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Characteristics contributing to low- and minimum-wage labour in Germany

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Abstract

In this article we examine the characteristics of individuals, companies, and industries involved in low-wage labour in Germany to understand their impact on the risks workers face of earning hourly wages that are below the minimum-wage and low-wage thresholds. To identify these characteristics, we use the Structure of Earnings Survey 2014 (SES). The SES is a mandatory survey of companies which provides information on wages and working hours from about 1 million jobs and nearly 70,000 companies from all industries. This data allows us to present the first systematic analysis of the interaction of individual-, company-, and industry-level factors on minimum- and low-wage working in Germany. Using a descriptive analysis, we first give an overview of typical low-paying jobs, companies, and industries. Second, we use random intercept-only models to estimate the explanatory power of the individual, company, and industry levels. One main finding is that the influence of individual characteristics on wage levels is often overstated: Less than 25 percent of the differences in the employment situation regarding being employed in minimum-wage or low-wage jobs can be attributed to the individual level. Third, we performed logistic and linear regression estimations to assess the risks of having a minimum- or low-wage job and the distance between a worker's actual earnings and the minimum- and low-wage thresholds. Our findings allow us to conclude that several determinants related to individuals appear to suggest a high low-wage incidence, but in fact lose their explanatory power once controls are added for factors relating to the companies or industries that employ these individuals.

JEL Classification:

J310, J830

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1 Introduction

Since the end of the 20th century, and above all since reunification, the German system of industrial relations has come under considerable pressure. Before reunification, the rate of coverage by collective agreements was around 85 percent (Visser 2015). Most companies belonged to an employers' association, and even companies not bound by collective agreements tended to use the collectively agreed-upon pay rates as points of reference (Bosch 2018). But certain trends clearly indicated the reduced significance of industrial relations after reunification: declining union membership and collective bargaining coverage, along with a decrease in the importance of codetermination in organizations. Further developments leading to significant changes in the German labour market can be traced back to transnationalization processes within the economy and also to deregulation policies. Transnationalization meant that companies were more and more exposed to cost pressures and faced expectations of rising returns (Neubäumer and Tretter 2008; Struck 2006). As a result, production processes were subdivided and parts of companies were outsourced. These changes contributed to reduced elasticity in the face of fluctuations in demand (Picot and Wigand 2001). Additionally, the speed of innovation increased, while on the other hand product cycles became shorter. Deregulation, in the form of the German Law on Labour Leasing and the Part-Time and Fixed-Term Act, also left its mark on the labour market. The "Hartz" laws, aimed at a policy of "activating" the unemployed by increasing the pressure to work and to accept "non-standard jobs" (Eichhorst and Marx 2011: 74), in turn increased wage pressure for jobs with easily replaceable staff.

Low wages are a consequence of the structural changes mentioned and are particularly common among basic service providers in small, regionally oriented companies without international competition and collective bargaining (Brenke and Müller 2013). In these companies, the pressure on lower- and medium-skilled groups is particularly high (Sesselmeier 2015). In Germany, the low-wage sector has grown since 1995 to a level that is above average among developed countries. The incidence of low pay in 2016 in all OECD countries amounted to 15.8 percent, but in Germany it was 18.9 percent (OECD 2018). Wages at the bottom end of the wage distribution scale have plunged sharply downwards since 1995 so that the average gap between the pay levels of low-wage workers and the low-wage threshold is greater in Germany than in any other European country. The trend of increasing wage inequality was a key argument behind the introduction of a statutory minimum wage in Germany (Bosch and Weinkopf 2014: 185; Dustmann et al. 2014: 185).

Against the background of these developments, we explore the individual and structural determinants that had an impact on the risks of earning wages below the minimum-wage and low-wage thresholds in 2014, the year prior to the introduction of the statutory minimum wage. These considerations are crucial for understanding the effects of the new minimum wage on specific groups of workers and companies. Up to now only a few studies have aimed at characterizing these segments of the German

labour market (Bosch and Kalina 2008; Bruttel et al. 2017; Kalina and Weinkopf 2015, 2017). Moreover, they have either only explored the significance of individual factors in the risk of becoming a low-wage earner or they have given descriptive analyses that focused on structural determinants. Thus, although Coleman (1990) and Esser (1996) have pointed to the importance of the broader social context for individual behaviour, research on the low-pay sector has not systematically provided that context. Thus, the impact of company-specific factors and disparities between industries on low-wage working has remained largely unexplored.

To investigate the risk factors for becoming low-wage workers, we use a rich dataset containing information on about 1 million jobs and about 70,000 companies from all industries. This data allows us to assess not only the significance of individual determinants but also company-level and industry-level determinants, which we present here in detail for the first time. Thus, the risk factors acting as determinants of low wages can be estimated by using a rich set of individual- company-, and industry-level characteristics.

In the next section we provide a comprehensive review of the current state of research on this topic, present theoretical assumptions, and derive several hypotheses. Data and the estimation strategy are described in section 3. Section 4 contains the empirical results, and section 5 presents the findings and conclusion.

2 State of research and theoretical assumptions

In order to understand minimum- and low-wage employment and its implications for individual employment careers, recent research has focused on 4 topics. The first addresses the determinants of being in a low-wage job, or the individual characteristics that are typical for low-wage employment (Bosch and Kalina 2008; Bruttel et al. 2017; Kalina and Weinkopf 2015, 2017). The second topic deals with the question of how long employees remain in low-wage positions and whether they successfully achieve the transition into regular employment (through the stepping stone effect) or become unemployed and end up in the “low-pay, no-pay cycle” (Fok et al. 2015; Mosthaf et al. 2011; Knabe and Plum 2013; Schnabel 2016). The third topic is the body of studies examining the consequences of low-wage employment for employees’ well-being and health (Appelbaum 2010; Gallie 2007; Kalleberg 2011). The 4th topic is possible alternatives to taking up a low-wage job or remaining in the low-wage sector through strategies such as searching longer and more intensely for better paid employment or participating in further training (Schnabel 2016). The aim of this paper is to contribute to the first topic by focusing not only on low-wage labour, but also on minimum-wage jobs in Germany using multivariate estimation strategies which control for determinants at the individual, company, and industry levels.

Only a few studies have dealt with minimum-wage and low-wage employment and its characteristics in Germany. Kalina and Weinkopf (2015); (Kalina and Weinkopf 2017) have identified individual characteristics of low-wage workers based on the German Socio-economic Panel (GSOEP) and have shown that the incidence of low pay is nearly twice as high for female workers as it is for male workers. Fur-

thermore, a higher level of educational achievement reduces the risks of working for low wages. The incidence of low-wage employment is higher for younger workers, foreigners, workers with fixed-term contracts, and those in marginal employment. These findings were in accordance with the results reported by Bosch and Kalina (2008), who use data from the employment panel of the federal agency for work. Descriptive analyses based on the Structure of Earnings Survey 2014 suggest, that the risk of low-wage employment is most often associated with working for small companies or those not bound by a collective agreement (Bruttel et al. 2017). Low-wage work is more concentrated in the sectors comprising “agriculture, forestry and fishing”, “accommodation and food service activities”, and “retail” (Bosch and Kalina 2008; Kalina and Weinkopf 2015, 2017). Further studies assessed possible changes in the composition of the low-wage sector after the introduction of a statutory minimum wage in Germany. Kalina and Weinkopf (2017), in their study based on the GSOEP, found no clear effect of the introduction of a minimum wage on the share and composition of low-wage employment. Bruttel et al. (2017) have shown that the group of workers facing the risk of earning low wages is almost identical to the group earning minimum wage. The latter group faces a similar risk but at an even lower level.

With regard to characteristics on the individual level that act as determinants of employment in low-wage jobs, several theoretical assumptions have been made in recent literature. The first deals with wage differences for men and women. One prominent empirical finding is that women earn less than men. Three reasons for the existence of the gender pay gap are discussed. First, few women hold certain positions at the upper end of the career ladder or occupy certain professions and labour sectors because of the horizontal and vertical segregation of the labour market along gender lines. Second, women often interrupt their employment careers and reduce their working time for family reasons, and this occurs more frequently and for longer periods than it does among men. This disparity leads to a devaluation of the acquired human capital. Third, company and sectoral collective wage negotiations have not yet successfully increased wage levels in traditionally female-dominated professions. Furthermore, the gender pay gap remains or even widens through the life course due to losses in the stock of human capital and shorter job tenure (Cahuc et al. 2014: 481 f.).

Hypothesis 1: Women face greater risks than men of being paid below the low-wage threshold.

According to human capital theory, individuals’ qualifications and skills are closely linked to their productivity (Becker 1962, 1975; Mincer 1962; Oi 1962). A higher stock of human capital therefore leads to better career opportunities and higher wages. The amount of human capital accumulation is regarded as an important factor in explaining social inequalities. Referring to the human capital approach, we hypothesize:

Hypothesis 2: The incidence of minimum- and low-wage employment among workers with low education levels is higher than the incidence of this type of employment among workers with higher levels of education.

Another factor influencing wages is age. It is well known that in developed countries wages grow substantially over the life cycle (Lagakos et al. 2018). Under the condition that no serious illness or longer

period of unemployment occurs during the life course, age is highly correlated with job experience and tenure. Particularly in Germany, company and sectoral collective agreements contain seniority-based wages. Thus, wages increase over the employment career in relation to a worker's age and job tenure (Lazear 1981; Fachinger and Himmelreicher 2008). The following hypotheses can be derived:

Hypothesis 3: The older a worker is, the lower the probability of that worker earning below the minimum-wage and low-wage thresholds.

Hypothesis 4: The minimum- and low-wage incidence for a younger worker with short tenure is higher than it is for an older worker with longer tenure.

