

Discussion Paper No. 14-052

**Youth Unemployment After  
Apprenticeship Training and  
Individual, Occupation and  
Training Employer Characteristics**

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Centre for European  
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# Youth unemployment after apprenticeship training and individual, occupation and training employer characteristics

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## Abstract

This paper analyses the risk of unemployment, unemployment duration and the risk of long-term unemployment immediately after apprenticeship graduation. Unemployed apprenticeship graduates constitute a large share of unemployed youth in Germany but unemployment incidence within this group is unequally distributed. Our paper extends previous research in three dimensions. It shows that individual productivity assessment of the training firm, initial selection into high reputation training firms and occupations, and adverse selection of employer moving graduates are correlated with unemployment after apprenticeship graduation.

JEL classification: J24, J62, J64, M53

Key words: apprenticeship, youth unemployment, Germany

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## ***Introduction***

Youth unemployment is traditionally low in Germany in an international perspective. In March 2013, for example, the youth unemployment rate was 7.6% in comparison to an average rate of 23.5% in the European Union (Eurostat, 2013). One frequently mentioned reason for the low youth unemployment rate is the dual apprenticeship system. Apprenticeship training improves the learning motivation of young people and their chances to find an adequate job after apprenticeship. Apprenticeships improve the transition into employment because training firms determine the number of apprenticeships on basis of their expected demand for skilled employees (Steedman, 1993; Harhoff and Kane, 1997; Franz et al., 2000; Ryan, 2001; Ryan, 2011; Wolter and Ryan, 2011).

Even if six per cent unemployment rate of apprenticeship graduates is comparable to the unemployment rate of all people in employment age (five per cent) and lower than the average youth unemployment rate (eight per cent; Brenke, 2013), unemployment risk between apprenticeship graduates differs in several dimensions such as training occupation and educational background (Winkelmann, 1996; Franz et al., 2000; Schwerdt and Bender, 2003; Franz and Zimmermann, 2002; Euwals and Winkelmann, 2004).

This paper analyses individual, establishment and occupational characteristics that are correlated with unemployment risk, unemployment duration, and the risk of long-term unemployment when apprenticeship graduates enter the labour market. It hereby integrates individual ability, initial selection into training firms, and adverse selection of apprenticeship graduates who leave the training firm into the analysis of unemployment risk. We differentiate between initial selection into training firms, initial selection into training occupations and adverse selection after the end of the apprenticeship training into unemployment. We also differentiate between unemployment incidence that may have a random or even a voluntary element and the risk to be unemployed for more than half a year which definitely should be involuntary.

Previous research on the unemployment risk of apprenticeship graduates mainly focusses on individual characteristics on the probability to stay in the training firm (Schwerdt and Bender, 2003; Franz and Zimmerman, 2003; Euwals and Winkelmann, 2004), employer change intention of graduates (Wagner and Wolf, 2013), the duration of non-employment after apprenticeship (Winkelmann, 1996; Franz et al. 2000), the duration of the first job (Euwals and Winkelmann,

2004) and the probability to find an adequate job (Büchel, 2002). Further papers are mainly concerned with the complexity of job mobility of apprenticeship graduates, i.e. whether they change their employer and/or their occupation in order to change their career (Neal, 1999; Göggel and Zwick, 2012). These papers mainly ignore unemployment risk and instead identify individual characteristics such as educational background and gender as drivers of the transition from apprenticeship to work. Only a few studies in this literature on career decisions investigate the relevance of employer characteristics but these use only firm size (Schwerdt and Bender, 2003; Franz and Zimmermann, 2002; Euwals and Winkelmann, 2004). The study that comes closest to our approach is that by Franz et al. (2000). They estimate the duration of non-employment for more than 1000 apprenticeship graduates on the basis of the GSOEP for the years 1984-1992. Analogously to our study, they include age, sex, nationality, and schooling background. In addition to our study, they have information on the vocational background of the head of household and the socioeconomic background of the head of household as well information on the graduate's family and handicap status.

