and strictly negative duration dependence when applicants were recruited only through informal means such as asking employees for recommendations. We also find increasing returns to scale in vacancies in a parsimonious model of the recruitment duration that only includes tightness measures of the regional labor market, but find it reverting to constant returns to scale once we control for a variety of attributes of the establishment and the job to be filled. Finally, we show that measuring the vacancy duration as the time between the start of search and the start of work, rather than between the start of search and the decision for a particular applicant, introduces considerable measurement error. We conclude that omitted variable bias and measurement error of the outcome variable may be two reasons why micro studies of vacancy durations often find non-constant returns to scale.

JEL Codes: D22, E24, J63

Keyword: Vacancies, vacancy durations, employer search, matching

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1. Introduction

The employer side of the hiring process remains understudied in empirical research and functions largely as a black box in leading theoretical models. Compared to a vast literature on the characteristics of unemployed workers, unemployment spell durations and the search activity of unemployed workers, we know little about the characteristics of vacant job positions, the factors that influence vacancy durations, and the process through which firms recruit workers. As a result, much theorizing about recruiting behavior and the hiring process can draw on only limited guidance from empirical work. Our main goal in this paper is to throw new empirical light on the hiring process and to thereby help guide the development, refinement and calibration of theoretical models.

To do so, we study job recruitments and vacancy durations in the IAB Job Vacancy Survey, a rich and largely untapped source of data on individual hires. Our data set covers 55,000 recruitments into vacant job positions for stratified random samples of German employers from 2000 to 2013. We have information about the employer, the job position and the newly hired worker for all recruitments – including firm size, occupation, qualification requirements, previous labor market status of the new hire, and whether the job is a new position. We measure recruitment duration and the lag from recruitment to first day of work, which sum to the full vacancy duration. In addition, we link our micro data on recruitments and new hires to data on contemporaneous labor market conditions at the regional, occupation and industry levels. For this purpose, we draw on administrative records derived from the German Federal Employment Agency and Federal Statistical Office.

Unlike previous empirical work on vacancy durations, our data allow us to distinguish the recruitment duration from the full vacancy duration, where the latter includes the start lag between the recruitment date and the first day of new work. Most previous work identifies the full vacancy duration or the recruitment duration, but not both. For example, Burdett and Cunningham (1998) analyze the determinants of vacancy durations from the start of the recruitment process until the first day of work by the new hire. Using data from the Job Openings and Labor Turnover Survey, Davis, Faberman and Haltiwanger (2013) estimate a mean "vacancy duration" in the United Sates from 2000 to 2011 of about 20 working days. However, their JOLTS-derived measure of vacancy duration corresponds to what we call the recruitment duration in this paper. Thus, the mean recruitment duration of 34 days we find for Germany is 70 percent longer than the estimated mean duration for the United States in Davis

et al. (2013). Our ability to separately measure recruitment durations, start lags, and total vacancy durations affords a fuller study of the hiring process and facilitates comparison with previous research. Other empirical studies of vacancy durations include van Ours and Ridder (1991), Holzer (1994), Barron et al. (1999) and Andrews et al. (2008).

Another advantage offered by the IAB Job Vacancy Survey is the availability of information about the firm's intended vacancy duration at the outset of the recruiting process. It reflects firms' desires as well as expectations, and it reflects market pressure as well as internal organizational structures. Thus the meaning of this measure is not as clear as the reported "real" durations of recruitment and start lag, even as one might expect that intended and factual vacancy duration are related to each other. Due to the unique information on the actual (not estimated) length of different phases during the complete hiring process, insights from the underlying study are not limited to Germany but can provide a better understanding of the general functioning of labor markets.

The remainder of the paper proceeds as follows: Section 2 describes the IAB Job Vacancy Survey and briefly describes the administrative record sources that we exploit to construct measures of labor market conditions by occupation, industry sector and region. Section 3 defines the different phases of the hiring process: recruitment duration, start lag and other concepts pertaining to the actual and intended duration of the complete process. Section 4 reports summary statistics of recruitment durations, start lags and total vacancy durations by occupation, and Section 5 considers how these measures vary at the aggregate level over time. Section 6 reports results of fitting hazard functions to the individual data on new hires. Here we first present results on independent models of recruitment duration, start lag and vacancy duration. Secondly we show results on the estimation of the hiring delay. Section 7 offers some remarks on directions for our future research.

2. Theoretical background and previous research on vacancy durations

In the macroeconomic literature, the hazard rate or probability of a vacancy being filled is given by the matching function m(U,V)/V, with U being the stock of unemployed (or jobseekers) and V the stock of vacancies (Petrongolo/Pissarides 2001). The inverse of the hazard rate is the mean vacancy duration. Macro theory usually treats the employer side as a mirror image of the jobseeker's side in the job matching process: employers vary their job advertising while

jobseekers vary their search intensity, both variables together creating the "matching technology", see e.g. Pissarides (2000).

Sequential search versus screening

However, van Ours/Ridder's (1992) seminal work showed using data from the Netherlands form 1986/1987 that unlike in jobseekers' job search, the largest part of a vacancy's duration is spent not on searching for applicants, but on screening applications. Vacancies are thus filled at the earliest once screening has begun. This is reflected in the positive duration dependence of the hazard of filling a vacancy in their empirical model. On the other hand, Burdett/Cunningham (1998), using U.S. data from the early 1980s, found that 44 percent of vacancies last for at most seven days and 72 percent last for at most two weeks. Their hazard estimates provide no indication of positive duration dependence, and accordingly, their theoretical model assumes sequential rather than pool-and-screen search. Holzer (1994) reports similar results also using U.S. data from the early 1980s. Negative duration dependence in duration analysis however may always be the result of unobserved heterogeneity (Zorn 2000). Andrews et al. (2008) find negative duration dependence using British data for vacancies that have not lapsed, and positive duration dependence for vacancies that have lapsed. If the negative duration dependence were merely the result of unobserved heterogeneity, it would also show up for vacancies that have lapsed. The fact that switching from successfully-filled to lapsed vacancies also flips the duration dependence from negative to positive indicates that the negative duration dependence is substantive rather than a statistical artifact. Negative duration dependence of the hazard of successfully filling a vacancy may be explained by stock-flow matching: when a vacancy is posted, the entire stock of jobseekers applies. If none of these is acceptable, assuming that applicants that have already been screened out do not apply again, then further applications will subsequently only be received from the inflow into jobseeker status. Using Dutch data gain, Gorter et al. (1996) attribute the question of positive versus negative duration dependence on the search strategy used by the employer: vacancies that were advertised exhibit positive, vacancies that were filled using informal contacts exhibit no or negative duration dependence. These findings are consistent with the supposition that sequential search implies no or negative duration dependence and that non-sequential search with screening implies positive duration dependence.

In this paper, we will test for the duration dependence of the hazard of filling a vacancy with German data, separately for jobs that were advertised externally (described as "formal search") and for jobs that were filled through informal contacts such as asking employees if they know of a suitable person (described as "informal search").

Returns to scale

Davis et al. (2013) propose and fit a model of the employer-level vacancy posting and hiring process. They use the fitted model to show that the cross-sectional elasticity of job-filling rates with respect to the gross hires rate is about 0.8, far above the zero elasticity implied by standard equilibrium search models of the type developed in Pissarides (2000). They also show how to use the fitted model to estimate returns to scale in the use of vacancies to hire and to identify employers' use of other recruiting instruments, in addition to vacancy numbers, to vary the pace of hiring. Compare this to most matching models which assume a Cobb-Douglas matching function with constant returns to scale (CRS), which is supported by empirical studies with aggregated data (for an overview see Petrongolo & Pissarides 2001). This discrepancy between the micro and aggregated levels has not been adequately resolved so far.

3. The IAB Job Vacancy Survey

The IAB Job Vacancy Survey (JVS, see Kettner/Vogler-Ludwig 2010 and Kettner et al. 2011 for details) is a representative establishment survey in Germany that has been conducted in every fourth quarter since 1989. Its primary purposes are firstly to enquire the total number of vacancies in the German economy, including those not reported to the Federal Employment Agency (FEA), Germany's public employment service, and secondly to observe hiring processes in detail. Every year a cross-section of establishments is drawn from the business register of the Federal Employment Agency, covering all German establishments employing at least one worker who earns enough to trigger mandatory contributions to social security ("contributory employment"). The survey's response rate is around 20 percent each year, yielding about 13,000 to 15,000 participating establishments in the most recent years who filled out the written questionnaire or participated on-line (see also Appendix for details).

To observe hiring processes, participating establishments are asked to report details on their last hire of a new employee within the previous 12 months (see our sensitivity analysis in this paper for a discussion of the implications of this). Together with other data from the survey, the following information becomes available for our research:

- basic establishment information (industry, size, region, growth, churning, vacancies, hires)
- job information (occupation, required skills, working conditions, hours, wage)
- information on the hired person (age, sex, previous employment status)
- information on the recruitment process (duration, search channels, difficulties)

An outstanding aspect of JVS is the very detailed inquiry of the dates when several important dates of a recruitment process are defined:

- date of the start of search for applicants
- date of the decision for an applicant (date of recruitment of a selected applicant)
- date of the intended start of work of the newly hired employee (from the firm's perspective)
- date of the actual start of work of the newly hired employee

These dates allow the calculation of several durations with substantial relevance to understanding hiring processes. The longest of these, the vacancy duration, is the period between the start of the search and the start of work, and corresponds to the measure used in most of the literature. There are two critical points in time within this vacancy duration.

The first point is the date when the decision for a particular applicant is made. The period from the start of search to this decision date is the recruitment duration, during which the employer is actually looking for and screening applicants. The period from the decision date to the start of work is the start lag, during which the employer no longer searches for applicants but merely prepares for the new employee. On average the start lag is shorter in most occupations when hiring takes place from the pool of unemployed jobseekers, as those can usually start working immediately after receiving the notice that they were selected for the job, while persons switching jobs must typically follow a notification period at their old workplace. This distinction is meaningful as only the recruitment duration involves search and screening

activity on the part of the employer, leading rise to the expectation that recruitment duration and start lag differ in their sensitivities to labor market tightness and other explanatory variables.

The second important point in time is the date at which the employer originally intended the newly hired person to start working. The employer will make an educated guess on how long the process of filling the vacancy will or shall take, and adjust the start of search date accordingly given the intended start of work date. We call the period between the start of search and the intended start of work the intended vacancy duration, and the period from the intended to actual start of work the hiring delay. This distinction is particularly meaningful for making a more informed judgement about which vacancies are difficult to fill, and which hires take place according to the employer's expectations. Long vacancies are not ipso facto hard-to-fill vacancies, as they may merely indicate intense screening of applicants for high-productivity jobs that the employer fully expects and compensates for by beginning to search for applicants very early. Instead, a vacancy is only hard to fill in terms of its duration if it takes significantly longer to fill it than originally anticipated by the employer, in other words, if the actual start of work is later than the intended start of work and thus the hiring delay is positive. Both the intended vacancy duration and the hiring delay can theoretically be zero or negative: the start of search can be at or after the intended start work if a job becomes vacant without advance notice, yielding a zero or negative intended vacancy duration. The hiring delay as well can be negative if the employer agrees to let the new employee start working earlier than originally intended, for example, to prevent him or her from accepting another job offer from another firm.

Figure 1 and 2 illustrate these concepts using two examples. In Figure 1, an employer starts soliciting applications on September 3 for a position that should be filled on October 1; the intended vacancy duration is thus 28 calendar days. On September 17, he decides for a particular applicant; the recruitment duration thus is 14 calendar days. The applicant agrees and starts to work on October 1, so the start lag is 14 calendar days. Since the actual start of work matches the intended start of work, the intended vacancy duration is equal to the vacancy duration at 28 days, and thus the hiring delay is zero. Figure 1 therefore depicts an easy hiring. Figure 2 on the other hand depicts the process of filling a more difficult-to-fill position. As before, search starts on September 3 for a position to be filled on October 1, hence the intended vacancy duration is 28 calendar days. However, it takes until October 10 until a suitable applicant is found, thus the recruitment duration is 37 calendar days. That applicant can only

start working on October 29, making for 19 days of start lag. The total vacancy duration thus is 56 calendar days, which when compared to the intended vacancy duration of 28 days results in a hiring delay of 28 days.

Figure 1: Example of filling an easy-to-fill job vacancy

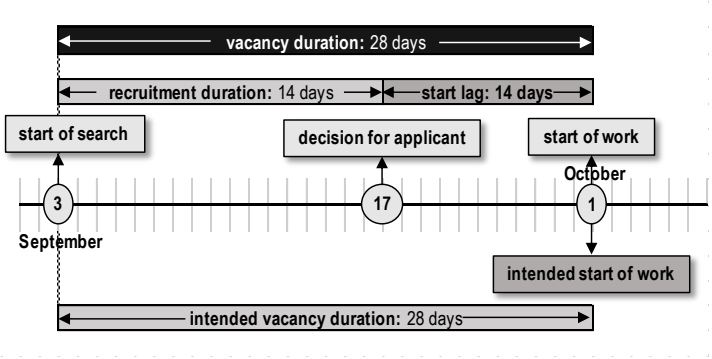
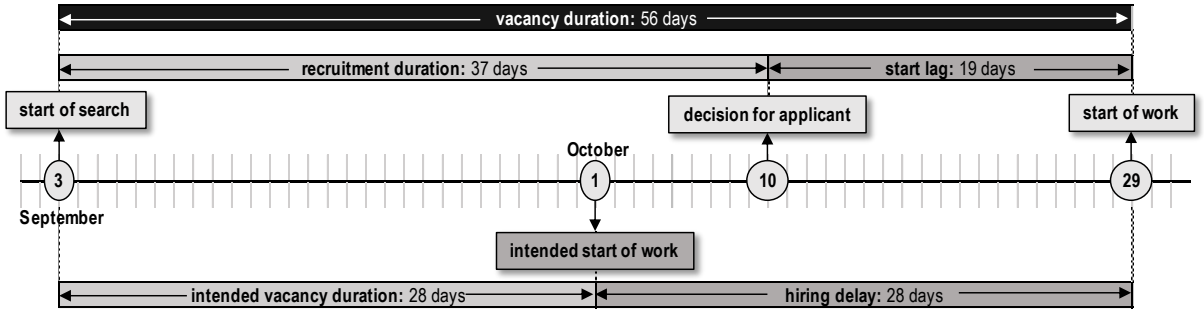


Figure 2: Example of filling a difficult-to-fill job vacancy



4. Descriptive evidence on hiring durations

Table 1 shows the 5, 10, 50 and 90 percent quantiles of the distribution as well as the mean of these durations for the pooled cross-section (2000 to 2013) in the analysis sample. Given that employers in Germany usually search for and screen applicants on working days only, we consider vacancy durations both without adjustment as calendar days and after adjustment by removing Saturdays, Sundays and public holidays, yielding the durations in working days.