Part-time work and marginal employment primarily serve the purpose of an internal flexibilization of a company's staff (Dütsch and Struck 2011). Female employees often take these part-time and marginal jobs to be able to balance work and family life and care for older relatives (Wanger 2011). For the same reasons, women often change occupations (Hall 2011), thereby losing or devaluing some of their acquired human capital (Becker 1962). Additionally, marginal and part-time employees have fewer opportunities for promotion and wage increases than full-time workers.

Hypothesis 5: Part-time or marginal workers have a higher probability of being paid below the minimum-wage and the low-wage thresholds.

A significant factor in low-wage work is whether the employee is permanent or regular, on the one hand, or temporary or working for a fixed term, on the other hand. Temporary and fixed-term employment is intended as an instrument of external flexibility of staff that allows the employer to respond quickly to demand and production fluctuations (Brehmer and Seifert 2008). Temporary and fixed-term workers mostly carry out routine tasks (Dütsch and Struck 2011) and are "outsiders" in the internal labour market who have not had to meet the same rigorous qualifications of regular employees and generally occupy inferior positions in their companies (Cahuc et al. 2014: 883).

Hypothesis 6: The incidence of minimum- and low-wage workers in nonpermanent (fixed-term or temporary) jobs is higher than the incidence of minimum- and low-wage workers in permanent positions.

Beyond the individual factors, it is important, according to Coleman (1990) and Esser (1996), to consider the contextual conditions. Just as it is important to recognize that individuals act within specific contexts, this also applies to the labour market. To some extent, employees' options for decisions and actions depend on the resources and limitations of the companies and industries that employ them. Regarding company size, it is generally agreed that smaller companies have a more limited capacity to adapt to changing market conditions than larger companies have. Larger firms are in a better position to cope with sudden fluctuations in sales revenue, for example, because they can balance out lost sales in one product area through gains in another (Struck 2006). Furthermore, compared to smaller firms, large firms can offer more employment opportunities, promotion prospects, and benefits; hence, they promote job mobility, both laterally and vertically. We therefore draw the following hypothesis:

Hypothesis 7: Employees working in smaller companies have a higher probability of earning below the minimum-wage or low-wage thresholds than employees working in larger companies.

Besides the size of a company, its location is a further crucial factor because economic and social inequality also has a spatial dimension. Extensive regional inequalities arising from German reunification and the transformation process in eastern Germany still persist (Himmelreicher 2016). Hence, the labour structure and economic power in Germany feature an unequal distribution in large areas of northern, southern, eastern, and western Germany, and the differences have even increased over the past few years (Albrech et al. 2017). Notably less favourable economic conditions prevail in eastern and northern Germany compared to the federal states and regions in the south of the country, and these weaker economic conditions directly affect the regional wage levels.

Hypothesis 8: The incidence of minimum- and low-wage labour in northern and eastern Germany is higher than in other regions, particularly in southern Germany.

Working conditions and wages are partly determined by the types of collective agreements to which employees and companies are bound. Companies tied to collective agreements have higher wage levels and lower levels of internal wage inequality (Addison et al. 2010; Dustmann et al. 2009). One reason for this is that less skilled workers benefit from collective agreements because such agreements regulate the lowest pay grades and level out wage differences within the workforce (Jirjahn and Stephan 2006). In fact, according to Dustmann et al. (2009) and (Antonczyk et al. 2010), the decline in collective bargaining has led to a rise in wage inequality, particularly at the lower end of the wage distribution. From this, the following hypothesis can be derived:

Hypothesis 9: The risk of earning low wages is higher in companies not bound by a collective agreement than in companies with sectoral or company agreements.

As a social phenomenon, the gender pay gap is well known. Based on the theoretical discussion above concerning the lower pay of women compared to men, it can be assumed that the distribution of men and women in companies has an impact on wage levels. It follows, then, that a larger share of women in a company may negatively affect the internal wage structure.

Hypothesis 10: The incidence of minimum- and low-wage employment in companies with a greater share of women is higher than in male-dominated companies.

The industry to which a company belongs and industry-specific productivities have a strong impact on workers' wages. This correlation is confirmed by several studies focusing on Germany (Bispinck 2017; Mindestlohnkommission 2018). While the creation of value and thus the scope of profit distribution is comparatively high in the manufacturing industry, this is less the case in the service sector. Accordingly, in the manufacturing industry the average wage level is higher than in other sectors, especially the service sector.

Hypothesis 11: Minimum- and low-wage workers are more concentrated in the service sector than in manufacturing industries.

In the following chapter we describe our data and methods, after which we present the empirical results and test the derived hypotheses.

3 Data and method

The empirical basis for answering our questions is the most recent version of the Scientific Use File of the Structure of Earnings Survey 2014 (SES), cited under the tables and figures below as “Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, own calculations.” The SES is an official, mandatory survey conducted in companies (Günther 2013; Statistisches Bundesamt 2013). The collected data mainly refers to employment relationships in the surveyed companies (linked employer-employee data). Data collected on employment relationships by the SES primarily stems from the respective companies’ payroll accounting. For most of the civil service employees, the data is taken from the staff statistics, which also include data from payroll accounting. Hence, wage information gathered there is comparatively accurate and corresponds with the wages paid through company’s internal accounting. SES data collected on working hours, however, is less accurate since the documentation on working hours outside manufacturing is often incomplete (Statistisches Bundesamt 2016b). For the special case of companies which only have marginal employees, information on marginal employment is entirely generated by means of nearest-neighbour-imputation using information on marginal employment from companies that additionally employ workers subject to social security contributions. The last regular SES was conducted in April 2014 for those employees who were employed during the entire month (ibid.). In 2014, the SES survey was broadened to also include very small businesses with fewer than 10 employees and to cover companies in the economic sectors of agriculture and forestry as well as fishing. Comprising nearly all sectors, with the exception of private households, exterritorial organizations, and corporate bodies, the SES data fulfils the prerequisites for evaluating the minimum-wage and low-wage sectors.

The linked employer-employee SES data permits simultaneous analyses of employees and companies. It provides information on 1 million employment relationships (jobs) in approximately 70,000 companies. Regarding employment relationships, it needs to be specified that the SES is a case and not a personal or individual survey and that it does not provide information on the number of employees or whether a given job is held as the main occupation or a second job. We restricted our sample to employees older than 18 years of age and excluded those who were partially retired as well as apprentices, trainees, and interns. This leaves us with a sample of 978,817 jobs in 70,303 companies. Due to the large sample size and the large set of characteristics, the SES allows for sophisticated analyses on both individual and organizational levels (Amlinger and Bispinck 2013).

The SES data makes it possible to calculate gross hourly wages based on the gross monthly wages and weekly working hours surveyed. The information it provides on earnings uses the month of April of the given year as its reference point. The SES data allows us to separately identify total overtime pay (including overtime premiums) and the sum of other premium payments (for shift work; night work; and work on Saturdays, Sundays, and public holidays). We use the total gross earnings, including overtime pay but without annual bonuses, as the main variable to calculate gross hourly wages. The sur-

vey of working hours in the SES 2014 refers to different working hour concepts. Firstly, respondents are asked about regular weekly working hours. This refers to the working hours agreed to under the employment contract, if applicable. Secondly, they are surveyed about their monthly paid working hours (without overtime). Thirdly, the respondents are asked about their monthly hours of paid overtime. Where companies do not provide information on the monthly hours paid, those hours are approximated using the contractually agreed-upon weekly working hours multiplied by the number of weeks per month (Statistisches Bundesamt 2016a). The SES information on contracted hours is regarded as more reliable than the other measures of "actual working time" or paid and unpaid overtime. Thus, we use contracted weekly working hours multiplied by 4.33 in this study to calculate the monthly working time (Dütsch et al. 2017). We obtain our figure for gross hourly wages by dividing the total gross earnings by the monthly working time.

As dependent variables we use different income thresholds which are based on gross hourly wages. One of these is the statutory minimum wage of 8.50 euros gross per hour, introduced in Germany in 2015, and the other is the low-pay threshold, which is defined as two-thirds of the median wage. In 2014 the low-wage threshold amounted to a gross hourly wage of 10.33 euros. Thus, we calculated 2 dummy variables to specify whether a job pays more or less than 8.50 euros and more or less than 10.33 euros. Additionally, 2 metric variables indicate the distance between the hourly wage and the minimum- or low-wage thresholds for jobs paying below these thresholds.

Central indicators of the analyses are various individual and company characteristics as well as information on the industrial sector. Individual characteristics include sex, age, the highest attained education level, tenure, employment status (full-time, part-time, or marginal)[2], type of contract (fixed-term or permanent), and whether the employment is temporary or regular. Company-level characteristics include the region where the company is located (north-west including Berlin, north-east, west and south), information on whether or not the company is bound by sectoral collective or company collective agreement, the size of the company (whether the number of jobs is <5, 5-49, 50-249, or 250 and more), and gender distribution. Industrial sectors are classified according to the Statistical Classification of Economic Activities (NACE, Rev. 2), excluding the categories "Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use" and "Activities of extraterritorial organizations and bodies" because they are not part of the sample.