### ***Data***

We use the second longitudinal version of the Linked-Employer-Employee (LIAB) data of the Institute of Employment Research in Nuremberg (IAB). The data combine individual Social Security Records with the employer survey of the IAB Establishment Panel. The employer survey includes information on establishment size, sector, and industrial relations. This information is collected once a year. Employee data include information about daily earnings, labour market history, age, gender, and schooling as well as occupation for the entire workforce in the surveyed establishments (Jacobebbinghaus, 2008). These data are available as longitudinal spell data with daily accuracy. We use information of the first spell after graduation of all apprenticeship graduates from the years 2000-2006 captured in the longitudinal version of the LIAB as a quasi-pooled data set because every apprentice graduates only once and we therefore have exactly one observation per employee.<sup>1</sup> When a job or the unemployment duration is uninterrupted, we combine spells until the apprenticeship graduate leaves the first employer after graduation or leaves unemployment. We use all individual, occupational and

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<sup>1</sup> The longitudinal LIAB data set only entails establishments that responded to all employer surveys in the period 2000-2002. The data set entails individual and establishment information until 2006, however. Therefore, we cannot capture many additional observations when we add the years before 2000.

training firm characteristics from the last spell of apprenticeship training as covariates for the characteristics of the first employment or unemployment spell after apprenticeship graduation.

The LIAB includes all necessary information to measure the effect of individual, training firm and occupational characteristics on unemployment directly after apprenticeship training. In particular, we know the exact employment and unemployment durations and each status change on a daily basis (for example apprentices to skilled employee). We restrict the employee sample to those employees who have participated in apprenticeship training for at least 24 months and graduated between January and August in each year. We also exclude all apprentices with more than one apprenticeship period. We do not have information whether an apprentice successfully graduated from training and therefore we need these restrictions in order to make sure that we do not capture drop-outs. Regular apprenticeships take between three and three and a half years. Apprenticeships automatically end with the final exam at the chambers of craft and chambers of industry and commerce. The chambers usually have examination periods in January and February for occupations taking three and a half years and in June and July for occupations taking three years.

We drop individuals who work less than fulltime, individuals with earnings above the upper social security earnings limit (more than 140€ per day in Western Germany and around 120€ a day in Eastern Germany) and below the marginal part-time income threshold (below 11€ per day), because of rare cases with misreports of earnings. Furthermore, we only include apprentices from firms that train at least two apprentices who graduate in one occupation in a given year because we need the relative earnings position in a training establishment/ occupation/ graduation year cell as a measure of apprentice productivity (see below). We count spells with unemployment benefits (the incidence in our sample is about 75%) as well as unemployment assistance (25%) as unemployment.

### ***Estimation strategy***

In this section, we present our framework for measuring correlations between employer and employee characteristics and unemployment risk as well as unemployment duration of apprenticeship graduates. It is based on the familiar models of information asymmetry between training firms and outside firms interested in apprenticeship graduates trained elsewhere and the adverse selection of employer movers resulting from superior information of training firms (Greenwald, 1986; Gibbons and Katz, 1991; Acemoglu and Pischke, 1998; Grund,

1999). These models assume that productivity of an employee is not observable by the market but by the training firm only. The training firm learns about the true productivity during the training period, can decide without costs whom to retain and can base the wage offer after training on the true individual productivity information. It also uses this private information in order to counter wage offers from outside firms that are below the productivity of trained employees whom they would like to keep.

Outside firms offer a wage for apprenticeship graduates based on a known productivity distribution of employer movers regarding observable characteristics such as occupation, age or gender. The information difference about apprentice productivity between the training firm and the market opens a wedge between the maximum wage offer of the training firm that equals apprentice's productivity and the outside firm. The wedge increases with productivity (Acemoglu and Pischke, 1998). This widening gap between inside and outside wage offers makes it more attractive for training firms to keep high productivity but lay-off low productivity apprentices. This induces an adverse selection of those apprenticeship graduates available on the second hand labour market (Acemoglu and Pischke, 1999; Wagner and Zwick, 2012; Mohrenweiser, Wydra-Sommagio and Zwick, 2014). Hence, the pool of employer movers after apprenticeship largely consists of relatively low productivity apprenticeship graduates<sup>2</sup>.

Potential outside employers take into account not only the adverse selection of apprenticeship graduates on the second hand labour market but also the initial selection into training firms and occupations. The selection also contains valuable information on the expected productivity of the applicant because firms with certain characteristics such as large and high-wage firms may be able to attract more able school leavers (Franz and Soskice, 1995) and deliver a superior training quality (Smits, 2006). This means that we have to differentiate between individual and training firm characteristics because of initial selection of apprenticeship applicants and adverse selection of moving apprenticeship graduates when we form our hypotheses on the correlations between individual, training firm, and occupation characteristics and unemployment risk as well as unemployment duration.