Table 1: Hiring durations in the analysis sample, pooled cross-section

	calendar days: percentiles				mean
	5%	10%	50%	90%	
recruitment duration	0	4	31	117	50
recruitment duration, informal search	0	0	19	76	33
recruitment duration, formal search	2	6	37	123	56
start lag	1	2	17	61	28
start lag, previously unemployed	0	1	7	31	14
start lag, previously employed	2	4	30	78	37
hiring delay	0	0	0	77	24
vacancy duration	7	14	61	166	78
	working days: percentiles				mean
	5%	10%	50%	90%	
recruitment duration	0	3	22	81	35
recruitment duration, informal search	0	0	14	54	23
recruitment duration, formal search	1	4	26	85	38
start lag	0	1	12	43	19
start lag, previously unemployed	0	0	5	22	10
start lag, previously employed	1	2	20	54	25
hiring delay	0	0	0	54	16
vacancy duration	5	10	42	114	54

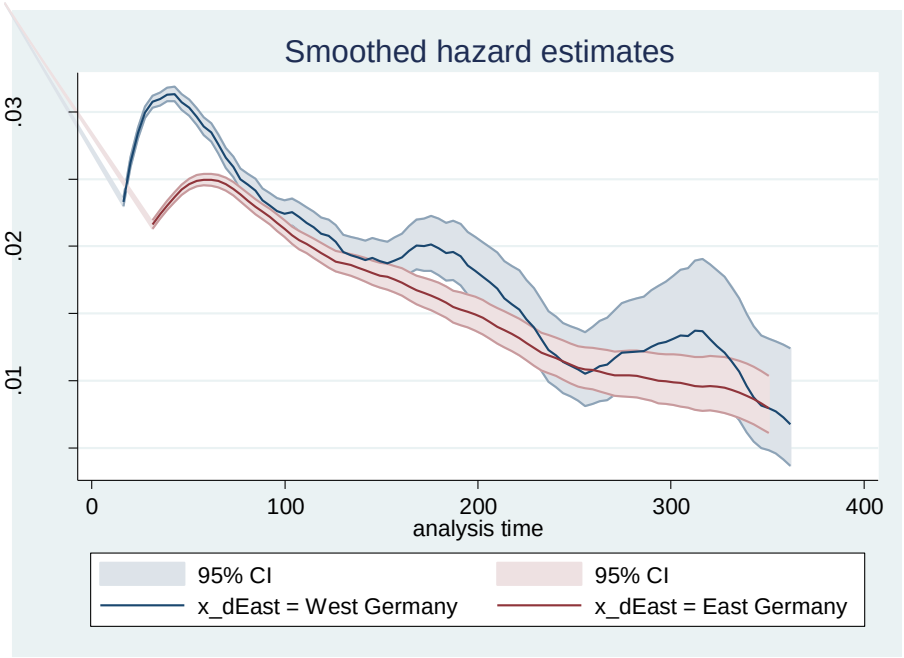
N=58,000. Source: IAB Job Vacancy Survey 2000–2013 (weighted), own calculations.

Because employers answer retrospectively, a certain degree of inaccuracy of the dates has to be taken into account: employers are asked about the most recent hire in the previous 12 months, so the hiring could have been nearly a year ago, with the start of search for applicants even earlier. By using only the answers of firms who answered consistently to all four questions on dates of the hiring process, we minimize such unpreventable imprecision.

A median of 22 working days are spent on recruitment, whereas the start lag is at a median of 12 working days, half of the time for recruitment, and almost a third of the total vacancy duration. As expected, the median start lag is far shorter at five days for hires who were previously unemployed than the 20 days for those who switched jobs, since job switchers often cannot quit their former jobs immediately; their means are also significantly different at 10 versus 25 days (p=0.000). The hiring delay is on average 16 working days, but the median is zero, indicating that the majority of hires succeed within the intended time span.

Figure 3 depicts the smoothed (width=12) Kaplan-Meier estimates for the hazard rates for the recruitment duration in working days, separately for East and West Germany, with 95 % confidence intervals. While it takes longer in East Germany until a suitable applicant is found, both curves display a sharp rise in the hazard rate at the beginning of the vacancy spell. After that, the hazard curve declines smoothly in East Germany while exhibiting local peaks at 180 and 320 days. Except for the beginning of the spell, the two curves' confidence intervals overlap most of the time, indicating that if any differences between the two regions are found in multivariate analyzes, they will likely come from the beginning of the spell.

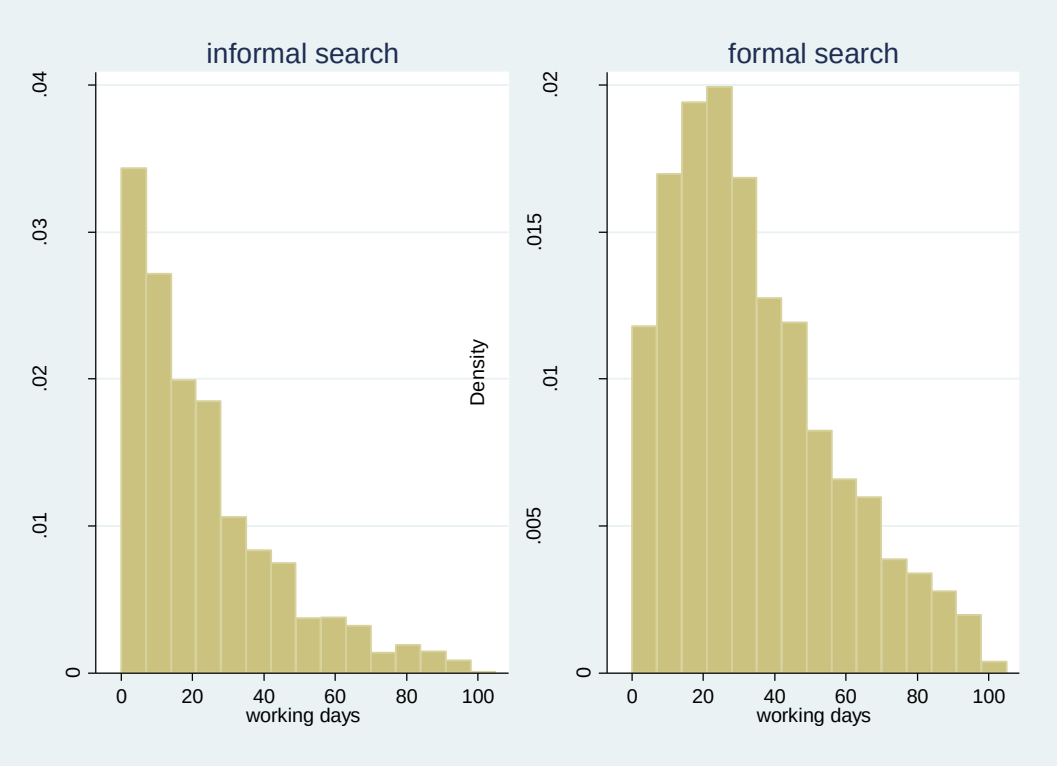
Figure 3: Kaplan-Meier estimates of the recruitment hazard in working days, by region



N=58,000. Source: IAB Job Vacancy Survey 2000–2013, own calculations.

The picture provides us with early evidence for positive duration dependence consistent with what one would expect from screening models. Similar to Gorter et al. (1996), we separate the sample by whether the employer searched externally for applicants or only solicited recommendations from employees and other contacts in the company's network. As Figure 4 shows, the hazard of deciding for an applicant first rises before it falls in the case of formal search (positive duration dependence at the beginning of the spell), while it begins at its highest point in the case of purely informal search.

Figure 4: Hazard of the recruitment duration over time, by search strategy



N=58,000. Source: IAB Job Vacancy Survey 2000–2013 (weighted), own calculations.

Next, we provide descriptive evidence for different occupations (compare also Burdett and Cunningham 1998). Occupations differ widely in their skill requirements and in the employment culture. For our sample we apply the German occupational classification with 37 occupational groups (KldB 2010). According to Table 2 and Table 3 the average vacancy durations for the reference period vary between 32 days for interior construction to (see Table 2). Average intended vacancy durations are shorter in all occupational groups, but the difference between the employers' plans and the hiring reality – and therefore the relative importance of unfilled vacancies – differ. On the one hand, unfilled vacancies might indicate labor market tightness and imply additional costs for the firms and for the economy as a whole. On the other hand, large discrepancies between the plans of the employers and the actual duration until a new employee starts working point to an unrealistic personnel planning in many firms.

A look at the average recruitment duration and the average start lag underlines the importance of analyses by occupations, as Table 3 shows. A very different composition of the vacancy duration becomes visible, resulting from different shares of recruitment duration and start lag in the total duration of the hiring process. There are occupations with short median

recruitment durations and start lags, such as cleaning services, an occupation requiring mostly low skills and an occupation with a comparably large labor supply among the unemployed. In contrast, to hire workers in computer science, firms need a medium amount of time (median 33 days) to find a suitable candidate in the performing arts, and it takes in addition about two thirds(median 21 days) until the selected person starts working. By comparison, in metal-making, the start lag is far shorter (at a median five days) than the recruitment duration (median 18 days).

Table 2: (Intended) vacancy duration in working days by occupation

	vacancy duration					intended vacancy duration				
	percentiles					percentiles				
occupation (Kldb 2010)	5%	10%	50%	90%	mean	5%	10%	50%	90%	mean
1 Armed forces personnel	41	41	62	70	55	20	20	64	70	49
11 agriculture, forestry, farming	3	5	23	95	40	0	4	21	60	31
12 horticulture floristry	4	7	40	115	49	0	4	22	66	34
21 production processing of raw materials, glass, ceramics	1	3	11	123	34	0	0	21	104	35
22 plastic-making -processing, wood-working, -processing	2	2	23	85	37	0	0	17	64	24
23 paper-making -processing, printing, technical media design	14	20	47	104	56	1	11	20	65	30
24 metal-making -working, metal construction	2	3	30	104	45	0	3	21	64	29
25 Technical machine-building, automotive industry	4	7	38	125	51	0	0	21	81	33
26 mechatronics, energy electronics, electrical engineering	5	10	44	146	65	0	2	22	79	35
27 technical R&D, construction, production planning, scheduling	11	20	65	162	78	0	5	40	87	45
28 textile- leather-making -processing	4	7	40	103	47	0	1	22	82	36
29 food-production -processing	5	8	33	108	47	0	1	22	66	33
31 construction scheduling, architecture surveying	19	22	51	123	64	0	0	27	80	36
32 building construction above/below ground	2	3	21	75	34	0	0	13	55	22
33 interior construction	1	2	20	73	32	0	0	14	43	21
34 building services engineering, technical building services	3	5	38	101	48	0	1	22	71	35
41 mathematics, biology, chemistry physics	18	22	60	147	73	0	5	39	86	45
42 geology, geography environmental protection	9	9	32	115	49	0	0	32	73	33
43 computer science, information, communication technology	20	24	62	148	76	0	11	40	86	44
51 traffic logistics (without vehicle driving)	3	5	31	92	41	0	3	20	63	28
52 Drivers operators of vehicles, transport equipment	4	8	22	80	36	0	2	20	63	28
53 safety health protection, security surveillance	4	5	28	121	50	6	9	30	65	37
54 cleaning services	2	5	15	75	33	0	2	10	43	18
61 purchasing, sales & trading	10	19	51	126	64	0	8	33	86	43
62 Sales retail trade	8	11	40	104	50	0	8	33	65	37
63 tourism, hotels & restaurants	7	11	42	106	51	2	7	43	86	49
71 business management/organisation	4	12	43	107	54	0	4	32	81	39
72 financial services, accounting, tax consultancy	11	19	56	134	68	1	10	40	88	46
73 law public administration	12	18	42	106	54	1	1	23	77	35
81 Medical health care occupations	12	20	53	128	66	6	11	32	86	42
82 non-medical healthcare, body care, wellness medical technicians	10	16	43	126	59	0	4	42	65	39
83 education social work, housekeeping, theology	9	15	43	104	53	7	11	33	85	40
84 teaching training	11	19	52	124	62	0	9	43	102	51
91 in philology, literature, humanities, social sciences, economics	16	16	40	106	53	0	14	22	65	35
92 advertising marketing, in commercial editorial media design	15	20	61	125	69	0	9	40	89	44
93 product design, artisan craftwork, fine arts	6	12	44	119	62	0	4	42	81	44
94 performing arts, entertainment	12	20	43	85	52	0	5	44	82	50

N=58,000. Source: IAB Job Vacancy Survey 2000–2013 (weighted), own calculations.

Table 3: Recruitment duration and start lag in working days by occupation

	recruitment duration					start lag				
	Percentiles					percentiles				
occupation (Kldb 2010)	5%	10%	50%	90%	mean	5%	10%	50%	90%	mean
1 Armed forces personnel	40	40	62	63	53	0	0	0	6	1
11 agriculture, forestry, farming	0	0	16	72	28	0	1	7	28	13
12 horticulture floristry	1	3	21	85	34	0	1	8	38	15
21 production processing of raw materials, glass, ceramics	0	2	4	63	23	0	1	2	27	11
22 plastic-making -processing, wood-working, -processing	0	0	13	64	26	0	1	5	28	11
23 paper-making -processing, printing, technical media design	2	5	30	69	35	1	3	16	44	21
24 metal-making -working, metal construction	0	1	18	80	33	0	0	5	38	12
25 Technical machine-building, automotive industry	0	2	21	84	34	0	1	10	43	17
26 mechatronics, energy electronics, electrical engineering	0	3	26	104	45	0	1	12	44	20
27 technical R&D, construction, production planning, scheduling	0	4	38	105	50	1	3	22	63	28
28 textile- leather-making -processing	2	3	21	75	34	0	1	9	25	13
29 food-production -processing	0	3	21	78	33	0	0	7	35	14
31 construction scheduling, architecture surveying	0	11	29	85	40	3	6	19	43	23
32 building construction above/below ground	0	0	16	65	25	0	0	3	23	9
33 interior construction	0	0	10	63	24	0	0	4	21	8
34 building services engineering, technical building services	0	3	19	73	33	0	0	8	35	14
41 mathematics, biology, chemistry physics	3	9	32	95	45	4	7	22	55	29
42 geology, geography environmental protection	2	3	20	71	31	1	3	9	44	18
43 computer science, information, communication technology	7	9	33	104	49	2	5	21	62	27
51 traffic logistics (without vehicle driving)	0	2	17	73	27	0	1	8	34	14
52 Drivers operators of vehicles, transport equipment	0	2	13	52	24	0	1	6	28	12
53 safety health protection, security surveillance	0	1	18	78	33	0	1	9	43	17
54 cleaning services	0	2	12	65	25	0	0	3	22	8
61 purchasing, sales & trading	3	7	30	84	41	2	3	19	46	23
62 Sales retail trade	0	2	20	81	32	0	1	10	39	17
63 tourism, hotels & restaurants	0	3	22	81	36	0	0	10	33	15
71 business management/organisation	0	3	23	66	33	0	1	15	44	21
72 financial services, accounting, tax consultancy	2	6	29	92	42	2	3	20	60	26
73 law public administration	4	9	25	71	34	1	2	12	46	21
81 Medical health care occupations	0	5	28	89	40	1	3	20	47	25
82 non-medical healthcare, body care, wellness medical technicians	2	6	25	98	40	0	1	12	41	18
83 education social work, housekeeping, theology	1	5	22	67	32	1	2	17	44	21
84 teaching training	3	7	26	82	37	1	1	19	55	25
91 in philology, literature, humanities, social sciences, economics	10	10	19	84	31	4	6	12	44	21
92 advertising marketing, in commercial editorial media design	3	8	35	86	42	3	5	19	59	26
93 product design, artisan craftwork, fine arts	0	0	26	100	41	0	1	16	44	22
94 performing arts, entertainment	3	8	23	55	30	2	4	20	39	22

N=58,000. Source: IAB Job Vacancy Survey 2000–2013 (weighted), own calculations.