First, descriptive analyses give an overview of low-paid workers and low-wage companies as well as minimum-wage workers and minimum-wage companies. In a second step, random intercept-only models are estimated to assess the explanatory power of the individual, company, and industry levels. Finally, logistic and linear regressions are performed to estimate individual and company-level characteristics on the risk of earning minimum wage or low wages and on the distance between a worker's actual earnings and the minimum- and low-wage thresholds. The multivariate analyses are performed using data covering jobs, companies, and industries. This structuring of the data from the level of jobs

[2] Marginal employment refers to jobs with maximum earnings of 450 euros gross per month, which are exempt from social security contributions for employees.

to industries is an important aspect when choosing an estimation procedure. Moulton (1986, 1990) has noted that the inclusion of meso- and macro-level variables in a standard regression analysis in which observations are assumed to be independent leads to an inefficient estimation of the coefficients and to biased standard errors. Therefore, in the first step, multilevel models are estimated because they allow a grouping of jobs *i* within companies *j* nested in industries *k* by considering residuals at the company and industry levels. These residuals represent unobserved characteristics that cause correlations between outcomes for jobs from the same company and industry. The empirical analyses are performed with the following 3-level random intercept-only model (Rabe-Hesketh and Skrondal 2008):

$$y_{ijk} = \beta_0 + C_{jk}^{(2)}, C_k^{(3)}$$

in which β_0 represents the regression constant, β_1 refers to the regression coefficients, and $C_{jk}^{(2)}$ and $C_k^{(3)}$ denote the random effects that are assumed to be independent not only of each other but also across clusters. $C_{jk}^{(2)}$ is also assumed to be independent across units. In the third step we estimate logit models for binary variables and linear OLS models with cluster-robust standard errors (Wooldridge 2012, 2013).

4 Empirical findings

4.1 Descriptives

In Germany, about 11 percent of jobs are paid below the minimum-wage threshold of 8.50 euros, and about 26 percent below the low-wage threshold of 10.33 euros (Table 1). The average gross hourly wage amounts to 16.99 euros. In the minimum-wage and low-wage ranges, the mean wages are 7.01 euros and 8.36 euros, respectively. Overall, about 49 percent of workers are female; about 14 percent of women earn less than 8.50 euros and about 32 percent less than 10.33 euros. This percentage of working women in minimum- or low-wage jobs is significantly higher than the corresponding share of men. On average, women earn 4.14 euros less than men; however there is almost no difference in remuneration levels for males and females in minimum-wage and low-wage jobs. Although only 6 percent of employees are younger than 25, their share in the minimum-wage range (26 percent) or low-pay range (51 percent) is very high. This also applies to workers older than 64 years. About 9 percent of employees have not completed vocational training; they have the largest share in the minimum-wage range (18 percent) or low-wage range (43 percent), but also about 19 percent of those with a vocational qualification receive low pay. About 60 percent of jobs in Germany are full time, 24 percent are part time, and 16 percent are marginal positions. With regard to the marginal employees, 37 percent are paid below the minimum wage and 75 percent below the low-pay threshold. They earn significantly lower hourly wages (9.39 euros) than part-time workers (15.42 euros) or full-time workers (19.70 euros). Furthermore, the average remuneration for the marginally employed who are paid in the minimum-wage or low-wage range only amounts to 6.82 euros and to 8.10 euros. Marginal employment applies to all branches, even in higher-wage industries, and to varying extents. The marginally employed often earn less than minimum wage, even in firms with higher sectoral or company collec-

tive agreements (see Table A1). Sixteen percent of workers with fixed-term contracts find themselves in minimum-wage employment, and 39 percent in low-paid employment. These are significantly higher shares than for permanent employees. About 49 percent of temporary work consists of low-wage jobs, but the proportion of temporary jobs below the minimum-wage threshold is not above average. This is due to sectoral collective agreements negotiated for this branch of the economy. Job tenure seems to be an important factor regarding minimum- and low-wage employment: the share of minimum-wage jobs (18 percent) and low-wage jobs (42 percent) in short-tenured employment clearly exceeds the percentage of such jobs in longer-tenured employment.

Table 1: Individual-level characteristics of jobs in Germany, 2014

		All jobs	Minimum-wage jobs < 8.50 euros	Low-wage jobs < 10.33 euros
	Percentage of all workers	100%	11.01%	25.63%
	Mean wage in euros	*16.99*	*7.01*	*8.36*
Gender	Women	49.34%	13.77%	31.69%
	Mean wage in euros	*14.89*	*7.06*	*8.36*
	Men	50.66%	8.32%	19.72%
	Mean wage in euros	*19.03*	*6.95*	*8.36*
Age	18-24 years old	6.14%	26.38%	50.61%
	Mean wage in euros	*10.99*	*6.88*	*8.06*
	25-34 years old	20.48%	10.32%	24.62%
	Mean wage in euros	*15.17*	*7.03*	*8.39*
	35-44 years old	21.70%	8.47%	21.43%
	Mean wage in euros	*17.93*	*7.08*	*8.46*
	45-54 years old	30.32%	8.45%	21.47%
	Mean wage in euros	*18.68*	*7.10*	*8.48*
	55-64 years old	18.37%	10.95%	24.93%
	Mean wage in euros	*17.90*	*7.04*	*8.34*
	65 years and older	2.98%	29.09%	60.48%
	Mean wage in euros	*12.11*	*6.79*	*8.15*
Highest attained education level	No vocational training	8.61%	18.38%	42.64%
	Mean wage in euros	*12.44*	*6.96*	*8.31*
	Vocational training/ master craftsman	55.73%	7.64%	19.39%
	Mean wage in euros	*16.37*	*7.15*	*8.52*
	Polytechnic / university degree	15.56%	1.47%	3.71%
	Mean wage in euros	*27.22*	*6.84*	*8.44*
	unknown	20.10%	24.60%	52.63%
	Mean wage in euros	*12.74*	*6.92*	*8.21*
Employment status	Full-time employment	59.57%	4.19%	11.92%
	Mean wage in euros	*19.70*	*7.27*	*8.65*

	Part-time employment	24.14%	10.02%	25.86%
	Mean wage in euros	*15.42*	*7.24*	*8.55*
	Marginal employment	16.29%	37.42%	75.43%
	Mean wage in euros	*9.39*	*6.82*	*8.10*
Type of contract	Permanent contract	87.26%	10.23%	23.66%
	Mean wage in euros	*17.53*	*7.02*	*8.36*
	Fixed-term contract	12.74%	16.39%	39.10%
	Mean wage in euros	*13.25*	*6.98*	*8.35*
Temporary vs. regular work	Regular work	98.26%	11.00%	25.22%
	Mean wage in euros	*17.08*	*7.00*	*8.34*
	Temporary work	1.74%	11.79%	49.00%
	Mean wage in euros	*11.56*	*7.71*	*8.82*
Tenure	0-4 years	42.05%	18.47%	41.62%
	Mean wage in euros	*13.68*	*6.98*	*8.30*
	5-9 years	18.54%	10.15%	24.85%
	Mean wage in euros	*16.59*	*7.08*	*8.46*
	10 and more years	39.40%	3.46%	8.94%
	Mean wage in euros	*20.71*	*7.11*	*8.52*
Number of observations		978,817	110,019	234,720

Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, all indications are population weighted which correct for sex, region, type of employment and company size, own calculations.

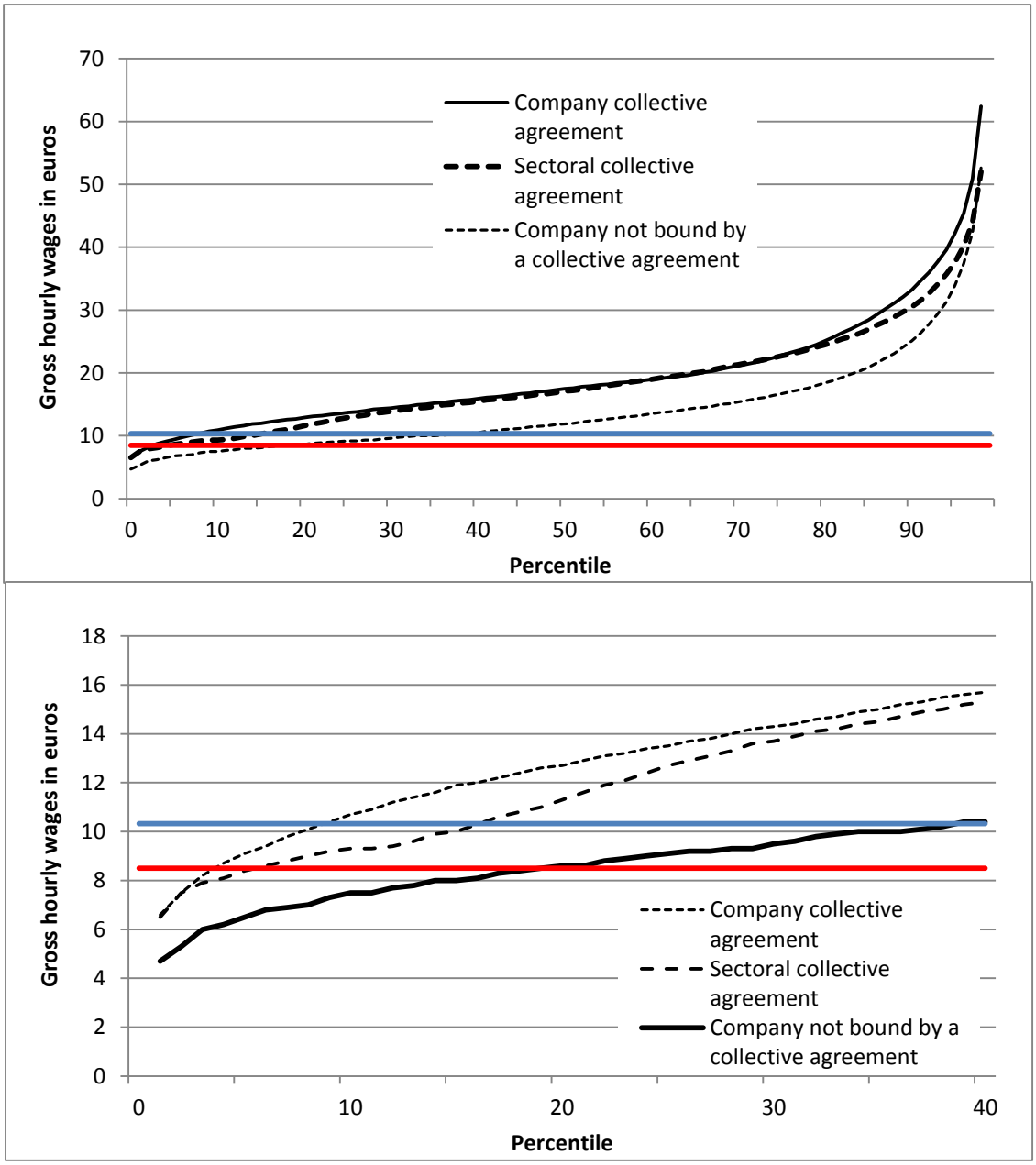
In Table 2 company-level characteristics of jobs in Germany are described. It becomes obvious that the larger the company, the smaller the proportion of jobs below the minimum-wage and the low-wage thresholds. Small companies with fewer than 5 employees have the highest share of minimum-wage jobs (23 percent) or low-wage employment (52 percent). They also pay the lowest average wages in total as well as the lowest average minimum wage (6.95 euros) and low wage (8.29 euros). Regarding regional differences, Table 2 shows that companies located in the northeastern part of Germany have the greatest proportions of minimum-wage jobs (23 percent) and low-wage employment (39 percent); these companies also pay below-average wages. About 42 percent of all jobs are in companies that are not bound by a collective agreement. Of these jobs, 39 percent pay below the low-wage threshold, and 18 percent even pay below the minimum-wage threshold. In comparison, employees in companies bound by sectoral or company collective agreements are much better protected from low wages. This is also shown in the Pen's Parade in figure 1, which depicts the distribution of hourly wages according to collective bargaining coverage. However, as the Pen's Parade illustrates, company collective agreements lead to higher earnings in the lower income bracket up to the 4th decile compared to sectoral collective agreements. While the low-wage threshold is reached at the 9th decile in the case of company collective agreements, it is not reached until the 15th percentile by sectoral collective agreements. According to Table 2, the distribution of men and women in companies also affects wages. In companies where men make up most of the workforce, smaller proportions of workers receive pay that is below the minimum-wage or low-wage thresholds.