Moreover, in the interpretation of our findings we have to take into account that the group of employed apprenticeship graduates consists of those who stay with the training firm and those

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<sup>2</sup> Acemoglu and Pischke (1998) introduce a disutility variable for apprentices during their apprenticeship training that is not correlated with productivity and unobservable to employers in order to include some exogenous employer movers.

who switch their employer and immediately find a new job. The second group consists of those who voluntarily change their employer and those who are forced to look for another job. We cannot separate both groups and therefore it is difficult to find causal effects between the covariates and the unemployment variables in our multivariate regressions. However, we expect differences in the correlations of unemployment risk and unemployment for at least half a year directly after apprenticeship graduation. A short unemployment term might be the consequence of bad luck such as an unforeseen reduction in employment demand in the training firm or adverse regional labour market shocks. This should not hold for longer-term unemployment (Bender and von Wachter, 2006; Göggel and Zwick, 2012). We also should not forget that some unemployment spells might be voluntary search unemployment of apprentices who are dissatisfied with their training firms (Acemoglu and Pischke, 1998). Especially young people might prefer to take some time in order to improve their match rather than to stay in an inferior employment relationship or they even might prefer to accept a short unemployment spell instead of jumping into an inferior match right after training (Neal, 1999). This might be one of the reasons that unemployment spells of young people tend to be shorter than those of older people (Franz et al., 2000; Zwick, 2012). In the case of voluntary unemployment, we have to ask however why the graduates preferred to leave the training firm and look for another job from an unemployment position instead of accepting the offer of a skilled job in the training firm. In order to be sure that the correlations with unemployment are those for involuntary unemployment, we also run the unemployment incidence regression only for those people with an unemployment spell longer than half a year (removing individuals with a shorter unemployment spell in this robustness check).

Hence, we include a number of individual and training firm characteristics in our framework that have been used in previous papers and add three new dimensions: individual productivity, initial selection into training firms and occupations and adverse selection after apprenticeship. First, we include the individual characteristics frequently used in previous papers (Winkelmann, 1996; Franz et al., 2000; Schwerdt and Bender, 2003; Franz and Zimmermann, 2002; Euwals and Winkelmann, 2004). We expect *ceteris paribus* that graduates with higher school certificates (in our case with higher secondary education, *Abitur*) have a lower probability of unemployment incidence and duration. A higher schooling background should lead to a positive initial selection and a lower probability of adverse selection. Therefore higher educated apprenticeship

graduates should be preferred by the training firms and by potential employers on the second hand labour market.

For females and age at apprenticeship graduation, the correlation with unemployment risk is unclear. Women might choose less risky career options because they more frequently face interrupted careers than men (Blundell et al., 2013). As a consequence, young women choose different (“typically female”) occupations than young men and they might also choose a training firm with a higher retention rate and hence a lower unemployment risk after graduation (initial selection). In “female” occupations and high retention rate training firms, it therefore might be easier to find an alternative job when the apprenticeship graduate has to leave the training firm. Therefore unemployment incidence and unemployment duration of female apprenticeship graduates might be lower. On the contrary, a strong tendency to avoid employer switching might also stigmatise the few female employer changers and lead to a more adverse selection of females on the second hand labour market. This consequence might lead to a longer unemployment duration of female apprenticeship graduates. Older apprentices on the one hand might be less productive apprentices because it took them longer to finish school or they had a spell in the transitional system (*Übergangssystem*) before they started an apprenticeship, both of which indicate worse initial selection. Therefore age might be positively correlated with unemployment incidence and length. On the other hand, older apprentices might have worked as unskilled or semi-skilled employees for some time before their apprenticeship training and either were encouraged by their employer to learn a “proper occupation” or decided themselves to aim for a formal occupational degree in order to improve their career options and income. Therefore, older apprentices might be more motivated to avoid unemployment at the end of apprenticeship training (and be more experienced how to do so) or to get out of unemployment sooner than their younger peers.