5 The German labor market and hiring durations between the years 2000 and 2013

The observation period covers several macroeconomic situations in the German economy: Starting with quite favorable economic growth around the year 2000, the economy went into a recession that lasted until 2005, gave way to a strong recovery in 2006/2007 and finally had to deal with the effects of the international financial crisis in 2009/2010. Additionally remarkable changes in German labor market policy, the so-called Hartz reforms, were implemented in 2003 and 2005. They comprised many features related to supply, demand and their interaction on the labor market. The main goals were, first, to increase efficiency in placement services by improving transparency about vacancy and worker profiles and establishing a market-segmentation with specific support. Second, the reforms aimed at increasing the incentives to search for a job more intensively and to be ready to take concessions. The period of entitlement to unemployment benefits was shortened. Means-tested unemployment assistance for people without claims against unemployment insurance was lowered. Third, higher flexibility, e.g. with respect to temporary agency work, employment protection legislation and marginal employment, was supposed to boost labor demand.

With regard to our research it is important to consider possible effects of the Hartz reforms on hiring durations. As research shows, the reforms significantly influenced the behavior of job seekers and employees regarding their willingness to compromise and significantly improved the matching efficiency (Rebien/Kettner 2011, Klinger/Rothe 2012, Klinger/Weber 2016).

Figure 5 presents the overall economic development by the course of GDP and employment and contains the average (adjusted) vacancy duration and the intended vacancy duration during the observation period. One can easily observe the business cycle, including the strong decline during the financial crisis, when GDP growth rate decreased to minus five percent. The minimum length of vacancy duration can be observed in the recession year 2003: it took 45 days on average to complete a hiring. The maximum length was in 2012 with altogether 62 days.

In most periods the vacancy duration, GDP and employment are changing in the same direction: in recession years it takes less time to fill a position, whereas the durations are longer when the economy is growing and employment is increasing.

The intended vacancy duration, reflecting the perception of employers on the length of the hiring process, is shorter than the factual vacancy duration. It varies between 32 and 41 days. Changes over time are small and seem to be independent from GDP and employment.

Upon first glance, the vacancy duration does not appear to be related to the Hartz reforms. One would assume decreasing durations after the implementation because of a higher matching efficiency, in specific after the implementation of the fourth stage of the Hartz reforms in 2005 (‘Hartz IV’). But as the picture shows the vacancy duration in tendency became longer over time.

Figure 5: Vacancy duration, intended vacancy duration, GDP and Employment, 2000-2013

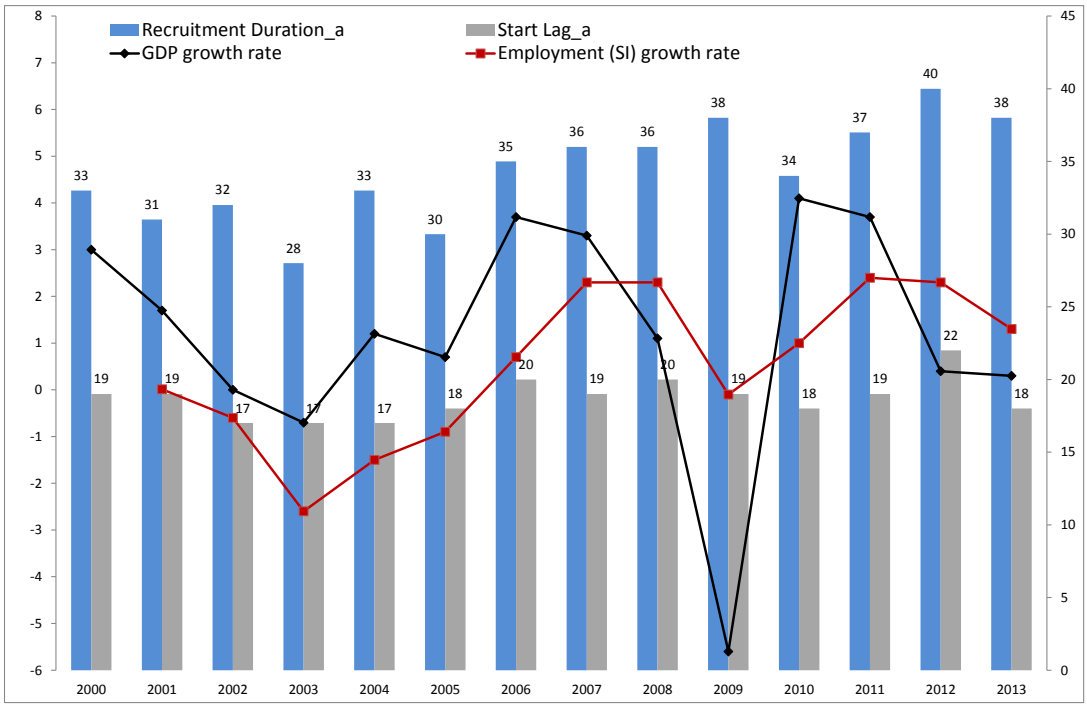
Sources: Vacancy durations and intended vacancy duration: IAB Job Vacancy Survey, weighted, GDP: Federal Statistical Office, Employment: Federal Employment Agency

Thus, it seems worth to dig further into the driving forces of different phases of the vacancy durations. Our dataset gives us the opportunity to analyze at the micro level to what extent firm and job specific factors, the firm’s individual hiring behavior (intensity and efficiency) and external labor market conditions have a significant influence. We can distinguish between recruitment duration and start lag and we can identify the length of the

hiring delay. Figures 6 and 7 show the lengths of these separate phases in the context of the overall economic development and employment.

During the observation period the recruitment duration varies between a minimum of 28 days (2003) and a maximum of 40 days (2012). The start lag moves less strong. The minimum are 17 days in 2003 and 2004, the maximum is in 2012 with 22 days. So minimum and maximum apply to the same years as for the vacancy duration, showing the relevance of the length of both phases for the length of the total hiring process.

Figure 6: Recruitment duration, Start lag, GDP and Employment, 2000–2013

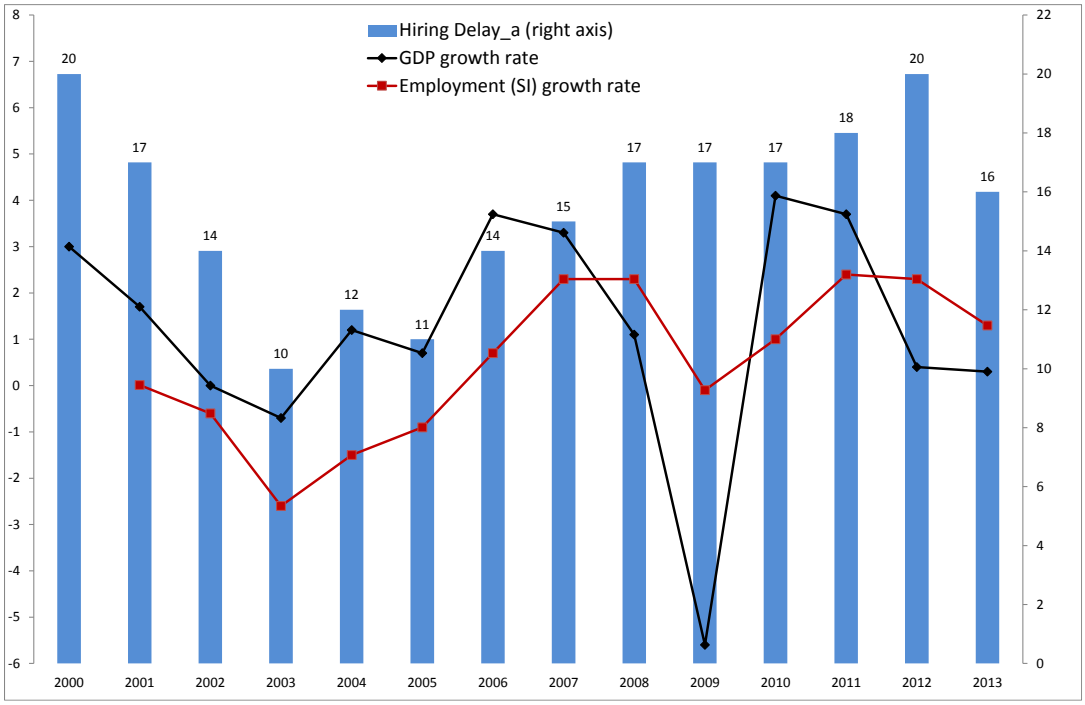


Sources: Recruitment duration and Start lag: IAB Job Vacancy Survey, weighted, GDP: Federal Statistical Office, Employment: Federal Employment Agency

Based on our data we can allow the influencing factors to vary in their strength of influence during different stages in the hiring process. While firm specific factors, firm specific behavior and job specifics should be most relevant for recruitment duration (searching, screening, selecting), a start lag will be determined by external factors such as the behavior of the new employee and the time he/she needs to resign from the previous job, to change residence, etc. Additionally a start lag might depend on the length of the recruitment duration. If recruitment takes longer than the firm initially had planned for the whole vacancy duration

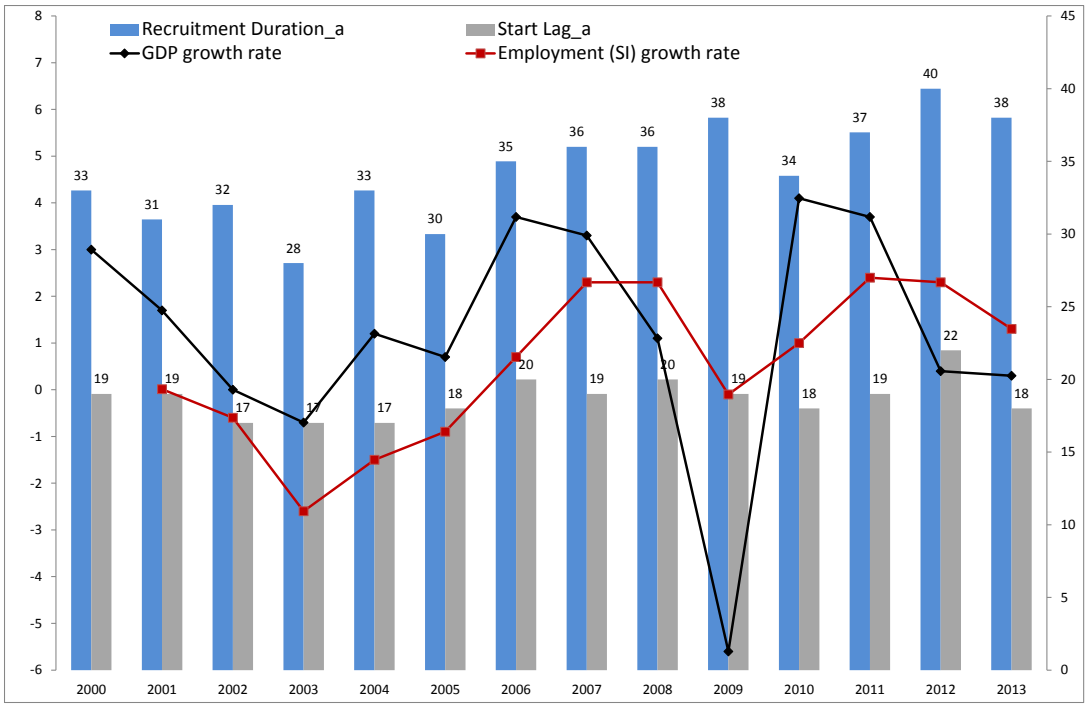
(recruitment duration > intended vacancy duration), the employer might put pressure on the newly hired person to start working as soon as possible or even choose the applicant depending on her/his willingness and ability to start working immediately after the recruitment decision. Whereas unemployed applicants will be available soon, employed job seekers will usually take longer to change their job.

Figure 7: Hiring delay, GDP and Employment, 2000-2013



Sources: Hiring durations: IAB Job Vacancy Survey, weighted, GDP: Federal Statistical Office, Employment: Federal Employment Agency

The mean hiring delay measured as the divergence between the plans of the firms and the reality of the hiring processes is shown in Figure 6: Recruitment duration, Start lag, GDP and Employment, 2000–2013



Sources: Recruitment duration and Start lag: IAB Job Vacancy Survey, weighted, GDP: Federal Statistical Office, Employment: Federal Employment Agency

Based on our data we can allow the influencing factors to vary in their strength of influence during different stages in the hiring process. While firm specific factors, firm specific behavior and job specifics should be most relevant for recruitment duration (searching, screening, selecting), a start lag will be determined by external factors such as the behavior of the new employee and the time he/she needs to resign from the previous job, to change residence, etc. Additionally a start lag might depend on the length of the recruitment duration. If recruitment takes longer than the firm initially had planned for the whole vacancy duration (recruitment duration > intended vacancy duration), the employer might put pressure on the newly hired person to start working as soon as possible or even choose the applicant depending on her/his willingness and ability to start working immediately after the recruitment decision. Whereas unemployed applicants will be available soon, employed job seekers will usually take longer to change their job.

Figure 7. As one would assume, the delay is shorter in weak economic years, marked by a low number of vacancies and a high number of unemployed, such as in the years 2003 to 2005, when the delay is between 10 and 12 working days. Short delay implies relatively lower costs of hiring, whereas hiring becomes more cost intensive (including recruitment efforts and

waiting time) when the labor market becomes tighter and the hiring delay increases. The maximum length of the hiring delay can be observed with 20 working days in the years 2000 and 2012.