Table 2: Company-level characteristics of jobs in Germany, 2014

		All jobs	Minimum-wage jobs < 8.50 euros	Low-wage jobs < 10.33 euros
	Percentage of all workers	100%	11.01%	25.63%
	Mean wage in euros	*16.99*	*7.01*	*8.36*
Size of company	Fewer than 5 employees	7.98%	23.48%	52.06%
	Mean wage in euros	*11.88*	*6.95*	*8.29*
	5-49 employees	32.94%	16.37%	35.95%
	Mean wage in euros	*14.11*	*7.06*	*8.32*
	50-249 employees	24.13%	9.37%	24.06%
	Mean wage in euros	*16.79*	*7.12*	*8.48*
	250 and more employees	18.21%	4.75%	12.99%
	Mean wage in euros	*20.61*	*6.78*	*8.41*
	unknown number of employees	16.75%	3.71%	8.75%
	Mean wage in euros	*21.42*	*6.74*	*8.25*
Region in Germany	Northeast, excluding Berlin	13.53%	22.54%	39.14%
	Mean wage in euros	*13.66*	*6.87*	*7.92*
	Northwest, including Berlin	19.90%	10.83%	26.13%
	Mean wage in euros	*16.62*	*7.05*	*8.40*
	West	35.17%	9.67%	24.24%
	Mean wage in euros	*17.54*	*7.08*	*8.45*
	South	31.40%	7.65%	21.05%
	Mean wage in euros	*18.03*	*7.08*	*8.57*
Presence or type of collective agreement	Company not bound by a collective agreement	42.22%	18.22%	38.88%
	Mean wage in euros	*14.46*	*6.98*	*8.25*
	Sectoral collective agreement	32.49%	5.14%	16.11%
	Mean wage in euros	*18.77*	*7.28*	*8.68*
	Company collective agreement	5.39%	3.31%	8.92%
	Mean wage in euros	*19.90*	*6.84*	*8.48*
	unknown	19.90%	7.39%	17.59%
	Mean wage in euros	*18.65*	*6.93*	*8.37*
Gender distribution	More men in company	13.72%	8.83%	20.94%
	Mean wage in euros	*17.85*	*6.88*	*8.35*
	More women in company	86.28%	11.36%	26.38%
	Mean wage in euros	*16.85*	*7.03*	*8.36*
Number of observations		978,817	110,019	234,720

West = North Rhine-Westfalia, Hesse, Rheinland-Palatinate, Saarland; South = Baden-Wuerttemberg, Bavaria
Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, all indications are population weighted which correct for sex, region, type of employment and company size, own calculations.

Figure 1: Distribution of hourly wages according to collective bargaining coverage (Pen's Parade)



Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, all indications are population weighted which correct for sex, region, type of employment and company size, own calculations.

Table 3 shows the sectoral characteristics of jobs in Germany. It becomes clear that in some sectors jobs that pay below the minimum-wage and low-wage thresholds are relatively rare. This is true of the following sectors: "Public administration and defence as well as compulsory social security", "Mining and quarrying", "Electricity, gas, steam and water supply", "Financial and insurance activities", and "Education". However, there are large proportions of low-wage and minimum-wage jobs in the sectors "Accommodation and food service activities", "Administrative and support service activities", "Agriculture, Forestry and Fishing", "Arts, entertainment and recreation", and "Transportation and storage". One notable point is that in the sectors with large proportions of workers earning low and minimum wages, the share of marginally employed is also comparatively high (see Table A1). In summary, with regard to the sectors, there is great heterogeneity in low-pay risk factors and wage levels.

Table 3: Sectoral characteristics of jobs in Germany, 2014

	All jobs	Minimum-wage jobs < 8.50 euros	Low-wage jobs < 10.33 euros
Percentage of all workers	100%	11.01%	25.63%
Mean wage in euros	*16.99*	*7.01*	*8.36*
Agriculture, Forestry, and Fishing	0.91%	33.42%	63.73%
Mean wage in euros	*10.62*	*7.08*	*8.16*
Mining and quarrying	0.18%	1.12%	5.51%
Mean wage in euros	*20.83*	*7.42*	*9.07*
Manufacturing	18.59%	5.32%	13.98%
Mean wage in euros	*20.09*	*7.10*	*8.55*
Electricity, gas, steam, and water supply	1.33%	2.00%	10.64%
Mean wage in euros	*20.92*	*7.08*	*8.93*
Construction	4.98%	4.59%	15.96%
Mean wage in euros	*15.27*	*6.99*	*8.83*
Wholesale and retail trade; repair of motor vehicles and motorcycles	13.95%	15.15%	32.17%
Mean wage in euros	*14.82*	*7.12*	*8.33*
Transportation and storage	5.38%	21.08%	37.52%
Mean wage in euros	*13.88*	*6.61*	*7.82*
Accommodation and food service activities	4.39%	44.76%	76.34%
Mean wage in euros	*9.37*	*6.95*	*7.89*
Information and communication	2.85%	7.91%	14.65%
Mean wage in euros	*23.45*	*6.61*	*7.88*
Financial and insurance activities	2.78%	2.60%	7.07%
Mean wage in euros	*24.07*	*7.04*	*8.54*
Real estate activities	1.28%	15.30%	41.00%
Mean wage in euros	*14.79*	*6.93*	*8.49*
Professional, scientific, and technical activities	5.82%	7.07%	17.25%
Mean wage in euros	*20.84*	*6.66*	*8.31*
Administrative and support service activities	7.40%	16.28%	57.28%
Mean wage in euros	*11.83*	*7.42*	*8.78*
Public administration and defence; compulsory social security	6.69%	1.36%	3.19%
Mean wage in euros	*19.56*	*6.85*	*8.30*
Education	6.21%	2.93%	8.36%
Mean wage in euros	*19.60*	*6.75*	*8.47*
Human health and social work activities	12.93%	7.25%	21.22%
Mean wage in euros	*16.18*	*7.18*	*8.65*
Arts, entertainment, and recreation	1.24%	30.90%	51.08%
Mean wage in euros	*13.02*	*6.76*	*7.79*

Other service activities	3.11%	17.61%	37.31%
Mean wage in euros	*14.94*	*7.04*	*8.25*
Number of observations	978,738	110,019	234,720

Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, all indications are population weighted which correct for sex, region, type of employment and company size, own calculations.

Against this backdrop, in the next section the significance of the individual, company, and sectoral levels regarding their power to explain low-wage and minimum-wage employment are assessed.