The first novel characteristic in our paper is the individual relative productivity assessment of the training firm. As an individual productivity assessment of the training firm, we use the bonus the training firm pays for the apprentice at the end of the apprentice training period controlling for occupation and graduation year.<sup>3</sup> Importantly, the bonus is not visible for

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<sup>3</sup> Note that we control for cognitive abilities by including the schooling level of the apprenticeship graduate. When the bonus has an additional impact on unemployment risk, this might be related to work related skills relevant for productivity such as motivation, team work ability etc., see Mohrenweiser et al. (2014).

outside firms<sup>4</sup>. In more detail, we calculate the bonus as the difference between the individual and minimum earnings in a cell defined by training firm, occupation, and graduation year. Our interpretation that this measure can be taken as training firms' relative individual productivity assessment of work related skills in this cell is supported by the fact that the bonus strongly increases towards the end of the apprenticeship period (Mohrenweiser and Zwick, 2013) and positively correlates with the grades in the final exams (Mohrenweiser, Wydra-Sommagio and Zwick, 2014), with the probability to stay in the training firm (Mohrenweiser and Zwick, 2013) and with the entry wages of skilled workers in their first job after graduation – for stayers and firm changers alike – (Wagner and Zwick, 2012). If the private productivity assessment of the training firm is negatively correlated with unemployment incidence and length, this is an indicator of an adverse selection of those apprenticeship graduates who have to look for a new employer. This further means that training firms are more likely to keep high productivity apprentices. We therefore think that the bonus is negatively correlated with unemployment incidence and duration.

Furthermore, we capture initial selection with training firm characteristics that are associated with a superior reputation of the training firm and the quality of training provided. On the one hand, firms with certain characteristics may be able to attract more able school-leavers, both concerning school grades and personality. Franz and Soskice (1995) called this phenomenon “the pupils' tournament for better apprenticeships”. On the other hand, certain firms may be able to invest more resources in apprenticeship training, such as an apprenticeship workshop and professional full-time training instructors (Schönfeld et. al, 2010; Mohrenweiser, 2012) where apprentices can learn more during training (Wenzelmann, 2012; Mühlemann et. al, 2013). In addition to that, the information about initial selection transmitted by training establishment characteristics are also informative for potential outside employers given that they cannot properly assess the productivity of apprenticeship graduates in the second hand labour market.

Since previous research has shown the relevance of firm size in the transition process between apprenticeship training and skilled employment (Schwerdt and Bender, 2003; Franz and Zimmermann, 2002; Euwals and Winkelmann, 2004), we include this variable but also use

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<sup>4</sup> Greenwald (1986) notes that outside firms cannot see the complete wage structure of rival firms even if they have an idea of the general remuneration level in the firm. This means that outside firms might know the absolute earnings level of an apprenticeship graduate in another firm but they do not know their relative position in the earnings hierarchy of comparable apprenticeship graduates in this firm.

additional training firm characteristics. We argue that positive initial selection is more likely in larger firms and in high-paying firms (Soskice, 1994; Franz and Soskice, 1995). These firms retain more apprentices (Mohrenweiser and Backes-Gellner, 2010). Moreover, those graduates on the second hand labour market may also profit from the signal of a tough initial selection.<sup>5</sup> Therefore, unemployment incidence should be smaller. On the contrary, unemployment duration might be higher because getting unemployed from a well-paying and large training firm may be associated with a stronger stigma, accordingly. A similar argument applies for establishments with works councils that tend to be interested in avoiding dismissals of skilled employees (Addison, 2009; Kriechel et al, 2014). Also establishments covered by collective wage bargaining agreements might be inclined to keep their apprenticeship graduates because their training costs may be higher than those of training firms without collective bargaining.

The last training establishment characteristics we include is the long-run establishment retention rate<sup>6</sup>. Establishment retention rates are relatively stable over time (Mohrenweiser and Backes-Gellner, 2010) and the average retention policy of training firms may be known in local labour markets. If apprenticeship graduates have to leave firms with a high long-term retention rate, they are more likely to be adversely selected than those who have to leave from firms with a low long-term retention rate. Therefore one hypothesis is that a high training firm retention rate leads to longer unemployment duration of apprenticeship graduates and a higher risk of an unemployment period longer than half a year because outside employers infer that unemployed apprenticeship graduates from these firms are an especially adversely selected group.<sup>7</sup> Another probable hypothesis is however that training firms with high retention rates are more attractive employers and that they therefore have stronger initial selection criteria. This would count in favour of unemployed apprenticeship graduates and reduce their unemployment period accordingly.