However, during a strong economic recovery firms might reduce their intended vacancy duration, as was observed in Germany with engineers in 2006. In this specific occupation the intended vacancy duration (unadjusted) changed from 103 days in 2005 (recession, low labor demand) to 58 days during the recovery in 2006 (Biersack/Kettner/Schreyer 2007). Even with constant recruitment duration and a constant start lag, the hiring delay will increase strongly in such a case, reflecting mainly a high need of employers to recruit fast, but not reflecting changes in the hiring process itself.

A main aim of our work on hires is therefore not just to find out determinants of the several phases of the vacancy duration, but also to relate the single phases of hiring to each other. What is influencing the recruitment duration and the start lag in specific, and how is this related to one of the main outcome variables of the hiring process, the hiring delay? To what extent do firms significantly influence the success of their staff searching processes and to what extent are external factors determining hiring durations? With regard to such questions, we will shed more light on of some hypotheses discussed in the literature, but have not been analyzed so far for Germany and especially not analyzed on the basis of a representative employer survey covering employers and hiring processes from all economic sectors and size classes over a period of more than ten years.

6. Multivariate evidence

Model choice

On base of interesting descriptive evidence on the relevance of occupation, region, the business cycle and institutional changes for determining the length of a hiring spell and on base of discussions on search-strategy-specific duration dependence we use multivariate duration models to check these findings for the German labor market in the presence of a rich set of controls (see Appendix for details). We suppose that the control variables will have different influence on different phases of the hiring process. Whereas the recruitment duration might depend strongly from the overall economic situation, the start lag might be more affected by

the former status of the hired person, if he/she was unemployed or employed before the (new) job started.

Based on standard matching theory, labor market tightness measured as the number of jobseekers and vacancies should play a decisive role in the recruitment duration. It is far less clear what their role should be for the duration of the start lag: having decided for a particular applicant, the employer no longer advertises jobs nor screens applicants and just prepares for the new hire to start working, leading to the expectation that the start lag should be insensitive to market tightness measures. On the other hand, employers might decide for a particular applicant specifically to reduce the start lag; to the extent that they do this, the start lag duration will depend on tightness measures. Such a start-lag-reducing strategy should be more likely if the vacancy has already run past its intended duration.

To permit the matching function to exhibit non-constant returns to scale, we include jobseekers (measured as registered unemployed persons) and vacancies (measured as FEA-reported vacancies) as separate terms in logarithmic form, similar to Andrews et al. (2008). We then check for constant returns to scale by testing against the null hypothesis of the sum of the two terms' coefficients being zero. To allow for spatial, industry and occupation-specific heterogeneity, we include tightness measures on two levels: one on the level of twelve industries interacted with sixteen federal states, and one on the level of 37 occupations interacted with West/East Germany.1 Other covariates of note are the reason for the hiring – as a replacement or as an additional worker – as well as the previous labor market status of the person being hired.

The shapes of the Kaplan-Meier estimates of the smoothed hazard curves presented in

Figure 3 and Figure 4 suggest a log-logistic functional form of the hazard rate specification. However, the falling hazard rate towards the end may also be the result of unobserved heterogeneity (Zorn 2000). We will thus estimate using both Weibull and Log-logistic parametric models and make use of the shape parameter to test for positive versus negative duration dependence, separately for hires with formal versus informal search. We expect positive duration dependence due to screening in the case of formal search and negative

[1] Starting in 2007, spatial information in the IAB Job Vacancy Survey is detailed enough to allow for the identification of commuting zones. Including tightness measures measured at the level of commuting zones neither improved the model fit nor yielded any substantive conclusions different from the ones presented here and thus only served to remove seven waves of the survey from the sample.

or no duration dependence in the case of purely informal search, which we assume to be sequential.

Table 4 shows which cases from the IAB Job Vacancy Survey are not included in the analysis sample for various reasons. We furthermore censor all durations at 381 working days (one and a half year when removing non-working days in Germany), arguing that because the survey questions on durations are answered retrospectively, data quality will be low when they refer to a point in time too far in the past. This only affects 84 cases with censored recruitment duration and nine cases with a censored start lag. By comparison, Burdett/Cunningham censor their data on hires in the U.S. quite early, at 90 days.

Table 4: Sample exclusions

initial sample: firms with hirings in last year	99.512
excluded because:	
at least one date missing	25.199
vacancy duration >1000 days	34
hiring weight missing	7.664
previous year's employment level missing	958
regional indicators invalid	216
cannot recode occupation	3.275
occupation missing	2.602
required skill level missing	1.564
net sample	58.000

Table 5 shows Akaike's Information Criterion when estimating each outcomes in both subsamples assuming either a Weibull or a log-logistic distribution. Except for the recruitment duration without formal search, which calls for the Weibull model, the log-logistic distribution is preferred.

Table 5: Distribution by outcome and search type

Outcome	Search type	Model type	AIC
Recruitment duration	Informal search	**Weibull**	59,347
		Log-logistic	60,635
	Formal search	Weibull	106,523
		Log-logistic	105,815
Start lag	Informal search	Weibull	54,869
		Log-logistic	54,224
	Formal search	Weibull	107,902

		Log-logistic	106,677
Hiring delay	Informal search	Weibull	69,577
		Log-logistic	62,775
	Formal search	Weibull	154,907
		Log-logistic	152,861

N=58,000. Source: IAB Job Vacancy Survey 2000–2013, own calculations.

Recruitment duration

The Weibull model confirms that the recruitment duration only has positive duration dependence if the employer searched formally (shape parameter p=1.16, standard error 0.004; not shown in tables). If not, it shows a decidedly negative duration dependence (shape parameter p=0.959, standard error 0.005, Table 6). Since in the case of formal search, the AIC measure shows that the Log-logistic model provides a better fit than the Weibull model, all results for formal searches are only presented from the Log-logistic model.

Table 6: Weibull model results for recruitment duration, informal search

	Hazard ratio		SE
East Germany	0.829	***	(0.027)
Impediment: Lack of revenue	1.009		(0.020)
Impediment: Lack of staff	0.717	***	(0.026)
Job required experience	0.961	*	(0.015)
Job required special skills	0.912	***	(0.018)
Number of applicants missing	1.167	***	(0.023)
Contract type: fixed-term	1.046	**	(0.018)
Contract type: unknown	0.898		(0.053)
Year: 2001	1.003		(0.052)
Year: 2002	0.868	**	(0.047)
Year: 2003	0.936		(0.052)
Year: 2004	0.848	**	(0.047)
Year: 2005	0.729	***	(0.038)
Year: 2006	0.797	***	(0.038)
Year: 2007	0.738	***	(0.035)
Year: 2008	0.747	***	(0.036)
Year: 2009	0.782	***	(0.037)
Year: 2010	0.772	***	(0.037)
Year: 2011	0.756	***	(0.039)
Year: 2012	0.734	***	(0.039)
Year: 2013	0.762	***	(0.040)
Size: 10-19	1.126	***	(0.030)
Size: 20-49	1.177	***	(0.030)
Size: 50-249	1.249	***	(0.033)
Size: 250-499	1.217	***	(0.045)
Size: 500+	1.162	***	(0.041)
Job type: replacement, long-term	0.744	***	(0.020)
Job type: additional, short-term	1.170	***	(0.039)
Job type: additional, long-term	0.743	***	(0.021)
Job type: not specified	0.700	***	(0.051)
Hire previously unemployed	1.124	***	(0.021)
Hire previously neither employed nor unemployed	0.928	***	(0.018)
Required skill: vocational training	0.808	***	(0.019)
Required skill: college degree	0.642	***	(0.020)
Industry: agriculture	0.912	*	(0.040)

Industry: energy, mining	0.937		(0.035)
Industry: construction	1.287	***	(0.050)
Industry: trade and retail	1.012		(0.038)
Industry: hospitality	1.048		(0.056)
Industry: transport, communication	1.070		(0.040)
Industry: financial services	0.932		(0.043)
Industry: commercial services	1.010		(0.033)
Industry: public administration	0.881	***	(0.032)
Industry: edcuation, health, social services	1.019		(0.035)
Industry: other services	0.910	**	(0.028)
Occ.: armed forces	1.000	***	((omitted))
Occ.: agriculture, forestry, farming	1.118		(0.107)
Occ.: horticulture floristry	1.088		(0.098)
Occ.: production processing of raw materials, glass, ceramics	1.095		(0.163)
Occ.: plastic-making -processing, wood-working, -processing	1.036		(0.089)
Occ.: paper-making -processing, printing, technical media design	1.039		(0.124)
Occ.: metal-making -working, metal construction	1.041		(0.079)
Occ.: Technical machine-building, automotive industry	1.016		(0.076)
Occ.: mechatronics, energy electronics, electrical engineering	0.971		(0.082)
Occ.: technical R&D, construction, production planning, scheduling	0.863		(0.080)
Occ.: textile- leather-making -processing	1.061		(0.133)
Occ.: food-production -processing	0.969		(0.076)
Occ.: construction scheduling, architecture surveying	0.997		(0.137)
Occ.: building construction above/below ground	1.058		(0.079)
Occ.: interior construction	1.182		(0.102)
Occ.: building services engineering, technical building services	0.962		(0.074)
Occ.: geology, geography environmental protection	0.973		(0.124)
Occ.: computer science, information, communication technology	0.859		(0.214)
Occ.: traffic logistics (without vehicle driving)	0.926		(0.102)
Occ.: Drivers operators of vehicles, transport equipment	0.958		(0.070)
Occ.: safety health protection, security surveillance	1.177	*	(0.083)
Occ.: cleaning services	1.001		(0.106)
Occ.: purchasing, sales & trading	0.925		(0.077)
Occ.: Sales retail trade	0.945		(0.076)
Occ.: tourism, hotels & restaurants	1.082		(0.093)
Occ.: business management/organisation	0.894		(0.063)
Occ.: financial services, accounting, tax consultancy	0.906		(0.076)
Occ.: law public administration	0.979		(0.103)
Occ.: Medical health care occupations	1.003		(0.078)
Occ.: non-medical healthcare, body care, wellness medical technicians	1.067		(0.091)
Occ.: education social work, housekeeping, theology	0.989		(0.069)
Occ.: teaching training	0.882		(0.096)
Occ.: in philology, literature, humanities, social sciences, economics	1.023		(0.204)
Occ.: advertising marketing, in commercial editorial media design	1.056		(0.110)
Occ.: product design, artisan craftwork, fine arts	0.984		(0.176)
Occ.: performing arts, entertainment	0.897		(0.135)
Number of applicants	0.997		(0.001)
Worker flow rate	1.222	***	(0.023)
Worker flow rate squared	0.995	***	(0.001)
Number of applicants squared	1.000		(0.000)
Ln vacancies in state	0.990		(0.026)
Ln unemployed in state	0.989		(0.025)
Ln vacancies in occupation and region	0.995		(0.023)
Ln unemployed in occupation and region	1.035		(0.040)
Constant	0.071	***	(0.041)
p (shape parameter)	0.959		(0.005)
AIC	59,347		
N	18,480		

Table 7: Log-logistic model results for recruitment duration, formal search

	(i)			(ii)		
	Coeff.		SE	Coeff.		SE
East Germany				0.115	***	(0.018)
Impediment: Lack of revenue				-0.044	***	(0.013)
Impediment: Lack of staff				0.374	***	(0.015)
Job required experience				0.040	***	(0.009)
Job required special skills				0.061	***	(0.011)
Number of applicants missing				-0.003		(0.018)
Contract type: fixed-term				-0.085	***	(0.010)

Contract type: unknown	-0.055		(0.040)
Year: 2001	0.003		(0.030)
Year: 2002	-0.005		(0.033)
Year: 2003	-0.042		(0.036)
Year: 2004	0.119	***	(0.035)
Year: 2005	0.153	***	(0.034)
Year: 2006	0.207	***	(0.030)
Year: 2007	0.240	***	(0.028)
Year: 2008	0.224	***	(0.028)
Year: 2009	0.281	***	(0.028)
Year: 2010	0.247	***	(0.027)
Year: 2011	0.274	***	(0.028)
Year: 2012	0.260	***	(0.029)
Year: 2013	0.292	***	(0.028)
Size: 10-19	-0.135	***	(0.018)
Size: 20-49	-0.157	***	(0.017)
Size: 50-249	-0.165	***	(0.017)
Size: 250-499	-0.113	***	(0.022)
Size: 500+	-0.077	***	(0.021)
Job type: replacement, long-term	0.119	***	(0.017)
Job type: additional, short-term	-0.181	***	(0.026)
Job type: additional, long-term	0.177	***	(0.018)
Job type: not specified	0.095	*	(0.046)
Hire previously unemployed	-0.091	***	(0.011)
Hire previously neither employed nor unemployed	0.039	**	(0.013)
Required skill: vocational training	0.224	***	(0.019)
Required skill: college degree	0.488	***	(0.021)
Industry: agriculture	0.003		(0.032)
Industry: energy, mining	0.048	*	(0.023)
Industry: construction	-0.194	***	(0.028)
Industry: trade and retail	-0.049	*	(0.023)
Industry: hospitality	0.014		(0.030)
Industry: transport, communication	-0.062	*	(0.025)
Industry: financial services	0.091	***	(0.026)
Industry: commercial services	-0.117	***	(0.018)
Industry: public administration	0.074	***	(0.018)
Industry: edcuation, health, social services	-0.004		(0.020)
Industry: other services	0.044	*	(0.018)
Occ.: armed forces	-0.401		(0.817)
Occ.: agriculture, forestry, farming	0.122		(0.066)
Occ.: horticulture floristry	0.211	***	(0.065)
Occ.: production processing of raw materials, glass, ceramics	0.007		(0.105)
Occ.: plastic-making -processing, wood-working, -processing	0.009		(0.062)
Occ.: paper-making -processing, printing, technical media design	0.202	**	(0.078)
Occ.: metal-making -working, metal construction	0.198	***	(0.055)
Occ.: Technical machine-building, automotive industry	0.237	***	(0.052)
Occ.: mechatronics, energy electronics, electrical engineering	0.333	***	(0.055)
Occ.: technical R&D, construction, production planning, scheduling	0.361	***	(0.060)
Occ.: textile- leather-making -processing	0.120		(0.085)
Occ.: food-production -processing	0.141	**	(0.053)
Occ.: construction scheduling, architecture surveying	0.187	*	(0.084)
Occ.: building construction above/below ground	0.091		(0.056)
Occ.: interior construction	0.053		(0.064)
Occ.: building services engineering, technical building services	0.211	***	(0.054)
Occ.: geology, geography environmental protection	0.285	***	(0.079)
Occ.: computer science, information, communication technology	0.155		(0.152)
Occ.: traffic logistics (without vehicle driving)	0.279	***	(0.065)
Occ.: Drivers operators of vehicles, transport equipment	0.156	**	(0.051)
Occ.: safety health protection, security surveillance	-0.009		(0.052)
Occ.: cleaning services	0.157	*	(0.067)
Occ.: purchasing, sales & trading	0.304	***	(0.054)
Occ.: Sales retail trade	0.117	*	(0.056)
Occ.: tourism, hotels & restaurants	0.141	**	(0.054)
Occ.: business management/organisation	0.177	***	(0.049)
Occ.: financial services, accounting, tax consultancy	0.215	***	(0.054)
Occ.: law public administration	0.140	*	(0.067)
Occ.: Medical health care occupations	0.107	*	(0.052)
Occ.: non-medical healthcare, body care, wellness medical technicians	0.117	*	(0.056)
Occ.: education social work, housekeeping, theology	0.083		(0.048)
Occ.: teaching training	0.124		(0.069)
Occ.: in philology, literature, humanities, social sciences, economics	0.084		(0.117)
Occ.: advertising marketing, in commercial editorial media design	0.187	**	(0.062)
Occ.: product design, artisan craftwork, fine arts	0.193		(0.113)
Occ.: performing arts, entertainment	0.188	*	(0.095)
Number of applicants	0.001	***	(0.000)