4.2 Examination of the variance components

We use estimates for 3-level logistic random intercept models to analyse the probability of being employed in the low-wage or minimum-wage sector and to assess the distance to both thresholds. In models without explanatory variables (intercept-only models), the variance in the outcome variable can be decomposed into proportions associated with the individual level, the company level, and the industry level. For this purpose, the random part of the 3-level models is explored by considering the estimated residual intraclass correlation ρ of the latent responses. It is assumed that in models on the risk of earning minimum wage or low wages, the level-1 error variance is equal to $\pi^2/3$ for the logistic link function while $\psi^{(2)}$ is the variance between companies and $\psi^{(3)}$ the variance between industrial sectors (Rabe-Hesketh and Skrondal 2008). We thus obtain for the similarity of employees *i* within the same industrial sector *k*:

$$\rho(\text{sector}) = \frac{\psi^{(3)}}{\psi^{(2)}+\psi^{(3)}+\pi^2/3}.$$

Within the same company *j* (and the same industrial sector *k*), we get:

$$\rho(\text{company}) = \frac{\psi^{(2)}}{\psi^{(2)}+\psi^{(3)}+\pi^2/3}.$$

In the linear intercept-only models on the distance between a worker's actual earnings and the minimum- and low-wage thresholds, the level-1 error variance is θ. Thus, the similarity of employees *i* within the same industrial sector *k* is:

$$\rho(\text{sector}) = \frac{\psi^{(3)}}{\psi^{(2)}+\psi^{(3)}+\theta}.$$

Within the same company *j* (and the same industrial sector *k*), we get:

$$\rho(\text{company}) = \frac{\psi^{(2)}}{\psi^{(2)}+\psi^{(3)}+\theta}.$$

Table 4 shows random-intercept models without explanatory variables. The values of the random part denote that 46.09 percent of the differences in the employment situation regarding being employed in a low-wage job or being not is explained by the company level, 30.05 percent by industrial sectors

level, and 23.86 percent by the individual level. Regarding the employment situation of being employed in a minimum-wage job or not, 52.06 percent and 23.85 percent of the differences can be attributed to the company level and industrial sector level, respectively; 24.09 percent relate to the individual level. Regarding the differences in the distance between earnings and the low-wage threshold, 45.64 percent can be traced back to the company level, 4.99 percent to the industrial sector level, and 49.37 percent to the individual level. The company level and the industrial sector level account for 48.37 percent and 3.45 percent, respectively, of the differences in the distance to the minimum-wage threshold, and the individual level accounts for the remaining 48.18 percent. These results indicate – in line with findings from Card et al. (2013) – strong explanatory power of the company level regarding the risk of being employed in the minimum-wage or low-wage segment of the workforce and regarding the distance to both thresholds in the German labour market. Industrial sectors especially impact the risk of earning low or minimum wages, but they impact to a lesser extent the distance to low- and minimum-wage thresholds. Individual characteristics explain more variance in the wage gap than in the probability of earning more or less than a low wage or minimum wage.

Table 4: Estimation results for intercept-only models (3-level random intercept models without explanatory variables)

	Probability of earning low wage	Probability of earning minimum wage	Distance to low-wage threshold	Distance to minimum-wage threshold
Residual variance (industrial sectors)	3.956	3.111	0.118	0.055
Residual variance (companies)	6.069	6.791	1.078	0.772
Residual variance (jobs)	3.289	3.289	1.166	0.769
Number of industrial sectors*	45	45	45	45
Number of companies	70,303	70,303	46,829	28,804
Number of jobs	978,817	978,817	234,720	110,019
LR test vs. logistic model	653.02	430.40	447.70	218.39
Prob > chi²	0.000	0.000	0.000	0.000

*In the intercept-only models all 45 industries contained in the dataset were used.
Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, own calculations.

Against the backdrop of the significance of the individual, company, and industry levels for being employed in the low-wage and minimum-wage ranges, we discuss the determinants of these probabilities in the next section. Additionally, the hypotheses derived in section 2 are tested there.

4.4 Estimates on individual-, company-, and industry-specific characteristics

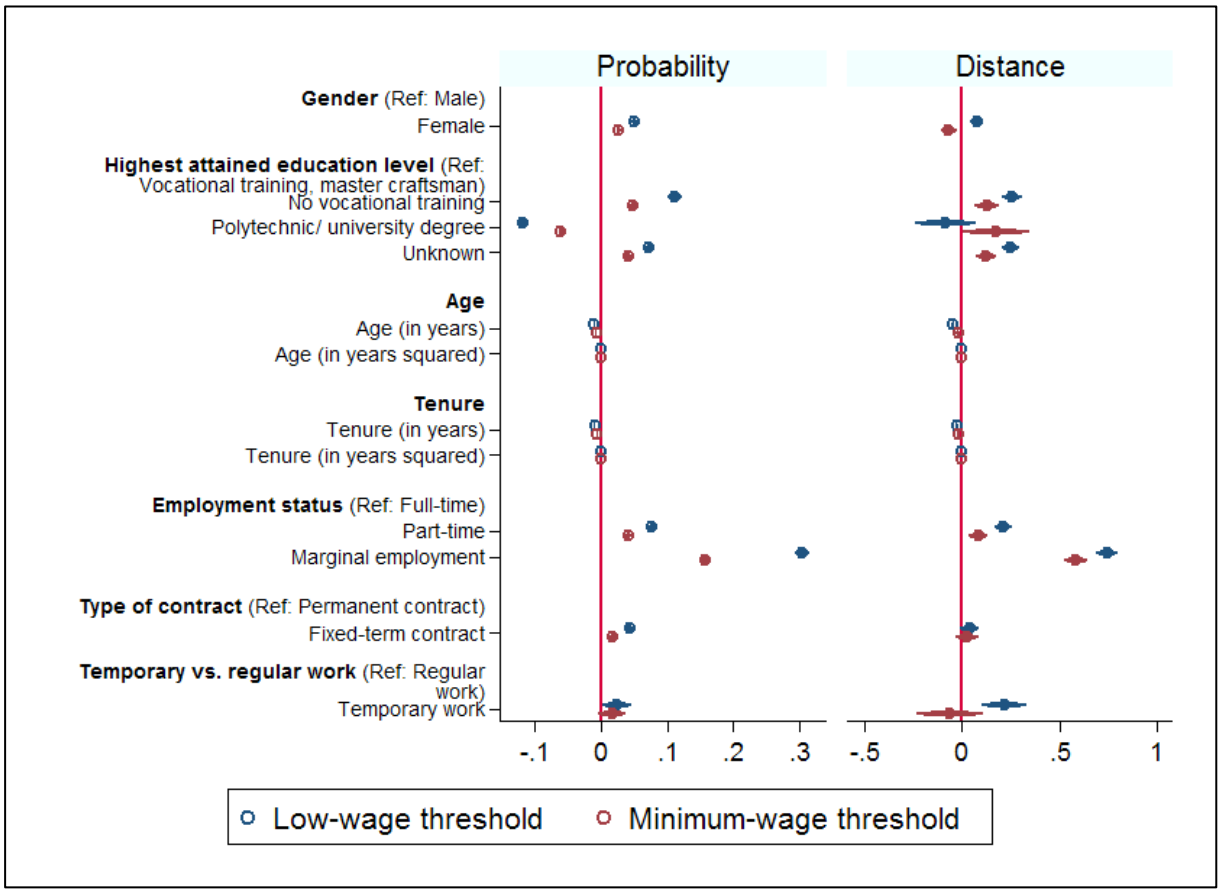
In the left parts of figures 2 to 4 (below) the marginal effects of logit estimates on the probability of earning below the low-wage threshold (blue diamonds) and the minimum-wage threshold (red diamonds) are depicted. The right parts of the figures display coefficients from linear OLS regressions which indicate the distance between the gross hourly wage and the low-wage threshold (blue dia-

monds) and the minimum-wage threshold (red diamonds).[3] Although the results are presented in 3 figures, they come from one estimation that included variables on individual, company, and industry levels. In the following, only effects which are significant at the 95% level at least are interpreted.

Individual determinants are shown in figure 2. The data clearly shows that women are at a higher risk of being employed in the low-wage and minimum-wage sectors. The distance between actual low wages and the low-wage threshold is greater for women than for men. However, the distance between actual earnings below minimum wage to the minimum-wage threshold is smaller for women. These findings are in line with hypothesis 1, that the incidence of minimum-wage and low-wage employment is higher among women than among men. An employee's highest attained educational level is a strong indicator of low- and minimum-wage risks. Both risks are greatly increased for workers who have not earned a vocational degree. Additionally, their wage gaps relative to both thresholds are comparatively large. In contrast, highly skilled employees exhibit lower risks of earning below the low- and minimum-wage thresholds. Thus, our findings support hypothesis 2, that the minimum and low-wage incidences of unskilled workers are higher compared to the incidences among higher-skilled workers. With increasing age, the probability of earning below the low-wage and the minimum-wage thresholds decreases, but so does the distance to both thresholds. Hence, hypothesis 3, that the probability of earning below the minimum-wage and low-wage thresholds decreases as workers age, cannot be rejected. With increasing tenure, the probability of earning below the low-wage and the minimum-wage thresholds as well as the wage gap to both thresholds slightly decreases. This is in line with hypothesis 4. Among the individual determinants, employment status has the strongest impact on the low-pay and minimum-wage risks. Employees in part-time jobs and especially those in marginal employment suffer from significantly higher low-wage and minimum-wage risks compared to full-time employees. Wages in marginal employment, in particular, are far below both thresholds. Thus, hypothesis 5 cannot be rejected. The probability of minimum- and low-wage employment is increased in fixed-term as well as in temporary employment. These findings support hypothesis 6, which predicts higher risks of low earnings for workers in atypical jobs.

[3] The corresponding point estimates and standard errors are given in the appendix in Table A2.