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<sup>5</sup> Training firms that attract high productivity workers and high quality training firms are quite similar in terms of observable determinants such as larger firm size and higher wages (Franz and Soskice, 1995; Smits, 2006).

<sup>6</sup> The retention rate is the proportion of the number of retained apprenticeship graduates on the number of all apprenticeship graduates in the training firm. The long-run retention rate is the average retention rate during our seven years observation period.

<sup>7</sup> As the training firm retention rate is highly endogenous in the estimation equation of unemployment incidence, we do not include it here.

Finally, we take occupational retention rates<sup>8</sup> into account. Occupations differ with respect to the initial selection of school-leavers because occupational careers are of different attractiveness. High productivity school-leavers may be more likely to select themselves in occupations with a higher retention rate. Hence, graduation from an occupation with a high retention rate reduces unemployment risk per se and in addition it might be a positive signal on the second hand labour market and therefore increase re-employment chances for unemployed apprenticeship graduates. In occupations with a high retention rate, unemployed apprenticeship graduates however are also more likely to carry a stigma of adverse selection in comparison to occupations with lower occupational retention rates, even if they voluntarily decide to leave their training occupation. Hence, the unemployment duration could be longer and the risk of an unemployment period longer than half a year higher in occupations with a high occupational retention rate, which is in analogy to high training firm retention rates.

Summing up, we have the following hypotheses on correlations between individual, establishment and occupational characteristics and unemployment incidence: apprenticeship graduates with a high productivity assessment by their training firms, a higher schooling background and possibly female and older apprenticeship graduates should have a lower unemployment incidence. Graduates from large, well-paying firms and from firms with works councils should experience a lower unemployment risk. Apprenticeship graduates in groups with a low unemployment risk might signal that they have unobservable negative characteristics and this might lead to a longer unemployment spell. More specifically, we hypothesise that apprenticeship graduates from occupations and training employers with high retention rates and those from well-paying and larger training firms (possibly with works councils and collective bargaining) face longer unemployment spells.

## **Results**

### *Descriptive findings*

We start in this section with a description of the sample (Table 1). The unemployment incidence is 14 per cent of apprenticeship graduates immediately after training. Those who get unemployed receive on average 182 days unemployment benefits and 48 per cent receive the benefits longer than 180 days.

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<sup>8</sup> The occupational retention rate is defined as the share of apprenticeship graduates who do not change their occupation directly after their graduation divided by all apprenticeship graduates in the occupation.

Table 1: Descriptive Statistics

Variables	Mean	Std. dev.
<i>Dependent variables</i>		
Unemployment incidence	0.14	
Length of unemployment in days if unemployed	181.42	154.30
Proportion of those who are unemployed for more than half a year if unemployed	0.47	
<i>Individual characteristics</i>		
Age	23.43	2.37
Female	0.38	
Grammar school	0.13	
Earnings bonus in occupation/establishment/year cell (log)	0.93	1.07
<i>Training establishment characteristics</i>		
Establishment size smaller than 250	0.19	
Establishment size 250-999	0.30	
Establishment size larger than 1000	0.51	
Western Germany	0.79	
Average daily establishment training earnings at the end of apprenticeship training (log)	3.33	0.30
Works council	0.89	
Collective bargaining	0.91	
Establishment retention rate smaller than 40%	0.18	
Establishment retention rate 40-60%	0.15	
Establishment retention rate larger than 60%	0.67	
<i>Occupational characteristics</i>		
Occupation retention rate smaller than 40%	0.11	
Occupation retention rate 40-60%	0.36	
Occupation retention rate larger than 60%	0.53	
Number of observations	270,168	

Source: LIAB longitudinal version 2. The number (and shares) of observations per year are: 2000: 18,560 (0.07), 2001: 32,960 (0.12), 2002: 44,308 (0.16), 2003: 46,469 (0.17), 2004: 44,037 (0.16), 2005: 41,525 (0.15), 2006: 42,011 (0.16).

Apprentices are somewhat older than 23 years when they graduate, almost 40 per cent are women and 13 per cent have a grammar school certificate (*Abitur*). The average earnings bonus at the end of apprenticeship is 0.93 log points or 2.54 Euros a day. The bonus is less than 10 per cent of total daily earnings that are around 27 Euros or 3.3 in log (compare establishment average).