Worker flow rate				-0.199	***	(0.013)
Worker flow rate squared				0.003	***	(0.000)
Number of applicants squared				0.000		(0.000)
Ln vacancies in state	0.027	***	0.007	0.034	*	(0.015)
Ln unemployed in state	-0.049	***	0.010	-0.038	**	(0.014)
Ln vacancies in occupation and region	0.049	***	0.007	-0.009		(0.015)
Ln unemployed in occupation and region	-0.133	***	0.007	-0.020		(0.023)
Constant	4.813	***	0.109	3.242	***	(0.349)
p (shape parameter)	0.536		0.002	0.507		(0.002)
AIC	110,040			105,815		
N	39,511			39,501		

In accordance with what one would expect form strictly informal search, both indicators of the external labor market, the number of unemployed and the number of vacancies, are insignificant both on the level of state and region/occupation (Table 6). For formal searches, both are significant in the expected duration (note that the log-logistic model uses accelerated time as an outcome variable), with a higher number of vacancies being associated with a longer and a higher number of unemployed persons with a shorter recruitment duration, both at a magnitude of .04 log points (Table 7, model ii). While a simple model including only the four tightness measures shows increasing returns to scale in unemployed persons (Table 7 model i), with a p-value of 0.002 of the CRS test of the sum of both state coefficients being zero, adding our covariates that control for other aspects of employer characteristics returns us to constant returns to scale (Table 7 model ii, CRS test p-value of 0.640).

Hazards decline from 2004 on, both for informal and formal searches. Recruitments in East Germany show a significantly lower hazard of the recruitment decision than those in West Germany. One may have assumed the opposite effect due to less tight labor markets in East Germany. But since we already include measures for labor market tightness, the regional dummy captures other regional differences such as a different matching technology in East Germany. As expected, the higher the required skill level, and (to a lesser extent) if experience or (to a greater extent) special skills beyond the usual in that field are required, the longer the recruitment duration. We will consider to what extent these longer durations also indicate hiring difficulties when we discuss the estimation results for the hiring delay.

Middle-sized establishments between 50 and 249 employees decide for applicants the fastest, the smallest (below 10 employees) and the largest (500 employees and above) the slowest. These coefficients suggests two opposing mechanisms at work: first, the smaller the establishment, the lower the number of applicants, and thus the lower the recruitment hazard; second, the larger the establishment, the more restrictive the selection process and the lower the willingness to compromise, and thus the lower the recruitment hazard despite a high number of

applicants and adequate resources to screen applicants (see Kettner 2012). This applies to both informal and formal searches.

Lack of revenue only makes a significant difference in that if sales are low, open positions (to the extent that they exist) are filled more quickly. Only formal searches are affected by this, suggesting that the mechanism plays out on the local labor market: Low sales in an establishment may indicate an overall product market weakness leading to more unemployment in that establishment's local labor market and industry that is not captured by our tightness measures and industry dummies, and thus to more applicants and shorter recruitment durations.

For purely informal searches, occupation makes almost no difference. Only the occupation "safety health protection, security surveillance" has a slightly higher recruitment hazard than the reference category "cleaning services". Occupation however is highly relevant in the case of formal searches, with engineers requiring the longest recruitment duration. When interpreting these coefficients, it must be kept in mind that the numbers of occupation-specific vacancies and unemployed workers are already being controlled for.

The employer's industry on the other hand makes a difference even for purely informal searches, with "construction" showing 29 percent higher recruitment hazards than the reference category "manufacturing", and "public administration" having a 12 percent lower recruitment hazard. These two sectors are similarly relevant for formal searches, with the addition of jobs in the "financial services" industry taking longer and in "commercial services" taking shorter to fill.

Positions filled on a fixed-term contract exhibit shorter recruitment durations than those filled on open-ended contracts. Because dissolving open-ended contracts is very difficult due to Germany's strong employment protection statutes, employers will utilize time-consuming intense screening methods to guard against hiring an unsuitable person. For the same reason, jobs that exist to fulfill long-term labor demand (either for replacement or to fulfill additional product demand) are filled far more slowly than vacancies that exist as short-term replacements (the reference category).

If a vacancy was filled with a previously unemployed person, the recruitment duration is considerably shorter than if it was filled with someone who changed jobs. If employers were willing to settle for unemployed applicants only after exhausting the search for previously-employed persons, unemployed hires would be associated with a longer recruitment duration. Instead, hiring an unemployed person indicates lower hiring standards by an employer that are

not captured by the additional skills, experience and schooling degree dummies and which lead to a quicker filling of vacancies. This applies both to strictly-informal and formal searches; hiring an unemployed person following an informal search indicates that the unemployed person was, for example, recommended to the employer by one of his employees.

Start lag

Because employers typically cannot finish all administrative paperwork quickly enough for the successful applicant to start working immediately after being told that he or she got the job, and because people changing jobs first have to notify their previous employer, some positive duration dependence at the beginning of a start lag spell should be expected, and is confirmed by the shape parameter of the log-logistic duration model in Tables 8 and Table 9. We include an additional dummy that indicates whether the recruitment duration, which precedes the start lag, took longer than the intended vacancy duration. Its influence on the start lag duration is strongly negative, indicating that when a vacancy is difficult to fill, taking longer than expected, employers try to minimize any additional delays from administrative sources. Jobs filled with previously unemployed persons exhibit a significantly shorter start lag; in fact, the start lag is almost half as long in the case of formal search as it is for jobs that were filled with previously employed persons.

It is difficult to predict what the influence of labor market tightness measures should be on the start lag, as theory only concerns itself with the recruitment duration. If employers decide for particular applicants based in part on how quickly they can start working, tightness measures will influence the availability of applicants who are more readily-available in this sense in the usual direction, longer start lags from more vacancies and shorter lags from more jobseekers. Indeed, we find that the labor market has a highly significant effect on the start lag, even for purely informal searches, with informal searches exhibiting constant returns to scale while formal searches exhibit rising returns to scale in vacancies (p=0.000) and higher coefficients than on the recruitment duration with formal search, with the expected signs.

Table 8: Log-logistic model results for start lag, informal search

	Coeff.	SE
East Germany	-0.005	(0.032)
Impediment: Lack of revenue	-0.011	(0.020)

Impediment: Lack of staff	-0.075	*	(0.037)
Job required experience	0.040	*	(0.016)
Job required special skills	0.079	***	(0.020)
Number of applicants missing	0.051	*	(0.020)
Contract type: fixed-term	-0.145	***	(0.018)
Contract type: unknown	-0.169	**	(0.061)
Year: 2001	0.055		(0.052)
Year: 2002	0.082		(0.055)
Year: 2003	0.056		(0.057)
Year: 2004	0.205	***	(0.056)
Year: 2005	0.185	***	(0.053)
Year: 2006	0.116	*	(0.048)
Year: 2007	0.160	***	(0.048)
Year: 2008	0.211	***	(0.048)
Year: 2009	0.183	***	(0.048)
Year: 2010	0.134	**	(0.048)
Year: 2011	0.160	**	(0.051)
Year: 2012	0.186	***	(0.053)
Year: 2013	0.175	***	(0.052)
Size: 10-19	-0.166	***	(0.027)
Size: 20-49	-0.216	***	(0.026)
Size: 50-249	-0.188	***	(0.027)
Size: 250-499	-0.131	***	(0.037)
Size: 500+	-0.054		(0.036)
Job type: replacement, long-term	0.265	***	(0.028)
Job type: additional, short-term	-0.101	**	(0.035)
Job type: additional, long-term	0.207	***	(0.028)
Job type: not specified	0.333	***	(0.074)
Hire previously unemployed	-0.510	***	(0.019)
Hire previously neither employed nor unemployed	-0.138	***	(0.020)
Required skill: vocational training	0.218	***	(0.024)
Required skill: college degree	0.488	***	(0.031)
Industry: agriculture	0.067		(0.045)
Industry: energy, mining	0.090	*	(0.037)
Industry: construction	-0.260	***	(0.040)
Industry: trade and retail	0.010		(0.038)
Industry: hospitality	-0.077		(0.055)
Industry: transport, communication	-0.004		(0.038)
Industry: financial services	0.302	***	(0.046)
Industry: commercial services	0.072	*	(0.033)
Industry: public administration	0.179	***	(0.036)
Industry: edcuation, health, social services	0.165	***	(0.035)
Industry: other services	0.205	***	(0.031)
Occ.: armed forces	0.000	***	((omitted))
Occ.: agriculture, forestry, farming	0.037		(0.099)
Occ.: horticulture floristry	0.163		(0.096)
Occ.: production processing of raw materials, glass, ceramics	0.011		(0.154)
Occ.: plastic-making -processing, wood-working, -processing	0.064		(0.089)
Occ.: paper-making -processing, printing, technical media design	0.294	*	(0.122)
Occ.: metal-making -working, metal construction	0.146		(0.080)
Occ.: Technical machine-building, automotive industry	0.230	**	(0.078)
Occ.: mechatronics, energy electronics, electrical engineering	0.251	**	(0.086)
Occ.: technical R&D, construction, production planning, scheduling	0.354	***	(0.096)
Occ.: textile- leather-making -processing	0.066		(0.131)
Occ.: food-production -processing	0.247	**	(0.082)
Occ.: construction scheduling, architecture surveying	0.123		(0.142)
Occ.: building construction above/below ground	-0.080		(0.078)
Occ.: interior construction	-0.012		(0.091)
Occ.: building services engineering, technical building services	0.242	**	(0.080)
Occ.: geology, geography environmental protection	0.359	**	(0.130)
Occ.: computer science, information, communication technology	0.243		(0.249)
Occ.: traffic logistics (without vehicle driving)	0.283	*	(0.113)
Occ.: Drivers operators of vehicles, transport equipment	0.185	*	(0.077)
Occ.: safety health protection, security surveillance	0.009		(0.074)
Occ.: cleaning services	0.055		(0.110)
Occ.: purchasing, sales & trading	0.481	***	(0.085)
Occ.: Sales retail trade	0.209	*	(0.084)
Occ.: tourism, hotels & restaurants	0.201	*	(0.088)
Occ.: business management/organisation	0.374	***	(0.074)
Occ.: financial services, accounting, tax consultancy	0.388	***	(0.086)
Occ.: law public administration	0.307	**	(0.109)
Occ.: Medical health care occupations	0.293	***	(0.081)
Occ.: non-medical healthcare, body care, wellness medical technicians	0.183	*	(0.088)
Occ.: education social work, housekeeping, theology	0.335	***	(0.073)
Occ.: teaching training	0.278	*	(0.112)

Occ.: in philology, literature, humanities, social sciences, economics	0.227		(0.202)
Occ.: advertising marketing, in commercial editorial media design	0.382	***	(0.104)
Occ.: product design, artisan craftwork, fine arts	-0.036		(0.188)
Occ.: performing arts, entertainment	0.301		(0.155)
Number of applicants	0.003	*	(0.001)
Worker flow rate	-0.266	***	(0.023)
Worker flow rate squared	0.005	***	(0.001)
Number of applicants squared	0.000	*	(0.000)
Ln vacancies in state	0.109	***	(0.027)
Ln unemployed in state	-0.089	***	(0.025)
Ln vacancies in occupation and region	0.001		(0.024)
Ln unemployed in occupation and region	-0.030		(0.040)
Recruitment duration exceeded intended vacancy duration	-0.643	***	(0.022)
Constant	2.650	***	(0.589)
p (shape parameter)	0.585		(0.004)
AIC	54,224		
N	18,480		

Table 9: Log-logistic model results for start lag, formal search

	Coeff.		SE
East Germany	-0.064	***	(0.019)
Impediment: Lack of revenue	-0.058	***	(0.013)
Impediment: Lack of staff	-0.060	***	(0.016)
Job required experience	0.053	***	(0.010)
Job required special skills	0.076	***	(0.011)
Number of applicants missing	0.048	*	(0.019)
Contract type: fixed-term	-0.168	***	(0.011)
Contract type: unknown	-0.043		(0.042)
Year: 2001	-0.037		(0.031)
Year: 2002	-0.018		(0.034)
Year: 2003	-0.024		(0.037)
Year: 2004	0.087	*	(0.036)
Year: 2005	0.060		(0.035)
Year: 2006	0.056		(0.031)
Year: 2007	0.045		(0.029)
Year: 2008	0.052		(0.029)
Year: 2009	0.056		(0.029)
Year: 2010	0.068	*	(0.028)
Year: 2011	0.070	*	(0.028)
Year: 2012	0.091	**	(0.029)
Year: 2013	0.089	**	(0.028)
Size: 10-19	-0.116	***	(0.019)
Size: 20-49	-0.134	***	(0.018)
Size: 50-249	-0.059	***	(0.018)
Size: 250-499	0.012		(0.023)
Size: 500+	0.078	***	(0.021)
Job type: replacement, long-term	0.180	***	(0.018)
Job type: additional, short-term	-0.056	*	(0.027)
Job type: additional, long-term	0.192	***	(0.019)
Job type: not specified	0.201	***	(0.047)
Hire previously unemployed	-0.603	***	(0.011)
Hire previously neither employed nor unemployed	-0.248	***	(0.013)
Required skill: vocational training	0.311	***	(0.020)
Required skill: college degree	0.577	***	(0.022)
Industry: agriculture	0.015		(0.033)
Industry: energy, mining	0.111	***	(0.024)
Industry: construction	-0.322	***	(0.029)
Industry: trade and retail	-0.032		(0.024)
Industry: hospitality	-0.050		(0.031)
Industry: transport, communication	-0.053	*	(0.026)
Industry: financial services	0.295	***	(0.027)
Industry: commercial services	-0.030		(0.019)
Industry: public administration	0.188	***	(0.019)
Industry: edcuation, health, social services	0.081	***	(0.021)
Industry: other services	0.120	***	(0.019)
Occ.: armed forces	-0.765		(0.581)
Occ.: agriculture, forestry, farming	0.006		(0.069)
Occ.: horticulture floristry	0.030		(0.067)
Occ.: production processing of raw materials, glass, ceramics	-0.041		(0.109)