Figure 2: Estimates on individual determinants of earning below the low-wage and minimum-wage thresholds

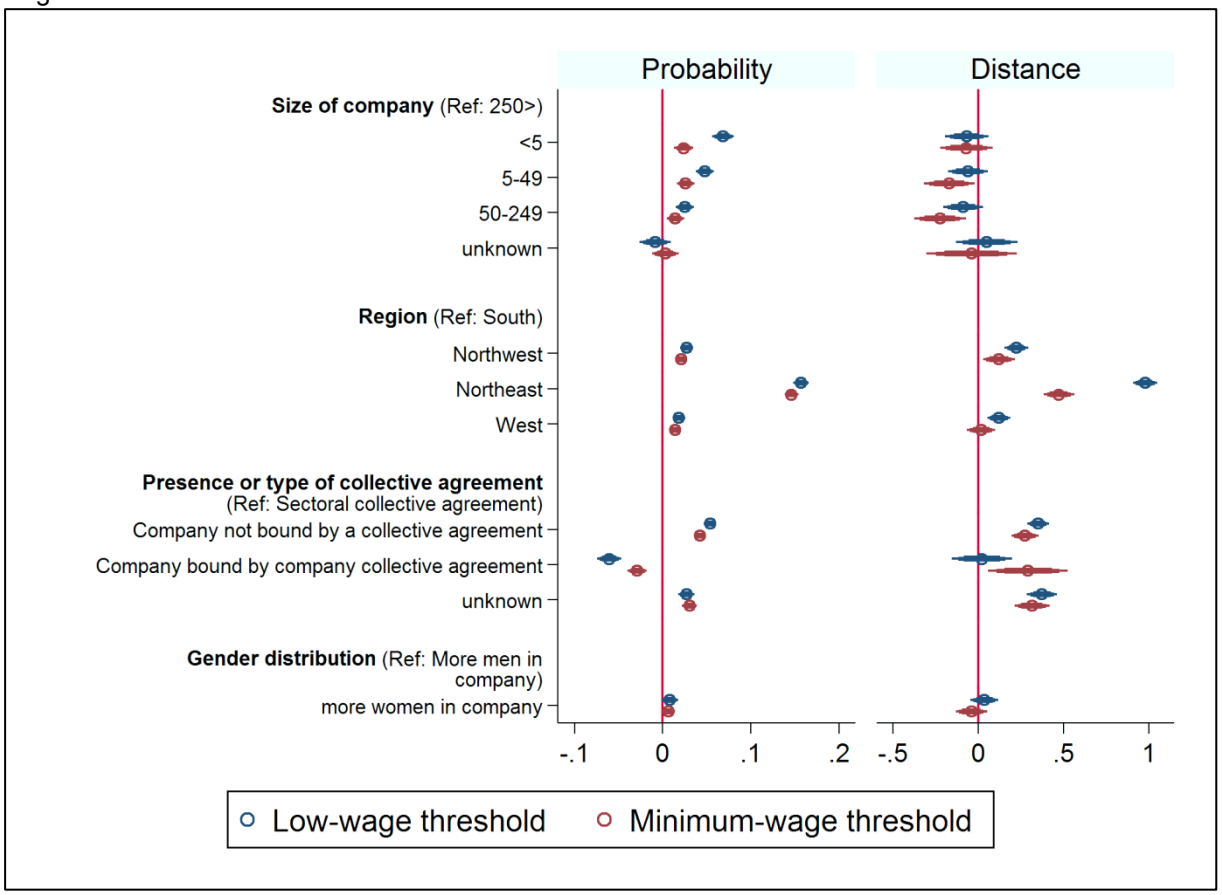


Standard errors are clustered at the company level. The dependent variables "probability" are coded as dummy variables. The value 1 represents a job paying less than 10.33 euros (low-wage threshold) or 8.50 euros (minimum-wage threshold); the dependent variables "distance" are metric and denote the gap between the hourly wage and the low or minimum wage. In the case of binary logit estimates, the average marginal effects are shown. Although the results are presented in figures 2-4, they come from one estimation that included individual-, company-, and industry-level variables.
Spikes are drawn for 99.9%, 99%, and 95% confidence intervals.
Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, own calculations.

Company-level determinants are displayed in figure 3. Estimates on company size indicate that the likelihood of jobs paying below the low- or minimum-wage threshold increases in small companies with fewer than 5 or between 5 and 49 employees compared to large companies. This is line with hypothesis 7, which assumes a higher minimum- and low-wage incidence in smaller companies. The region in which a company is based also plays a major role. Especially in the northeast of Germany and to a lesser extent in the north, the risk of earning below the low-wage and minimum-wage thresholds is significantly higher compared to in the south. Furthermore, in the northeast of the country, the gap between low-wage earners' pay and the low-wage threshold is remarkably big. These findings support hypothesis 8. The existence of collective agreements represents a significant factor. Companies not bound by a collective agreement are more likely to pay wages below the low- or minimum-wage thresholds. Additionally, the distances between hourly pay and the low- and the minimum-wage thresholds is comparatively large. Company collective agreements reduce the low- and minimum-wage risks. These results are in line with hypothesis 9. Hypothesis 10 predicts a higher minimum- and low-wage incidence in female-dominated companies. Although the impact is comparatively small, hy-

pothesis 10 cannot be rejected.

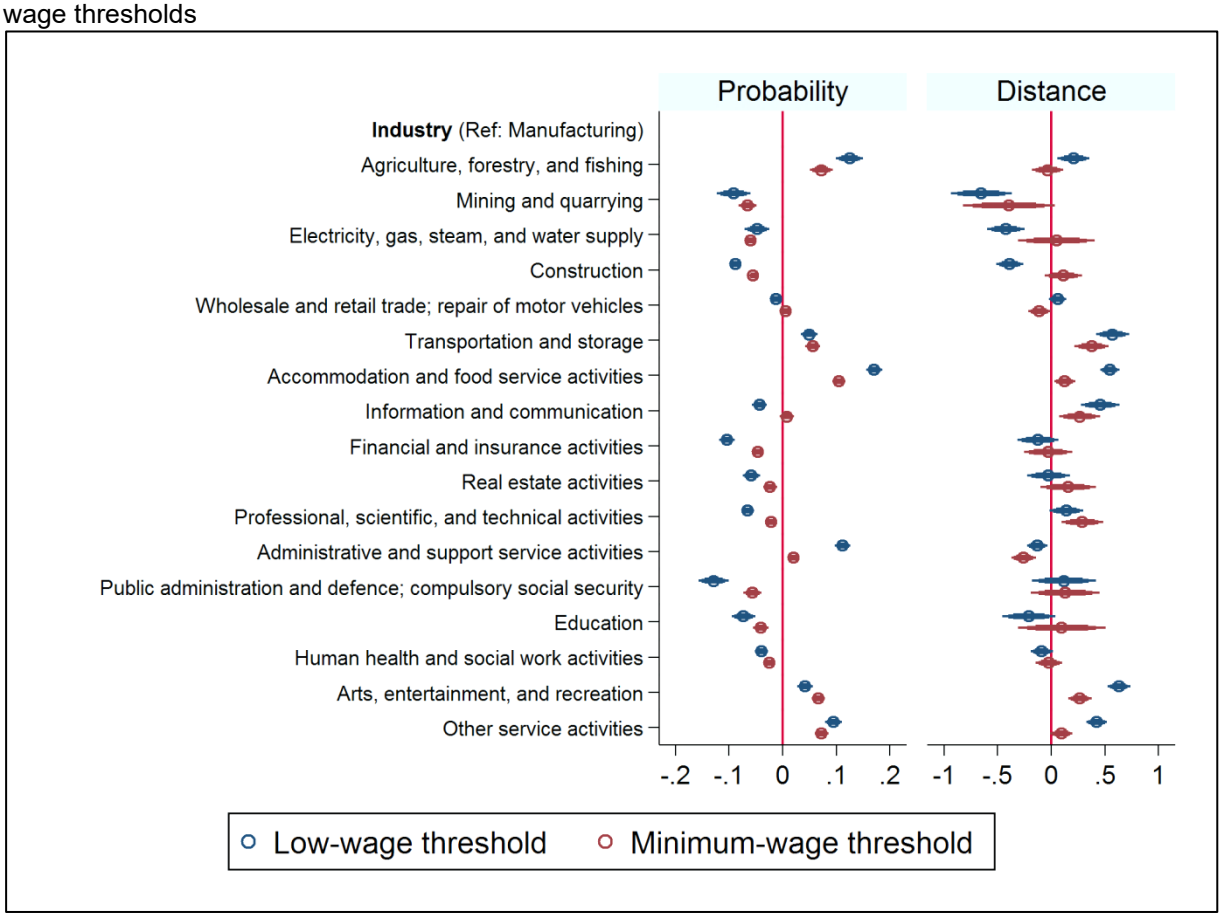
Figure 3: Estimates on company-level determinants of earning below the low-wage and minimum-wage thresholds



Standard errors are clustered at the company level. The dependent variables "probability" are coded as dummy variables. The value 1 represents a job paying less than 10.33 euros (low-wage threshold) or 8.50 euros (minimum-wage threshold); the dependent variables "distance" are metric and denote the gap between the hourly wage and the low or minimum wage. In the case of binary logit estimates, the average marginal effects are shown. Although the results are presented in figures 2-4, they come from one estimation that included individual-, company, and industry-level variables.
Spikes are drawn for 99.9%, 99%, and 95% confidence intervals.
Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, own calculations.

Figure 4 illustrates the estimates on industry-specific determinants of earning below the low-wage and minimum-wage thresholds. These risks are strongly increased in the industries "Accommodation and food service activities", "Agriculture, forestry and fishing", "Administrative and support service activities", "Other activities", "Transportation and storage", and "Arts, entertainment and recreation". The wage gap to both thresholds is particularly large in the industries "Transportation and storage", "Accommodation and food service activities", "Information and communication", and "Arts, entertainment and recreation". These findings are in line with hypothesis 11.