On the establishment-level, most apprentices have been trained in an enterprise in West Germany (79 per cent) covered by collective bargaining (89 per cent) or works councils (91 per cent). The share of apprentices in large training firms with more than 1,000 employees is almost 50 per cent while 30 per cent have been trained in enterprises with 250-999 employees and about 20 per cent in smaller establishments. Please note that our restrictions lead to a more than proportionally higher share of apprentices from larger firms in our sample because we restrict it to training firms that have at least two apprenticeship graduates in one occupation in a given year. Moreover, two thirds of the training enterprises have retention rates of more than 60 per cent, 15 per cent have retention rates between 40 and 60 per cent and less than 20 per cent have retention rates of less than 40 per cent.

On the occupation-level, we characterize occupations by the same retention rate boundaries in order to obtain an indicator for the degree of adverse selection on the occupation-level. The average occupational retention rate is 52.4 per cent and 53 per cent of the graduates receive an apprenticeship certificate in an occupation with a long-term retention rate of more than 60 per cent, 37 per cent of the graduates receive one in occupations with an occupational retention rate between 40 and 60 per cent and, accordingly, 10 per cent in occupations with an occupational retention rate below 40 per cent.

### *Multivariate findings*

We estimate joint correlations between individual, occupation and establishment characteristics measured before the end of apprenticeship training and unemployment after apprenticeship training. We calculate these correlations with unemployment directly after apprenticeship graduation using a Probit ML approach (Table 2, column 1). Besides the unemployment incidence, we also have a look at the length of unemployment spells because the correlations between our covariates and the unemployment incidence and unemployment length might differ (Franz et al., 2000). One reason might be for example that for some groups unemployment incidence is higher but unemployment spell length is lower. In principle, we

might expect the same signs for unemployment length as for unemployment incidence, however. We distinguish between an OLS estimation of linear unemployment length (Table 2, column 2) and a Probit of long-term unemployment (more than half a year) in order to capture non-linearities (Table 2, column 3). We include occupation dummies in the regression on Table 2 column 1 but occupation and establishment retention rate categories in the correlations with unemployment duration and long unemployment because retention rates are highly endogenous in unemployment incidence estimations.

All three estimations show the same sign for most of the regressors. On the individual-level, females and apprenticeship graduates with a higher schooling level have a lower risk of unemployment and if they get unemployed they experience a shorter unemployment duration and a lower risk of long-term unemployment. This pattern also holds for apprenticeship graduates who receive a higher earnings bonus (and therefore were more productive than their peers in the same establishment and occupation). On the contrary, the age coefficients change their signs. Older graduates have a higher risk of unemployment but if they get unemployed, they experience shorter unemployment duration and a lower risk of long-term unemployment.

On the training firm-level, apprenticeship graduates from large training firms have a lower risk to get unemployed but the unemployment duration does not significantly differ by firm size. Unemployed graduates from larger firms, however, have a higher risk of long-term unemployment. Graduates from firms in Western Germany and from high-paying firms have a lower probability to get unemployed and if unemployed, they have a shorter unemployment duration. On the contrary, apprenticeship graduates from firms with a works council have a lower probability to get unemployed but if they are unemployed they have a higher risk of long-term unemployment. Graduates from firms covered by a collective bargaining agreement do not differ in the unemployment risk from those graduates who come from firms not covered but they have a lower risk of long-term unemployment. Finally, graduates from firms with a higher establishment retention rate who get unemployed have a higher risk of long-term unemployment. On the occupation-level, graduates in occupations with a higher average occupational retention rate who get unemployed have lower unemployment duration and a lower risk of long-term unemployment.