Occ.: plastic-making -processing, wood-working, -processing	-0.013		(0.064)
Occ.: paper-making -processing, printing, technical media design	0.190	*	(0.081)
Occ.: metal-making -working, metal construction	0.195	***	(0.056)
Occ.: Technical machine-building, automotive industry	0.277	***	(0.054)
Occ.: mechatronics, energy electronics, electrical engineering	0.368	***	(0.057)
Occ.: technical R&D, construction, production planning, scheduling	0.376	***	(0.061)
Occ.: textile- leather-making -processing	0.056		(0.088)
Occ.: food-production -processing	0.089		(0.055)
Occ.: construction scheduling, architecture surveying	0.255	**	(0.087)
Occ.: building construction above/below ground	0.018		(0.058)
Occ.: interior construction	-0.063		(0.066)
Occ.: building services engineering, technical building services	0.272	***	(0.055)
Occ.: geology, geography environmental protection	0.319	***	(0.081)
Occ.: computer science, information, communication technology	0.108		(0.156)
Occ.: traffic logistics (without vehicle driving)	0.315	***	(0.067)
Occ.: Drivers operators of vehicles, transport equipment	0.269	***	(0.053)
Occ.: safety health protection, security surveillance	-0.044		(0.053)
Occ.: cleaning services	0.167	*	(0.069)
Occ.: purchasing, sales & trading	0.350	***	(0.055)
Occ.: Sales retail trade	0.211	***	(0.057)
Occ.: tourism, hotels & restaurants	0.227	***	(0.056)
Occ.: business management/organisation	0.336	***	(0.050)
Occ.: financial services, accounting, tax consultancy	0.319	***	(0.056)
Occ.: law public administration	0.236	***	(0.069)
Occ.: Medical health care occupations	0.265	***	(0.054)
Occ.: non-medical healthcare, body care, wellness medical technicians	0.118	*	(0.058)
Occ.: education social work, housekeeping, theology	0.209	***	(0.050)
Occ.: teaching training	0.151	*	(0.072)
Occ.: in philology, literature, humanities, social sciences, economics	0.164		(0.121)
Occ.: advertising marketing, in commercial editorial media design	0.332	***	(0.063)
Occ.: product design, artisan craftwork, fine arts	0.037		(0.117)
Occ.: performing arts, entertainment	0.168		(0.099)
Number of applicants	0.001	**	(0.000)
Worker flow rate	-0.254	***	(0.013)
Worker flow rate squared	0.003	***	(0.000)
Number of applicants squared	0.000		(0.000)
Ln vacancies in state	0.087	***	(0.015)
Ln unemployed in state	-0.061	***	(0.015)
Ln vacancies in occupation and region	-0.046	**	(0.016)
Ln unemployed in occupation and region	-0.031		(0.024)
Recruitment duration exceeded intended vacancy duration	-0.450	***	(0.010)
Constant	3.093	***	(0.363)
p (shape parameter)	0.522		(0.002)
AIC	106,677		
N	39,501		

Hiring delay

As Heckmann et al. (2013) showed, a long recruitment or vacancy duration does not make a vacancy hard-to-fill for an employer. Instead, it is the fact that the filling takes longer than expected, which is measured by our hiring delay outcome variable. A small number of observations (2,088, or 3.4% of the sample) exhibit a negative hiring delay, meaning that the employee started working earlier than the employer intended. These have to be excluded for the sample when using the hiring delay as an outcome variable in a duration analysis. As seen in Tables 10 and 11, the external labor market is significant only in vacancies for purely informal searches and significant both in vacancies and jobseekers for formal searches. It is intuitively plausible that the conditions on the labor market, both the number of other employers

competing for applicants as well as the number of potential applicants itself would be decisive for a measure of how difficult a vacancy is to fill. For informal searches, which in practice will mean that the new hire was recommended, the number of unemployed persons is not relevant, as unemployed persons are far less likely to be recommended by in-house colleagues than persons already employed.

When controlling for the labor market tightness, only very few of the occupational dummies differ significantly from the reference category "cleaning services". Only "traffic, logistics", "product design, artisan craftwork, fine arts" and "performing arts, entertainment" stand out with long hiring delay durations in the case of purely informal search, while "traffic, logistics", "technical machine-building" and "automotive industry" do for formal searches. Interestingly, "fixed-term contracts" are significantly less likely to suffer from a long hiring delay. The potential unattractiveness of a fixed-term position does not serve to lower the applicant arrival rate sufficiently to offset the reduced need for intensive screening.

Table 10: Log-logistic model results for hiring delay, informal search

	Coeff.		SE
East Germany	0.095	*	(0.044)
Impediment: Lack of revenue	0.002		(0.028)
Impediment: Lack of staff	0.536	***	(0.056)
Job required experience	-0.002		(0.022)
Job required special skills	0.024		(0.027)
Number of applicants missing	-0.094	***	(0.027)
Contract type: fixed-term	-0.018		(0.024)
Contract type: unknown	-0.005		(0.079)
Year: 2001	-0.003		(0.070)
Year: 2002	0.057		(0.073)
Year: 2003	-0.014		(0.075)
Year: 2004	0.103		(0.074)
Year: 2005	0.109		(0.071)
Year: 2006	0.072		(0.065)
Year: 2007	0.148	*	(0.064)
Year: 2008	0.152	*	(0.065)
Year: 2009	0.139	*	(0.064)
Year: 2010	0.124		(0.065)
Year: 2011	0.044		(0.069)
Year: 2012	0.085		(0.072)
Year: 2013	0.094		(0.071)
Size: 10-19	0.097	**	(0.036)
Size: 20-49	0.027		(0.035)
Size: 50-249	0.060		(0.036)
Size: 250-499	0.150	**	(0.051)
Size: 500+	0.229	***	(0.050)
Job type: replacement, long-term	0.086	*	(0.037)
Job type: additional, short-term	-0.094	*	(0.044)
Job type: additional, long-term	0.043		(0.038)
Job type: not specified	-0.134		(0.093)
Hire previously unemployed	-0.064	*	(0.025)
Hire previously neither employed nor unemployed	-0.148	***	(0.027)
Required skill: vocational training	0.066	*	(0.032)
Required skill: college degree	0.212	***	(0.042)
Industry: agriculture	-0.104		(0.060)
Industry: energy, mining	-0.052		(0.053)
Industry: construction	-0.031		(0.054)
Industry: trade and retail	-0.083		(0.053)

Industry: hospitality	-0.044		(0.073)
Industry: transport, communication	-0.117	*	(0.053)
Industry: financial services	-0.091		(0.069)
Industry: commercial services	-0.113	*	(0.046)
Industry: public administration	-0.198	***	(0.049)
Industry: edcuation, health, social services	-0.272	***	(0.047)
Industry: other services	-0.153	***	(0.042)
Occ.: armed forces	0.000	***	((omitted))
Occ.: agriculture, forestry, farming	0.169		(0.127)
Occ.: horticulture floristry	0.180		(0.121)
Occ.: production processing of raw materials, glass, ceramics	0.380		(0.204)
Occ.: plastic-making -processing, wood-working, -processing	0.106		(0.115)
Occ.: paper-making -processing, printing, technical media design	-0.009		(0.159)
Occ.: metal-making -working, metal construction	0.087		(0.103)
Occ.: Technical machine-building, automotive industry	-0.002		(0.100)
Occ.: mechatronics, energy electronics, electrical engineering	0.132		(0.114)
Occ.: technical R&D, construction, production planning, scheduling	0.221		(0.126)
Occ.: textile- leather-making -processing	0.195		(0.170)
Occ.: food-production -processing	-0.019		(0.103)
Occ.: construction scheduling, architecture surveying	0.098		(0.184)
Occ.: building construction above/below ground	0.197	*	(0.099)
Occ.: interior construction	0.162		(0.116)
Occ.: building services engineering, technical building services	0.007		(0.102)
Occ.: geology, geography environmental protection	0.303		(0.177)
Occ.: computer science, information, communication technology	0.915	*	(0.378)
Occ.: traffic logistics (without vehicle driving)	0.335	*	(0.152)
Occ.: Drivers operators of vehicles, transport equipment	-0.044		(0.097)
Occ.: safety health protection, security surveillance	0.112		(0.094)
Occ.: cleaning services	-0.112		(0.136)
Occ.: purchasing, sales & trading	0.259	*	(0.113)
Occ.: Sales retail trade	-0.056		(0.106)
Occ.: tourism, hotels & restaurants	0.042		(0.114)
Occ.: business management/organisation	0.072		(0.094)
Occ.: financial services, accounting, tax consultancy	0.107		(0.112)
Occ.: law public administration	0.275		(0.142)
Occ.: Medical health care occupations	0.092		(0.103)
Occ.: non-medical healthcare, body care, wellness medical technicians	0.103		(0.114)
Occ.: education social work, housekeeping, theology	-0.048		(0.091)
Occ.: teaching training	0.156		(0.146)
Occ.: in philology, literature, humanities, social sciences, economics	0.527		(0.279)
Occ.: advertising marketing, in commercial editorial media design	-0.120		(0.138)
Occ.: product design, artisan craftwork, fine arts	0.532	*	(0.246)
Occ.: performing arts, entertainment	0.407	*	(0.206)
Number of applicants	-0.004	*	(0.002)
Worker flow rate	-0.055	*	(0.027)
Worker flow rate squared	0.003	**	(0.001)
Number of applicants squared	0.000		(0.000)
Ln vacancies in state	0.103	**	(0.036)
Ln unemployed in state	-0.071	*	(0.035)
Ln vacancies in occupation and region	0.053		(0.031)
Ln unemployed in occupation and region	0.019		(0.053)
Constant	-0.429		(0.776)
p (shape parameter)	0.786		(0.005)
AIC	62,775		
N	17,720		

Table 11: Log-logistic model results for hiring delay, formal search

	Coeff.		SE
East Germany	0.149	***	(0.040)
Impediment: Lack of revenue	0.004		(0.028)
Impediment: Lack of staff	0.959	***	(0.032)
Job required experience	0.063	**	(0.020)
Job required special skills	0.067	**	(0.024)
Number of applicants missing	-0.034		(0.039)
Contract type: fixed-term	-0.131	***	(0.022)
Contract type: unknown	-0.230	**	(0.086)
Year: 2001	-0.046		(0.064)
Year: 2002	-0.062		(0.070)
Year: 2003	-0.201	**	(0.075)

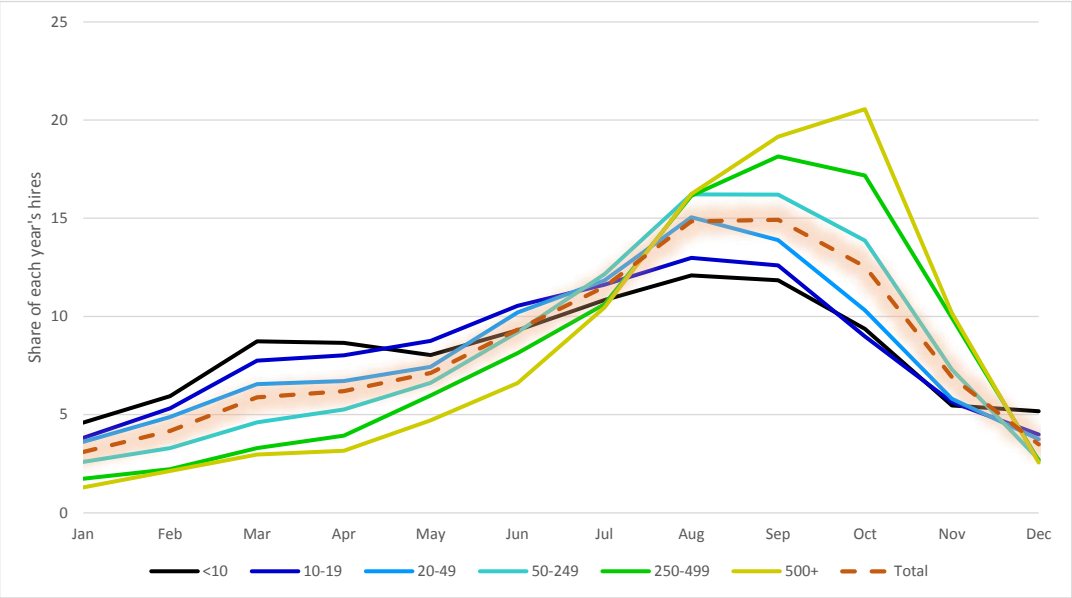
Year: 2004	0.067		(0.074)
Year: 2005	0.179	*	(0.072)
Year: 2006	0.106		(0.064)
Year: 2007	0.113		(0.059)
Year: 2008	0.110		(0.060)
Year: 2009	0.200	***	(0.060)
Year: 2010	0.268	***	(0.058)
Year: 2011	0.073		(0.060)
Year: 2012	0.202	***	(0.061)
Year: 2013	0.232	***	(0.060)
Size: 10-19	-0.066		(0.038)
Size: 20-49	-0.105	**	(0.036)
Size: 50-249	-0.031		(0.037)
Size: 250-499	0.155	***	(0.047)
Size: 500+	0.337	***	(0.045)
Job type: replacement, long-term	0.179	***	(0.036)
Job type: additional, short-term	-0.011		(0.052)
Job type: additional, long-term	0.243	***	(0.038)
Job type: not specified	0.066		(0.094)
Hire previously unemployed	-0.260	***	(0.023)
Hire previously neither employed nor unemployed	-0.127	***	(0.028)
Required skill: vocational training	0.142	***	(0.038)
Required skill: college degree	0.579	***	(0.043)
Industry: agriculture	-0.172	*	(0.068)
Industry: energy, mining	-0.342	***	(0.052)
Industry: construction	-0.043		(0.059)
Industry: trade and retail	-0.105	*	(0.050)
Industry: hospitality	0.058		(0.064)
Industry: transport, communication	-0.298	***	(0.054)
Industry: financial services	-0.225	***	(0.061)
Industry: commercial services	-0.300	***	(0.039)
Industry: public administration	-0.570	***	(0.039)
Industry: edcuation, health, social services	-0.495	***	(0.043)
Industry: other services	-0.380	***	(0.040)
Occ.: armed forces	-1.989		(1.097)
Occ.: agriculture, forestry, farming	0.006		(0.137)
Occ.: horticulture floristry	0.177		(0.132)
Occ.: production processing of raw materials, glass, ceramics	-0.301		(0.220)
Occ.: plastic-making -processing, wood-working, -processing	-0.209		(0.126)
Occ.: paper-making -processing, printing, technical media design	0.084		(0.164)
Occ.: metal-making -working, metal construction	0.116		(0.113)
Occ.: Technical machine-building, automotive industry	0.110		(0.107)
Occ.: mechatronics, energy electronics, electrical engineering	0.151		(0.115)
Occ.: technical R&D, construction, production planning, scheduling	0.210		(0.123)
Occ.: textile- leather-making -processing	-0.181		(0.175)
Occ.: food-production -processing	-0.159		(0.107)
Occ.: construction scheduling, architecture surveying	-0.110		(0.179)
Occ.: building construction above/below ground	0.222	*	(0.113)
Occ.: interior construction	-0.155		(0.126)
Occ.: building services engineering, technical building services	-0.273	*	(0.110)
Occ.: geology, geography environmental protection	-0.034		(0.168)
Occ.: computer science, information, communication technology	-0.352		(0.326)
Occ.: traffic logistics (without vehicle driving)	0.317	*	(0.137)
Occ.: Drivers operators of vehicles, transport equipment	-0.024		(0.104)
Occ.: safety health protection, security surveillance	-0.071		(0.104)
Occ.: cleaning services	-0.121		(0.138)
Occ.: purchasing, sales & trading	-0.126		(0.111)
Occ.: Sales retail trade	-0.206		(0.113)
Occ.: tourism, hotels & restaurants	-0.113		(0.111)
Occ.: business management/organisation	0.057		(0.099)
Occ.: financial services, accounting, tax consultancy	-0.144		(0.112)
Occ.: law public administration	-0.223		(0.139)
Occ.: Medical health care occupations	-0.037		(0.107)
Occ.: non-medical healthcare, body care, wellness medical technicians	0.043		(0.115)
Occ.: education social work, housekeeping, theology	-0.323	***	(0.097)
Occ.: teaching training	-0.651	***	(0.144)
Occ.: in philology, literature, humanities, social sciences, economics	-0.236		(0.252)
Occ.: advertising marketing, in commercial editorial media design	-0.169		(0.131)
Occ.: product design, artisan craftwork, fine arts	-0.185		(0.239)
Occ.: performing arts, entertainment	-0.346		(0.201)
Number of applicants	-0.003	***	(0.001)
Worker flow rate	-0.031		(0.023)
Worker flow rate squared	0.000		(0.000)
Number of applicants squared	0.000	**	(0.000)
Ln vacancies in state	0.154	***	(0.032)