Figure 4: Estimates on industry-specific determinants of earning below the low-wage and minimum-wage thresholds



Standard errors are clustered at the company level. The dependent variables "probability" are coded as dummy variables. The value 1 represents a job paying less than 10.33 euros (low-wage threshold) or 8.50 euros (minimum-wage threshold); the dependent variables "distance" are metric and denote the gap between the hourly wage and the low or minimum wage. In the case of binary logit estimates, the average marginal effects are shown. Although the results are presented in figures 2-4, they come from one estimation that included individual-, company-, and industry-level variables.
Spikes are drawn for 99.9%, 99%, and 95% confidence intervals.
Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, own calculations.

5 Discussion of results and conclusions

Since the mid-1990s, the low-wage sector in Germany has gained in size to a level that is above average among developed countries (OECD 2018). In particular, earnings at the bottom end of the wage distribution have plunged sharply downwards. The resulting huge wage inequality in Germany was a decisive reason for the introduction of the statutory minimum wage in Germany in January 2015 (Bosch and Weinkopf 2014; Dustmann et al. 2014: 185).

Against this background, our aim was to empirically characterize the low-wage and the minimum-wage sectors in 2014, the year prior to the introduction of the statutory minimum wage. By now only a few studies have described these segments of the German labour market; they have explored the importance of individual factors in the incidence of low-wage labour but have only assessed structural determinants descriptively (Bosch and Kalina 2008; Bruttel et al. 2017; Kalina and Weinkopf 2015, 2017). For this reason, we took as our point of departure Coleman's (1990) and Esser's (1996) conceptual comments on the importance of the broader social context for individual behaviour and sys-

tematically explored the impact of individual determinants, company-specific factors, and disparities between industries on the risks of earning wages below the minimum-wage and low-wage thresholds. Our descriptive and multivariate analyses were based on the Structure of Earnings Survey 2014, a rich dataset containing information on about 1 million jobs and about 70,000 companies from all industries.

First, we could descriptively show that in 2014, one year before the introduction of the German minimum wage, about 11 percent of all jobs paid below the minimum-wage threshold of 8.50 euros gross per hour, and about 26 percent of jobs paid below 10.33 euros, the threshold defining low-wage earnings. These figures indicate that there is a widespread low-wage sector in Germany compared to other developed countries. According to our bivariate analyses, the following individual characteristics exhibit the highest low-wage and minimum-wage proportions. First, about 32 percent of female workers earned low wages, and about 14 percent earned less than 8.50 euros. Second, among marginal employees, 37 percent were paid less than minimum wage and 75 percent earned wages below the low-pay threshold. With regard to individual characteristics, marginal employment is the main factor explaining low wages. Every 6th worker is marginally employed in the German labour market, and more than 35 percent earn less than the minimum wage. Our descriptions show that this even applies to industries with collective agreements and higher industry-specific minimum wages. This result suggests that in the case of marginal employment, the level of compliance with specific labour regulations may be lower than in the case of regular employment (Stegmaier et al. 2015; Bachmann et al. 2017). Yet the distance between the minimum-wage and low-wage thresholds is comparatively large. Third, among workers with job tenure of only 0 and 4 years, the share of minimum-wage and low-wage jobs amounted to 18 percent and 42 percent. Furthermore, less educated and younger employees, those older than 65 years, and employees with fixed-term contracts had higher incidences of low pay and minimum wage. Regarding company-level characteristics, it was clear that small companies with fewer than 5 employees had high shares of minimum-wage jobs (23 percent) or low-wage jobs (52 percent). The percentage of jobs paying below the low-wage threshold in companies not bound by a collective agreement was 39, while 18 percent were below the minimum-wage threshold. Additionally, jobs in companies located in the northeast of Germany or in female-dominated companies also showed high proportions of minimum-wage and low-wage jobs. Large proportions of low-wage and minimum-wage jobs could be found in the sectors “Accommodation and food service activities”, “Administrative and support service activities”, and “Agriculture, Forestry and Fishing”.

Second, using estimated random-intercept models without explanatory variables, we could assess the explanatory power of the individual, company, and industry levels. The findings indicated that 46.09 percent of the differences in the employment situation regarding being employed in a low-wage job or being not was explained by the company level, while 30.05 percent of the differences had to do with the industrial-sector level and 23.86 percent with the individual level. 52.06 percent, 23.85 percent, and 24.09 percent of the differences in the employment situation regarding being employed in a minimum-wage job or not was explained by the company level, by the industrial sector level, and by the individual level. However, differences in the distances between a worker’s actual wage and the minimum- or low-wage thresholds can mainly be traced back to the individual and company level, while

industrial sectors lose importance. These results sustainably confirm the conceptual considerations of Coleman (1990) and Esser (1996) that structural determinants are highly important when assessing individual behaviour. This consideration can obviously be transferred to the labour market and to research on employment situations.

Third, estimations of logit models for binary variables and linear OLS models indicated that women are at a higher risk of being employed in the low-wage and minimum-wage sectors. The distance between the wages of low-paid workers and the low-wage threshold was greater for women than men. This is in line with gender pay gap research which explains wage differences between men and women as the result of interrupted employment careers and the associated losses in the stock of human capital and shorter job tenure (Cahuc et al. 2014: 481 f.). Low- and minimum-wage risks greatly increased and wage gaps with both thresholds were comparatively large for workers without a vocational degree; however, highly skilled employees were at lower risk of earning below the low- and minimum-wage thresholds. These results support the assumptions of human capital theory (Becker 1962, 1975; Mincer 1962; Oi 1962) that the amount of qualifications and skills workers possess are closely linked to their productivity and thus lead to higher wages. Although they were significant, age and tenure had little impact on the likelihood of being minimum- or low-wage earners. Thus, the theoretical arguments of wage growth over the life cycle and seniority-based wage increases do not play an important role with regard to minimum and low wages. Part-time and especially marginally employed workers had the highest risks of earning below the minimum- and the low-wage thresholds, and the marginally employed were far below both thresholds. These findings strongly indicate that marginal employment occupies a segment of companies' employment systems which serves to increase internal flexibility (Dütsch and Struck 2011), but at the same time it involves considerable disadvantages in terms of the earnings of the employees concerned. In fixed-term as well as temporary employment the probability of earning minimum wage or low wages was higher than in other kinds of employment; these forms of employment thus obviously form parts of the internal employment segment that serve to enhance the external flexibility of the staff (Brehmer and Seifert 2008) and provide inferior positions in companies.

Company-level determinants indicated that the likelihood of jobs paying below the low- or minimum-wage threshold was increased in small companies; this is in line with the assumption that they can provide employment opportunities, promotion prospects, and additional benefits only to a limited extent (Struck 2006). Our findings confirmed that economic and social inequality has a spatial dimension (Albrech et al. 2017) because companies based in northeast Germany offered jobs paying below the low-wage and minimum-wage thresholds to a greater extent than companies in other regions. Furthermore, the gap between worker's earnings and the low-wage threshold in the northeast was remarkably wide. In the results, companies not bound by a collective agreement were more likely to pay wages well below the low- or minimum-wage thresholds than companies bound by such agreements. We can thus infer that companies tied to a collective agreement have a higher wage level (Addison 2016; Addison et al. 2010; Dustmann et al. 2009) because such agreements serve to regulate the lowest pay grades (Jirjahn and Stephan 2006). Less explanatory power came from the distribution of gender within a company. An important impact emanated from the specific sectors to which companies belong. The risks of earning below the low-wage and the minimum-wage thresholds were strongly

increased in the industries “Accommodation and food service activities”, “Agriculture, forestry and fishing”, “Administrative and support service activities”, “Other activities”, “Transportation and storage”, and “Arts, entertainment and recreation”. The wage gap to both thresholds is particularly large in the industries “Transportation and storage”, “Accommodation and food service activities”, “Information and communication”, and “Arts, entertainment and recreation”. The fact that the majority of these industries belong to the service sector confirms that the creation of value and the scope of distribution of profits are comparatively low in the service sector compared to the manufacturing industry.

From these findings we can conclude that although current research points to the significance of individual determinants in explaining low wages (Bosch and Kalina 2008; Bruttel et al. 2017; Kalina and Weinkopf 2015, 2017), fewer than 25 percent of the differences in the employment situation regarding being employed in a minimum- or low-wage job are attributable to the individual level. On the contrary, characteristics of companies and large disparities between industries significantly impact the risks of earning low pay or minimum wage. This picture changes a little when the gap between a worker’s actual earnings and the minimum-wage or low-wage threshold is considered, because in this instance the individual level acquires more explanatory power. With regard to substantive statements, future research should pay particular attention to the fact that several individual determinants, which descriptively suggest a high low-wage incidence, lose their explanatory power when company factors and industries are additionally controlled for in multivariate analyses. More generally, working in the “right” company in a high-wage industry reduces the risks of earning low pay to a greater extent than individual characteristics.

As regards content, our study showed that highest attained educational level and employment status are particularly important factors in explaining low earnings. At the company level the region in which the company is located and the size of a company both have a strong impact. After all, industries play a significant role in wage levels due to their great differences in employment conditions. Against this backdrop, it is important to note that risk-promoting circumstances often occur cumulatively. For instance, staying at a small company as a marginal employee can lead to low pay becoming a permanent state.

Our study has some limitations, particularly regarding the data used. Our data contains information on jobs, not on workers, and this means that we cannot distinguish between main and second jobs. Additionally, there is no information on subjective indicators or family context, particularly the size, characteristics, and conditions of other members of the household (e.g. relatives or young children who require care). Furthermore, the SES is only cross-sectional data and cannot be used for longitudinal questions. For example, earlier SES did not contain information about small companies and whole industries, as a result of which the data would not provide a good basis for retrospective comparisons. For these reasons, there are conceptual considerations for linking the SES with administrative longitudinal data of the Federal Employment Agency to increase the potential for analysis (Himmelreicher et al. 2017).