Table 2: Correlations with unemployment directly after apprenticeship graduation

Variable	Unemployment yes/no	Unemployment duration (ln)	Unemployment longer than half a year
Age (deviation from occupation mean)	0.008*** (17.32)	-0.048*** (4.56)	-0.036*** (20.05)
Female	-0.004*** (2.72)	-0.242*** (7.75)	-0.041*** (6.57)
Grammar school	-0.060*** (24.34)	-0.129*** (2.57)	-0.002 (0.49)
Earnings bonus in occupation/ establishment/ year cell	-0.004** (5.27)	-0.042* (1.78)	-0.019*** (6.45)
Establishment size 250-999	-0.052*** (27.02)	0.058 (1.30)	-0.015** (2.06)
Establishment size +1000	-0.070*** (34.10)	0.027 (0.52)	-0.014* (1.68)
Western Germany	-0.025*** (15.97)	-0.158*** (5.43)	-0.067*** (11.87)
Daily earnings at the end of apprenticeship training (log)	-0.071*** (30.52)	-0.095* (1.85)	-0.040*** (4.90)
Works council	-0.011*** (5.06)	0.015 (0.34)	0.046*** (5.80)
Collective bargaining	0.002 (0.82)	-0.041 (1.04)	-0.039*** (4.76)
Establishment retention rate 40- 60%		0.015 (0.30)	0.022*** (3.37)
Establishment retention rate +60%		0.032 (0.74)	0.020*** (3.33)
Occupation retention rate 40-60%		-0.075 (1.63)	-0.030*** (3.93)
Occupation retention rate +60%		-0.478*** (9.00)	-0.304*** (38.50)
Number of observations	270,168	39,152	39,152
(Pseudo) R2	0.14	0.13	0.12

Column (2) and (4), marginal effects after Probit at means in dummy variables estimations, column (3) OLS estimates, z (t)-values in brackets, significance levels: \*\*\*<0.01, \*\*<0.05, \*<0.1, the estimations also included: 17 industry sectors, 7 year dummies, in column (2) in addition 88 occupation dummies, in column two standard errors clustered at establishment level, Source: LIAB longitudinal version 2.

## ***Interpretation***

So far, we get rather similar results as previous papers on the correlations with unemployment for apprenticeship graduates. Analogously to Franz et al. (2000), we estimate a negative correlation between age and schooling to unemployment duration. Franz et al. (2000) do not find a negative correlation between the female gender dummy and unemployment duration, however. Moreover, our interpretation for the changing sign of the age coefficient between unemployment incidence and unemployment length is as follows: firms prefer younger graduates when they have to decide whom to retain or hire directly after graduation. Older graduates have more experience with a problematic labour market situation and therefore find a new job quicker when they get unemployed. It might also be the case that the share of involuntary unemployment is larger for younger than for older apprenticeship graduates.

We extend the previous research on unemployment risk and duration of apprenticeship graduates by including three additional categories of variables: a measure of individual productivity, several measures of initial selection on the school-to-apprenticeship transition and for the degree of adverse selection after apprenticeship. First, it is not surprising that apprentices with a high bonus during apprenticeship training who get unemployed also find a new job quicker since we could show in previous papers that a higher bonus than the peers is correlated with better grades in the final exam in the establishment/ occupation/ and graduation year cell at the end of apprenticeship (Mohrenweiser et al., 2014).

An additional point of our paper is initial selection captured by training firm characteristics such as large and high-paying training firms and those training firms with high retention rates. These establishments are more likely to have a good reputation and higher training quality and therefore can attract better school-leavers for apprenticeships. The signal of a better initial selection and/ or better training quality reduces unemployment risk and duration for apprenticeship graduates compared to those graduates from firms with a worse reputation. Moreover, works councils reduce the risk of getting unemployed because they use their codetermination rights on personnel matters to protect the jobs of apprenticeship graduates (Hirsch et al., 2010). If apprenticeship graduates from training firms with works councils get unemployed nevertheless, they carry a stigma because the selection of those who are not retained is more negative if less employees of a training firm face unemployment (Acemoglu and Pischke, 1998; Wagner and Zwick, 2012). Therefore these apprenticeship graduates are

more likely to be unemployed for a longer period of time. Furthermore, we interpret the positive sign of a high training firm retention rate for long-term unemployment in a similar manner. If an apprentice loses the job although he or she graduated from a firm that usually retains most of its apprentices, this is a strong indication for adverse selection. The positive signal that the unemployed apprenticeship graduate had been chosen by a highly attractive employer with a high retention rate therefore seems to play a minor role. Hence, our indicators for initial selection and training quality show an important impact on the risk and duration of unemployment after graduation of apprenticeship and the risk of long-term unemployment. Initial selection of school-leavers into training firms has an impact on later labour market careers.