Ln unemployed in state	-0.117	***	(0.031)
Ln vacancies in occupation and region	0.059		(0.033)
Ln unemployed in occupation and region	-0.178	***	(0.049)
Constant	2.628	***	(0.745)
p (shape parameter)	1.037		(0.004)
AIC	152,861		
N	38,258		

7. Sensitivity analysis

To keep response rates high, the IAB Job Vacancy only enquires about the last successful hiring, as opposed to all hirings made by an establishment within the past year. As the survey is conducted in the fall of each year, the observed hirings are not evenly distributed throughout the year, but exhibit a peak in late summer or early fall that is more pronounced in larger establishments, as
Figure 8 shows.

Figure 8: Distribution of hires over the course of a year in the sample



N=58,000. Source: IAB Job Vacancy Survey 2000–2013, own calculations.

An objection to our use of duration analysis methods using this sample might be that this clustering around the months of August and September results in distorted estimates,

because we do not have a random sample from all hires. Table 12 shows how our estimation results for the recruitment duration using formal search (model ii in Table 7) would be different if we assume that the real distribution of hirings over the year is a uniform distribution and create weights $w_{m,k}$ for every month m and establishment size class k: $w_{m,k} = (N_k/N_{m,k})/12$. The coefficients do not change significantly.

Table 12: Partial Log-logistic model results for recruitment duration, formal search, original and seasonally reweighted samples

Formal search, log-logistic model	distribution over year			
	original		uniform	
Ln vacancies in state	0.034	*	0.034	*
Ln unemployed in state	-0.038	**	-0.040	**
Sum of both coefficients	-0.004		-0.006	
Ln vacancies in occupation and region	-0.009		-0.016	
Ln unemployed in occupation and region	-0.020		-0.020	
Shape parameter γ	0.507		0.501	

Significance levels: * 10%, ** 5%, *** 1%

8. Summary and Directions for Future Research

Our study is the first to directly investigate different parts of a total vacancy duration. Using a large set of hirings from 2000 to 2013 from Germany, we estimated influences on the recruitment, start lag and hiring delay durations. In particular, we included measures of labor market tightness at the state and occupational levels and tested for constant returns to scale. We also checked for particular forms of time dependence and separated our sample by whether the vacancy was advertised externally in light of the substantive conclusions that Gorter et al. (1996) drew with regard to sequential versus non-sequential search.

We find that the recruitment duration, being the part of a vacancy duration that most micro and macro theory focuses on, exhibits constant returns to scale in a model specification that controls for a large number of firm-, job- and hire-specific characteristics. We also found that the start lag duration exhibits non-constant returns to scale, at least if the job was advertised externally. This suggests that the non-constant returns to scale found in some other micro studies may be the result of omitted variable bias, of measuring the total vacancy duration as opposed to just the recruitment duration and thus mixing the effects on the two durations, or both reasons.

We do not find the recruitment duration rising monotonically with establishment size, as Davis et al. (2013) have found in the United States. Instead, it is middle-sized establishments that have the shortest recruitment durations, as smaller employers have fewer applicants to choose from while larger employers use more restrictive screening methods. We also did not find the Hartz reforms of 2004/2005 improving the matching technology in such a way that recruitment durations significantly decreased. Instead, we found the increasing recruitment durations following that point in time, as one would expect from a general economic upturn.

Future research could further separate the recruitment duration into an "arrival period" and a "selection period" similar to Abbring/van Ours (1994), which should allow more precise estimates and more substantive interpretations of duration dependence. Furthermore, a formalized theoretical model of the start lag, during which neither employer nor jobseeker are actively searching, and its duration and determinants would be promising, as standard matching theory only concerns itself with the recruitment duration, when employers are actively searching or screening.

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9. Appendix

9.1 Descriptives of model covariates

Table 13: Covariate descriptives - informal search

	N	min	p25	p50	p75	max	mean	sd
East Germany	18487	0	0	1	1	1	0.516	0.500
Impediment: Lack of revenue	18487	0	0	0	0	1	0.192	0.394
Impediment: Lack of staff	18487	0	0	0	0	1	0.046	0.210
Job required experience	18487	0	0	0	1	1	0.462	0.499
Job required special skills	18487	0	0	0	0	1	0.188	0.391
Number of applicants missing	18487	0	0	0	0	1	0.173	0.378
Contract type: fixed-term	18487	0	0	0	1	1	0.466	0.499
Contract type: open-ended	18487	0	0	1	1	1	0.518	0.500
Contract type: unknown	18487	0	0	0	0	1	0.017	0.128
Year: 2000	18487	0	0	0	0	1	0.037	0.187
Year: 2001	18487	0	0	0	0	1	0.045	0.208
Year: 2002	18487	0	0	0	0	1	0.040	0.195
Year: 2003	18487	0	0	0	0	1	0.044	0.206
Year: 2004	18487	0	0	0	0	1	0.077	0.266
Year: 2005	18487	0	0	0	0	1	0.076	0.265
Year: 2006	18487	0	0	0	0	1	0.084	0.277
Year: 2007	18487	0	0	0	0	1	0.088	0.284
Year: 2008	18487	0	0	0	0	1	0.087	0.281
Year: 2009	18487	0	0	0	0	1	0.101	0.302
Year: 2010	18487	0	0	0	0	1	0.100	0.300
Year: 2011	18487	0	0	0	0	1	0.081	0.273
Year: 2012	18487	0	0	0	0	1	0.068	0.252
Year: 2013	18487	0	0	0	0	1	0.073	0.260
Size: 1-10	18487	0	0	0	0	1	0.153	0.360
Size: 10-19	18487	0	0	0	0	1	0.194	0.395
Size: 20-49	18487	0	0	0	1	1	0.260	0.439
Size: 50-249	18487	0	0	0	0	1	0.243	0.429
Size: 250-499	18487	0	0	0	0	1	0.066	0.247
Size: 500+	18487	0	0	0	0	1	0.084	0.277
Job type: replacement, short-term	18487	0	0	0	0	1	0.106	0.308
Job type: replacement, long-term	18487	0	0	0	1	1	0.432	0.495
Job type: additional, short-term	18487	0	0	0	0	1	0.101	0.302
Job type: additional, long-term	18487	0	0	0	1	1	0.349	0.477
Job type: not specified	18487	0	0	0	0	1	0.011	0.106
Hire previously unemployed	18486	0	0	0	1	1	0.341	0.474
Hire previously employed	18486	0	0	0	1	1	0.416	0.493
Hire previously neither employed nor unemployed	18486	0	0	0	0	1	0.243	0.429
Required skill: none	18487	0	0	0	0	1	0.141	0.348
Required skill: vocational training	18487	0	0	1	1	1	0.673	0.469
Required skill: college degree	18487	0	0	0	0	1	0.186	0.389
Industry: agriculture	18481	0	0	0	0	1	0.054	0.225
Industry: manufacturing	18481	0	0	0	1	1	0.261	0.439
Industry: energy, mining	18481	0	0	0	0	1	0.052	0.221
Industry: construction	18481	0	0	0	0	1	0.059	0.235
Industry: trade and retail	18481	0	0	0	0	1	0.052	0.222
Industry: hospitality	18481	0	0	0	0	1	0.031	0.173
Industry: transport, communication	18481	0	0	0	0	1	0.064	0.246
Industry: financial services	18481	0	0	0	0	1	0.041	0.197
Industry: commercial services	18481	0	0	0	0	1	0.080	0.271
Industry: public administration	18481	0	0	0	0	1	0.075	0.263
Industry: edcuation, health, social services	18481	0	0	0	0	1	0.127	0.333
Industry: other services	18481	0	0	0	0	1	0.105	0.307
Occ.: Armed forces personnel	18487	0	0	0	0	0	0.000	0.000
Occ.: agriculture, forestry, and farming	18487	0	0	0	0	1	0.039	0.193
Occ.: horticulture and floristry	18487	0	0	0	0	1	0.017	0.130
Occ.: production and processing of raw materials, glass- and ceramic-making and -processing	18487	0	0	0	0	1	0.011	0.103
Occ.: plastic-making and -processing, and wood-working and -processing	18487	0	0	0	0	1	0.022	0.147
Occ.: paper-making and -processing, printing, and in technical media design	18487	0	0	0	0	1	0.009	0.095
Occ.: metal-making and -working, and in metal construction	18487	0	0	0	0	1	0.040	0.195

Occ.: Technical machine-building and automotive industry	18487	0	0	0	0	1	0.045	0.207
Occ.: mechatronics, energy electronics and electrical engineering	18487	0	0	0	0	1	0.026	0.158
Occ.: technical research and development, construction, and production planning and scheduling	18487	0	0	0	0	1	0.032	0.175
Occ.: textile- and leather-making and -processing	18487	0	0	0	0	1	0.009	0.094
Occ.: food-production and -processing	18487	0	0	0	0	1	0.026	0.159
Occ.: construction scheduling, architecture and surveying	18487	0	0	0	0	1	0.010	0.100
Occ.: building construction above and below ground	18487	0	0	0	0	1	0.033	0.179
Occ.: interior construction	18487	0	0	0	0	1	0.017	0.129
Occ.: building services engineering and technical building services	18487	0	0	0	0	1	0.037	0.189
Occ.: purchasing, sales and trading	18487	0	0	0	0	1	0.010	0.098
Occ.: Sales retail trade	18487	0	0	0	0	1	0.002	0.048
Occ.: tourism, hotels and restaurants	18487	0	0	0	0	1	0.014	0.116
Occ.: mathematics, biology, chemistry and physics	18487	0	0	0	0	1	0.053	0.225
Occ.: geology, geography and environmental protection	18487	0	0	0	0	1	0.055	0.228
Occ.: computer science, information and communication technology	18487	0	0	0	0	1	0.010	0.097
Occ.: traffic and logistics (without vehicle driving)	18487	0	0	0	0	1	0.017	0.129
Occ.: Drivers and operators of vehicles and transport equipment	18487	0	0	0	0	1	0.027	0.163
Occ.: safety and health protection, security and surveillance	18487	0	0	0	0	1	0.032	0.175
Occ.: cleaning services	18487	0	0	0	0	1	0.020	0.139
Occ.: business management and organisation	18487	0	0	0	0	1	0.112	0.315
Occ.: financial services, accounting and tax consultancy	18487	0	0	0	0	1	0.051	0.220
Occ.: law and public administration	18487	0	0	0	0	1	0.034	0.182
Occ.: Medical and health care occupations	18487	0	0	0	0	1	0.041	0.199
Occ.: non-medical healthcare, body care, wellness and medical technicians	18487	0	0	0	0	1	0.026	0.158
Occ.: education and social work, housekeeping, and theology	18487	0	0	0	0	1	0.072	0.258
Occ.: teaching and training	18487	0	0	0	0	1	0.023	0.151
Occ.: in philology, literature, humanities, social sciences, and economics	18487	0	0	0	0	1	0.004	0.065
Occ.: advertising and marketing, in commercial and editorial media design	18487	0	0	0	0	1	0.012	0.108
Occ.: product design, artisan craftwork, fine arts and the making of musical instruments	18487	0	0	0	0	1	0.005	0.068
Occ.: the performing arts and entertainment	18487	0	0	0	0	1	0.009	0.096
Number of applicants	18487	0	1	1	2	700	2.590	12.200
Worker flow rate	18487	0.002	0.091	0.176	0.340	44.700	0.299	0.568
Worker flow rate squared	18487	0.000	0.008	0.031	0.115	1995.000	0.412	15.600
Number of applicants squared	18487	0	1	1	4	490,000	155.000	5,414.000
Ln vacancies in state	18487	7.810	9.090	9.730	10.800	11.600	9.890	0.925
Ln unemployed in state	18487	10.400	12.000	12.300	12.700	13.800	12.400	0.628
Ln vacancies in occupation and region	18487	4.160	8.820	9.330	9.850	10.600	9.200	0.891
Ln unemployed in occupation and region	18487	6.370	10.600	11.200	11.800	12.800	11.100	0.881
Recruitment duration longer than intended	18487	0	0	0	0	1	0.148	0.355