Appendix

Table A1: Sectoral and marginal job characteristics in Germany, 2014

	All jobs	Share of marginal employed jobs	Share of marginal employed jobs < 8.50 euros
Percent of all workers	100%	11.01%	25.63%
Mean wage in euros	*16.99*	*7.01*	*8.36*
Agriculture, Forestry, and Fishing	0.91%	26.17%	42.11%
Mean wage in euros	*10.62*	*8.95*	*6.95*
Mining and quarrying	0.18%	3.89%	18.25%
Mean wage in euros	*20.83*	*10.74*	*7.38*
Manufacturing	18.59%	6.73%	35.20%
Mean wage in euros	*20.09*	*9.50*	*6.97*
Electricity, gas, steam, and water supply	1.33%	4.66%	22.12%
Mean wage in euros	*20.92*	*10.22*	*6.82*
Construction	4.98%	12.32%	19.07%
Mean wage in euros	*15.27*	*10.56*	*6.81*
Wholesale and retail trade; repair of motor vehicles and motorcycles	13.95%	21.40%	45.61%
Mean wage in euros	*14.82*	*9.12*	*7.03*
Transportation and storage	5.38%	21.57%	59.36%
Mean wage in euros	*13.88*	*8.01*	*6.31*
Accommodation and food service activities	4.39%	44.77%	59.19%
Mean wage in euros	*9.37*	*8.08*	*6.79*
Information and communication	2.85%	12.13%	46.18%
Mean wage in euros	*23.45*	*9.27*	*6.47*
Financial and insurance activities	2.78%	6.62%	21.41%
Mean wage in euros	*24.07*	*10.51*	*7.06*
Real estate activities	1.28%	44.91%	26.08%
Mean wage in euros	*14.79*	*9.97*	*6.85*
Professional, scientific, and technical activities	5.82%	15.64%	27.80%
Mean wage in euros	*20.84*	*10.42*	*6.51*
Administrative and support service activities	7.40%	26.88%	24.36%
Mean wage in euros	*11.83*	*9.33*	*7.08*
Public administration and defence; compulsory social security	6.69%	3.38%	37.95%
Mean wage in euros	*19.56*	*8.99*	*6.89*
Education	6.21%	11.34%	12.99%
Mean wage in euros	*19.60*	*10.89*	*6.96*
Human health and social work activities	12.93%	13.38%	25.46%

Mean wage in euros	*16.18*	*10.28*	*6.95*
Arts, entertainment, and recreation	1.24%	40.87%	49.37%
Mean wage in euros	*13.02*	*9.08*	*6.63*
Other service activities	3.11%	27.03%	30.55%
Mean wage in euros	*14.94*	*10.11*	*6.82*
Number of cases	978,738	159,479	59,385

Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, all indications are population weighted which correct for sex, region, type of employment and company size, own calculations

Table A2: Estimates on individual and structural determinants of earning below the low-wage and the minimum-wage thresholds

	Probability of low-wage job	Probability of minimum-wage job	Distance to low-wage threshold	Distance to minimum-wage threshold
Gender (Ref.: male)				
female	0.051***	0.027***	0.081***	-0.064***
	(0.001)	(0.001)	(0.010)	(0.012)
Highest attained education level (Ref.: Vocational training, master craftsman)				
No vocational training	0.111***	0.050***	0.258***	0.130***
	(0.003)	(0.002)	(0.015)	(0.019)
Polytechnic/ university degree	-0.118***	-0.059***	-0.082*	0.176***
	(0.003)	(0.001)	(0.048)	(0.052)
Unknown	0.074***	0.042***	0.251***	0.128***
	(0.002)	(0.002)	(0.014)	(0.016)
Age				
Age (in years)	-0.009***	-0.006***	-0.044***	-0.018***
	(0.000)	(0.000)	(0.002)	(0.003)
Age (in years squared)	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Tenure				
Tenure (in years)	-0.009***	-0.005***	-0.023***	-0.016***
	(0.000)	(0.000)	(0.002)	(0.002)
Tenure (in years squared)	0.000***	0.000***	0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Employment state (Ref.: Full-time)				
Part-time	0.077***	0.042***	0.211***	0.085***
	(0.002)	(0.001)	(0.013)	(0.015)
Marginal employment	0.304***	0.157***	0.744***	0.587***
	(0.003)	(0.002)	(0.016)	(0.018)
Type of contract (Ref.: Permanent contract)				
Fixed-term contract	0.044***	0.019***	0.042***	0.027
	(0.002)	(0.002)	(0.015)	(0.018)
Temporary vs. regular work (Ref.: Regular work)				
Temporary work	0.025***	0.018***	0.218***	-0.060
	(0.007)	(0.006)	(0.034)	(0.051)
Size of company (Ref.: 250>)				
<5	0.069***	0.024***	-0.068*	-0.070
	(0.004)	(0.003)	(0.039)	(0.047)
5-49	0.048***	0.026***	-0.060*	-0.172***
	(0.003)	(0.003)	(0.036)	(0.045)
50-249	0.025***	0.014***	-0.089**	-0.224***

	(0.003)	(0.003)	(0.036)	(0.046)
unknown	-0.008	0.003	0.049	-0.039
	(0.005)	(0.005)	(0.055)	(0.081)
Region (Ref.: South)				
Northwest	0.027***	0.021***	0.223***	0.121***
	(0.002)	(0.002)	(0.021)	(0.029)
Northeast	0.157***	0.146***	0.979***	0.473***
	(0.003)	(0.002)	(0.022)	(0.027)
West	0.018***	0.014***	0.120***	0.016
	(0.002)	(0.002)	(0.021)	(0.025)
Collective agreement (Ref.: Company bound by a sectoral collective agreement)				
Company not bound by a collective agreement	0.054***	0.042***	0.351***	0.273***
	(0.002)	(0.002)	(0.019)	(0.024)
Company bound by a company collective agreement	-0.061***	-0.029***	0.021	0.292***
	(0.004)	(0.003)	(0.054)	(0.071)
unknown	0.027***	0.030***	0.373***	0.315***
	(0.003)	(0.003)	(0.027)	(0.031)
Gender distribution (Ref.: more men in company)				
more women in company	0.008***	0.007***	0.036	-0.040
	(0.003)	(0.002)	(0.025)	(0.028)
Industry (Ref.: Manufacturing)				
Agriculture, forestry, and fishing	0.125***	0.072***	0.206***	-0.033
	(0.008)	(0.007)	(0.046)	(0.044)
Mining and quarrying	-0.091***	-0.065***	-0.653***	-0.396***
	(0.010)	(0.005)	(0.086)	(0.130)
Electricity, gas, steam, and water supply	-0.048***	-0.060***	-0.424***	0.048
	(0.007)	(0.003)	(0.053)	(0.109)
Construction	-0.088***	-0.055***	-0.388***	0.113**
	(0.003)	(0.002)	(0.038)	(0.053)
Wholesale and retail trade; repair of motor vehicles	-0.012***	0.006**	0.059**	-0.111***
	(0.003)	(0.003)	(0.025)	(0.032)
Transportation and storage	0.050***	0.056***	0.571***	0.377***
	(0.005)	(0.004)	(0.047)	(0.049)
Accommodation and food service activities	0.171***	0.105***	0.544***	0.126***
	(0.005)	(0.004)	(0.027)	(0.031)
Information and communication	-0.043***	0.008*	0.455***	0.264***
	(0.004)	(0.004)	(0.055)	(0.058)
Financial and insurance activities	-0.104***	-0.046***	-0.123**	-0.029
	(0.004)	(0.003)	(0.059)	(0.069)
Real estate activities	-0.058***	-0.023***	-0.027	0.157**
	(0.005)	(0.004)	(0.061)	(0.079)
Professional, scientific, and technical activities	-0.065***	-0.022***	0.142***	0.290***
	(0.004)	(0.003)	(0.048)	(0.059)
Administrative and support service activities	0.112***	0.020***	-0.132***	-0.259***
	(0.005)	(0.003)	(0.029)	(0.035)
Public administration and defence; compulsory social security	-0.129***	-0.056***	0.117	0.130
	(0.009)	(0.005)	(0.091)	(0.097)
Education	-0.073***	-0.041***	-0.210***	0.098
	(0.007)	(0.004)	(0.075)	(0.125)

Human Health and social work activities	-0.040***	-0.025***	-0.090***	-0.022
	(0.004)	(0.003)	(0.032)	(0.038)
Arts, entertainment, and recreation	0.042***	0.066***	0.630***	0.267***
	(0.004)	(0.004)	(0.032)	(0.033)
Other service activities	0.095***	0.072***	0.423***	0.095***
	(0.005)	(0.004)	(0.030)	(0.032)
Constant	-1.096***	-2.447***	1.671***	1.264***
	(0.086)	(0.090)	(0.067)	(0.084)
Number of observations	978,817	978,817	234,720	110,019
Pseudo R^2 / R^2	0.474	0.377	0.159	0.111
AIC				
BIC				
Wald-Chi² / F-test	54,682	42,386	228.86	83.87
p	0.000	0.000	0.000	0.000
Correctly classified	87.05%	90.17%	-/-	-/-
Log pseudolikelihood (final)	-28,346	-214,231	-/-	-/-

Standard errors (in parentheses) are clustered at the company level. The dependent variables "probability" are coded as dummy variables. The value 1 represents a job paying less than 10.33 euros (low-wage threshold) or 8.50 euros (minimum-wage threshold); the dependent variables "distance" are metric and denote the gap between the hourly wage and the low or the minimum wage. In the case of binary logit estimates, the average marginal effects are shown.

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

Source: Research data centres of the statistical offices of the Federation and the Länder, SES, 2014, own calculations.

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