Third, we find no adverse selection in the apprenticeship-to-work transition with respect to occupational retention rates. We interpret the signs of the occupation retention rates on the unemployment duration and the risk of long-term unemployment as indications for no stigma of apprenticeship graduates who get unemployed in occupations with a high retention rate. It might be a positive quality indicator if an apprenticeship candidate can enter an occupation with a high retention rate – which can usually be interpreted as quality signal for the occupation. This positive signal seems to be more important than the negative signal of an adverse selection of those who get unemployed although the general retention rate in their occupation is high.

We also want to stress that employer and occupation characteristics have a stronger impact on the explanatory value of the multivariate regressions than the individual characteristics. In the third model in Table 2, the individual characteristics explain 3.8% of the incidence of unemployment spells and the training firm characteristics additional 10.2%. In the second model in Table 2, the individual characteristics explain 2.7% of the variation of unemployment duration, the employer characteristics additionally 3.7% and occupation characteristics additionally 5.5%. In the third model in Table 2, the individual characteristics explain 2.5% of the incidence of unemployment spells longer than half a year, the training firm characteristics additional 5.1%, and the occupation characteristics an additional 4.2%.

### ***Robustness checks***

We extensively test the robustness of our results. First, we repeat the Probit estimation on unemployment incidence without the occupation dummies. We do not find any changes in the results but the negative female coefficient even increased in absolute terms. This might be interpreted as a sign that not the possibility to switch between occupations drives the lower risk of females to become unemployed.

Second, we also calculated the correlations in Table 2 separately for Western and Eastern Germany. The results are remarkably similar and most correlations have the same signs and similar strength. The correlation is more positive for females, the earnings bonus, the earnings level of firms, and works councils in Western Germany. The correlations are stronger, however, for grammar school and larger establishments in Eastern Germany. Third, we compare the correlations for men and women and also find remarkably similar results. The correlation is slightly more positive for grammar school, the occupation retention rate, and works councils for men. The correlation is stronger for the average establishment earnings at the end of apprenticeship training for women.

Fourth, we replace the occupation retention rate dummies with the 88 occupation dummies in the second and third column and our results remain qualitatively the same. Fifth, we estimate the correlations replacing the dependent variable in the long-term unemployment incidence regression with one that counts only short unemployment spell of up-to 30 days directly after apprenticeship graduation and all significant coefficients in the third column switch their sign as expected. Finally, we include all apprenticeship graduates who come from the smaller training firms with less than two apprentices per occupation and graduation year cell and our results also remain qualitatively the same.

### ***Conclusions***

This paper investigates a broad range of correlations of individual, training firm and training occupations characteristics with unemployment risk, unemployment duration and the risk of long-term unemployment (more than six months) of apprenticeship graduates immediately after graduation. We extend previous research by using three categories of additional variables: individual productivity, initial selection in the school-to-apprenticeship transition and adverse selection in the labour market for apprenticeship graduates.

First, we confirm that more productive graduates are less likely to get unemployed and if they become unemployed they have a lower unemployment duration and a lower risk of long-term unemployment. Second, we capture initial selection with training firm characteristics that are associated with a superior reputation of the training firm. Apprentices graduating from high reputation firms have a lower risk of unemployment, a lower unemployment duration and a lower risk of long-term unemployment. Third, a strong reputation of the training firm can also play against the candidate. If a graduate from a firm with a works council and those from firms with a high establishment retention rate nevertheless gets unemployed, he or she carries a stigma and experiences longer unemployment duration and a higher risk of long-term unemployment. On the contrary, we find no adverse selection in the apprenticeship-to-work transition with respect to occupational retention rates.

These results show that outsider firms come to a similar conclusion with respect to the productivity of apprentices as the training firm and therefore obviously discern lower and higher ability apprentices. Moreover, our results demonstrate the importance of initial selection of school-leavers by training firms for unemployment risk and duration. The consequences of initial selection into training firms might cause the school-leaver tournament for good apprenticeships as mentioned by Soskice (1994) and theoretically derived in Franz and Soskice (1995). Finally, our estimations show that there is adverse selection of those not retained by the training firms (Wagner and Zwick, 2012). Adverse selection may generate an additional incentive for graduates to stay in the training firm. Training firms then possess monopsony power after apprenticeship graduation that helps them to earn initial investment costs of apprenticeship training. This interpretation is supported by the fact that occupations with high net investments also have high retention rates (Schönfeld et. al, 2010).

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