Table 14: Covariate descriptives - formal search

	N	min	p25	p50	p75	max	mean	sd
East Germany	39513	0	0	0	1	1	0.424	0.494
Impediment: Lack of revenue	39513	0	0	0	0	1	0.158	0.365
Impediment: Lack of staff	39513	0	0	0	0	1	0.112	0.315
Job required experience	39513	0	0	1	1	1	0.511	0.500
Job required special skills	39513	0	0	0	0	1	0.222	0.416
Number of applicants missing	39513	0	0	0	0	1	0.063	0.243
Contract type: fixed-term	39512	0	0	0	1	1	0.423	0.494
Contract type: open-ended	39512	0	0	1	1	1	0.564	0.496
Contract type: unknown	39512	0	0	0	0	1	0.013	0.111
Year: 2000	39513	0	0	0	0	1	0.040	0.195
Year: 2001	39513	0	0	0	0	1	0.049	0.217
Year: 2002	39513	0	0	0	0	1	0.036	0.186
Year: 2003	39513	0	0	0	0	1	0.034	0.182
Year: 2004	39513	0	0	0	0	1	0.053	0.225
Year: 2005	39513	0	0	0	0	1	0.050	0.218

Year: 2006	39513	0	0	0	0	1	0.061	0.240
Year: 2007	39513	0	0	0	0	1	0.082	0.274
Year: 2008	39513	0	0	0	0	1	0.084	0.278
Year: 2009	39513	0	0	0	0	1	0.096	0.295
Year: 2010	39513	0	0	0	0	1	0.104	0.305
Year: 2011	39513	0	0	0	0	1	0.108	0.310
Year: 2012	39513	0	0	0	0	1	0.097	0.296
Year: 2013	39513	0	0	0	0	1	0.105	0.307
Size: 1-10	39513	0	0	0	0	1	0.109	0.312
Size: 10-19	39513	0	0	0	0	1	0.166	0.372
Size: 20-49	39513	0	0	0	0	1	0.245	0.430
Size: 50-249	39513	0	0	0	1	1	0.277	0.448
Size: 250-499	39513	0	0	0	0	1	0.082	0.274
Size: 500+	39513	0	0	0	0	1	0.120	0.326
Job type: replacement, short-term	39513	0	0	0	0	1	0.085	0.279
Job type: replacement, long-term	39513	0	0	1	1	1	0.518	0.500
Job type: additional, short-term	39513	0	0	0	0	1	0.049	0.216
Job type: additional, long-term	39513	0	0	0	1	1	0.336	0.472
Job type: not specified	39513	0	0	0	0	1	0.011	0.105
Hire previously unemployed	39513	0	0	0	1	1	0.359	0.480
Hire previously employed	39513	0	0	0	1	1	0.468	0.499
Hire previously neither employed nor unemployed	39513	0	0	0	0	1	0.173	0.378
Required skill: none	39513	0	0	0	0	1	0.080	0.272
Required skill: vocational training	39513	0	0	1	1	1	0.630	0.483
Required skill: college degree	39513	0	0	0	1	1	0.290	0.454
Industry: agriculture	39504	0	0	0	0	1	0.029	0.169
Industry: manufacturing	39504	0	0	0	0	1	0.240	0.427
Industry: energy, mining	39504	0	0	0	0	1	0.044	0.206
Industry: construction	39504	0	0	0	0	1	0.037	0.190
Industry: trade and retail	39504	0	0	0	0	1	0.050	0.218
Industry: hospitality	39504	0	0	0	0	1	0.042	0.200
Industry: transport, communication	39504	0	0	0	0	1	0.049	0.217
Industry: financial services	39504	0	0	0	0	1	0.039	0.193
Industry: commercial services	39504	0	0	0	0	1	0.104	0.306
Industry: public administration	39504	0	0	0	0	1	0.122	0.327
Industry: edcuation, health, social services	39504	0	0	0	0	1	0.142	0.349
Industry: other services	39504	0	0	0	0	1	0.102	0.302
Occ.: Armed forces personnel	39513	0	0	0	0	1	0.000	0.010
Occ.: agriculture, forestry, and farming	39513	0	0	0	0	1	0.021	0.142
Occ.: horticulture and floristry	39513	0	0	0	0	1	0.013	0.112
Occ.: production and processing of raw materials, glass- and ceramic-making and -processing	39513	0	0	0	0	1	0.005	0.073
Occ.: plastic-making and -processing, and wood-working and -processing	39513	0	0	0	0	1	0.014	0.118
Occ.: paper-making and -processing, printing, and in technical media design	39513	0	0	0	0	1	0.008	0.090
Occ.: metal-making and -working, and in metal construction	39513	0	0	0	0	1	0.028	0.165
Occ.: Technical machine-building and automotive industry	39513	0	0	0	0	1	0.042	0.200
Occ.: mechatronics, energy electronics and electrical engineering	39513	0	0	0	0	1	0.031	0.173
Occ.: technical research and development, construction, and production planning and scheduling	39513	0	0	0	0	1	0.043	0.202
Occ.: textile- and leather-making and -processing	39513	0	0	0	0	1	0.007	0.083
Occ.: food-production and -processing	39513	0	0	0	0	1	0.026	0.160
Occ.: construction scheduling, architecture and surveying	39513	0	0	0	0	1	0.014	0.116
Occ.: building construction above and below ground	39513	0	0	0	0	1	0.019	0.136
Occ.: interior construction	39513	0	0	0	0	1	0.012	0.107
Occ.: building services engineering and technical building services	39513	0	0	0	0	1	0.029	0.168
Occ.: purchasing, sales and trading	39513	0	0	0	0	1	0.012	0.107
Occ.: Sales retail trade	39513	0	0	0	0	1	0.002	0.047
Occ.: tourism, hotels and restaurants	39513	0	0	0	0	1	0.027	0.161
Occ.: mathematics, biology, chemistry and physics	39513	0	0	0	0	1	0.046	0.210
Occ.: geology, geography and environmental protection	39513	0	0	0	0	1	0.034	0.181
Occ.: computer science, information and communication technology	39513	0	0	0	0	1	0.011	0.103
Occ.: traffic and logistics (without vehicle driving)	39513	0	0	0	0	1	0.012	0.109
Occ.: Drivers and operators of vehicles and transport equipment	39513	0	0	0	0	1	0.040	0.195
Occ.: safety and health protection, security and surveillance	39513	0	0	0	0	1	0.026	0.160
Occ.: cleaning services	39513	0	0	0	0	1	0.027	0.163
Occ.: business management and organisation	39513	0	0	0	0	1	0.116	0.320

Occ.: financial services, accounting and tax consultancy	39513	0	0	0	0	1	0.066	0.249
Occ.: law and public administration	39513	0	0	0	0	1	0.045	0.206
Occ.: Medical and health care occupations	39513	0	0	0	0	1	0.050	0.219
Occ.: non-medical healthcare, body care, wellness and medical technicians	39513	0	0	0	0	1	0.030	0.170
Occ.: education and social work, housekeeping, and theology	39513	0	0	0	0	1	0.084	0.277
Occ.: teaching and training	39513	0	0	0	0	1	0.026	0.158
Occ.: in philology, literature, humanities, social sciences, and economics	39513	0	0	0	0	1	0.006	0.076
Occ.: advertising and marketing, in commercial and editorial media design	39513	0	0	0	0	1	0.017	0.128
Occ.: product design, artisan craftwork, fine arts and the making of musical instruments	39513	0	0	0	0	1	0.004	0.067
Occ.: the performing arts and entertainment	39513	0	0	0	0	1	0.009	0.097
Number of applicants	39513	0	1	3	5	2,500	6.390	20.100
Worker flow rate	39513	0.000	0.099	0.188	0.366	78.000	0.319	0.617
Worker flow rate squared	39513	0.000	0.010	0.035	0.134	6084.000	0.483	31.000
Number of applicants squared	39513	0	1	9	25	6,300,000	446.000	31,640.000
Ln vacancies in state	39513	7.810	9.290	9.940	11.000	11.600	10.100	0.922
Ln unemployed in state	39513	10.400	12.000	12.300	12.600	13.800	12.300	0.636
Ln vacancies in occupation and region	39513	4.160	8.890	9.350	9.880	10.600	9.250	0.873
Ln unemployed in occupation and region	39511	6.370	10.500	11.000	11.600	12.800	11.000	0.888
Recruitment duration longer than intended	39513	0	0	0	1	1	0.301	0.459

9.2 English translation of survey questions on the last new hire (example from wave 2016)

The last hire

Please think of the **last hire of a new employee into a position subject to social security contributions** in the past 12 months. If more than one person was hired at the same time, please choose the person whose last name comes first in the alphabet.
Please do not consider …

- *hiring of apprentices*
- *marginal employment ("mini jobs")*
- *renewals of fixed-term contracts or conversions into open-ended contracts*
- *employees currently leased from temporary employment agencies*
- *publicly-funded employees such as One-Euro-Jobs*

Personal characteristics

32. How old was this person when he/she was hired and what was his/her gender?
    Age ☐
    Gender Male ☐
    Female ☐

33. What was the employment status of this person **immediately before** he/she was hired?
    Was unemployed ☐
    Up to one year ☐
    Longer than one year ☐

Was employed elsewhere	☐
Was leased from a temporary employment agency into our establishment	☐
Was self-employed	☐
Was an apprentice in our establishment	☐
Was in apprenticeship/further education/studied elsewhere	☐
Was not gainfully employed (homemaker etc.)	☐

34. What was the **reason for the hiring**?

Temporarily increased labour demand/seasonal work	☐
Long-term increased labour demand	☐
Temporarily replacement (due to illness, maternal leave, voluntary military service, further training etc.)	☐
Long-term replacement for departing/departed employees	☐
Of these: age-related replacement (retirement, part-time work for older people, early retirement etc.)	☐

Recruitment process

	Day	Month	Year
35. Which was the **earliest date to fill** this position?			
36. When did you **start searching** for applicants for this position?			
37. When did you **decide** for this particular **applicant**?			
38. When did the **employment contract begin**?			

39. Was there a **deadline for applications**?

☐ Yes ☐ No ➔ *Please continue with Question 47*

If yes: **When** was the deadline for applications?	Day	Month	Year

40. **How many** persons **applied**?

	Total number	Women	Long-term unemployed
Number of applicants			
Number of suitable applicants			
Number of applicants invited to a job interview			

41. **How** did you **search** for applicants for this position? *Multiple answers possible*

(1)	Placed advertisements in newspapers or magazines	☐
(2)	Posted vacancy to own website	☐
(3)	Posted vacancy to internet job exchanges (excluding FEA internet services)	☐
(4)	Contact to FEA (excluding FEA internet services)	☐
(5)	Using FEA internet services	☐
(6)	Social media (Xing, Facebook etc.)	☐
(7)	Selected among unsolicited applications/pool of applicants to other positions	☐
(8)	Private placement service	☐
(9)	Internal job advertisement	☐
(10)	Via own employees/personal contacts	☐
(11)	Selected among apprentices, leased workers or interns	☐
(12)	Other search channel, please specify:	☐

42. Which one of the search channels listed above eventually led to **filling the position**? Please fill in the **number of the search channel**, e.g. "1" if the person hired was **found** through advertisements in newspapers or magazines.

Number of the search channel through which the hired person was found ☐

43. **If you searched using the Federal Employment Agency:**

	Day	Month	Year
When did you involve them into your search efforts?			

44. Did you also **search abroad** for suitable employees?

Yes ☐ No ☐

52. Did you experience difficulties in filling this vacancy?

☐ Yes ☐ No ➔ *Please continue with Question 53*

If yes, **which** difficulties?
Multiple answers possible

Applicants not qualified enough	☐
Wage/salary expectations too high	☐
Applicants unwilling to agree to working conditions	☐
Too few applicants	☐
Other difficulties, please specify:	

Job characteristics

53. **Job title of the filled position**
Please enter the job title as precisely as possible, e. g. "mechanical engineer" rather than just "engineer", "automotive mechatronics technician" rather than just "mechatronics technician", "geriatric nurse" rather than just "nurse".

54. What **skill level is required** for the filled position?

Unskilled or at most one year of training	☐
Completed industrial/management/other vocational degree/technical college diploma	☐
Master craftsman, technician	☐
Bachelor's degree	☐
College degree, Diplom, Magister, Master's degree, PhD etc.	☐

55. **Working hours in this position**

Number of **weekly hours** on average according to job contract or collective agreement ☐

56. Does this position require working **overtime**? Overtime hours may be unpaid, paid, or compensated through leisure.

☐ Yes ☐ No ➔ *Please continue with Question 57*

If overtime is required:

Average number of overtime hours per week	☐
Of these: paid number of overtime hours per week	☐

57. How often does this position involve the following **working conditions**?

	Often	Rarely	Never
Heat, pollution, noise	☐	☐	☐
Physical stress (lifting/moving of persons/loads, repetitive movements, one-sided posture)	☐	☐	☐
Time pressure/deadlines	☐	☐	☐
Overtime work	☐	☐	☐
Changes in work content on short notice	☐	☐	☐
Changes in working time on short notice	☐	☐	☐
Changes in the place of work (business trips, assembly line, field service)	☐	☐	☐
Work in shifts or at night	☐	☐	☐
Working on weekends	☐	☐	☐

58. Does this position require **special knowledge and skills** exceeding the usual requires in its occupational field?

☐ Yes ☐ No ➔ *Please continue with Question 59*

If yes, **which ones**? *Multiple answers possible*

Long experience in this line of work	☐
Knowledge and skills acquired in seminars or courses post-vocational training	☐
Intercultural skills	☐
Foreign languages	☐
Social, communication and team skills	☐
Leadership skills	☐
Environmentally-conscious use of goods and services	☐
Others, please specify:	

59. Were there **negotiations** with the applicant on remuneration (base wage and further components)?

Yes	☐
No, fixed offer by establishment/administrative post	☐
No, other reasons, please specify:	

60. **How high** is the **monthly gross wage included paid overtime hours** and/or the corresponding **gross hourly wage** of the person hired?
Please do not include special payments (e.g. thirteenth salary, christmas/holiday bonus). If a piece-rate wage was agreed upon, please specify the average hourly or monthly wage achieved. Please estimate if necessary.

Gross hourly wage in €/hour	
Gross monthly wage in €	

61. Did the new hire receive **special payments** (e.g. thirteenth salary, christmas or holiday bonus)?

☐ Yes ☐ No ➔ *Please continue with Question 62*

If yes,
Amount of special payments in €

62. Do you receive a **wage subsidy** for the new hire?

☐ Yes ☐ No

63. Was it necessary to **pay more** than you wanted to fill this position?

☐ Yes ☐ No

64. Was a **fixed-term contract** signed?

Yes, lasting for up to six months	☐
Yes, lasting for six to 18 months	☐
Yes, lasting more than 18 months	☐
No, the contract is open-ended ➔ *Please continue with Question 66*	☐

65. **Why** was a **fixed-term** contract signed? Please state the decisive reason.

66. Does this employee **differ** from what you **originally searched for** intended in terms of qualification, experience in this occupational field, age or other aspects important to you?

☐ Yes ☐ No ➔ *Please continue with "Stopped search for workers"*

If yes, how does he or she differ?

Qualification is	higher	☐	lower	☐
Experience is	higher	☐	lower	☐
Employee is	younger	☐	older	☐

Other differences, please specify:
