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Aspects of wage dynamics in Germany

Jens Stephani

Dissertationen

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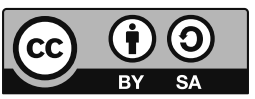

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List of acronyms

administr.	Administrative
AIC	Akaike Information Criterion
BA	Bundesagentur für Arbeit (German Federal Employment Agency)
BHP	Betriebs-Historik-Panel (Establishment History Panel)
BIK	Beratung, Information, Kommunikation (Aschpurwis + Behrens GmbH)
BLH	Beschäftigten- und Leistungsempfängerhistorikdatei (Employee and Benefit Recipient History)
comm.	Commercial
cont.	Continued
D9/D1	Ratio of the 9th and the 1st decile of the wage distribution
DADD	Differentially adjusted difference-in-differences
educ.	Education
estab.	Establishment
€	Euro
EU	European Union
EU-27	The 27 member states of the European Union
FDZ	Forschungsdatenzentrum (Research Data Centre)
fed. state	Federal state
GDP	Gross domestic product
GSES	German Structure of Earnings Survey
h	Hours
IAB	Institut für Arbeitsmarkt- und Berufsforschung (Institute for Employment Research)
IEB	Integrated Employment Biographies of the IAB
LIAB	Linked Employer-Employee Data of the IAB
LIAB QM2	Cross-Sectional Model Version 2 of the LIAB
LoC	Locus of Control
n.s.	Not statistically significant
occ.	Occupation
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
p.	Page

pp.	Pages
perc.	Percentile
ref.	Reference category
SOEP	German Socio-Economic Panel Study
SOEPv28	Version 28 of the SOEP
UK	United Kingdom of Great Britain and Northern Ireland
US	United States of America
voc. training	Vocational training

Preface

This book is a slightly revised version of my doctoral thesis which was accepted by the University of Erlangen-Nuremberg in November 2013. Accomplishing this dissertation would not have been possible without the support of many people. First of all, I am deeply grateful to Claus Schnabel for supervising this work. He provided invaluable guidance, critical counsel and helpful suggestions both before and during my doctoral project. Furthermore, he always had an open ear for any issues that came up during this time and readily responded to any questions. I am also highly indebted to my co-supervisor and IAB mentor Lutz Bellmann for his great and manifold support and valuable advice.

During my dissertation project, I was a member of the joint Graduate Programme of the Institute for Employment Research (IAB) and the School of Economics and Business of the University of Erlangen-Nuremberg (GradAB) and I received a doctoral scholarship from the IAB. At the same time, I worked as a researcher in the department "Establishments and Employment" of the IAB. I am very grateful for the generous funding provided by the GradAB and I benefited enormously from the learning opportunities it offers and from discussions with other participants. Being a member of this well-organized programme clearly was an important asset for my doctoral project.

In addition, I would like to thank current and former colleagues and researchers from the IAB and other institutions for valuable discussions, helpful suggestions and for their support during different stages of my dissertation project. In particular, I thank Stefan Bender, Hans-Dieter Gerner, Alexander Mosthaf, Helmut Rudolph, Thorsten Schank, Daniel D. Schnitzlein and all colleagues from the research department "Establishments and Employment" at the IAB. Special thanks go to John T. Addison, Lutz Bellmann and Paulino Teixeira for co-authoring a paper with me which later became a part of my dissertation. I learned a lot during our cooperation and I strongly benefited from their experience.

Finally, I am deeply grateful to my parents for their tremendous and constant support at all times and their belief in my accomplishment. I also thank Glenny for being a great source of motivation and for her unwavering support over the last years. This dissertation is dedicated to my parents and to her.

Jens Stephani
Nuremberg, November 2014

1 Introduction

1.1 Motivation

Over the last decades, the German labour market has witnessed a significant increase in wage inequality. The ratio of the 9th and the 1st decile of the wage distribution (D9/D1), i.e., the ratio of the wages of the 10% best-paid workers to those of the 10% least-paid workers, increased in Germany by about 14% between 1984 and 2008, with the largest part of this increase taking place after the year 2000 (OECD, 2011: p. 87).[1] In their influential paper, Dustmann et al. (2009) have shown that the widening of the German wage distribution at the top has been driven particularly by technological change, while the rise in lower-tail inequality can be better explained by supply shocks and the sharp decline in unionization.[2] Without the decline in unionization, low-wage workers in particular would have had a significantly higher wage growth (Dustmann et al., 2009). The increasing wage inequality has been paralleled by a significantly growing low-wage sector (Mason and Salverda, 2010), with more than one-fifth of the German workers receiving a wage below the commonly accepted low-wage threshold of two-thirds of the median wage in 2010; in European comparison, this figure is relatively high (Bezzina, 2012).[3]

Due to its social implications, the growth of the low-wage sector has attracted a considerable amount of interest among researchers and politicians. For several years now, low pay has played an important role in academic and policy debates on living standards, rising costs of welfare programs, and employment rates. Thereby, the low-wage sector is mainly viewed from two different perspectives. One perspective is stressing that low pay is often linked to in-work poverty and therefore the incidence of low-wage work needs to be reduced. Often, the establishment of a minimum wage is advocated as a proper means for achieving this goal (see, e.g., Kalina and Weinkopf, 2012). Another perspective is arguing that low-wage jobs can serve as an important means to provide work for low-

1 The widening of the wage distribution has been identified to be one of the key drivers of the increase in overall income inequality over the last decades which took place not only in Germany and other traditionally low-inequality countries such as Sweden or Denmark, but in the large majority of OECD countries as well (see, e.g., OECD, 2011).

2 See Schnabel (2013) for a recent overview on trends in unionization and its determinants in Germany and other advanced countries.

3 In this dissertation, the threshold of 2/3 of the median wage is used to define the low-wage sector. This threshold is used by the large majority of current studies on low pay and has also been adopted by the European Commission and the OECD. This threshold facilitates international comparisons and the analysis of developments over time (Lucifora and Salverda, 2009). However, note that there exist different possible measures of low pay which are applying either an absolute or a relative level of wages as a threshold. While the process of defining a low-wage threshold can be regarded as somewhat arbitrary (McKnight, 1998), Eichhorst et al. (2005) have shown that the development and the structure of the German low-wage sector can be considered as robust towards the choice of a certain threshold. See Sloane and Theodossiou (1998) for an in-depth discussion of methological issues in the measurement of low pay.

skilled individuals and for reintegrating long-term unemployed individuals into the labour market (see, e.g., Sinn et al., 2007). While the former perspective implies that low-wage workers are permanently low-paid, the latter perspective implies that at least for a part of the low-wage workers low-paid jobs can serve as stepping stones to higher-paid jobs (Schank et al., 2009).

The different views on the low-wage sector point to the high relevance which the mobility of individual workers plays in the context of low pay. As noted by Mason and Salverda (2010: p. 48), there are three possible employment paths which low-wage workers can follow over time. First, these workers may get stuck in low pay and remain low-paid for a longer period of time; some workers may even stay low-paid for their whole working life. Second, low-wage workers may be caught in a "low-pay no-pay cycle", i.e., they may be continuously cycling between low pay and unemployment or inactivity. Third, low-wage employment may act as a stepping stone, thereby enabling low-wage workers to move up to higher-paid employment. If the latter would be what is usually observed, i.e., if most low-wage workers would move up to higher-paid employment after a limited period of time, low-wage work would not be a significant social problem. However, this is not the case: a significant number of workers can be observed following all three employment paths which have been sketched above. Therefore, it is important to analyze the mobility of low-wage workers in detail and to investigate how individual, job and establishment characteristics influence the probability of workers taking a specific mobility path (Mason and Salverda, 2010: p. 48). Evidence from such analyses may provide starting points for increasing the upward wage mobility of low-wage workers.

By now, a considerable literature has developed investigating various aspects of the wage growth and the wage mobility of low-wage workers in Germany and other countries. Inter alia, this literature has found that the upward wage mobility of low-wage workers is modest, with less than one-fifth of the full-time employed low-wage workers in Germany moving up to higher-paid employment. In addition, the chances of leaving low pay differ between subgroups of workers and are also different in particular types of establishments. A major part of this dissertation is contributing to this literature by analyzing several research questions which have not been investigated previously. Are low-wage workers able to stay in higher-paid employment after moving up? Are there typical characteristics of wage growth firms for low-wage workers? How important are non-cognitive skills for transitions from low pay to higher pay? I aim to answer these research questions in chapters 2, 3 and 4 of this dissertation by using administrative linked employer-employee data and household survey data.[4]

4 The study underlying chapter 4 is based on joint work with a co-author.

As mentioned earlier, the decline in unionism has been identified as being one of the drivers of the increase in wage inequality at the bottom of the German wage distribution over the last decades (Dustmann et al., 2009). Particularly at the lower end of the wage distribution, unions seem to compress the German wage structure (see, e.g., Fitzenberger and Kohn, 2005; Gerlach and Stephan, 2006; Dustmann and Schönberg, 2009). Although the impact of unions on wages is therefore not the same at different points of the wage distribution, the examination of the magnitude of the *average* wage gap between covered and uncovered workers can provide basic information about the effect of unions on wages. However, while both union density and collective bargaining coverage decreased significantly over the last decade (see, e.g., Fitzenberger et al., 2011; Addison et al., 2007; Bispinck et al., 2010), most recent studies on the union-nonunion wage differential in Germany pertain to the 1990s or the early 2000s.[5] Therefore, a smaller part of this dissertation contributes to this literature by presenting an updated estimate of the union wage premium, i.e., an estimate of the union wage premium for the years 2008–2010. Using linked employer-employee data, in chapter 5 I thereby provide a first step for the further research on the impact of the decline in unionization on wages in Germany.[6]

1.2 Organization of the dissertation

This dissertation is based on four studies, which are described in this section. Each of these studies is intended to be a stand-alone analysis. While the studies underlying chapter 2 and chapter 3 are single authored, chapter 4 and chapter 5 are based on studies which have been co-authored. Therefore, the latter two chapters are written in the first-person plural perspective. All studies have been published as discussion papers and have been or will be submitted to peer-reviewed international journals.

1.2.1 Escaping the low-wage sector? Wage growth and career patterns of German low-wage workers[7]

The research in this chapter is motivated by the fact that most previous studies on the wage mobility of low-wage workers have focused only on transitions between low pay and other employment states, such as higher-pay employment or non-

5 See, e.g., Fitzenberger et al. (2013); Gürtzgen (2012).

6 Chapter 5 is based on joint work with three co-authors.

7 This chapter is based on Stephani (2012).

employment. From their results, one cannot infer whether the amount of wage growth of low-wage workers is high or low. In addition, it is not clear whether or not low-wage workers are able to stay in higher-paid employment after moving up. Furthermore, it is also not clear whether the firm-level variables which are usually included in studies on low-wage mobility do capture the full range of firm-level heterogeneity which is impacting on the wage mobility of low-wage workers. I approach these research gaps by using administrative linked employer-employee data and by applying different multivariate models which take into account endogenous sample selection. By using a sample of workers who were low-paid in two consecutive years, I focus on those workers who were low-paid for a considerable period of time. This approach distinguishes the study from the large majority of the studies on low-pay mobility, as the latter usually focus on low-wage workers who have been low-paid in one single year.[8]

1.2.2 Does it matter where you work? Employer characteristics and the wage growth of low-wage workers and higher-wage workers[9]

Employers play an important role for the wage growth and the wage mobility of low-wage workers (see, e.g., Andersson et al., 2005). While this finding has been corroborated by several previous studies, due to a lack of data the impact of a number of potential employer-level determinants of individual wage growth has not been investigated to date. In addition, it is not clear whether the wage growth of low-wage workers and higher-wage workers is influenced by the same set of establishment characteristics. The research in chapter 3 adds to the literature by analyzing the impact of a number of potential employer-level determinants on the wage growth of low-wage workers and higher-wage workers which have not been investigated previously. Inter alia, I investigate the impact of the coverage by a collective agreement, the share of fixed-term co-workers, and the establishment age. For the analysis in this chapter, I use a rich linked employer-employee dataset and I apply endogenous switching regression models. By using this econometric method, I am able to analyze the wage growth of low-wage workers and higher-wage workers simultaneously and to control for the endogenous selection of workers into the state of being a low-wage worker or a higher-wage worker.

8 Note that the analyses in the other chapters of this dissertation are not focusing exclusively on low-wage workers. Instead, they are incorporating higher-wage workers as well. In order to keep low-wage workers and higher-wage comparable to each other and to avoid inconsistency, in these chapters I do not impose the restriction that individuals need to be low-paid in two consecutive years in order to be classified as low-wage workers.

9 This chapter is based on Stephani (2013).

1.2.3 Locus of Control and low-wage mobility

Over the last decade, the case for the use of non-cognitive skills in economic analyses has become stronger. An increasing literature has developed analysing the importance of non-cognitive skills for economic and social outcomes (see, e.g., Heckman et al., 2006). In chapter 4, I contribute to this literature by investigating how the individual probability of West German men[10] moving from low pay to higher pay is influenced by their individual score of Locus of Control, i.e., by the extent to which an individual believes that he has control over his life.[11] By doing so, I also control for possible correlations with other non-cognitive skills such as the Big Five and reciprocity. In contrast to the previous chapters, this chapter is based on data from a large household panel survey[12] and applies dynamic multinomial logit models with random effects.

1.2.4 Union decline and the coverage wage gap in Germany

The continuing decline in union density and collective bargaining coverage has been identified to be one of the drivers of the increase in wage inequality at the bottom of the German wage distribution over the last decades (Dustmann et al., 2009). However, the literature dealing with the impact of unions on wages is lacking recent information on the average difference between the wages of those workers who are covered by a collective agreement and the wages of those workers who are not covered by a collective agreement. Therefore, in chapter 5 I use rich linked employer-employee data and different fixed-effects models to provide an updated estimate of the union wage premium.[13] I analyze two establishment sub-samples which include collective bargaining joiners and never members on the one hand and collective bargaining leavers and always members on the other hand; each of these sub-samples includes only worker job stayers. Although a possible difference in average wages between covered workers and uncovered workers does not inform about the distribution of wages, it provides a critical first step for the further research on the consequences of the decline in unionism on wages by showing whether or not the union wage premium still exists.

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10 Due to the heterogeneous employment trajectories of women which may interact with their non-cognitive skills, I do not include both sexes in the analysis. Furthermore, due to data limitations the analysis in this chapter pertains to West Germany. In contrast, the analyses in the other chapters of this dissertation include both men and women and cover West Germany and East Germany.

11 The study underlying this chapter has been co-authored with Daniel D. Schnitzlein (see Schnitzlein and Stephani, 2013).

12 The analyses in this chapter include both full-time workers and part-time workers. Due to data limitations, the analyses in the other chapters of this dissertation are covering full-time employed workers only.

13 This chapter is based on joint work with John T. Addison, Paulino Teixeira and Lutz Bellmann (see Addison et al., 2012a).

2 Escaping the low-wage sector? Wage growth and career patterns of German low-wage workers

2.1 Introduction

In 2006, about 17 % of full-time employees in the EU-27 countries received a wage below the threshold of 2/3 of the median wage, which usually demarcates the low-wage sector. Germany had a higher-than-average proportion of low-wage workers (19.6 %) among its workforce (Casali and Alvarez Gonzalez, 2010). Over the last decade, the low-wage sector in Germany has been growing, and in 2009 it accounted for 22 % of all German workers (Bundesagentur für Arbeit, 2010).

As a consequence, the low-wage sector has attracted increased attention from researchers and policy-makers over the last years, and a number of international studies on various aspects of low-wage work and the mobility of these workers have been published. Many of these studies have analysed the probability of workers escaping low pay by crossing a certain relative or fixed low-wage threshold. Inter alia, they have found that male, younger and higher-skilled low-wage workers have better chances to escape low wages. In addition, various establishment characteristics such as firm size or the share of low-wage workers in the establishment are relevant in this context.[14]

Despite this number of previous studies, several important research gaps still remain. For example, empirical evidence on the *amount of wage growth* of individual low-wage workers is scarce, especially for Germany. However, this should be regarded as an important piece of information relating to the wage mobility of these workers: A low extent of individual wage growth in the low-wage sector or a high persistence of (very) low wages for certain individuals might call for labour market policies that will assist these workers. Additionally, it would also be interesting to know whether the wage mobility of relatively well-paid low-wage workers differs from the mobility of the worst-paid workers in the low-wage sector, for example, as a result of labour market segmentation. Finally, significant inter-firm differences regarding the extent of the wage growth of low-wage workers might point to the existence of firms who choose a "high road" strategy that also involves better prospects and career opportunities for low-wage workers.[15]

14 For Germany, see for example Schank et al. (2009); Mosthaf et al. (2011); Knabe and Plum (2013). See section 3.2 of this dissertation for a more detailed review of studies on the wage mobility of low-wage workers in Germany and other countries.

15 See Pyke and Sengenberger (1992) for an early discussion of possible "high road" and "low road" strategies of firms.

Another research gap concerns the in-depth analysis of the career patterns of low-wage workers. For example, we do not know whether these individuals are able to stay in higher-paid employment after having escaped the low-wage sector or not. Because downward mobility from the higher-wage sector also exists, it would be interesting to see whether the upward mobility of low-wage workers is only a transitory experience or whether it results in longer-lasting employment in higher-paid jobs. Furthermore, taking such a multi-period perspective by looking at the careers of low-wage workers after upward movement could broaden our understanding of low-wage careers. For example, it would be interesting to see how firm characteristics affect the probability of longer-lasting upward wage mobility of low-wage workers.

In this chapter, I address both of the research gaps discussed above by using administrative linked employer-employee data and multivariate models which take into account endogenous sample selection. First, I show that there exists a substantial extent of upward and downward wage mobility within the low-wage sector which has been overlooked to date. In addition, I find that the firm heterogeneity which is not captured by the firm variables analysed by previous studies is important for the upward mobility of low-wage workers. Second, I find that the upward wage mobility of low-wage workers leads to longer-lasting higher wage levels for a significant part of these workers. The remainder of the chapter is organised as follows: section 2.2 discusses the theoretical background and presents hypotheses; section 2.3 gives information on the data used; section 2.4 presents the descriptive evidence; section 2.5 discusses the multivariate results; and section 2.6 concludes the work.

2.2 Theoretical background and hypotheses

According to human capital theory and search theory, the main determinants of individual wage growth are the accumulation of general and firm-specific human capital and job searching (i.e., switching to a better-paid job) (e.g., Schönberg, 2007). As a consequence, wages are predicted to grow with labour market experience and tenure, at a decreasing rate (Topel, 1991). In line with this theoretical argument, I expect a positive relationship with a decreasing rate between labour market experience and tenure on the one hand and wage growth (and career stability) of low-wage workers on the other hand.[16]

16 In this context, it has often been stated that age together with years of schooling can be used as a proxy for labour market experience; therefore, in order to avoid multicollinearity, one should refrain from including age, years of schooling and labour market experience together in an earnings regression. However, in the case of low-wage workers this rule might not be appropriate: due to the high unemployment risk of low-wage workers, their age and years of schooling might not serve as a good measure for their labour market experience. For more information about the unemployment risk of low-wage workers, see de Lathouwer and Marx (2005) or Eriksson (1998).

In addition, human capital theory and search theory suggest comparatively lower wage growth for women, foreigners, elderly or lower educated individuals and workers belonging to low-skilled occupational groups.[17] The reasons for this are varied: for example, they might be rooted in gender differences in job preferences or a higher probability of work interruptions (for women), lower growth of individual productivity or a higher unemployment risk. For foreign workers, certain labour market barriers such as the lack of language skills may have a negative impact on wage growth. In addition, (statistical) discrimination may also hamper the future careers of women and foreign workers. In line with these theoretical considerations, I expect that low-wage workers who belong to these demographic groups experience a comparatively lower level of individual real wage growth and less often stay in higher-paid employment after having escaped the low-wage sector.

Furthermore, relatively well-paid jobs in the low-wage sector might coincide with more opportunities to accumulate general and firm-specific human capital than the worst-paid jobs. Therefore, they may constitute a better signal to other potential employers, while the opposite might be true for the worst-paid jobs in the low-wage sector. For example, a relatively well-paid waitress working in an exclusive restaurant might benefit from her workplace's operating experience and reputation, while this might be less true for a waitress in a snack bar. This would imply that the higher the current wage of a low-wage worker, the higher her chances for future wage growth and remaining in higher-paid employment after having escaped the low-wage sector.

However, a contrary effect can be expected following search theory. Because the probability that a new wage offer will exceed the current wage of an individual declines with the level of her current wage, workers in higher wage quantiles are assumed to exhibit lower wage growth than workers in lower wage quantiles (e.g., Fitzenberger and Garloff, 2007). One could expect a similar relationship when investigating only the wage growth of low-wage workers: on average, relatively well-paid low-wage workers should then experience a comparatively lower wage growth than relatively poorly-paid low-wage workers. As becomes clear from the two different lines of argument, the relationship between the wage level of a low-wage worker and her further career is not clear ex ante.

Turning to establishment characteristics, one factor that potentially influences the wage growth and career advancement of low-wage workers is firm size. First, firm size can be considered as a good proxy for the existence of an internal labour market in the firm. An internal labour market increases the chances for individuals

17 See, e.g., the in-depth treatment of these two theories in Cahuc and Zylberberg (2004), chapters 2 and 3.

to move up in the firm (e.g., Gürtzgen and Heinze, 2010; Siebert and Addison, 1991). Therefore, in large firms low-wage workers may have a higher probability of wage growth and career advancement. Second, compared to small firms, large firms in Germany more often provide on-the-job training (Gerner and Stegmaier, 2009). Besides increasing upward mobility within the firm, on-the-job training might also provide employees with general human capital that (at least in part) is transferable to other employers. When changing firms, this transferable human capital could then help a low-wage worker to obtain a higher wage at her new job. Overall, this implies that firm size is positively associated with the wage growth and the career prospects of low-wage workers, irrespective of whether they stay with the firm or change employers.

The composition of the workforce in the firm might also be relevant for the wage growth and the career prospects of low-wage workers. For example, a high percentage of highly qualified workers may characterise a firm where the accumulation of general and firm-specific human capital is easier, for example, due to knowledge spill-overs or on-the-job training. Furthermore, working for a firm with a high percentage of women or foreign workers could be detrimental for the wage growth and career advancement of low-wage workers. For example, workplace segregation or low-cost strategies in these firms may imply lower wage growth and fewer possibilities for human capital accumulation (Mosthaf et al., 2011). A high share of older workers might characterise a firm in which moving up is more difficult, for example, due to less flexible internal structures (Nienhüser, 1998).

Furthermore, labour market segmentation may also hamper the wage growth and the career prospects of low-wage workers. In this context, Grün et al. (2011) point out that one might be able to identify firms that offer relatively poor promotion prospects for low-wage workers by looking at the average wage level in the firm. On average, firms that offer relatively poor promotion prospects may also have a lower wage level than firms that offer better promotion prospects. The reason for this could be that a firm that chooses a "high road" strategy, which also involves a higher prevalence of internal labour markets or on-the job training, may also be characterised by a comparatively higher wage level in the firm. On the one hand, such a "high road" strategy might have a positive effect on the careers of workers who stay with the firm (i.e., stayers), as the internal labour market may offer various career opportunities for them. On the other hand, workers who change their employer (i.e., movers) may benefit from the transferable part of the human capital that they accumulated with the previous ("high road") employer and his reputation, both in terms of wage growth and future career prospects. Therefore, I expect the median wage level in a firm to be positively related to the

wage growth of low-wage workers and their probability of staying in higher-paid employment after an upward move.[18]

Finally, several other factors may be relevant for the wage growth and the careers of low-wage workers and therefore should be controlled for, although it is difficult to formulate clear-cut hypotheses about their effects. First, due to the high amount of heterogeneity between different industry sectors, one should control for industry affiliation. Second, due to the differing economic situations and relevance of institutions in East and West Germany (for instance regarding collective bargaining), it is also important to control for the location of the firm. Third, it would be interesting to see whether changing firms is associated with increased wage growth and better future career prospects of low-wage workers, as suggested by Andersson et al. (2005); however, some of these (voluntary) changes may of course be endogenous.

2.3 The data

I use a representative 2% random sample from the Integrated Employment Biographies (IEB) of the German Institute for Employment Research in Nuremberg (IAB) for the years 2001, 2004 and 2006 that has been augmented by the inclusion of employer information from the Establishment History Panel (BHP). The IEB contain information about all German employees who are liable to social security, benefit recipients, as well as individuals who are searching for employment, unemployed individuals and participants in measures of active labour market policy. For more information on a sample of the IEB which is available for scientific purposes, see Jacobebbinghaus and Seth (2007) as well as Oberschachtsiek et al. (2009). In contrast, the BHP is an establishment dataset composed of yearly cross sections for both East and West Germany. Each cross section of the BHP contains information on all German establishments that are covered by the Employee and Benefit Recipient History (BLH) on 30 June in that year (see Spengler, 2008). A representative 2% sample of the IEB, as well as different versions of the BHP, is available to researchers at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) in Nuremberg.

By combining these two datasets, I create a linked employer-employee dataset that enables me to investigate the impact of both individual and firm characteristics on the wage growth and the career patterns of full-time low-wage

18 The average is more sensitive to extreme values than the median. In order to avoid bias, in this study, the median wage is used to describe the wage level in the firm.

workers in Germany between three points in time: on 30 June in 2001, 2004 and 2006. I use the commonly accepted low-wage threshold of 2/3 of the median daily gross wage of full-time employees, which has been computed separately for East and West Germany. In 2001, the low-wage threshold corresponded to a real daily wage of 44.4 € (60.2 €) in East (West) Germany; until 2006, its value fell to 43.5 € (59.4 €), reflecting the decrease of real wages in Germany at the start of the new millennium (see, e.g., Brenke, 2009, for details on the development of real wages in Germany).[19] The restriction to full-time employed workers is due to technical reasons: as precise information on working hours is not available in this dataset, the accurate categorisation of part-time workers into low-paid or higher-paid individuals is not possible. However, this restriction also avoids potential biases that might arise from the fact that some part-time workers have voluntarily chosen part-time work, such as individuals engaged in childcare or elderly care.

To focus on the core groups of the labour market, I limit the sample to the full-time employed workers aged 15 to 58 years (in 2001), and I exclude trainees, working students and retired individuals. Because the data at hand only contain information for 30 June of a given year, I further restrict the analysis to workers who were low-paid while being full-time employed in both starting years 2000 and 2001. By doing so, I ensure that the sample does not contain individuals who received a low wage once and for a short time; for example, this might be the case if a previously higher-paid worker temporarily has to take up a low-paid job after being laid off. For workers who have more than one job, I only use information about their main job, i.e., the employment relationship with the maximum daily wage.

Stemming from the social security records (i.e., administrative sources), both the IEB and the BHP can be regarded as highly reliable. For example, one can expect the wage information in this data to have been measured with utmost accuracy by the authorities since this information is decisive for a worker's entitlement to social security benefits. Nevertheless, I exclude full-time employed workers with implausibly low wages from the analysis as well as individuals working in a high-skilled job while earning a wage below the low-wage threshold in both starting years 2000 and 2001.[20] Table 2.1 presents summary statistics of the sample. To facilitate readability of the text, in this book all tables have been moved to the end of the corresponding chapter.

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19 The nominal wages have been deflated using the consumer price index of the German Federal Statistical Office with 2006 = 100.

20 I exclude full-time employed workers earning a daily wage of less than 20.1 € (21.5 €) in East (West) Germany in prices of 2006; this is equivalent to a monthly wage of about 602 € (645 €).The results of the analysis are not altered significantly by choosing a higher cut-off point. Furthermore, I also exclude individuals earning a wage below 2/3 of the median in both starting years 2000 and 2001 while working full-time in higher-paying jobs, such as technicians, engineers, managers or jobs belonging to the occupational group of the professions. Since the dataset is highly reliable, this problem affects only about 5 % of full-time employees.

In the remainder of the chapter, I use this dataset to analyse the amount of real wage growth of the low-wage workers between 2001 and 2006 and their transitions between a low wage and a higher wage in 2001, in 2004, and in 2006.

2.4 Descriptive evidence

2.4.1 The real wage growth of low-wage workers

As can be inferred from Table 2.2, the full-time employed low-wage workers in the sample earned a real daily wage of about 43.4 € on average in 2001. Until 2006, they experienced a relative real wage growth of about 10.4 %. Disaggregation by individual characteristics shows that women earned about 2.4 € less than men, while their amount of relative real wage growth was roughly half the amount of wage growth of men. Foreigners in the low-wage sector earned 2 € more than Germans, whereas there was hardly any difference between the two groups regarding wage growth.

Another interesting result can be seen when looking at the wage level of a full-time low-wage worker in 2001, which is measured by categorising the workers into three groups: those workers earning a wage below the 5th percentile of the entire wage distribution, those earning a wage between the 5th and the 10th percentile, and those earning a wage between the 10th percentile and the low-wage threshold.[21] As can be seen from the figures, the worst-paid workers in the low-wage sector experienced a much higher positive relative wage growth than the better-paid low-wage workers (23.5 % versus 7.7 % and 4.2 %, respectively). However, only about 11 % of the worst-paid low-wage workers were able to cross the low-wage threshold, whereas about 23.5 % of the best-paid low-wage workers and about 12 % of the wage group in between managed this career move (these figures are not shown in the table).

As the figures reflect both positive growth (wage increases) as well as negative growth (wage losses), the table shows that there has been a considerable degree of upward wage mobility in the low-wage sector. After disaggregating these figures into workers who experienced wage increases and workers who experienced wage decreases, I find some more interesting results. Overall, about 10,300 of the low-wage workers from 2000/01 experienced wage increases, whereas about 9,700 of them suffered wage decreases (these figures are not shown in the table). This demonstrates that there is a considerable amount of downward wage mobility

21 In 2001, the 5th percentile of the daily wages of all full-time employees corresponded to a nominal daily wage of 30.5 € (38.0 €) in East (West) Germany; the 10th percentile corresponded to a daily wage of 35.1 € (48.0 €); and the low-wage threshold corresponded to a daily wage of 43.5 € (59.4 €).

in the low-wage sector which is probably connected to the comparatively higher job instability and the higher unemployment risk of these workers. However, the relative magnitude of the average wage increases (+31.1 %) is almost three times the relative magnitude of the average wage decreases (-11.5 %). This is the reason why in Table 2.2, I observe a considerable extent of positive wage growth for low-wage workers on average, despite the fact that the frequencies of wage increases and wage decreases are quite close. In previous studies, this significant amount of upward and downward wage mobility in the low-wage sector remained hidden since these studies narrowed their analysis to the probability of low-wage workers crossing the low-wage threshold.

2.4.2 The career patterns of low-wage workers

While the previous section aimed at shedding light on the development of the wages of full-time employed low-wage workers, this section examines the career patterns of low-wage workers while also taking into account workers who leave full-time employment. In contrast to previous studies, I adopt a multi-period perspective by analysing the career patterns of the low-wage workers from 2000/01 that had reached higher-paid employment by the year 2004. Particularly, I would like to know how many of these workers were still in higher-paid employment in 2006.

Figure 2.1 gives information about the employment state of the low-wage workers from 2000/01 in the years 2004 and 2006 by presenting the frequency of different career patterns in these two years.[22] While "N" characterises workers who were no longer full-time employed in the year 2004 or 2006, "L" represents the workers who were still full-time employed and still earning a low wage. Finally, "H" indicates that a low-wage worker from 2000/01 was still full-time employed but receiving a wage above the low-wage threshold. For example, in this context, the pattern "LH" indicates that a low-wage worker from 2000/01 was still low-paid in 2004 ("L") but had reached higher-paid employment in 2006 ("H").

Figure 2.1 shows that more than 32 % of the low-wage workers were no longer full-time employed in 2004 (see the sum of the frequencies for the first three career patterns on the left hand side: "NN", "NL" and "NH"). Interestingly, even two years later, most of these individuals (more than 25 % of all low-wage workers from 2000/01, see career pattern "NN") had not returned to full-time employment. More than 35 % of the low-wage workers from 2000/01 still received a low wage

22 See Bingley et al. (1995) for a similar analysis for Germany and Denmark for the years 1984–1990. Of course, even more could be learned by incorporating more years into this descriptive analysis; for example, one could try to identify low-wage workers who frequently switch between a low wage and a higher wage. However, due to the increased complexity that would result, this is not addressed here.

in 2004 and in 2006 while being full-time employed (see career pattern "LL"). The high persistence in low pay as well as the high number of transitions out of (full-time) low-paid employment has also been found by previous studies on the mobility of low-wage workers, for example, by Stewart (2007) for the UK and by Uhlendorff (2006) for Germany. Therefore, not taking into account transitions from full-time employment into part-time employment or into the state of no longer being employed would result in overestimating the upward mobility of low-wage workers. In line with previous studies on low-wage mobility in Germany, I further find that about 15% of the low-wage workers had found higher-paid employment three years later ("HN", "HL", "HH"). More than 60% of these workers (i.e., about 9% of all low-wage workers) were still higher-paid in 2006 ("HH"), whereas about 4% of all low-wage workers were no longer full-time employed in 2006 after having moved to higher-paid employment by the year 2004 ("HN"). Only about 2% of all low-wage workers were again low-paid in 2006 after having reached a higher-paid position by 2004 ("HL"). In summary, despite the high persistence in low-paid employment and the considerable number of transitions out of full-time employment that accounts for an important part of the mobility in the low-wage sector, there also seems to be a certain amount of upward mobility of low-wage workers that results in longer-lasting higher-paid jobs for about 9% of all low-wage workers in the sample.

Table 2.3 presents disaggregated information on the career patterns of the low-wage workers, focusing on the question of which of them were able to maintain higher-paid employment until 2006. For analytical reasons and for the purpose of clarity, I have built three aggregated groups out of the nine career patterns used in Figure 2.1. The first group consists of the low-wage workers who were "low-paid in 2004 or not full-time employed in 2004" (this comprises about 85% of all low-wage workers from 2000/01)[23]; the second group contains the workers who were "higher-paid in 2004, low-paid or not full-time employed in 2006" ("HN" and "HL", about 6% of the low-wage workers), while the third group of workers was "higher-paid both in 2004 and 2006" ("HH", about 9%).

Women were more likely than men to be low-paid or to no longer be full-time employed in 2004, and at the same time, they were less likely to be higher-paid both in 2004 and in 2006; while about 13% of the male low-wage workers were higher-paid in 2004 and in 2006, only about 8% of the females had managed to achieve higher-paid employment. The differences between the figures for Germans and for foreigners are not particularly pronounced. Compared to relatively poorly paid low-wage workers, relatively well-paid low-wage workers more often managed to be

23 These are: „NN", „NL", „NH", „LN", „LL" and „LH".

higher-paid both in 2004 and 2006. Interestingly, in the third column, the figures for the workers earning less than the 5th percentile are quite close to the figures for the workers earning a wage between the 5th percentile and the 10th percentile, while the number of the previously best-paid low-wage workers from 2000/01 who were higher-paid both in 2004 and in 2006 is more than twice as high. This shows that the best-paid low-wage workers more often remain in higher-paid employment than the relatively poorly-paid low-wage workers.

Using the descriptive results of this section as a starting point, it will be interesting to see which factors influence the real wage growth and the careers of the low-wage workers in the multivariate analysis.

2.5 Econometric analysis

2.5.1 The determinants of the real wage growth of low-wage workers

In the first part of the multivariate analysis, I investigate the determinants of the real wage growth of low-wage workers between 2001 and 2006 by estimating a Heckman sample selection model. In doing so, I correct for the selectivity of the sample by taking into account that the status of being a low-wage worker in 2000/01 and of still being full-time employed in 2006 might not be exogenous.[24]

Let y_{i0} be a dummy variable which is 1 if a full-time employed individual from 2000/01 is low-paid in these two years:

$$P(y_{i0}=1)=P(y^*_{i0}=(z_i\gamma^*+\varepsilon_{i0})<\kappa)=\Phi_1(z_i\gamma), \quad (1)$$

where y^*_{i0} is the underlying latent variable, z_i is a vector of variables determining low pay status, κ is the low-wage threshold, and $\gamma=-\gamma^*$. I assume ε_{i0} to be distributed $N(0, 1)$. Φ_1 denotes the cumulative standard normal distribution. This probit model represents the selection equation.

Let Δlnw_i be the difference of the logarithms of an individual's real wages in 2006 and 2001, which is observed only if the individual was low-paid in 2000/01 and is still full-time employed in 2006:

$$\Delta lnw_i=x_i\beta+\varepsilon_{i1}, \quad (2)$$

where x_i is the vector of variables determining wage growth and ε_{i1} is distributed $N(0, \sigma_{\varepsilon 1})$. Assuming that the error terms ε_{i0} and ε_{i1} have a bivariate normal

24 This could result in the so-called initial conditions problem, see Heckman (1981) or Stewart and Swaffield (1999).

distribution with zero means, standard deviations $\sigma_{\varepsilon 0}$ and $\sigma_{\varepsilon 1}$ and correlation ρ, then

$$E(\Delta lnw_i \mid y_{i0} = 1) = (x_i\beta + \beta_\lambda \frac{\Phi_2(z_i\gamma^*/\sigma_{\varepsilon 0})}{\Phi_1(z_i\gamma^*/\sigma_{\varepsilon 0})}), \quad (3)$$

where Φ_2 is the standard normal density function and $\frac{\Phi_2(z_i\gamma^*/\sigma_{\varepsilon 0})}{\Phi_1(z_i\gamma^*/\sigma_{\varepsilon 0})}$ is the inverse Mills Ratio.

Following the theoretical considerations discussed earlier, I include a number of explanatory variables in the model. Explanatory variables that enter both z_i and x_i are individual characteristics (gender, age, level of education, non-German nationality and the occupational group) and several establishment characteristics. The latter are dummy variables describing establishment size and a number of variables describing the composition of the workforce in the establishment, including the percentage of women, the percentage of foreigners, the percentage of highly-skilled workers, the median age and the median daily wage of all full-time workers in the establishment. To control for industry affiliation, 18 industry dummy variables have been included. In addition, x_i contains three dummy variables describing the wage level of the worker in 2001 which has been discussed in the descriptive part of the chapter. All explanatory variables mentioned so far are measured in the year 2001 and are held fixed during estimation. x_i further contains four variables describing the amount of individual labour market experience and tenure between 1992 and 2006 and one dummy control variable indicating that a worker changed establishments between 2001 and 2006.[25] In contrast, z_i contains a variable that is not included in the wage growth equation. This variable measures the difference between the logarithm of the East (West) German low-wage threshold (2/3 of the median wage in the respective part of the country) and the logarithm of 2/3 of the median wage calculated at the level of the district in which an individual was employed.[26] The higher the difference between these two wage levels in 2001, the more likely it is that an individual working in the respective district in 2001 received a wage below the East (West) German low-wage threshold of 2/3 of the median wage. Therefore, I expect this variable to influence the selection of a full-time employed worker from 2000/01 into the group of the low-paid in these two years. However, this variable is a highly aggregated one because it has been calculated by aggregating the wages of more than 950 full-time employees per district on average. Therefore, this

25 Labour market experience and tenure enter the equation in linear and squared form. The tenure variable refers to the firm at which a worker was employed in the year 2006.

26 Germany is organised into 429 administrative districts.

variable is not likely to have a significant impact on the wage growth of an individual low-wage worker between 2001 and 2006. For this reason, I use this variable as an exclusion restriction.[27]

The first column of Table 2.4 presents the estimates of the determinants of the log wage growth of low-wage workers.[28] The correlation coefficient of the error terms ρ and the effect of the exclusion restriction are highly significant, indicating that the use of a simple OLS regression instead of the sample selection model would result in biased estimates.

As expected, women, older workers and low-skilled workers have a comparatively lower real wage growth than men, younger workers and higher-skilled workers. Furthermore, I find that labour market experience and tenure are positively related to the wage growth of low-wage workers, at decreasing rates. However, the marginal effect of labour market experience is only significant at the 10%-level.

The two dummy variables describing the wage level of a low-wage worker are positively associated with individual real wage growth: compared to the reference group of workers who earned a wage between the 10th percentile and the low-wage threshold of 2/3 of the median wage, the worst-paid workers in the low-wage sector had a higher real wage growth by roughly 15%. The workers earning a wage between the 5th and the 10th percentile had a higher wage growth than the reference group by roughly 4%. Of course, this result must be interpreted with caution due to the potential endogeneity of the dummy variables which describe the individual wage level of a worker. Nevertheless, this result suggests that even the worst-paid low-wage workers experience a significant amount of individual wage growth. In addition, this result supports the search theory hypothesis discussed in the theoretical part of the chapter: the higher the wage of a low-wage worker, the lower her relative wage growth.

With respect to the establishment characteristics, as expected, I find establishment size to be positively associated with the wage growth of low-wage workers. In contrast, the variables describing the composition of the workforce in the establishment are not always statistically significant. Interestingly, even

27 Note that, as it is also the case for most of the exclusion restrictions which are used in the literature, one could argue that this exclusion restriction is debatable. Therefore, I have run robustness checks using other possible exclusion restrictions which are available in this dataset, such as lagged low pay status; the results did not change significantly. Other studies, as for example Stewart and Swaffield (1999), are using information on the socio-economic background of the parents as exclusion restriction. However, such variables are not available in my dataset.

28 Due to the non-comparability of the daily wages of the full-time and part-time workers in this administrative dataset, and because of the non-existence of wage estimates for the low-wage workers who left employment, in this section, I aim to control for the transition of low-wage workers out of (full-time) employment by including those low-wage workers who were no longer full-time employed in 2006 into the selection equation of the model. More specifically, I include these workers into the "0" of the dependent variable of the selection equation.

after controlling for a number of individual and establishment characteristics, the median daily wage in the establishment is positively associated with individual real wage growth. This variable has not been analysed by previous studies on the upward wage mobility of low-wage workers. Considering all explanatory variables at their mean value, a higher median daily wage in the establishment by 10 € is associated with a 2% higher individual wage growth of the low-wage workers who were employed there in 2001. As discussed in the theoretical part of the chapter, this result suggests that there might be a considerable extent of inter-firm heterogeneity which is relevant for the wage growth of low-wage workers and which is not captured by the other firm variables integrated in the regression. In addition, it is also worth noting that low-wage workers in East Germany had a more than 6% higher real wage growth than low-wage workers in West Germany, which might reflect a catch-up process due to the initially lower wage level in the eastern part of the country.[29]

To account for the fact that low pay often constitutes a "special affliction" of women (Asplund and Persson, 2000: p. 53), the second and third column of Table 2.4 present separate estimations by gender. In this way, I try to control for deeper gender-specific differences that might not be captured by the gender dummy variable used in the previous regression. The results reveal a number of interesting differences between male and female low-wage workers.

For example, the amount of labour market experience does not have an influence on the wage growth of women in the low-wage sector, while the marginal effect of this variable on the wage growth of men is now highly significant at the 1%-level. Another interesting result is that although the individual wage level is positively associated with the wage growth of both women and men, the marginal effects of these variables are about two times higher for men than for women. For women, I also find a positive relationship between establishment size and wage growth; for men, no significant relationship can be identified. Furthermore, the positive marginal effect of the median daily wage in the establishment is five times bigger for men than for women. Overall, these results might reflect systematic job or workplace differences between the sexes that are not captured by the variables included in the regressions.

Last but not least, in all estimations, I find a highly significant positive marginal effect of the dummy variable that describes a change of the establishment. Of

29 As mentioned earlier, all establishment characteristics were measured at baseline and are held fixed during estimation. Therefore, the results for these variables should not be confounded by time-varying shocks. However, I cannot exclude the possibility that some establishment variables might be correlated with unobserved time-constant heterogeneity of workers or establishments.

course, one should keep in mind the potential endogeneity of this variable when interpreting it. Nevertheless, changing establishments seems to be a relevant element of the wage growth of low-wage workers.

2.5.2 The determinants of the career patterns of low-wage workers

As stated earlier, in contrast to previous studies, I now adopt a multi-period perspective and investigate the development of the careers of low-wage workers after they have moved to higher-paid employment. To be able to analyse the career development of low-wage workers from 2000/01 that have reached higher-paid employment by the year 2004, in the second part of the multivariate analysis, I estimate an ordered probit model with endogenous sample selection (for an extended review of this model, see Greene and Hensher, 2010). According to the aggregation of the employment states into the three broad categories presented earlier in Table 2.3, an ordered dependent variable y_{ord} that characterises the career of a low-wage worker can take three values, indicating temporary or permanent status improvements:

$y_{ord} = 1$ if a low-wage worker from 2000/01 was low-paid or not full-time employed in 2004,

$y_{ord} = 2$ if a low-wage worker from 2000/01 was higher-paid in 2004, and low-paid or not full-time employed in 2006,

$y_{ord} = 3$ if a low-wage worker from 2000/01 was higher-paid both in 2004 and 2006.

According to Long and Freese (2006), Williams (2006) and Gerner (2010), an ordered probit model can be regarded as equivalent to a sequence of related binary probit models. Although, in some cases, these related binary probit models might be less efficient than the "conventional" ordered probit model, this so-called "generalised" ordered probit model is consistent. Furthermore, it allows for a relaxation of the parallel lines assumption that is inherent to the conventional model, and which might be violated in certain cases. By estimating two related binary probit models with endogenous sample selection in Stata using maximum likelihood, I am therefore able to mimic the estimation of a generalised ordered probit model with endogenous sample selection, which would be computationally more burdensome when estimated directly.

When doing so, the procedure of defining the values of the two binary dependent variables in the career pattern equations of the two related binary probit models with sample selection is crucial: one needs to make sure to choose their respective values in a way that these two models together indeed mimic an

ordered probit model with sample selection. Table 2.5 illustrates the recoding of the ordered outcome variable y_{ord} into the dummy outcome variables of the two related binary probit models with sample selection.

As in the analysis of the determinants of wage growth, I correct for the selectivity of the sample. The two selection equations for the two related binary probit models with sample selection are identical. In each of these probit selection equations, y_{i0} is a dummy variable which is 1 if a full-time employed individual from 2000/01 is low-paid in these two years:

$$P(y_{i0}=1)=P(y_{i0}^{*}=(z_i\gamma^{*}+\varepsilon_{i0})<\kappa)=\Phi_1(z_i\gamma), \tag{4}$$

where y_{i0}^{*} is the underlying latent variable, z_i is a vector of variables determining low pay status, κ is the low-wage threshold, and $\gamma=-\gamma^{*}$. I assume ε_{i0} to be distributed $N(0, 1)$. Again, Φ_1 denotes the cumulative standard normal distribution.

In the first of the two related binary probit models with sample selection, let y_{i1a} be a dummy variable which takes the value "0" if a low-wage worker from 2000/01 was low-paid or not full-time employed in 2004 (i.e., if $y_{ord}=1$), and "1" if in 2004, she was receiving a wage above the low-wage threshold (i.e., if $y_{ord}\geq 2$). This yields a probit model for the probability of a low-wage worker being higher-paid in 2004:

$$P(y_{i1a}=1)=P(y_{i1a}^{*}=(x_i\beta_a^{*}+\varepsilon_{i1a})>\kappa)=\Phi_{1a}(x_i\beta_a). \tag{5}$$

In the second of the two related binary probit models with sample selection, I estimate the probability of a low-wage worker being higher-paid both in 2004 and in 2006. For this second model, let y_{i1b} be a dummy variable which takes the value "0" if a low-wage worker was low-paid or not full-time employed in 2004; or if she has been higher-paid in 2004 but returned to low pay or exited full-time employment in 2006 (i.e., if $y_{ord}\leq 2$). Accordingly, y_{i1b} takes the value "1" if a low-wage worker was higher-paid in both 2004 and 2006 (i.e., if $y_{ord}=3$). The probability of a low-wage worker being higher-paid in both 2004 and 2006 is then given by:

$$P(y_{i1b}=1)=P(y_{i1b}^{*}=(x_i\beta_b^{*}+\varepsilon_{i1b})>\kappa)=\Phi_{1b}(x_i\beta_b). \tag{6}$$

The error terms $(\varepsilon_{i0}, \varepsilon_{i1a})$ and $(\varepsilon_{i0}, \varepsilon_{i1b})$ are assumed to follow a bivariate standard normal distribution with correlation ρ_a and ρ_b, respectively.

Therefore, the conditional probability that a low-wage worker was higher-paid in 2004 is

$$P(y_{i1a} = 1 \mid y_{i0} = 1) = \frac{\Phi_{2a}(x_i\beta_a, z_i\gamma, \rho_a)}{\Phi_1(z_i\gamma)}, \tag{7}$$

and the conditional probability that a low-wage worker was higher-paid both in 2004 and in 2006 is

$$P(y_{i1b} = 1 \mid y_{i0} = 1) = \frac{\Phi_{2b}(x_i\beta_b, z_i\gamma, \rho_b)}{\Phi_1(z_i\gamma)}, \tag{8}$$

where Φ_{2a} and Φ_{2b} are the cumulative bivariate standard normal distributions. Φ_{2a} is derived from equations (4) and (5), Φ_{2b} from equations (4) and (6).

The variables included in x_i are largely the same as the ones used in the wage growth equation in the analysis of the real wage growth of low-wage workers in the previous section. However, because in this section I take into account transitions out of full-time employment also in the outcome equation, x_i contains neither the tenure variables nor the dummy variable indicating a change of establishment.

The selection equations in both models are supposed to correct for the fact that the probability of a full-time employed worker from 2000/01 being low-paid in these two years might not be exogenous. The set of explanatory variables included in z_i is the same as those used in the selection equation for the estimation of the real wage growth in the previous section. However, as an identifying restriction, I now use a dummy variable indicating whether or not a full-time employed worker from 2000/01 was low-paid in 1999. I assume that this variable influences the probability that a full-time employed worker from 2000/01 was low-paid in these two years. Due to the temporal distance, I do not expect this variable to influence the probability of leaving low-paid employment in 2004 or 2006. Table 2.6 presents the results of this generalised ordered probit model with sample selection.

First, one can see that compared to men, women exhibit a lower probability of reaching higher-paid employment and also a lower probability of remaining in higher-paid employment after an upward move. Compared to men, their probability of reaching higher-paid employment is more than 11 percentage points lower (see marginal effect in the first column), while their probability of *staying* in higher-paid employment after an upward move is more than 13 percentage points lower than the corresponding probability for men (see marginal effect in the second column).

Regarding the occupational groups, I find that compared to the reference category of skilled commercial and administrative occupations, most occupational

groups have a lower probability of reaching higher-paid employment and of staying in higher-paid employment afterwards.

Labour market experience is associated positively at a decreasing rate with the probability of a low-wage worker reaching higher-paid employment and with his probability of remaining in higher-paid employment afterwards. This points to the importance of work experience for the career advancement of low-wage workers.

The results for the variables describing the wage level of a low-wage worker in 2001 show that the worst-paid workers in the low-wage sector have a significantly lower probability of crossing the low-wage threshold than the reference group of the best-paid low-wage workers. Compared to the reference group of workers who earned a wage between the 10th percentile and 2/3 of the median wage, the worst-paid workers had a more than 13 percentage points lower probability of reaching higher-paid employment by the year 2004 and a more than 11 percentage points lower probability of staying in higher-paid employment after an upward move. Interestingly, the career prospects of medium-paid low-wage workers (i.e., the group of workers earning a wage between the 5th percentile and the 10th percentile) were worse than the career prospects of the worst-paid low-wage workers.

Regarding the marginal effects of establishment characteristics, similar to the analysis of the determinants of wage growth, I find a positive relationship between establishment size and upward mobility. Furthermore, there is a highly significant positive marginal effect of the median daily wage in the establishment. Again, the latter variable can be interpreted as a proxy for firm heterogeneity in the low-wage sector, which is not captured by the firm variables in the regressions. A higher median daily wage in the establishment by 10 € is associated with a 2 percentage points higher probability of a low-wage worker reaching higher-paid employment by the year 2004; the probability of staying in higher-paid employment after moving up is higher by 2 percentage points as well. The results are qualitatively robust towards a further disaggregation of the analysis by gender.

2.6 Conclusions

Using administrative linked employer-employee data from Germany, this chapter has provided several new insights into the real wage growth and career patterns of full-time employed low-wage workers between 2001 and 2006.

First, there is a significant extent of upward and downward real wage mobility in the low-wage sector, as the number of low-wage workers experiencing real wage increases is only slightly higher than the number of low-wage workers experiencing real wage losses. However, even the worst-paid workers in the

low-wage sector, i.e., the workers who earned a wage below the 5th percentile, experienced a considerable extent of upward wage mobility: on average, their real wages increased by more than 23 % between 2001 and 2006. Since previous studies analysed only the probability of a low-wage worker crossing the low-wage threshold, this considerable extent of upward and downward wage mobility within the low-wage sector was previously not known.

Second, in line with previous studies, I find that only about 15 % of all low-wage workers managed to move up to higher-paid employment within three years. In addition, I go beyond the previous studies by analysing the careers of these workers after their upward move. I find that more than 60 % of these workers were still higher-paid two years later. This result shows that the upward wage mobility of low-wage workers is not a merely transitory phenomenon, but can lead to longer-lasting higher wage levels for low-wage workers.

Third, the multivariate analysis shows the relevance of individual, job and firm characteristics for the wage growth and the career advancement of low-wage workers. Notably, I find a highly significant positive marginal effect of the median daily wage in the establishment. This variable can be interpreted as a proxy for firm heterogeneity and has not been taken into account by previous studies. Therefore, the results point to the existence of firms in the low-wage sector that choose a "high road" strategy. Besides higher wage growth, such a strategy might also involve better prospects and career opportunities for low-wage workers.

For the US, studies have shown that employers indeed play an important role in the earnings and the employment outcomes of low-wage workers (see Holzer, 2005, for a discussion). Therefore, future researchers might be able to identify potential career firms for German low-wage workers by addressing the aspect of firm heterogeneity in the low-wage sector in more detail. In doing so, qualitative approaches should also be considered. As Lane (2009) points out, case studies might constitute a particularly helpful tool for understanding the relationship between employers and wage inequality.

2.7 Figure and tables to chapter 2

Table 2.1: Summary statistics of variables in the sample

	Observations	Mean	Std. Dev.
Full-time employed workers with low wage in 2000/01			
Individual characteristics			
Woman (1 = yes)	36,459	0.70	0.46
Foreigner (1 = yes)	36,456	0.10	0.31
Age 15–24 (1 = yes)	36,459	0.12	0.33
Age 25–34 (1 = yes)	36,459	0.25	0.43
Age 35–54 (1 = yes)	36,459	0.56	0.45
Age 55–58 (1 = yes)	36,459	0.06	0.24
School leaving certificate without vocational training (1 = yes)	36,459	0.18	0.39
School leaving certificate with vocational training (1 = yes)	36,459	0.58	0.49
High school certificate or university degree (1 = yes)	36,459	0.03	0.16
Education unknown (1 = yes)	36,459	0.21	0.41
Unskilled manual occupations (1 = yes)	36,459	0.19	0.39
Skilled manual occupations (1 = yes)	36,459	0.13	0.33
Unskilled service occupations (1 = yes)	36,459	0.22	0.42
Skilled service occupations (1 = yes)	36,459	0.12	0.33
Unskilled commercial and administrative occupations (1 = yes)	36,459	0.15	0.35
Skilled commercial and administrative occupations (1 = yes)	36,459	0.16	0.37
Semi-professions (1 = yes)	36,456	0.03	0.16
Occupation unknown (1 = yes)	36,459	0.01	0.09
Labour market experience 1992–2006, in years	34,580	10.90	3.21
... squared	34,580	129.16	65.52
Tenure 1992–2006, in years	34,580	5.21	5.01
... squared	34,580	52.15	70.96
Wage < 5th percentile in 2001 (1 = yes)	36,459	0.31	0.46
5th percentile < wage < 10th percentile in 2001 (1 = yes)	36,459	0.32	0.47
10th percentile < wage < 2/3 of the median wage in 2001 (1 = yes)	36,459	0.37	0.48
Change of establishment (1 = yes)	26,590	0.48	0.50
Establishment characteristics			
1–20 employees (1 = yes)	36,459	0.54	0.50
21–100 employees (1 = yes)	36,459	0.27	0.45
101–500 employees (1 = yes)	36,459	0.16	0.36
More than 500 employees (1 = yes)	36,459	0.04	0.19
Median age of the full-time workers	36,398	37.82	7.03
Percentage of women	36,459	59.08	31.45
Median daily wage of the full-time workers	36,398	53.32	18.98
Percentage of foreigners	36,459	9.37	18.10
Percentage of highly qualified workers	36,459	1.97	6.50
East Germany (1 = yes)	36,459	0.21	0.41
All full-time employed workers from 2000/01			
Difference between the log of 2/3 of the East (West) German median wage and the log of 2/3 of the median wage in the district	344,893	-0.13	0.112
Low-wage employed in 1999 (1 = yes)	344,961	0.10	0.30

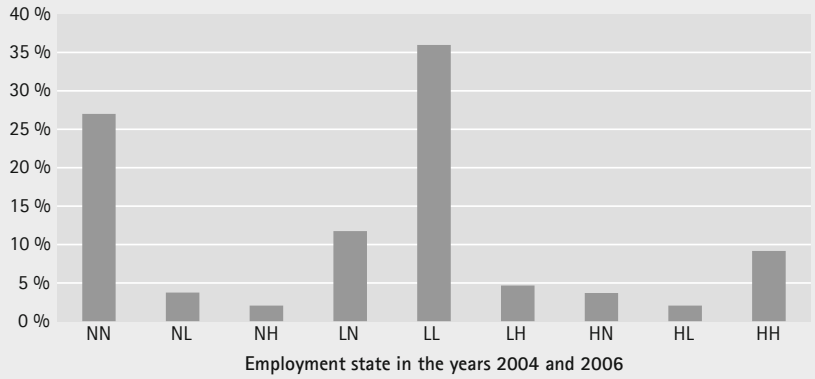
Notes: own calculations based on IEB and BHP. The individual and establishment-level characteristics are measured in 2001.

Table 2.2: Real daily wages and wage growth of the low-wage workers from 2000/01

	Mean wage in 2001	Δ wage (2001–2006)	N (N full-time employed in 2006)
Individual characteristics			
Women	42.7 €	7.7 %	25,346 (13,708)
Men	45.1 €	16.5 %	11,113 (6,228)
Germans	43.2 €	10.4 %	32,662 (18,158)
Foreigners	45.2 €	10.6 %	3,794 (1,778)
Secondary school certificate without vocational training	44.9 €	10.2 %	6,707 (3,612)
Secondary school certificate with vocational training	43.3 €	9.2 %	21,005 (11,800)
High school certificate or university degree	43.5 €	38.9 %	946 (495)
Education unknown	42.6 €	10.7 %	7,801 (4029)
Wage 2001 < 5th perc.	31.7 €	23.5 %	11,331 (5,306)
5th perc. < wage 2001 < 10th perc.	44.6 €	7.7 %	11,688 (6,335)
10th perc. < wage 2001 < 2/3 of the median wage	52.3 €	4.2 %	13,440 (8,295)
No change of establishment	44.5 €*	3.5 %	– (12,141)
Change of establishment	44.8 €*	21.2 %	– (7,795)
Establishment characteristics			
1–20 employees	41.7 €	10.6 %	19,495 (10,386)
21–100 employees	44.7 €	8.8 %	9,929 (5,654)
101–500 employees	46.4 €	10.4 %	5,679 (3,207)
More than 500 employees	47.0 €	21.8 %	1,356 (689)
West Germany	45.6 €	10.8 %	28,661 (15,609)
East Germany	35.4 €	9.1 %	7,798 (4,327)
Overall	43.4 €	10.4 %	36,459 (19,936)

Notes: own calculations based on IEB and BHP. * only workers included who were full-time employed in 2001 and 2006.

Figure 2.1: Career patterns of the low-wage workers from 2000/01 in 2004 and 2006 (percentages)



Legend: N: No longer employed full-time
L: Low wage (full-time)
H: Higher wage (full-time)

Example: LH = Low wage in 2004, Higher wage in 2006.

N = 36,459.

Note: own calculations based on IEB and BHP.

Table 2.3: Aggregated career patterns of the low-wage workers from 2000/01

	Low-paid or not full-time employed in 2004 (1)	Higher-paid in 2004; low-paid or not full-time employed in 2006 (2)	Higher-paid both in 2004 and in 2006 (3)
Individual characteristics			
Women	86.7 %	5.7 %	7.7 %
Men	81.5 %	5.9 %	12.7 %
Germans	85.0 %	5.7 %	9.3 %
Foreigners	86.1 %	6.0 %	7.9 %
Secondary school certificate without vocational training	87.1 %	4.6 %	8.4 %
Secondary school certificate with vocational training	84.3 %	6.1 %	9.6 %
High school certificate or university degree	78.0 %	6.7 %	15.3 %
Education unknown	86.5 %	5.6 %	7.9 %
Wage 2001 < 5th perc.	90.0 %	4.4 %	5.6 %
5th perc. < wage 2001 < 10th perc.	89.6 %	4.4 %	6.0 %
10th perc. < wage 2001 < 2/3 of the median wage	77.1 %	8.0 %	14.9 %
Establishment characteristics			
1–20 employees	85.7 %	5.9 %	8.4 %
21–100 employees	85.4 %	5.3 %	9.2 %
101–500 employees	83.7 %	5.5 %	10.8 %
More than 500 employees	79.7 %	7.3 %	13.0 %
West Germany	84.5 %	6.0 %	9.5 %
East Germany	87.3 %	4.9 %	7.9 %
Overall	85.1 %	5.7 %	9.2 %
Observations	31,030	2,091	3,338

Notes: own calculations based on IEB and BHP. The aggregated pattern (1) contains the career patterns „NN", „NL", „NH", „LN", „LL" and „LH"; (2) contains "HN" and "HL"; (3) contains "HH".

Table 2.4: Determinants of the real wage growth of the low-wage workers from 2000/01

	All workers	Women	Men
Individual characteristics			
Woman (1 = yes)	-0.084***	–	–
	(0.006)		
Foreigner (1 = yes)	-0.022***	3.8e-04	-0.041***
	(0.008)	(0.010)	(0.013)
Age 25–34 (1 = yes)	-0.040***	-0.039***	-0.032***
	(0.007)	(0.009)	(0.012)
Age 35–54 (1 = yes)	-0.091***	-0.084***	-0.084***
	(0.007)	(0.008)	(0.012)
Age 55–58 (1 = yes)	-0.095***	-0.094***	-0.084***
	(0.011)	(0.012)	(0.022)
School leaving certificate with vocational training (1 = yes)	0.001	-4.7e-04	0.009
	(0.005)	(0.006)	(0.009)
High school certificate or university degree (1 = yes)	0.089***	0.064***	0.108***
	(0.016)	(0.017)	(0.033)
Education unknown (1 = yes)	-0.005	-0.002	-0.011
	(0.006)	(0.007)	(0.010)
Unskilled manual occupations (1 = yes)	-0.033***	-0.032***	-0.069***
	(0.007)	(0.008)	(0.019)
Skilled manual occupations (1 = yes)	-0.035***	-0.039***	-0.068***
	(0.008)	(0.009)	(0.018)
Unskilled service occupations (1 = yes)	-0.061***	-0.059***	-0.089***
	(0.007)	(0.008)	(0.018)
Skilled service occupations (1 = yes)	-0.047***	-0.049***	-0.069**
	(0.009)	(0.010)	(0.035)
Unskilled commercial and administrative occupations (1 = yes)	-0.037***	-0.037***	-0.061***
	(0.007)	(0.008)	(0.023)
Semi-professions (1 = yes)	0.021	-0.003	0.113**
	(0.016)	(0.017)	(0.048)
Occupation unknown (1 = yes)	-0.048**	-0.048*	-0.077*
	(0.022)	(0.028)	(0.041)
Labour market experience 1992–2006, in years	0.011*	-0.004	0.031***
	(0.006)	(0.009)	(0.009)
... squared	-0.001*	1.4e-04	-0.001***
	(2.8e-04)	(3.8e-04)	(4.3e-04)
Tenure 1992–2006, in years	0.041***	0.034***	0.053***
	(0.003)	(0.003)	(0.004)
... squared	-0.002***	-0.002***	-0.003***
	(1.3e-04)	(1.7e-04)	(2.3e-04)
Wage < 5th percentile in 2001 (1 = yes)	0.147***	0.120***	0.221***
	(0.006)	(0.006)	(0.015)
5th percentile < wage < 10th percentile in 2001 (1 = yes)	0.041***	0.031***	0.063***
	(0.004)	(0.005)	(0.008)
Change of establishment (1 = yes)	0.162***	0.132***	0.204***
	(0.009)	(0.011)	(0.015)
Establishment characteristics			
21–100 employees (1 = yes)	-0.003	2.9e-04	-0.010
	(0.004)	(0.005)	(0.008)
101–500 employees (1 = yes)	0.016***	0.024***	-0.004
	(0.006)	(0.007)	(0.011)
More than 500 employees (1 = yes)	0.040***	0.061***	-0.003
	(0.012)	(0.014)	(0.021)
Median age of the full-time workers	-0.001***	-0.001***	-0.002***
	(3.0e-04)	(3.5e-04)	(0.001)
Percentage of women	-2.0e-05	-1.9e-04	3.1e-05
	(9.0e-05)	(1.2e-04)	(1.6e-04)

Table 2.4 (cont.): Determinants of the real wage growth of the low-wage workers from 2000/01

	All workers	Women	Men
Median daily wage of the full-time workers	0.002***	0.001***	0.005***
	(1.8e-04)	(1.9e-04)	(4.1e-04)
Percentage of foreigners	2.4e-04	2.1e-05	0.001**
	(1.5e-04)	(1.9e-04)	(2.3e-04)
Percentage of highly qualified workers	4.2e-04	3.5e-04	0.001
	(3.8e-04)	(4.1e-04)	(0.001)
East Germany (1 = yes)	0.062***	0.040***	0.104***
	(0.005)	(0.006)	(0.011)
Joint significance of dummy variable groups	Age***, level of education***, type of occupation***, wage level in 2001***, establishment size***, industry***	Age***, level of education**, type of occupation***, wage level in 2001***, establishment size***, industry***	Age***, level of education***, type of occupation***, wage level in 2001***, establishment size***, industry***
Observations	19,918	13,694	6,224
Selection equation			
Difference between the log of 2/3 of the East (West) German median wage and 2/3 of the log of the median wage in the district	0.007***	0.041***	0.001***
	(9.1e-04)	(0.005)	(2.8e-04)
ρ (correlation of the error terms)	0.846***	0.837***	0.868***
Significance of model	$\chi^2(48) =$ 3263.35***	$\chi^2(47) =$ 1732.93***	$\chi^2(47) =$ 1932.99***
Observations	344,766	116,077	228,689

Notes: own calculations based on IEB and BHP. Heckman sample selection models. Standard errors in parentheses (clustered at establishment level). 17 industry dummies suppressed in the table. Reference group of the dummy variable groups: age 15–24; secondary school certificate without vocational training; skilled commercial and administrative occupations; wage between the 10th percentile and 2/3 of the median wage; 1–20 employees. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; n.s. denotes statistical insignificance.

Table 2.5: Recoding of the ordered outcome variable y_{ord} into the dummy outcome variables of the related binary probit models with endogenous sample selection (y_{i1a} and y_{i1b})

Ordered dependent variable y_{ord}:	**"Low-paid or not full-time employed in 2004"** (1)	**"Higher-paid in 2004; low-paid or not full-time employed in 2006"** (2)	**"Higher-paid both in 2004 and in 2006"** (3)
Coded into			
Two related binary dependent variables:			
y_{i1a} =	0	1	
y_{i1b} =	0		1
Corresponding to the probability of a low-wage worker being ...	**"Low-paid in 2004 or no longer full-time employed in 2004"**	**"Higher-paid at least in 2004" (1) vs. (2) & (3)**	**"Higher-paid both in 2004 and 2006" (1) & (2) vs. (3)**

Notes: $y_{ord} = 1$ contains the career patterns "NN", "NL", "NH", "LN", "LL" and "LH"; $y_{ord} = 2$ contains "HN" and "HL"; $y_{ord} = 3$ contains "HH".

Table 2.6: Determinants of the career patterns of the low-wage workers from 2000/01

	Regression 1	Regression 2
Values of the binary outcome variable	y_{i1a}	y_{i1b}
	0 = "Low-paid or not full-time employed in 2004"	0 = "Low-paid or not full-time employed in 2004" or "Higher-paid in 2004; low-paid or not full-time employed in 2006"
	1 = "Higher-paid in 2004"	1 = "Higher-paid both in 2004 and in 2006"
Estimating the probability of a low-wage worker being ...	"Higher-paid at least in 2004"	"Higher-paid in 2004 and 2006"
Individual characteristics		
Woman (1 = yes)	-0.118***	-0.137***
	(0.010)	(0.011)
Foreigner (1 = yes)	0.026*	0.021
	(0.015)	(0.016)
Age 25–34 (1 = yes)	-0.065***	-0.081***
	(0.010)	(0.010)
Age 35–54 (1 = yes)	-0.159***	-0.169***
	(0.011)	(0.012)
Age 55–58 (1 = yes)	-0.229***	-0.232***
	(0.013)	(0.012)
School leaving certificate with vocational training (1 = yes)	0.014	-0.008
	(0.010)	(0.011)
High school certificate or university degree (1 = yes)	0.083***	0.084***
	(0.023)	(0.024)
Education unknown (1 = yes)	0.008	-0.006
	(0.011)	(0.012)
Unskilled manual occupations (1 = yes)	-0.077***	-0.077***
	(0.013)	(0.013)
Skilled manual occupations (1 = yes)	-0.077***	-0.084***
	(0.013)	(0.013)
Unskilled service occupations (1 = yes)	-0.094***	-0.105***
	(0.012)	(0.012)
Skilled service occupations (1 = yes)	-0.012	-0.056***
	(0.018)	(0.018)
Unskilled commercial and administrative occupations (1 = yes)	-0.051***	-0.069***
	(0.013)	(0.012)
Semi-professions (1 = yes)	0.002	-0.006
	(0.024)	(0.025)
Occupation unknown (1 = yes)	-0.095**	-0.096**
	(0.039)	(0.038)
Labour market experience 1992–2006, in years	0.134***	0.142***
	(0.007)	(0.008)
... squared	-0.005***	-0.005***
	(3.4e-04)	(3.4e-04)
Wage < 5th percentile in 2001 (1 = yes)	-0.135***	-0.112***
	(0.008)	(0.008)
5th percentile < wage < 10th percentile in 2001 (1 = yes)	-0.158***	-0.133***
	(0.007)	(0.007)

Table 2.6 (cont.): Determinants of the career patterns of the low-wage workers from 2000/01

	Regression 1	Regression 2
Values of the binary outcome variable	y_{i1a}	y_{i1b}
	0 = "Low-paid or not full-time employed in 2004"	0 = "Low-paid or not full-time employed in 2004" or "Higher-paid in 2004; low-paid or not full-time employed in 2006"
	1 = "Higher-paid in 2004"	1 = "Higher-paid both in 2004 and in 2006"
Estimating the probability of a low-wage worker being ...	"Higher-paid at least in 2004"	"Higher-paid in 2004 and 2006"
Establishment characteristics		
21–100 employees (1 = yes)	0.005	0.011
	(0.009)	(0.009)
101–500 employees (1 = yes)	0.027**	0.040***
	(0.011)	(0.011)
More than 500 employees (1 = yes)	0.059***	0.053**
	(0.020)	(0.021)
Median age of the full-time workers	-0.003***	-0.002***
	(0.001)	(0.001)
Percentage of women	-2.3e-04	-2.1e-04
	(1.6e-04)	(1.7e-04)
Median daily wage of the full-time workers	0.002***	0.002***
	(2.8e-04)	(3.0e-04)
Percentage of foreigners	-3.0e-04	-0.001**
	(2.7e-04)	(2.9e-04)
Percentage of highly qualified workers	-2.0e-04	-2.4e-04
	(0.001)	(0.001)
East Germany (1 = yes)	-0.001	0.004
	(0.010)	(0.011)
Joint significance of dummy variable groups	Age***, level of education**, type of occupation***, wage level in 2001***, establishment size*, industry***	Age***, level of education***, type of occupation***, wage level in 2001***, establishment size*, industry***
Observations	34,522	34,522
Selection equation		
Low-wage employed in 1999 (1 = yes)	0.144***	0.144***
	(0.004)	(0.004)
ρ (correlation of the error terms)	0.212***	0.220***
Significance of model	$\chi^2(45) = 1894.44$***	$\chi^2(45) = 1628.98$***
Observations	342,893	342,893

Notes: own calculations based on IEB and BHP. Generalised ordered probit model with endogenous sample selection estimated by two related probit regressions with endogenous sample selection; marginal effects. Standard errors in parentheses (clustered at establishment level). 17 industry dummies suppressed in the table. Reference group of the dummy variable groups: age 15–24; secondary school certificate without vocational training; skilled commercial and administrative occupations; wage between the 10th percentile and 2/3 of the median wage; 1–20 employees. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; n.s. denotes statistical insignificance.

3 Does it matter where you work? Employer characteristics and the wage growth of low-wage workers and higher-wage workers

3.1 Introduction

Wage inequality in Germany has been rising in recent decades, at both the top and bottom ends of the wage distribution (e.g., Dustmann et al., 2009), while wage mobility has been decreasing (e.g., Gernandt, 2009; Bayaz-Ozturk et al., 2011; Riphahn and Schnitzlein, 2011).[30] At the same time, the low-wage sector has grown considerably (Eichhorst et al., 2005; Kalina, 2008). In addition, concerns have been raised that there might have emerged a two-tier labour market in Europe that consists of "good" and well-paid jobs on the one hand and "bad" and low-paid jobs on the other hand (see, e.g., European Commission, 2001; Pouliakas and Theodossiou, 2010). Although these developments have led to a significant amount of research on low-wage work, several research gaps still exist.

For example, previous studies on low-wage work have shown that certain individual, job and firm characteristics are increasing the probability of low-wage workers escaping low pay. The fact that firm characteristics do play a significant role for the wage mobility of low-wage workers is important for two reasons. First, this information can help low-wage workers to move up on their own initiative by trying to find a job with an employer that offers them better chances for wage growth. Second, as suggested by Andersson et al. (2005) this information can provide a starting point for labour market policies aimed at increasing the wage mobility of low-wage workers, by improving their access to such firms, for example. However, due to a lack of data, previous studies have only been able to analyse a part of the considerable amount of firm heterogeneity that is associated with the wage growth of low-wage workers (Stephani, 2012).[31] Therefore, one aim of this chapter is to identify further characteristics of wage-growth firms for low-wage workers, i.e., firms that provide higher wage growth for these workers.

In addition, previous studies have focused exclusively on low-wage workers and have not compared their wage mobility to that of other workers (whom I will call higher-wage workers, for the sake of simplicity). This is surprising, given that it is not clear "[...] whether the distinction between low-wage employment and the rest of the economy is due to the level of pay simply being lower than elsewhere or a different functioning of the labor market" (Lucifora and Salverda,

30 See Riphahn and Schnitzlein (2011) for an overview of the literature on wage mobility in Germany and other developed countries.

31 Stephani (2012) is the study on which chapter 2 of this dissertation is based.

2009: p. 272). Therefore, after investigating possible characteristics of wage-growth firms for low-wage workers, this chapter also analyses whether the results are typical for low-wage workers, i.e., whether there are establishment characteristics that increase or decrease the wage growth of low-wage workers only and have no impact on the wage growth of higher-wage workers. In addition, this chapter investigates whether there are establishment characteristics that influence the wage growth of higher-wage workers only.

To answer these research questions, this chapter analyses the real wage growth of full-time employed workers between 2002 and 2007, using endogenous switching regression models and rich linked employer-employee data from Germany. The chapter adds to the literature in two ways. First, it shows that being employed in a large firm or a firm with a high export share or a low proportion of fixed-term co-workers increases the wage growth of low-wage workers. Second, it demonstrates that the establishment characteristics associated with individual wage growth differ between low-wage workers and higher-wage workers. The chapter is organised as follows. Section 3.2 gives a brief overview of the previous literature. Section 3.3 discusses the theoretical background. Section 3.4 describes the data. Section 3.5 and 3.6 present and discuss the empirical results. Section 3.7 concludes the chapter.

3.2 Literature review

Previous studies on the wage mobility of low-wage workers in Germany can be categorised roughly into a few groups, depending on their research objectives.[32] One group of studies provides evidence for the existence of state dependence in low wages and in unemployment (see, e.g., Uhlendorff, 2006; Mosthaf et al., 2009; Grün et al., 2011; Aretz and Gürtzgen, 2012; Knabe and Plum, 2013; Mosthaf, 2014). In addition, these studies find that this state dependence has increased over time. Nevertheless, especially for low-skilled workers, low-wage employment seems to be a stepping stone to higher-wage employment.

Another group of studies shows that male, younger and higher-skilled workers have comparatively better chances of escaping low wages, i.e., of crossing the low-wage threshold and reaching higher-paid employment. In addition, the chances of escaping low wages are also higher for workers in large firms and firms with low proportions of females or of low-wage workers (see, e.g., Schank et al., 2009; Mosthaf et al., 2011; Schnitzlein and Stephani, 2011). Gürtzgen and Heinze (2010)

32 There are also a number of studies on the mobility of low-wage workers in other countries, such as those by Stewart and Swaffield (1999), Stewart (2007) and Cappellari and Jenkins (2008a, 2008b) for the UK, Bolvig (2005) for Denmark, Blázquez Cuesta (2008) for Spain, Cappellari (2002, 2007) for Italy and Andersson et al. (2005) for the US. In addition, there are studies comparing the mobility of low-wage workers in several countries, such as those by the OECD (1996); Asplund et al. (1998); the European Commission (2004) and Clark and Kanellopoulos (2013).

find that collective bargaining coverage and the existence of a works council in the establishment positively impact on the probability of within-firm low-pay transitions in the West German manufacturing sector and service sector; however, this impact is different for women than for men.

Chapter 2 of this dissertation shows that there is a significant amount of upward and downward wage mobility in the low-wage sector. The majority of low-wage workers who were able to escape low wages were still higher-paid two years later. In addition, firm heterogeneity which is not captured by firm size, industry affiliation and the composition of the workforce in the firm is also important for the upward mobility of low-wage workers.

While the studies mentioned so far have analysed the wage mobility of low-wage workers exclusively, several studies have investigated various aspects of individual wage growth for all workers in Germany. For example, studies by Dustmann and Meghir (2005), Schönberg (2007) and Dustmann and Pereira (2008) measure the effects of tenure, sector-specific labour market experience, general labour market experience and job mobility on the wage growth of German workers.

Gernandt (2009) finds that university graduates, younger workers, white-collar workers and public sector employees are more likely to move up in the German wage distribution. In addition, he shows that wages are more volatile for low-wage workers and for workers who are moving downward in the wage distribution. Pavlopoulos et al. (2007) find that in Germany, workers in the lowest quartile of the wage distribution (categorised as low-paid workers) experience a greater amount of wage growth than workers in the highest quartile (categorised as high-paid workers). A voluntary change of employer results in wage growth for low-paid workers but not for high-paid workers.

In summary, previous studies have only investigated the impact of a few firm characteristics on the wage growth of low-wage workers. Furthermore, virtually none of these studies has analysed whether these firm characteristics also impact the wage growth of higher-wage workers. To the best of my knowledge, there are also no studies that analyse in detail the impact of firm characteristics on the wage growth of all workers in Germany. The following section presents a theoretical discussion of possible determinants of individual wage growth.

3.3 Theoretical background and hypotheses

According to human capital theory and job search theory, both the accumulation of human capital, via on-the-job learning and further training, and an improvement in job match quality should result in a higher individual wage (Cahuc and Zylberberg, 2004, chapters 2 and 3). In addition, the theories of segmented labour

markets state that the labour market can be divided roughly into a primary and a secondary segment (see, e.g., Taubman and Wachter, 1986; Reich, 2008). Jobs in the primary segment are well paid and offer good opportunities for further training and upward mobility, while jobs in the secondary segment are often low paid, offer unfavourable working conditions and a low degree of upward mobility (Schömann, 1994). Although the German labour market is complex, it is likely that compared to higher-wage workers, low-wage workers often work in jobs that have features of a "secondary" segment. The labour market theories presented in this paragraph yield several hypotheses about the wage growth of individual workers.

According to human capital theory, it is reasonable to expect that due to a lower growth of individual productivity, a higher probability of work interruptions and a higher unemployment risk, women, foreigners, low-skilled workers and older workers experience less individual wage growth than men, Germans, higher-skilled workers and younger workers. In addition, individual wages are expected to grow with labour market experience and tenure, at a decreasing rate (Topel, 1991). In contrast, the theories of segmented labour markets imply that labour market experience and tenure are associated with individual wage growth only for higher-wage workers.

Concerning the employer characteristics that are of key interest in the study at hand, the literature indicates that large establishments are more likely to have an internal labour market and to provide further training; in addition, collective agreements often imply wage increases based on pre-defined tenure profiles (Gürtzgen and Heinze, 2010; Siebert and Addison, 1991; Gerner and Stegmaier, 2009). Acemoglu and Pischke (1999) and Gerner and Stegmaier (2009) indicate that establishments with a low proportion of fixed-term workers might be more likely to offer further training to their workers because the probability that their workers will leave the establishment is smaller. However, if the internal labour market and further training are not accessible for low-wage workers, the establishment size, the coverage by a collective agreement and the proportion of fixed-term workers can be expected to influence the wage growth of higher-wage workers only.

Works councils in Germany are not supposed to bargain directly over wages; however, they are involved in the implementation of collective agreements and the negotiations on performance-related pay at the establishment level (Gürtzgen and Heinze, 2010). In addition, works councils increase the probability of firm-provided training (Gerlach and Jirjahn, 2001; Stegmaier, 2012). In principle, this should lead to higher individual wage growth in firms that have a works council. However, there is evidence that works council members in Germany are significantly older than their co-workers (Behrens, 2009) and that the incidence of low pay is especially high among young workers (Schnitzlein and Stephani,

2011). In addition, low-wage workers are often only loosely connected to the labour market and have a high unemployment risk (de Lathouwer and Marx, 2005). Assuming that there is a tendency for works councils to get involved in actions that are advantageous to their own peer group, a positive effect of works councils on individual wage growth might be especially pronounced for higher-wage workers, who often are older employees and employees with longer tenure.

Workers who are employed in establishments where the state of the technology is more current might have better chances for individual wage growth, due to the opportunity to accumulate human capital that is more up to date than the human capital that workers employed in establishments using outdated technology have the opportunity to accumulate. Grün et al. (2011) note that young establishments might be characterised by a high number of low-quality jobs that provide few or no possibilities for human capital accumulation. Brixy et al. (2007) show that newly founded firms do pay lower wages than incumbent firms in the first years after their foundation, although this wage differential vanishes after four years.

In addition, the chances for individual wage growth might also vary according to the composition of the workforce in the firm. For example, low-wage workers and higher-wage workers are likely to have increased wage growth due to knowledge spillover when working in an establishment with a high proportion of highly qualified co-workers. A high proportion of women, foreigners or low-wage workers in an establishment might be an indicator of workplace segregation or low-cost strategies in the firm, which also implies fewer possibilities for human capital accumulation and lower wage growth for low-wage workers (Bolvig, 2005; Mosthaf et al., 2011). In contrast, the proportion of women, foreigners and low-wage workers in the firm is not necessarily associated with the wage growth of *higher-wage workers*. For example, think of a company that offers low-skilled services, such as a cleaning company. Because the cleaning staff often consists of women, foreigners and low-wage workers, the proportions of these workers in the establishment are quite high. Nevertheless, one may expect that the wage growth of the higher-wage workers in the company (e.g., the managerial staff) is not lower than the wage growth of comparable higher-wage workers in establishments with smaller proportions of women, foreigners and low-wage workers.

Several authors argue that due to higher job-match quality, greater informal learning and higher returns to education, individual productivity and wages should be expected to grow more rapidly in densely populated areas (see Phimister et al., 2006, for an overview). Because exporting firms are more productive and pay higher wages than firms that operate only on the domestic market (Schank et al., 2007, 2010), one may expect the export share of a firm to also be positively associated with the wage growth of individual workers.

According to search theory, the probability that a new wage offer that a worker receives either from her current employer or from another employer will exceed her current wage declines with the level of her current wage (e.g., Fitzenberger and Garloff, 2007). This implies that low-wage workers are likely to have – ceteris paribus – higher wage growth than higher-wage workers. Accordingly, it is likely that the effect of any given explanatory variable on the individual wage growth of a worker is higher for low-wage workers than for higher-wage workers.

3.4 The data

I use the cross-sectional version of the Linked Employer-Employee Data Set LIAB of the German Institute for Employment Research (IAB) for the year 2002. The LIAB is compiled by matching the representative IAB Establishment Panel Survey with the personal information and employment histories of the employees of the surveyed establishment. The employee data stem from the labour administration and social security data processing of the Federal Employment Agency. By combining these data sources, the LIAB provides a rich and unique dataset for analysing both the demand side and the supply side of the German labour market. For more information on the LIAB, see Alda et al. (2005) and Jacobebbinghaus and Seth (2010).[33] To improve the quality of the linkage between the survey data and the administrative data, I adopt a procedure suggested by Jacobebbinghaus (2008: p. 53).

The dataset at hand provides individual, job and employer information, as well as the daily wage of a worker on 30 June 2002, together with her daily wage and employment state five years later (i.e., on 30 June 2007). This dataset enables me to analyse the wage growth of low-wage workers and higher-wage workers between 2002 and 2007. Because the data do not include precise information on the daily working time, accurate categorisation of part-time workers as low-wage workers or higher-wage workers is not possible. Therefore, I limit my analysis to full-time workers. Based on the literature, I classify a full-time worker as being low-paid (higher-paid) if she earns less (more) than the commonly accepted low-wage threshold of 2/3 of the median daily gross wage of all full-time employees. Because the LIAB is representative only at the establishment level, I compute the low-wage threshold separately for West Germany and East Germany, using a representative 2 % random sample from the Integrated Employment Biographies (IEB) of the IAB (see Jacobebbinghaus and Seth, 2007, and Dorner et al., 2010, for information on these data).

33 The analysis in chapter 5 of this dissertation is based on a cross-sectional version of the LIAB, too. See section 5.3 for a more detailed presentation of the LIAB cross-sectional data.

Individual wages in the LIAB are censored at the top due to legal requirements. The nominal value of the censoring threshold is set separately every year for West Germany and East Germany by the German government. To avoid biased results and time inconsistencies due to time-varying proportions of censored observations, I apply 'consistent top-coding', as suggested by Burkhauser et al. (2009) and by Riphahn and Schnitzlein (2011). First, I use the representative wage distribution computed from the IEB to determine the individual rank position in the German wage distribution in a given year for every full-time worker in the LIAB. I then delete those worker observations from the LIAB that correspond to wages among the top 15 % (10 %) in West (East) Germany in each year's wage distribution.

Because it stems from administrative sources, the information on individual workers in the LIAB can be regarded as highly reliable. Nevertheless, I exclude full-time workers who earn implausibly low hourly wages of less than 4 € (3.5 €) in West (East) Germany in 2006 prices.[34] Because this chapter focuses on the core groups of the labour market, I further limit the sample to workers who are liable to social security and I exclude workers younger than 20 and older than 59 years[35] in 2002, as well as trainees, working students and retired individuals. After these modifications, my sample covers 9,591 low-wage workers and 322,521 higher-wage workers. Table 3.1 presents summary statistics of the dataset.

3.5 Descriptive evidence

Table 3.2 presents the real wage levels and real wage growth of low-wage workers and higher-wage workers in the LIAB, disaggregated by selected individual and establishment characteristics.[36] The first column shows that in 2002, the low-wage workers in the dataset had a real daily wage of approximately 45 € on average and

34 This is equivalent to a monthly wage of about 645 € in West Germany (4 € × 37.5 h × 4.3 weeks) and 602 € in East Germany (3.5 € × 40 h × 4.3 weeks) and is affecting about 1 % of the full-time employed workers in the LIAB. I compute real wages by using the consumer price index of the German Federal Statistical Office, with 2006 = 100.

35 My results are robust towards varying the lower age threshold.

36 Note that due to the disproportionately stratified sampling procedure of the IAB Establishment Survey, the proportion of low-wage workers in this dataset is lower than the proportion of low-wage workers in the representative IEB sample. However, as there are no longitudinal weights in the LIAB which fit the research purpose of this chapter, I use the unweighted data. A robustness check using the cross-sectional weights indicates the weighted figure for the proportion of low-wage workers among all full-time workers in the LIAB was about 17.6 % in 2002, while the proportion of low-wage workers calculated from the representative IEB was 17.9 % in 2002. In addition, the weighted average of the real daily wages of the full-time workers in the LIAB in 2002 was about 43.9 € for low-wage workers and 88.4 € for higher-wage workers. These weighted figures are very close to the average real daily wages computed from the representative IEB: in that dataset, the average of the real daily wages in 2002 was 45.0 € for low-wage workers and 89.2 € for higher-wage workers. Therefore, I am confident that this LIAB sample can be used for a representative analysis of the German labour force: after correcting for the disproportionately stratified sampling procedure of the IAB Establishment Survey by including the stratification variables (establishment size, industry sector and federal state) in the regression analyses, one can expect the results to deliver an unbiased picture of the real wage growth of low-wage workers and higher-wage workers in Germany (see Winship and Radbill, 1994, for the validity of this correction).

that they experienced a real wage growth of approximately 11 % between 2002 and 2007. In addition, the figures suggest that low-wage workers have a higher relative real wage growth in certain establishments, e.g., in establishments that are covered by a collective agreement or that have a works council, establishments that use modern technology, establishments that export and establishments that are located in highly urbanised areas.

The figures in the second column of Table 3.2 show that higher-wage workers experienced a relative wage growth of approximately 4 % on average. They often have higher wage growth in the same types of establishments in which low-wage workers have higher wage growth. However, low-wage workers experience a large and positive amount of wage growth when changing employers, while higher-wage workers experience a slightly negative amount of wage growth in this case. Based on these descriptive results, the next section provides an econometric analysis to address the two research questions posed by this chapter.

3.6 Econometric analysis

3.6.1 The model

In analysing the determinants of the individual real wage growth of low-wage workers and higher-wage workers, one needs to take into account that the selection into the state of being a low-wage worker or a higher-wage worker may not be exogenous. Due to this initial conditions problem, the estimation of two separate linear wage growth regressions (one for low-wage workers and one for higher-wage workers) may lead to biased estimates. To take into account this potential endogeneity, I apply an endogenous switching regression model (see Maddala, 1983: pp. 223–224; and Lokshin and Sajaia, 2004, for a general exposition of this model).

The model can be described as follows: let s_i be a dummy variable that takes the value 0 if an individual who was employed full-time in 2002 and 2007 was a higher-wage worker in 2002 and 1 if the individual was a low-wage worker in 2002:

$$P(s_i = 0) = P(s_i^* = (z_i\gamma^* + \varepsilon_{i0}) > \kappa) = 1 - \Phi_0(z_i\gamma) \text{ (for a higher-wage worker)}, \quad (1)$$

$$P(s_i = 1) = P(s_i^* = (z_i\gamma^* + \varepsilon_{i0}) < \kappa) = \Phi_0(z_i\gamma) \text{ (for a low-wage worker)}; \quad (2)$$

s_i^* denotes the underlying latent variable and κ denotes the low-wage threshold. Φ_0 is the cumulative normal distribution, and z_i is a vector of variables that influence the selection of a worker into the state of being a higher-wage worker or a low-wage worker. This yields a probit selection equation.

The differences of the logarithms of the real daily wages of higher-wage workers and low-wage workers between 2007 and 2002 are given by

$$\Delta lnw_{i1} = x_i\beta_1 + \varepsilon_{i1} \text{ (for a higher-wage worker) and} \quad (3)$$

$$\Delta lnw_{i2} = x_i\beta_2 + \varepsilon_{i2} \text{ (for a low-wage worker),} \quad (4)$$

where x_i is a vector of variables that determine the real wage growth of a worker. I assume that ε_{i0}, ε_{i1}, and ε_{i2} follow a trivariate normal distribution with mean vector zero and a covariance matrix

$$\Omega = \begin{bmatrix} \sigma_0^2 & \sigma_{0,1} & \sigma_{0,2} \\ \sigma_{0,1} & \sigma_1^2 & \cdot \\ \sigma_{0,2} & \cdot & \sigma_2^2 \end{bmatrix}, \quad (5)$$

where σ_0^2 is the variance of the error term in the selection equation, σ_1^2 and σ_2^2 are the variances of the error terms in the wage growth equations (3) and (4), $\sigma_{0,1}$ is the covariance between ε_{i1} and ε_{i0} and $\sigma_{0,2}$ is the covariance between ε_{i2} and ε_{i0}. Because Δlnw_{i1} and Δlnw_{i2} are never observed simultaneously for a given worker, the covariance between ε_{i1} and ε_{i2} is not defined. Accordingly, the differences of the logarithms of the real daily wages of workers between 2007 and 2002 are

$$E(\Delta lnw_{i1} \mid s_i = 0) = x_i\beta_1 - \sigma_1\rho_1 \frac{\Phi_1(z_i\gamma^*/\sigma_{\varepsilon 0})}{1 - \Phi_0(z_i\gamma^*/\sigma_{\varepsilon 0})} \text{ (for a higher-wage worker) and} \quad (6)$$

$$E(\Delta lnw_{i2} \mid s_i = 1) = x_i\beta_2 + \sigma_2\rho_2 \frac{\Phi_1(z_i\gamma^*/\sigma_{\varepsilon 0})}{\Phi_0(z_i\gamma^*/\sigma_{\varepsilon 0})} \text{ (for a low-wage worker),} \quad (7)$$

where ρ_1 is the correlation coefficient between ε_{i0} and ε_{i1}, ρ_2 is the correlation coefficient between ε_{i0} and ε_{i2}, Φ_1 is the standard normal density function, and $\frac{\Phi_1(z_i\gamma^*/\sigma_{\varepsilon 0})}{1 - \Phi_0(z_i\gamma^*/\sigma_{\varepsilon 0})}$ and $\frac{\Phi_1(z_i\gamma^*/\sigma_{\varepsilon 0})}{\Phi_0(z_i\gamma^*/\sigma_{\varepsilon 0})}$ are the inverse Mills Ratios for a higher-wage worker and a low-wage worker, respectively.

Based on the theoretical considerations presented in section 3.3, z_i and x_i contain a number of individual, job and establishment characteristics. Both z_i and x_i contain dummy variables describing the gender, age, level of education, citizenship and occupational group of a worker, as well as variables describing establishment size, the industry affiliation, the proportion of highly qualified workers in the establishment, the proportion of women, the proportion of foreigners, the proportion of low-wage workers and the median age of the workforce. In addition, variables are also included in order to analyse the impact of a number of potential establishment-level determinants of individual wage

growth that have not been investigated in previous studies. These are the coverage by a sector-level collective agreement or a firm-level collective agreement, the existence of a works council in the establishment, the state of the technology that is used in the establishment, the establishment age, the degree of urbanisation at the location of the establishment (calculated according to the BIK classification; see Arbeitsgruppe Regionale Standards, 2005: pp. 54–60), the export share of the establishment, the proportion of fixed-term workers and the German federal state. All explanatory variables mentioned so far were measured in the starting year 2002 and are held fixed during the estimations.

In addition, there are some variables that are included in x_i only. These are four variables describing a worker's individual labour market experience[37] and tenure between 1993 and 2007, in linear and squared form, and one dummy control variable indicating whether a worker changed establishments between 2002 and 2007. As an exclusion restriction, z_i contains a dummy variable that indicates whether a worker was low-wage employed in 1998. I expect the latter variable to have a positive impact on whether the worker was a low-wage worker in 2002. Due to the temporal distance of four years to the starting period, I do not expect this variable to influence the amount of real wage growth of low-wage workers and higher-wage workers between 2002 and 2007.[38] The model is estimated in Stata, using the maximum likelihood estimator for the endogenous switching regression model by Lokshin and Sajaia (2004).

3.6.2 Estimation results

Table 3.3 presents the average marginal effects on the differences between the logarithms of the real daily wages of low-wage workers and higher-wage workers between 2002 and 2007. The discussion of the estimation results is split into two parts, reflecting the two research objectives of this chapter. First, I aim to identify further characteristics of firms that provide higher wage growth for low-wage workers. Second, I investigate whether these results are typical for low-wage workers or not, i.e., whether there are firm-level determinants that influence

37 Due to lack of data, empirical studies often use the age of an individual together with years of schooling as a proxy for her amount of labour market experience. In doing so, these studies might report biased results since they do not take into account possible voluntary or involuntary work interruptions of individuals. Such work interruptions can occur, e.g., due to unemployment periods, childcare or elderly care needs, or sabbaticals. Therefore, the age of an individual together with years of schooling is not necessarily a good proxy for her amount of labour market experience. Due to the comparatively high unemployment risk of low-wage workers, this is especially relevant when analysing the wage growth of low-wage workers and higher-wage workers.

38 Other studies on the wage mobility of low-wage workers, such as the one by Stewart and Swaffield (1999), use socio-economic information about the parents as exclusion restrictions. However, such information is not available in this dataset.

the wage growth of low-wage workers but not the wage growth of higher-wage workers and vice versa.

Consistent with the results of previous studies, the results in the left column of Table 3.3 show that the wage growth of low-wage workers is positively associated with being employed in large establishments and negatively associated with the proportion of women and low-paid workers in the establishment. Compared to the reference group of low-wage workers in small establishments with up to 19 employees, low-wage workers in large establishments with more than 499 employees experience wage growth that is more than 5 % higher. A proportion of low-paid workers in the establishment that is higher by 10 % is associated with a lower wage growth of approximately 1 %.

Turning to the establishment characteristics that have not been investigated in previous studies, the results show that low-wage workers who are employed in establishments that are covered by a sector-level collective agreement or in establishments that have a works council have a real wage growth that is approximately 2 % higher; however, these effects are only significant at the 10 %-level. Furthermore, an export share that is higher by 10 % is associated with a higher individual wage growth for low-wage workers of approximately 1 %. Obviously, the fact that exporting firms are usually more productive and pay better than non-exporting firms also translates into higher upward wage mobility for their low-paid employees. Compared to workers employed in less densely urbanised areas, workers in highly urbanised areas have a higher wage growth by approximately 2 %. In contrast, certain potential determinants such as the state of technology or the establishment age are not found to influence the wage growth of low-wage workers.

To control for differences between the employment trajectories of women and men that are not captured by the gender dummy variable integrated in the previous analysis, the results of separate estimations for low-paid women and low-paid men are presented in column 1 and column 3 of Table 3.4. The results of these separate estimations qualitatively confirm several of the results from the previous analysis. For example, this is the case for the effects of the proportion of low-paid workers, the proportion of women and the export share. However, the effect of the coverage by a sector-level agreement is statistically significant only for low-paid women, while the effect of a works council is significant only for low-paid men. In addition, the proportion of fixed-term workers is negatively associated with the wage growth of low-paid women, while the proportion of highly qualified co-workers is positively associated with the wage growth of low-paid men.

Compared to the reference group of low-paid women in small establishments with up to 19 employees, low-paid women in medium-sized establishments with 20–499 employees have a significantly lower amount of individual wage growth.

In contrast, no significant difference between the wage growth of the reference group and the group of low-paid women in large establishments with more than 499 employees can be found. This suggests that small establishments and large establishments do not differ in the extent of upward wage mobility that they provide for low-paid women.[39]

Although quite a few years have passed since German reunification, pronounced differences between West Germany and East Germany still exist, with respect to labour market performance and the relevance of industrial relations, for example (Görzig et al., 2004; Jung and Schnabel, 2011). To see whether these differences might influence the results, I further disaggregate the sample into West Germany and East Germany. Most of the results of the previous models are qualitatively confirmed after this disaggregation (see columns 1, 3, 5 and 7 of Table 3.5). However, the effects of the variables describing industrial relations are not statistically significant at conventional levels here. In addition, only low-paid women in West Germany have a lower wage growth in medium-sized establishments.

In summary, after controlling for a number of potential determinants of individual wage growth, a high export share seems to be a characteristic of wage-growth firms for low-wage workers. In contrast, a high proportion of fixed-term co-workers seems to be a characteristic of firms that provide lower wage growth for female low-wage workers. In addition, there is also weak evidence that the state of industrial relations and the degree of urbanisation are positively associated with the wage growth of low-wage workers. However, the latter results are not robust to splitting of the sample by gender and by West Germany versus East Germany. To see whether the results that have been presented so far are typical for low-wage workers or whether they apply to higher-wage workers as well, I now compare the results for low-wage workers with the results for higher-wage workers that are presented in Tables 3.3, 3.4 and 3.5, too.

In comparing the results for low-wage workers and higher-wage workers in column 1 and column 2 of Table 3.3, one can see that certain firm variables affect the wage growth of both low-wage workers and higher-wage workers: just as for low-wage workers, for higher-wage workers, the coverage by a sector-level collective agreement and the existence of a works council in the establishment increase individual wage growth, while the proportion of low-paid co-workers decreases individual wage growth. The latter result shows that low-cost strategies

39 Interestingly, in chapter 2 of this dissertation I find that firm size is positively related to the wage growth of both female and male low-wage workers. However, the analysis in chapter 3 is controlling for a considerably larger number of establishment characteristics and is not restricting the sample to individuals who were low-paid in two consecutive years. In addition, it is important to bear in mind that the individual employment trajectories of women are more heterogeneous than those of men. Taken together, these aspects may be responsible for the differing results concerning the impact of firm size on the wage growth of low-paid women.

of employers that are often characterised by employing a high proportion of low-wage workers dampen the wage growth of all of their employees. While for low-wage workers, changing establishments is associated with an individual wage growth that is approximately 17% *higher*, for higher-wage workers, changing establishments is associated with an individual wage growth that is approximately 4% *lower*. Of course, these results must be interpreted with caution, due to the possible endogeneity of workers changing employers.[40]

In contrast, there are several establishment characteristics that are associated with higher wage growth for low-wage workers but not for higher-wage workers. These are the establishment size, the export share and the degree of urbanisation at the location of the establishment. The reason for this might be that firms provide higher-wage workers with career prospects and further training irrespective of their size, exporting activity or geographical location.

In addition, certain establishment characteristics, such as the state of the technology used in the establishment and the establishment age, increase the wage growth of higher-wage workers only. Higher-wage workers who are employed in an establishment that is using modern technology instead of outdated technology have an individual wage growth that is approximately 2% higher, while higher-wage workers in incumbent establishments that are older than four years have an individual wage growth that is approximately 3% higher. The fact that the effects of these variables are not relevant for low-wage workers suggests a certain degree of segmentation of the German labour market.

Most of the results of this aggregate analysis are qualitatively confirmed in separate analyses by gender (see Table 3.4) and in separate analyses by gender and by West Germany versus East Germany (see Table 3.5).[41] Table 3.6 in the Appendix provides an overview of the most interesting results of the aggregated analysis,

40 Note that only 7% of the low-wage workers and 4% of the higher-wage workers in the LIAB changed establishments between the years 2002 and 2007. Therefore, holding the establishment characteristics fixed at the level of 2002 and at the same time controlling for possible establishment changes of workers ensures that the estimation results for the establishment variables are not confounded by variations of the establishment characteristics between 2002 and 2007.

41 Since I analyse the wage growth of employed individuals between two points in time, I need to restrict the sample to workers who had positive earnings both in the starting year and in the ending year; this procedure is standard in the analysis of wage growth (see, e.g., Riphahn and Schnitzlein, 2011). However, compared to higher-wage workers, low-wage workers have a higher risk of becoming unemployed and therefore dropping out of the sample. To assess whether this risk biases the results, I estimate two separate Heckman selection models for the wage growth of low-wage workers and higher-wage workers. The selection equation of the model for the wage growth of low-wage workers (higher-wage workers) also incorporates full-time low-wage workers (higher-wage workers) from 2002 who were no longer employed full-time in 2007. By doing so, I control for a possible bias due to differences between the unemployment risk of low-wage workers and that of higher-wage workers. I find that most results are qualitatively robust to non-random selection of full-time workers from 2002 into the group of full-time workers in 2007. However, for low-paid women, the effect of the proportion of fixed-term co-workers, and for higher-paid men, the effect of the share of low-paid co-workers, exhibit p-values of 11.5% and 18.3%, respectively, and are therefore not statistically significant at conventional levels.

while Table 3.7 and Table 3.8 in the Appendix give an overview of the most interesting results of the separate analyses by gender and by West Germany versus East Germany. Overall, the results summarized in this section suggest that firms that provide higher wage growth for low-wage workers differ from firms that provide higher wage growth for higher-wage workers in certain respects. This indicates that there indeed are *typical* wage growth firms for low-wage workers.

3.7 Conclusions

Using the German Linked Employer-Employee Data Set of the IAB (LIAB), this chapter contributes to the existing body of knowledge on the wage mobility of low-wage workers and higher-wage workers in several ways. First, I investigate the impact of a number of potential establishment-level determinants on the wage growth of low-wage workers that have not been analysed before. I find that large firms and firms with high export shares or low proportions of fixed-term workers are typical wage-growth firms for low-wage workers, while several other potential establishment-level determinants cannot explain their wage growth.

Second, I find that the wage growth of all employees in a firm is dampened by a high proportion of low-paid co-workers. While the impact of this variable on the wage growth of low-wage workers has been detected in previous studies, its impact on the wage growth of higher-wage workers was unknown to date. Obviously, there are employers that pursue a "low-road" or a low-cost strategy that dampens the upward wage mobility of all of their employees.

Third, certain establishments, such as establishments that use modern technology or incumbent establishments that are older than four years provide higher wage growth only for higher-wage workers, not for low-wage workers. This result points to a certain degree of segmentation of the German labour market.

In summary, the evidence presented in this chapter suggests that it may be necessary to investigate firm heterogeneity in more detail to identify further characteristics of typical wage-growth firms for low-wage workers. For example, there might be specific personnel policies that help low-wage workers to move up that are not captured by the (rather generic) establishment variables that are available in large-scale establishment surveys such as the one used in this study. As suggested by previous studies (e.g., Lane, 2009; Stephani, 2012), case studies might be helpful in this context.

In addition, this chapter shows that one cannot apply the existing theoretical and empirical knowledge about the factors that influence the wage growth of individual workers to the wage growth of individual *low-wage* workers. On the one hand, this insight may be helpful to policy makers because it makes clear that

any policy measure aimed at increasing the wage growth of low-wage workers needs to be specifically tailored to them. On the other hand, this insight suggests that the current understanding of the wage mobility of individual workers might be extended considerably by analysing this mobility at different quantiles of the wage distribution rather than only at the mean. In light of important labour market trends, such as polarisation and rising wage inequality (see, e.g., Antonczyk et al., 2010a), this may be a promising area for future research.

3.8 Tables to chapter 3

Table 3.1: Summary statistics of variables in the sample

	Low-wage workers			Higher-wage workers		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Individual characteristics						
Real daily wage in 2002	9,591	44.97	9.38	322,521	95.50	19.96
Real wage growth 2002–2007 (in %)	9,591	0.11	0.38	322,521	0.03	0.13
Woman (1 = yes)	9,591	0.71	0.46	322,521	0.25	0.43
Foreigner (1 = yes)	9,591	0.07	0.25	322,521	0.08	0.27
20–24 years (1 = yes)	9,591	0.10	0.31	322,521	0.05	0.22
25–34 years (1 = yes)	9,591	0.21	0.41	322,521	0.24	0.43
35–54 years (1 = yes)	9,591	0.65	0.48	322,521	0.69	0.46
55–59 years (1 = yes)	9,591	0.03	0.18	322,521	0.03	0.16
Secondary school certificate without voc. training (1 = yes)	9,591	0.22	0.41	322,521	0.15	0.36
Secondary school certificate with voc. training (1 = yes)	9,591	0.63	0.48	322,521	0.75	0.44
High school certificate (1 = yes)	9,591	0.02	0.16	322,521	0.04	0.19
University degree (1 = yes)	9,591	0.01	0.10	322,521	0.04	0.19
Education unknown (1 = yes)	9,591	0.12	0.32	322,521	0.03	0.17
Agricultural occ. (1 = yes)	9,591	0.04	0.20	322,521	0.01	0.09
Unskilled manual occ. (1 = yes)	9,591	0.33	0.47	322,521	0.33	0.47
Skilled manual occ. (1 = yes)	9,591	0.11	0.31	322,521	0.23	0.42
Unskilled comm. and administr. occ. (1 = yes)	9,591	0.09	0.28	322,521	0.03	0.16
Skilled comm. and administr. occ. (1 = yes)	9,591	0.15	0.36	322,521	0.14	0.35
Unskilled services (1 = yes)	9,591	0.16	0.37	322,521	0.10	0.30
Skilled services (1 = yes)	9,591	0.05	0.22	322,521	0.03	0.17
Semiprofessions (1 = yes)	9,591	0.03	0.18	322,521	0.05	0.23
Technicians/engineers/professions/ managers (1 = yes)	9,591	0.04	0.19	322,521	0.07	0.26
Tenure 1993–2007, in years	9,591	9.53	4.17	322,521	11.98	3.58
... squared	9,591	108.10	74.36	322,521	156.36	72.14
Experience 1993–2007, in years	9,591	12.00	2.86	322,521	13.92	1.81
... squared	9,591	152.20	61.98	322,521	196.93	42.68
Change of estab. 2002–2007 (1 = yes)	9,591	0.07	0.25	322,521	0.04	0.19
Low-paid in 1998 (1 = yes)	9,591	0.14	0.35	322,521	0.003	0.06

Table 3.1 (cont.): Summary statistics of variables in the sample

	Low-wage workers			Higher-wage workers		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Establishment characteristics						
1–19 employees (1 = yes)	9,591	0.13	0.34	322,521	0.01	0.12
20–99 employees (1 = yes)	9,591	0.31	0.46	322,521	0.08	0.27
100–499 employees (1 = yes)	9,591	0.40	0.49	322,521	0.28	0.45
More than 499 employees (1 = yes)	9,591	0.17	0.37	322,521	0.63	0.48
Proportion of highly qualified workers	9,591	4.71	8.00	322,521	10.08	10.11
Proportion of women	9,591	50.76	25.47	322,521	28.72	24.06
Proportion of foreigners	9,591	6.00	10.47	322,521	7.13	8.34
Median age of the workforce	9,591	39.80	5.06	322,521	40.56	3.27
Proportion of low-paid workers	9,591	38.32	29.47	322,521	1.89	6.51
Sector-level collective agreement (1 = yes)	9,591	0.39	0.49	322,521	0.69	0.46
Firm-level collective agreement (1 = yes)	9,591	0.10	0.30	322,521	0.20	0.40
Works council (1 = yes)	9,591	0.45	0.50	322,521	0.92	0.28
Modern technology in use (1 = yes)	9,591	0.74	0.44	322,521	0.68	0.46
Proportion of fixed-term workers	9,591	6.29	14.14	322,521	4.30	7.68
Estab. older than 4 years (1 = yes)	9,591	0.95	0.21	322,521	0.97	0.18
Export share	9,591	11.75	19.80	322,521	28.93	29.47
Highly urbanised area (1 = yes)	9,591	0.37	0.48	322,521	0.60	0.49
East Germany (1 = yes)	9,591	0.39	0.49	322,521	0.25	0.43

Note: own calculations based on LIAB.

Table 3.2: Real daily wages and wage growth of the low-wage workers and higher-wage workers in the sample

	Low-wage workers		Higher-wage workers	
	Mean wage in 2002	Δ wage (2002–2007)	Mean wage in 2002	Δ wage (2002–2007)
Individual characteristics				
Women	44.4 €	8.2 %	88.4 €	2.6 %
Men	46.3 €	17.3 %	97.8 €	3.8 %
Germans	44.6 €	10.7 %	95.3 €	3.4 %
Foreigners	50.4 €	12.7 %	98.2 €	4.0 %
No change of establishment	45.0 €	9.0 %	95.6 €	3.6 %
Change of establishment	45.0 €	36.8 %	92.5 €	-0.4 %
Establishment characteristics				
1–19 employees	41.6 €	3.7 %	76.3 €	-1.3 %
20–99 employees	43.3 €	5.2 %	81.6 €	0.6 %
100–499 employees	46.6 €	8.8 %	88.4 €	2.5 %
More than 499 employees	47.0 €	31.7 %	100.8 €	4.4 %
No collective agreement	43.3 €	6.1 %	80.6 €	1.6 %
Sector-level collective agreement	47.0 €	16.3 %	96.2 €	3.9 %
Firm-level collective agreement	45.7 €	13.8 %	101.0 €	3.0 %
No works council	43.3 €	4.9 %	78.7 €	-0.1 %
Works council	47.1 €	18.3 %	97.0 €	3.8 %
No modern technology in use	44.5 €	8.4 %	98.9 €	1.4 %
Modern technology in use	45.1 €	11.7 %	93.9 €	4.4 %
Establishment age 0–4 years	44.4 €	10.4 %	90.8 €	0.6 %
Establishment older than 4 years	45.0 €	10.9 %	95.7 €	3.6 %
No exporter	43.3 €	6.5 %	88.6 €	1.5 %
Exporter	47.1 €	16.5 %	98.5 €	4.4 %
Not highly urbanised area	44.9 €	8.8 %	89.4 €	3.9 %
Highly urbanised area	45.1 €	14.3 %	99.5 €	3.2 %
West Germany	49.3 €	13.6 %	101.0 €	3.8 %
East Germany	38.2 €	6.6 %	78.9 €	2.5 %
Overall	45.0 €	11.1 %	95.5 €	3.5 %

Note: own calculations based on LIAB.

Table 3.3: Determinants of the real wage growth of low-wage workers and higher-wage workers

	Low-wage workers	Higher-wage workers
	(1)	(2)
Individual characteristics		
Woman (1 = yes)	-0.045***	-0.011***
	(0.009)	(0.002)
Foreigner (1 = yes)	0.004	-0.001
	(0.013)	(0.001)
25–34 years (1 = yes)	-0.032***	-0.048***
	(0.011)	(0.004)
35–54 years (1 = yes)	-0.083***	-0.080***
	(0.010)	(0.005)
55–59 years (1 = yes)	-0.118***	-0.096***
	(0.015)	(0.005)
Secondary school certificate without	-0.010	0.003
voc. training (1 = yes)	(0.010)	(0.002)
High school certificate (1 = yes)	0.105***	0.018***
	(0.026)	(0.003)
University degree (1 = yes)	0.051	-0.006**
	(0.033)	(0.003)
Education unknown (1 = yes)	-0.015	-0.007
	(0.012)	(0.006)
Agricultural occ. (1 = yes)	2.8e-04	-0.008
	(0.020)	(0.006)
Skilled manual occ. (1 = yes)	-0.019	0.004
	(0.017)	(0.003)
Unskilled comm. and administr. occ. (1 = yes)	-0.016	0.013**
	(0.014)	(0.005)
Skilled comm. and administr. occ. (1 = yes)	0.014	0.029***
	(0.013)	(0.003)
Unskilled services (1 = yes)	-0.051***	-0.004
	(0.013)	(0.003)
Skilled services (1 = yes)	-0.021	0.012*
	(0.022)	(0.007)
Semiprofessions (1 = yes)	0.031	0.015***
	(0.028)	(0.004)
Technicians/engineers/professions/managers	0.039*	0.021***
(1 = yes)	(0.022)	(0.003)
Tenure 1993–2007, in years	0.009**	0.019***
	(0.004)	(0.004)
... squared	-4.4e-04**	-0.001***
	(2.0e-04)	(1.8e-04)
Experience 1993–2007, in years	0.014	-0.010**
	(0.011)	(0.004)
... squared	-0.001	4.3e-04**
	(0.001)	(1.9e-04)
Change of establishment 2002–2007 (1 = yes)	0.174***	-0.038***
	(0.022)	(0.009)
Establishment characteristics		
20–99 employees (1 = yes)	-0.009	-4.0e-05
	(0.009)	(0.004)
100–499 employees (1 = yes)	-0.017	0.004
	(0.012)	(0.006)
More than 499 employees (1 = yes)	0.054**	0.009
	(0.022)	(0.007)

Table 3.3 (cont.): Determinants of the real wage growth of low-wage workers and higher-wage workers

	Low-wage workers	Higher-wage workers
	(1)	(2)
Proportion of highly qualified workers	0.001	0.001***
	(0.001)	(2.5e-04)
Proportion of women	-0.001***	-1.0e-04
	(2.1e-04)	(1.3e-04)
Proportion of foreigners	-7.3e-06	-0.001
	(0.001)	(3.8e-04)
Median age of the workforce	-0.002**	4.7e-04
	(0.001)	(0.001)
Proportion of low-paid workers	-0.001***	-0.001***
	(1.9e-04)	(1.7e-04)
Sector-level collective agreement (1 = yes)	0.020*	0.012**
	(0.011)	(0.005)
Firm-level collective agreement (1 = yes)	0.024	0.008
	(0.017)	(0.009)
Works council (1 = yes)	0.021*	0.016***
	(0.012)	(0.005)
Modern technology in use (1 = yes)	0.007	0.019***
	(0.009)	(0.006)
Proportion of fixed-term workers	-3.8e-04	2.1e-05
	(3.4e-04)	(1.9e-04)
Establishment older than 4 years (1 = yes)	-0.013	0.027**
	(0.014)	(0.010)
Export share	0.001***	1.3e-04
	(3.6e-04)	(1.2e-04)
Highly urbanised area (1 = yes)	0.021**	-0.007
	(0.010)	(0.005)
Joint significance of dummy variable groups	Age***, level of education***, occupational group***, estab. size***, industry***, fed. state n.s.	Age***, level of education***, occupational group***, estab. size n.s., industry***, fed. state***
Observations	9,591	322,521
Selection equation		
Low-paid in 1998 (1 = yes), effect on the probability of being low-paid in 2002	0.035*** (0.002)	
Correlation coefficient ρ_1	–	-0.006
Correlation coefficient ρ_2	0.194***	–
Significance of the model	$\chi^2(72) = 3443.99$***	
Wald Test for the independence of all three equations	$\chi^2(2) = 60.92$***	
Observations	332,112	

Notes: own calculations based on LIAB. Endogenous switching regression model, conditional average marginal effects. Standard errors in parentheses (clustered at establishment level). 20 industry dummies and 16 federal state dummies suppressed in the table. Reference category of the dummy variable groups: age 20–24; secondary school certificate with vocational training; unskilled manual occupations; 1–19 employees; not covered by a collective agreement. Significance levels: * $p<0.1$; ** $p<0.05$; *** $p<0.01$; n.s. denotes statistical insignificance.

Table 3.4: Determinants of the real wage growth of low-wage workers and higher-wage workers, separate estimations by gender

	Women		Men	
	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers
	(1)	(2)	(3)	(4)
Individual characteristics				
Foreigner (1 = yes)	0.006	-0.005*	0.001	-1.8e-04
	(0.014)	(0.003)	(0.023)	(0.001)
25–34 years (1 = yes)	-0.002	-0.066***	-0.060***	-0.042***
	(0.013)	(0.007)	(0.017)	(0.004)
35–54 years (1 = yes)	-0.053***	-0.093***	-0.108***	-0.074***
	(0.012)	(0.007)	(0.016)	(0.005)
55–59 years (1 = yes)	-0.091***	-0.105***	-0.141***	-0.091***
	(0.016)	(0.007)	(0.027)	(0.005)
Secondary school certificate	0.001	0.003	-0.030**	0.003
without voc. training (1 = yes)	(0.012)	(0.003)	(0.015)	(0.002)
High school certificate (1 = yes)	0.075***	0.016***	0.143**	0.019***
	(0.024)	(0.003)	(0.065)	(0.003)
University degree (1 = yes)	0.094***	-0.005	-0.101	-0.007*
	(0.036)	(0.003)	(0.092)	(0.004)
Education unknown (1 = yes)	-0.007	-0.001	-0.008	-0.009
	(0.012)	(0.006)	(0.018)	(0.007)
Agricultural occ. (1 = yes)	0.005	-0.019*	0.007	-0.004
	(0.025)	(0.010)	(0.027)	(0.005)
Skilled manual occ. (1 = yes)	-0.025	-0.005	-0.023	0.005*
	(0.019)	(0.005)	(0.021)	(0.003)
Unskilled comm. and	-0.023	0.015**	-0.016	-0.001
administr. occ. (1 = yes)	(0.015)	(0.007)	(0.028)	(0.007)
Skilled comm. and administr.	0.011	0.026***	0.073**	0.030***
occ. (1 = yes)	(0.013)	(0.006)	(0.031)	(0.003)
Unskilled services (1 = yes)	-0.048***	0.002	-0.050***	-0.005**
	(0.015)	(0.005)	(0.018)	(0.003)
Skilled services (1 = yes)	-0.014	0.005	-0.060	0.015
	(0.024)	(0.006)	(0.038)	(0.010)
Semiprofessions (1 = yes)	0.026	0.011*	0.059	0.014***
	(0.027)	(0.006)	(0.126)	(0.005)
Technicians/engineers/professions/managers	0.019	0.017***	0.099***	0.021***
(1 = yes)	(0.023)	(0.006)	(0.038)	(0.003)
Tenure 1993–2007, in years	0.003	0.018***	0.015***	0.020***
	(0.005)	(0.002)	(0.004)	(0.004)
... squared	-1.5e-04	-0.001***	-0.001**	-0.001***
	(2.6e-04)	(1.1e-04)	(2.7e-04)	(2.2e-04)
Experience 1993–2007, in years	0.039**	0.007	-0.021*	-0.016***
	(0.017)	(0.009)	(0.012)	(0.005)
... squared	-0.002**	-2.7e-04	0.001*	0.001***
	(0.001)	(3.5e-04)	(0.001)	(7.0e-04)
Change of establishment 2002–2007 (1 = yes)	0.138***	-0.017	0.178***	-0.048***
	(0.030)	(0.012)	(0.026)	(0.010)
Establishment characteristics				
20–99 employees (1 = yes)	-0.023**	-0.001	0.026	0.001
	(0.011)	(0.008)	(0.017)	(0.005)
100–499 employees (1 = yes)	-0.031**	0.005	0.021	0.005
	(0.014)	(0.008)	(0.020)	(0.006)
More than 499 employees (1 = yes)	0.021	0.010	0.162***	0.009
	(0.021)	(0.009)	(0.043)	(0.008)

Table 3.4 (cont.): Determinants of the real wage growth of low-wage workers and higher-wage workers, separate estimations by gender

	Women		Men	
	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers
	(1)	(2)	(3)	(4)
Proportion of highly qualified workers	7.7e-05	0.001***	0.003**	0.001***
	(0.001)	(1.7e-04)	(0.001)	(3.4e-04)
Proportion of women	-0.001***	-2.0e-04	-0.002***	-9.5e-05
	(2.5e-04)	(1.2e-04)	(3.3e-04)	(1.4e-04)
Proportion of foreigners	1.1e-04	-2.0e-04	-1.8e-04	-0.001*
	(0.001)	(3.6e-04)	(0.001)	(4.0e-04)
Median age of the workforce	-0.001	0.001**	-0.004***	2.5e-04
	(0.001)	(0.001)	(0.001)	(0.001)
Proportion of low-paid workers	-0.001***	-0.001***	-0.001**	-4.7e-04**
	(2.0e-04)	(1.6e-04)	(2.6e-04)	(2.1e-04)
Sector-level collective agreement (1 = yes)	0.020*	0.012**	0.029	0.011*
	(0.011)	(0.006)	(0.020)	(0.006)
Firm-level collective agreement (1 = yes)	0.032*	0.010	-0.014	0.007
	(0.018)	(0.008)	(0.030)	(0.010)
Works council (1 = yes)	0.009	0.011*	0.048**	0.019***
	(0.013)	(0.006)	(0.020)	(0.006)
Modern technology in use (1 = yes)	0.010	0.012***	-0.001	0.021***
	(0.009)	(0.004)	(0.013)	(0.007)
Proportion of fixed-term workers	-0.001**	9.8e-05	1.0e-04	-4.4e-05
	(3.9e-04)	(1.6e-04)	(0.001)	(2.5e-04)
Establishment older than 4 years (1 = yes)	-0.018	0.038***	0.006	0.023**
	(0.017)	(0.011)	(0.023)	(0.011)
Export share	0.001**	7.8e-05	0.002***	1.3e-04
	(3.4e-04)	(1.3e-04)	(0.001)	(1.2e-04)
Highly urbanised area (1 = yes)	0.017	-0.001	0.023	-0.008
	(0.011)	(0.004)	(0.018)	(0.006)
Joint significance of dummy variable groups	Age***, level of education***, occupational group***, estab. size***, industry**, fed. state**	Age***, level of education***, occupational group***, estab. size n.s., industry***, fed. state***	Age***, level of education*, occupational group***, estab. size***, industry n.s., fed. state n.s.	Age***, level of education***, occupational group***, estab. size n.s., industry***, fed. state***
Observations	6,783	80,148	2,808	242,373
Selection equations				
Low-paid in 1998 (1 = yes), effect on the probability of being low-paid in 2002	0.076*** (0.005)		0.014*** (0.001)	
Correlation coefficient ρ_1	–	-0.027***	–	-0.022**
Correlation coefficient ρ_2	0.166***	–	0.197***	–
Significance of the model	$\chi^2(71) = 1839.99$***		$\chi^2(71) = 2982.73$***	
Wald Test for the independence of all three equations	$\chi^2(2) = 41.61$***		$\chi^2(2) = 30.32$***	
Observations	86,931		245,181	

Notes: own calculations based on LIAB. Endogenous switching regression models, conditional average marginal effects. Standard errors in parentheses (clustered at establishment level). 20 industry dummies and 16 federal state dummies suppressed in the table. Reference category of the dummy variable groups: age 20–24; secondary school certificate with vocational training; unskilled manual occupations; 1–19 employees; not covered by a collective agreement. Significance levels: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; n.s. denotes statistical insignificance.

Table 3.5: Determinants of the real wage growth of low-wage workers and higher-wage workers, separate estimations by gender and by West Germany and East Germany

	Women, West Germany		Women, East Germany		Men, West Germany		Men, East Germany	
	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Individual characteristics							
Foreigner (1 = yes)	0.008	-0.003	-0.006	-0.031**	0.016	3.9e-04	-0.101	-0.011
	(0.014)	(0.003)	(0.081)	(0.015)	(0.024)	(0.002)	(0.070)	(0.010)
25–34 years (1 = yes)	-0.022	-0.073***	0.024	-0.043***	-0.068***	-0.042***	-0.056***	-0.043***
	(0.017)	(0.008)	(0.021)	(0.007)	(0.022)	(0.004)	(0.021)	(0.006)
35–54 years (1 = yes)	-0.064***	-0.093***	-0.039**	-0.084***	-0.106***	-0.074***	-0.104***	-0.080***
	(0.015)	(0.008)	(0.020)	(0.007)	(0.022)	(0.006)	(0.022)	(0.007)
55–59 years (1 = yes)	-0.115***	-0.104***	-0.057**	-0.093***	-0.163***	-0.089***	-0.126***	-0.101***
	(0.021)	(0.008)	(0.026)	(0.008)	(0.040)	(0.006)	(0.031)	(0.008)
Secondary school certificate	-0.004	0.006**	0.026	-0.004	-0.052***	0.003	3.7e-04	-0.009
without voc. training (1 = yes)	(0.013)	(0.003)	(0.034)	(0.007)	(0.018)	(0.002)	(0.022)	(0.006)
High school certificate (1 = yes)	0.070***	0.018***	0.099*	0.010*	0.143**	0.021***	0.116	0.012***
	(0.026)	(0.004)	(0.057)	(0.005)	(0.069)	(0.003)	(0.143)	(0.004)
University degree (1 = yes)	0.156***	0.008	0.027	-0.007*	-0.289***	0.009*	0.354*	-0.018***
	(0.053)	(0.006)	(0.050)	(0.004)	(0.081)	(0.005)	(0.184)	(0.006)
Education unknown (1 = yes)	-0.013	-0.007	-0.015	0.007	-0.015	-0.011	-0.014	-0.001
	(0.016)	(0.008)	(0.016)	(0.007)	(0.022)	(0.008)	(0.023)	(0.009)
Agricultural occ. (1 = yes)	-0.015	-4.6e-04	0.041	-0.030**	-0.049	0.003	0.067**	-0.015*
	(0.068)	(0.016)	(0.026)	(0.013)	(0.055)	(0.006)	(0.029)	(0.009)
Skilled manual occ. (1 = yes)	-0.032	-0.005	-0.001	-0.003	-0.068**	0.005*	0.035*	0.003
	(0.025)	(0.006)	(0.020)	(0.009)	(0.031)	(0.003)	(0.019)	(0.004)
Unskilled comm. and administr. occ.	-0.019	0.026***	-0.029	-0.006	-0.024	-2.0e-04	-0.011	-0.004
(1 = yes)	(0.020)	(0.008)	(0.021)	(0.010)	(0.038)	(0.008)	(0.037)	(0.011)
Skilled comm. and administr.	-3.1e-04	0.035***	0.035	0.014*	0.062	0.033***	0.039	0.020***
occ. (1 = yes)	(0.018)	(0.006)	(0.022)	(0.008)	(0.040)	(0.003)	(0.038)	(0.005)
Unskilled services (1 = yes)	-0.045**	0.007	-0.055**	-0.003	-0.086***	-0.004	-0.024	-0.008*
	(0.020)	(0.006)	(0.023)	(0.009)	(0.026)	(0.003)	(0.022)	(0.004)

Table 3.5 (cont.): Determinants of the real wage growth of low-wage workers and higher-wage workers, separate estimations by gender and by West Germany and East Germany

	Women, West Germany		Women, East Germany		Men, West Germany		Men, East Germany	
	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Skilled services (1 = yes)	-0.027	0.014**	0.023	-0.008	-0.085*	0.020	-0.003	0.002
	(0.036)	(0.007)	(0.027)	(0.011)	(0.044)	(0.015)	(0.080)	(0.009)
Semi-professions (1 = yes)	0.003	0.016**	0.089*	-0.001	0.014	0.012**	0.168	0.006
	(0.032)	(0.007)	(0.047)	(0.010)	(0.147)	(0.006)	(0.198)	(0.008)
Technicians/engineers/professions/ managers (1 = yes)	-0.002	0.027***	0.044	0.003	0.068	0.025***	0.051	0.005
	(0.028)	(0.008)	(0.035)	(0.009)	(0.050)	(0.004)	(0.048)	(0.004)
Tenure 1993–2007, in years	-0.001	0.014***	0.003	0.024***	0.016*	0.021***	0.009**	0.017***
	(0.009)	(0.003)	(0.005)	(0.003)	(0.008)	(0.006)	(0.005)	(0.002)
... squared	-2.3e-05	-0.001***	-1.1e-04	-0.001***	-0.001	-0.001***	-5.0e-04*	-0.001***
	(4.4e-04)	(1.5e-04)	(2.8e-04)	(1.5e-04)	(4.8e-04)	(2.7e-04)	(3.0e-04)	(1.2e-04)
Experience 1993–2007, in years	0.047**	0.014	0.018	-0.006	-0.008	-0.018***	-0.031**	-0.010**
	(0.022)	(0.013)	(0.016)	(0.006)	(0.018)	(0.006)	(0.014)	(0.004)
... squared	-0.002**	-0.001	-0.001	2.3e-04	4.9e-04	0.001***	0.002**	4.8e-04**
	(0.001)	(0.001)	(0.001)	(2.5e-04)	(0.001)	(2.5e-04)	(0.001)	(2.1e-04)
Change of establishment 2002–2007 (1 = yes)	0.123***	-0.031**	0.155***	0.010	0.172***	-0.054***	0.181***	-0.018
	(0.044)	(0.014)	(0.041)	(0.020)	(0.035)	(0.013)	(0.037)	(0.014)
Establishment characteristics								
20–99 employees (1 = yes)	-0.028*	0.002	-0.015	-0.004	0.045	0.003	0.028	-0.002
	(0.017)	(0.012)	(0.014)	(0.009)	(0.029)	(0.006)	(0.020)	(0.007)
100–499 employees (1 = yes)	-0.057***	0.007	0.019	0.004	0.028	0.002	0.032	0.007
	(0.021)	(0.013)	(0.019)	(0.009)	(0.031)	(0.008)	(0.022)	(0.008)
More than 499 employees (1 = yes)	-0.002	0.009	0.114**	0.009	0.158***	0.006	0.205***	0.011
	(0.027)	(0.013)	(0.048)	(0.012)	(0.055)	(0.010)	(0.075)	(0.013)
Proportion of highly qualified workers	0.001	0.001***	-0.001	0.001***	0.005*	0.001**	0.001	0.001***
	(0.001)	(2.5e-04)	(0.001)	(2.2e-04)	(0.003)	(4.8e-04)	(0.001)	(3.2e-04)
Proportion of women	-0.001	-1.6e-04	-0.001***	-1.0e-04	-0.002***	-3.0e-04*	-0.002***	4.1e-04*
	(3.7e-04)	(1.5e-04)	(2.8e-04)	(2.4e-04)	(4.9e-04)	(1.8e-04)	(4.1e-04)	(2.1e-04)

Table 3.5 (cont.): Determinants of the real wage growth of low-wage workers and higher-wage workers, separate estimations by gender and by West Germany and East Germany

	Women, West Germany		Women, East Germany		Men, West Germany		Men, East Germany	
	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Proportion of foreigners	1.6e-04	2.5e-04	3.1e-04	-0.002***	-0.001	-0.001	0.002	-0.003**
	(0.001)	(3.8e-04)	(0.003)	(0.001)	(0.001)	(4.2e-04)	(0.003)	(0.001)
Median age of the workforce	-3.9e-04	-6.7e-04	-0.001	0.002**	-0.002	-3.2e-04	-0.003**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Proportion of low-paid workers	-0.001***	-0.001***	-0.001***	-0.001***	-0.001**	-3.8e-04	-0.001*	-0.001**
	(2.8e-04)	(2.0e-04)	(2.5e-04)	(2.5e-04)	(4.1e-04)	(3.7e-04)	(3.0e-04)	(6.0e-04)
Sector-level collective agreement	0.015	0.012*	0.031	0.016*	0.031	0.007	0.036	0.016*
(1 = yes)	(0.014)	(0.007)	(0.022)	(0.008)	(0.030)	(0.008)	(0.027)	(0.009)
Firm-level collective agreement	0.034	0.009	0.032	0.012	0.023	0.004	-0.042	0.014
(1 = yes)	(0.025)	(0.010)	(0.022)	(0.010)	(0.051)	(0.014)	(0.032)	(0.011)
Works council (1 = yes)	0.013	0.016*	0.004	0.012	0.036	0.027***	0.039	0.006
	(0.016)	(0.008)	(0.019)	(0.009)	(0.026)	(0.007)	(0.030)	(0.009)
Modern technology in use (1 = yes)	-0.001	0.008	0.021*	0.014***	-0.013	0.021**	0.004	0.014**
	(0.012)	(0.006)	(0.012)	(0.005)	(0.020)	(0.008)	(0.016)	(0.007)
Proportion of fixed-term workers	-0.001	-1.6e-04	-0.002***	2.8e-04	0.002*	-0.001	-0.001	2.0e-04
	(0.001)	(2.6e-04)	(4.2e-04)	(1.9e-04)	(0.001)	(3.8e-04)	(0.001)	(2.7e-04)
Establishment older than 4 years	-0.022	0.032***	-0.021	0.046***	0.010	0.017	0.002	0.039**
(1 = yes)	(0.024)	(0.009)	(0.022)	(0.017)	(0.032)	(0.013)	(0.035)	(0.018)
Export share	0.001**	6.5e-05	2.3e-04	2.1e-04	0.002**	8.5e-05	0.001**	0.001***
	(3.8e-04)	(2.6e-04)	(0.001)	(2.8e-04)	(0.001)	(1.4e-04)	(0.001)	(1.9e-04)
Highly urbanised area (1 = yes)	0.015	-0.008	0.019	0.004	0.006	-0.013*	0.022	0.012
	(0.013)	(0.005)	(0.020)	(0.006)	(0.026)	(0.007)	(0.020)	(0.008)

Table 3.5 (cont.): Determinants of the real wage growth of low-wage workers and higher-wage workers, separate estimations by gender and by West Germany and East Germany

	Women, West Germany		Women, East Germany		Men, West Germany		Men, East Germany	
	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers	Low-wage workers	Higher-wage workers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Joint significance of dummy variable groups	Age***, level of education***, occupational group n.s., estab. size***, industry***, fed. state**	Age***, level of education***, occupational group***, estab. size n.s., industry***, fed. state***	Age***, level of education n.s., occupational group***, estab. size**, industry***, fed. state**	Age***, level of education**, occupational group***, estab. size n.s., industry***, fed. state***	Age***, level of education***, occupational group***, estab. size**, industry***, fed. state*	Age***, level of education***, occupational group***, estab. size n.s., industry***, fed. state***	Age***, level of education n.s., occupational group n.s., estab. size*, industry***, fed. state n.s.	Age***, level of education***, occupational group***, estab. size n.s., industry***, fed. state***
Observations	4,326	47,722	2,457	32,426	1,520	194,791	1,288	47,582
Selection equations								
Low-paid in 1998 (1 = yes), effect on the probability of being low-paid in 2002	0.081*** (0.008)		0.025*** (0.003)		0.004*** (0.001)		0.008*** (0.001)	
Correlation coefficient ρ_1	–	-0.032***	–	0.001	–	-0.012	–	-0.031
Correlation coefficient ρ_2	0.167***	–	0.199***	–	0.263***	–	0.271***	–
Significance of the model	$\chi^2(65) = 1244.48$***		$\chi^2(61) = 1471.30$***		$\chi^2(65) = 2486.97$***		$\chi^2(61) = 1429.78$***	
Wald Test for the independence of all three equations	$\chi^2(2) = 28.65$***		$\chi^2(2) = 14.29$***		$\chi^2(2) = 19.36$***		$\chi^2(2) = 12.01$***	
Observations	52,048		34,883		196,311		48,870	

Notes: own calculations based on LIAB. Endogenous switching regression models, conditional average marginal effects. Standard errors in parentheses (clustered at establishment level). 20 industry dummies and 10 (6) federal state dummies for West (East) Germany suppressed in the table. Reference category of the dummy variable groups: age 20–24; secondary school certificate with vocational training; unskilled manual occupations; 1–19 employees; not covered by a collective agreement. Significance levels: * $p<0.1$; ** $p<0.05$; *** $p<0.01$; n.s. denotes statistical insignificance.

3.9 Appendix to chapter 3

Table 3.6: Summary of selected results from Table 3.3

Average marginal effects of selected establishment characteristics on the real wage growth of low-wage workers and higher-wage workers	Low-wage workers	Higher-wage workers
Coverage by a sector-level collective agreement (1 = yes)	(+)	+
Existence of a works council (1 = yes)	(+)	+
Proportion of low-paid workers	–	–
Establishment size	+	n.s.
Proportion of women	–	n.s.
Export share	+	n.s.
Highly urbanised area (1 = yes)	+	n.s.
Modern technology (1 = yes)	n.s.	+
Proportion of highly qualified workers	n.s.	+
Establishment older than 4 years (1 = yes)	n.s.	+
Proportion of fixed-term workers	n.s.	n.s.

Note: "+/–" denotes a positive/negative relationship that is statistically significant at least at the 5%-level; brackets denote a relationship that is significant at the 10%-level only; n.s. denotes statistical insignificance.

Table 3.7: Summary of selected results from Table 3.4

Average marginal effects of selected establishment characteristics on the real wage growth of low-wage workers and higher-wage workers	Low-wage workers		Higher-wage workers	
	Women	Men	Women	Men
Coverage by a sector-level collective agreement (1 = yes)	(+)	n.s.	+	(+)
Existence of a works council (1 = yes)	n.s.	+	(+)	+
Proportion of low-paid workers	–	–	–	–
Establishment size	–/n.s.	+	n.s.	n.s.
Proportion of women	–	–	n.s.	n.s.
Export share	+	+	n.s.	n.s.
Highly urbanised area (1 = yes)	n.s.	n.s.	n.s.	n.s.
Modern technology (1 = yes)	n.s.	n.s.	+	+
Proportion of highly qualified workers	n.s.	+	+	+
Establishment older than 4 years (1 = yes)	n.s.	n.s.	+	+
Proportion of fixed-term workers	–	n.s.	n.s.	n.s.

Note: "+/–" denotes a positive/negative relationship that is statistically significant at least at the 5%-level; brackets denote a relationship that is significant at the 10%-level only; n.s. denotes statistical insignificance.

Table 3.8: Summary of selected results from Table 3.5

Average marginal effects of selected establishment characteristics on the real wage growth of low-wage workers and higher-wage workers	Low-wage workers				Higher-wage workers			
	Women		Men		Women		Men	
	West	East	West	East	West	East	West	East
Coverage by a sector-level collective agreement (1 = yes)	n.s.	n.s.	n.s.	n.s.	(+)	(+)	n.s.	(+)
Existence of a works council (1 = yes)	n.s.	n.s.	n.s.	n.s.	(+)	n.s.	+	n.s.
Proportion of low-paid workers	–	–	–	(–)	–	–	n.s.	–
Establishment size	–	+	+	+	n.s.	n.s.	n.s.	n.s.
Proportion of women	n.s.	–	–	–	n.s.	n.s.	(–)	(+)
Export share	+	n.s.	+	+	n.s.	n.s.	n.s.	+
Highly urbanised area (1 = yes)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	(–)	n.s.
Modern technology (1 = yes)	n.s.	(+)	n.s.	n.s.	n.s.	+	+	+
Proportion of highly qualified workers	n.s.	n.s.	(+)	n.s.	+	+	+	+
Establishment older than 4 years (1 = yes)	n.s.	n.s.	n.s.	n.s.	+	+	n.s.	+
Proportion of fixed-term workers	n.s.	–	(+)	n.s.	n.s.	n.s.	n.s.	n.s.

Note: "+/–" denotes a positive/negative relationship that is statistically significant at least at the 5%-level; brackets denote a relationship that is significant at the 10%-level only; n.s. denotes statistical insignificance.

4 Locus of Control and low-wage mobility[42]

4.1 Introduction

In this chapter, we analyse whether personality traits or, more generally, non-cognitive skills are important determinants of the labour market processes at the low-wage margin, which is a question that has not been investigated previously. Our main focus is an individual's perceived Locus of Control – the extent to which an individual believes that he or she has control over his or her life. In addition, our data allow us to control for the Big Five personality traits and measures of reciprocity.

Over the last two decades, the literature has developed on the importance of non-cognitive skills for economic and social outcomes (see Almlund et al., 2011, for an extensive overview). Heckman et al. (2006) show that for many labour market outcomes, non-cognitive skills have the same predictive power as cognitive skills, which are the classic focus in economic analyses. Non-cognitive skills help to explain the observed variance in earnings (see Heckman et al., 2006; Müller and Plug, 2006; and Groves, 2005, for evidence from the US; Heineck and Anger, 2010, for evidence from Germany; Heineck, 2011, and Groves, 2005, for evidence from the UK), educational outcomes (Barón and Cobb-Clark, 2010) and occupational choices (Antecol and Cobb-Clark, 2013). Blázquez Cuesta and Budría (2012) show that non-cognitive skills affect unemployment persistence, and Caliendo et al. (forthcoming) find that non-cognitive skills influence job search behaviour.

However, the impact of Locus of Control and other non-cognitive skills on the wage mobility of low-wage workers has not been investigated to date. Previous studies on low-wage mobility have shown that the chances of escaping the low-wage sector are higher for males than females, for younger individuals than for older individuals and for more highly-skilled individuals than less skilled individuals. The odds of leaving the low-wage sector are also higher for workers in certain firms, such as large firms or firms with a low percentage of women or low-wage workers. In addition, there is evidence for the existence of state dependence in low pay, i.e., being low-paid today increases the probability of being low-paid in the future. Furthermore, the results of previous studies imply that the factors mentioned above account only for a part of the heterogeneity which is relevant for the upward wage mobility of low-wage

42 This chapter is based on Schnitzlein and Stephani (2013), which is joint work with Daniel D. Schnitzlein.

workers.[43] A significant part of this heterogeneity remains unobserved. A part of this unobserved heterogeneity could be due to differing levels of non-cognitive skills between individual workers.

If Locus of Control is a relevant determinant for escaping low-wage employment, there are two important implications for social policy. (i) First, potential programs to support low-wage workers have to consider the existing heterogeneity in non-cognitive skills between different individuals. For example, the individuals who believe that they do not have much influence on their future will need more support by case workers than individuals who believe that they have full control over their life. (ii) Second, while Locus of Control and other non-cognitive skills are seen as rather stable in adulthood (Cobb-Clark and Schurer, 2012, 2013)[44], they are malleable in early childhood and adolescence and therefore can be targeted by interventions.[45] If having a more internal individual level of Locus of Control significantly increases the individual chances of low-wage workers escaping low pay, internalising an individuals' Locus of Control may be a good starting point for policy interventions during childhood.[46]

In this chapter, we investigate the impact of Locus of Control on the wage mobility of low-wage workers using dynamic multinomial logit models with random effects that consider initial conditions and state dependence. In addition, we control for possible correlations with other non-cognitive skills, such as the Big Five personality traits and reciprocity. We contribute to the literature by answering the following research questions: does Locus of Control influence the probability of being low-paid or higher-paid? Does the extent of state dependence in low pay vary with Locus of Control, i.e., does a specific individual level of Locus of Control facilitate escaping low pay? The chapter is

43 For example, Clark and Kanellopoulos (2013) provide cross-country evidence for Europe. For Germany see, e.g., Knabe and Plum (2013) and Mosthaf (2014). See section 3.2 of this dissertation for a more detailed review of the studies on the mobility of low-wage workers.

44 The stability of non-cognitive skills in adulthood is a debated topic in the psychological literature. Psychologists are mainly interested in the mean-level stability and rank-order stability of personality traits. While the traditional view is that personality is stable at least after age 30 (e.g. Costa and McCrae, 1988), Roberts and DelVecchio (2000) and Roberts et al. (2006) challenge this view and present an extensive meta-analysis of rank-order and mean-level change in personality traits. For both concepts, they find that values change over the full age range of individuals. Specht et al. (2013) find similar results using German SOEP data. However, Cobb-Clark and Schurer (2013) point out that in an economic context intra-individual stability is the more relevant measure. By analysing the effects of life events on individuals' non-cognitive skills, they find high intra-individual stability for the Big Five (Cobb-Clark and Schurer, 2012) and Locus of Control (Cobb-Clark and Schurer, 2013) using Australian data for individuals of working ages. Specht et al. (2011) find high intra-individual stability of these non-cognitive skills based on German SOEP data for working aged individuals.

45 See, for example, Heckman et al. (2012) for an overview on the mechanisms through which one specific early intervention programme, namely the Perry Pre-School programme, supported the participants.

46 A fruitful target is to support the children of disadvantaged families. Stephens and Delys (1973) argue that children of disadvantaged families are less convinced they have control over their lives already at an early age relative to other children. Peter (2013) shows that a mother's job loss has a causal, negative effect on children's non-cognitive skills.

structured as follows. Section 4.2 presents theoretical considerations and derives our hypotheses on the influence of Locus of Control on transitions into and out of the low-wage sector. Section 4.3 describes our data. Section 4.4 outlines our empirical approach. Section 4.5 presents and discusses the results, and section 4.6 concludes.

4.2 Measures of non-cognitive skills

4.2.1 Locus of Control

The psychological concept of perceived Locus of Control (LoC) dates back to Rotter (1966). LoC measures the extent to which an individual believes that he or she controls the events in his or her life. Psychologists differentiate between individuals with a more internal LoC and individuals with a more external LoC. Individuals with a more internal LoC are convinced that the events that happen in their life are caused by their actions and their behaviour. Individuals with a more external LoC have a more fatalistic view on their life. They believe that their influence on their life is very limited and that what happens to them is caused not by their decisions but is mainly the result of faith or luck.[47]

This sense of control over one's life has important implications for an individual's human capital investments. Being convinced that effort will lead to success leads to comparatively higher expected returns on their human capital investments because the expected probability to fail is lower. Therefore, these internal LoC individuals invest more in their human capital than their external LoC counterparts (Caliendo et al., forthcoming). Barón and Cobb-Clark (2010) showed that a more internal LoC is associated with positive educational outcomes.[48] But LoC also influences labour market behaviour other than investments in education. Caliendo et al. (forthcoming) analyse the role of LoC for the job search behaviour of unemployed persons. They find that having a more internal LoC is associated with higher search intensity, a higher job offer rate and a higher reservation wage than having an external LoC. In addition, Caliendo et al. note that it is plausible that an internal LoC is related to positive labour market outcomes and economic success in general.

47 The data on non-cognitive skills used in this study are also used for research by psychologists. See, for example, Dyrenforth et al. (2010) for the relationship between personality and satisfaction, Lucas and Donnellan (2011) and Specht et al. (2011) for the development of personality, and Specht et al. (2013) for the development of LoC over the life course.

48 See Wang et al. (1999) for a detailed overview of the sociological and psychological literature on the relationship between LoC and educational outcomes.

In the context of our study, we therefore expect that:

H1: Individuals with a more internal LoC are more likely to work in higher-wage employment than individuals with a more external LoC.
H2: Conditional on being employed in the low-wage sector, the individual probability to move to higher-wage employment is positively correlated with a more internal LoC.

Although the focus of this chapter is on Locus of Control, we also include other non-cognitive skills to control for possible correlations between these non-cognitive skills and Locus of Control (Almlund et al., 2011). More specifically, we follow the literature and control for the correlation between Locus of Control and the Big Five and reciprocity.

4.2.2 Big Five and reciprocity

The Big Five taxonomy of personality traits (McCrae and Costa Jr., 1999) classifies an individual's personality into 30 personality traits that are grouped into five main factors. These factors are Openness to experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism. Openness to experience is the extent to which individuals are open to new occurrences in their life. Conscientiousness contains the subscales order, competence, dutifulness, achievement striving, self-discipline and deliberation. Individuals with higher scores on Conscientiousness are seen as more effectively organised than those with lower values. Extraversion covers the dimensions of social behaviour towards other people and is the opposite of introversion. Agreeableness also contains dimensions of social behaviour. Individuals with low scores on Agreeableness describe themselves as egocentric and uncooperative. Neuroticism is the opposite of emotional stability.

The third measure of non-cognitive skills considered in this chapter is reciprocity.[49] Reciprocity measures the extent to which an individual is willing to respond to positive or negative behaviour. One can distinguish positive reciprocity, i.e., the extent to which individuals respond positively to positive actions, and negative reciprocity, i.e., the extent to which individuals respond negatively to negative behaviour.

49 Similar to risk and trust measures, reciprocity is usually seen as being a preference and not a personality trait. Preferences may be complementary to personality traits in explaining labour market outcomes (see Becker et al., 2012, for a discussion). Although the focus of this study is on personality traits and not on preferences, we included reciprocity to make our analysis comparable to previous studies on non-cognitive skills (most of which include Locus of Control, the Big Five and reciprocity together). However, our results are robust to the exclusion of reciprocity from our models. For the sake of readability, in this chapter, we group Locus of Control, the Big Five and reciprocity into the term "non-cognitive skills".

4.3 Data and descriptive evidence

4.3.1 The data

Our estimates are based on data from the German Socio-Economic Panel Study (SOEP), which is a representative household panel survey that started in 1984 (Wagner et al., 2007). The SOEP conducts annual personal interviews with all household members aged 18 years and older and provides rich information on the socio-demographic characteristics, the family background, and the childhood environment of approximately 20,000 individuals in more than 11,000 families in the most recent wave. The SOEP included measures of LoC, Big Five, and reciprocity in 2005 and repeated measures of the Big Five in 2009 and reciprocity and LoC in 2010 (Richter et al., 2013). All non-cognitive skill measures were included in the main questionnaire and therefore represent self-ratings by the respondents. LoC is measured by seven items, the Big Five are measured by 15 items and reciprocity is measured by six items. The detailed questions are shown in Tables 4.5, 4.6 and 4.7 in the Appendix. Each item can be answered on 7-point Likert type scales.

Our analysis is based on data for the years 2006–2011.[50] We restrict our analysis to West German men who are aged 25–59 in the respective years. Because of the heterogeneous employment trajectories of women, which may additionally interact with their non-cognitive skills, we limit our analysis to men.[51] Individuals are excluded from our analysis after not participating in the SOEP for at least one year. Because we focus on the core groups of the labour market, we also exclude individuals who are still in the education system, self-employed individuals and early retirees. We use the commonly accepted low-wage threshold of two-thirds of the median hourly wage and we calculate this threshold from our sample for each year.[52] We define three different employment states: i) Higher-wage employment is defined as having a job that pays wages above the low-wage threshold in that year; ii) Low-wage employment is defined as having a job that pays wages below the low-wage threshold; and iii) Not working is defined as being unemployed or out of the labour force.

50 We use SOEPv28.

51 While it would be interesting to analyse East German men as well, due to data limitations, we are unable to do so. Because the East and West German labour market developed differently with respect to patterns of wage mobility (Riphahn and Schnitzlein, 2011), it is necessary to analyse West German men and East German men separately to obtain meaningful results. However, the small size of the East German SOEP sample would lead to very small cells, some with fewer than 20 observations. Such small cell sizes would not be a reasonable basis for analysis.

52 We exclude all observations with an hourly real wage lower than 2.5 € (in 2010 prices, calculated by using the Consumer Price index of the German Federal Statistical Office).

As measures of non-cognitive skills, we use the 2005 data on the psychological constructs discussed above. We do not include the 2009 and 2010 measures for two reasons. First, recent empirical contributions show that non-cognitive skills, at least for the age range of our sample, are reasonably stable (Cobb-Clark and Schurer, 2012, 2013). Given these results and the short time range, six years, between the measurement and latest observation year, the 2005 values are reasonable proxies, even for personality, in 2011. The more important reason is that by using the 2005 measures we avoid a reverse causality problem. Although non-cognitive skills are reasonably stable for the age range of our sample,[53] if we used the 2009/2010 measures we would not be able to completely rule out the possibility that these measures are influenced by the transitions that we want to model.[54]

The main descriptive statistics of our sample are shown in Table 4.1. Our sample consists of 10,456 person-year observations. Approximately 86 % of these observations are higher-wage person-year observations. Approximately 5 % are low-wage observations, and 9 % of the observed person-years are from individuals who were not working. This high proportion of non-working individuals underlines the need to explicitly model this state. Our main variable of interest, LoC, is given both as a continuous variable ranging from 1 (external) to 7 (internal) and as a categorical variable with three levels. The first category of the LoC is a dummy variable that indicates that an individual has a score of LoC of up to four (i.e., an external LoC). The second dummy variable indicates that an individual has a LoC score that is larger than four but less than five (i.e., a medium LoC). The third dummy variable indicates that an individual has a score of LoC larger than five and up to seven (i.e., an internal LoC).

The average individual score of LoC in the sample is 4.88 for higher-wage workers and 4.53 for low-wage workers. The three dummy variables for LoC show that while 45 % of the higher-wage workers report an internal LoC, only 18 % of them report an external LoC. In contrast, low-wage workers are distributed evenly over the three categories of Locus of Control: while 33 % of them report an internal Locus of Control, 34 % of them report an external Locus of Control. Our additional individual control variables show the patterns expected from the existing literature. The next section provides descriptive evidence on our hypotheses.

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53 In our sample, 77 % of the respondents answered the questions on Locus of Control both in 2005 and in 2010. The mean change (on a scale from 1–7) between the two years is very small (-0.03). The 25th percentile of the distribution of changes is -0.57, and the 75th percentile is 0.57. 83 % of the respondents answered the questions concerning the Big Five both in 2005 and in 2009. Again, the mean changes are very small, ranging from -0.1 (Extraversion) to -0.17 (Openness). 78 % of the respondents answered the questions on reciprocity in 2005 and 2010 and report mean changes of -0.05 (positive reciprocity) and -0.02 (negative reciprocity).

54 See Cobb-Clark and Schurer (2013) for a detailed discussion of potential biases. We follow their suggestions and restrict our sample to the working age population. In addition, according to their suggestions, we reran our models with an age standardised version of our non-cognitive skill measures. The results were not substantively different.

4.3.2 Descriptive evidence

Figure 4.1 presents descriptive evidence of H1 by depicting the percentage of individuals in each of the three employment states, higher-wage employment, low-wage employment and not working, by the categories of LoC. The first implication of H1 is that the proportion of higher-wage workers should be higher among the group of individuals with a more internal LoC. This implication is clearly supported by Figure 4.1 because the percentage of workers in higher-wage employment is higher for the internal LoC group. In addition, Figure 4.1 shows that the percentage of individuals in low-wage employment is decreasing with a more internal LoC. Figure 4.2 contains evidence on H2 by depicting the mobility from low-wage employment to higher-wage employment for each group of LoC. The percentage of workers who remain in low-wage employment from one year to the next is decreasing with a more internal LoC, while the percentage of workers who are moving from low pay to higher pay is increasing.

4.4 The econometric model

To investigate the impact of Locus of Control on transitions between low pay, higher pay and not working, we use dynamic multinomial logit models with random effects that take into account unobserved heterogeneity, initial conditions and state dependence.[55] This type of model has been used by others, including Mosthaf et al. (2009) and Mosthaf (2014). We follow these two papers and model the latent probability Y^* of an individual i to be in the employment state j (higher-wage employment, low-wage employment, not working) in the year $t = 1 \ldots T$ as:

$$Y^*_{ijt} = X_{it}\beta_j + Y_{it-1}\alpha_j + NC_i\gamma_j + \upsilon_{ij} + \varepsilon_{ijt} \quad (1)$$

where $i = 1, \ldots, N$; $j = 1, 2, 3$; and $t = 2007–2011$. X_{it} is a vector of time-constant and time-varying individual characteristics that are supposed to influence an individual's probability to be in a given employment state[56]. Following human capital theory

55 Although the focus of this chapter is on transitions from low pay to higher pay, we include individuals who are not working in order to take into account the possibly endogenous selection of individuals into this employment state.

56 Because previous studies have found that establishment characteristics, such as establishment size, impact the wage mobility of low-wage workers, it would be interesting to see whether our results are robust to the inclusion of establishment characteristics. Because there are no establishment characteristics for individuals who are not working, we test the robustness of our models by defining two different sets of explanatory variables for employed individuals and for individuals who are not working. For the employed individuals, we include three establishment size dummies; for non-working individuals we do not. Unfortunately, due to the heavy computation involved in estimating dynamic multinomial logit models with random effects that incorporate different sets of explanatory variables, these models do not converge.

and job search theory as well as previous studies on state dependence in low pay,[57] we include in X_{it} a dummy variable that indicates migration background, age in the linear and in squared form, three dummy variables describing the individual level of education, a dummy variable indicating whether an individual was married in time period t and a variable indicating the number of doctor visits in the last year. The number of doctor visits in the last year is a more objective measure of an individual's health status than self-reported health conditions. Y_{it-1} is a vector of three dummy variables that describe the lagged employment state in the period $t-1$; this vector captures state dependence. NC_i includes the non-cognitive skill Locus of Control measured by the three dummy variables discussed earlier.[58] We later augment our model by including the Big Five non-cognitive skills: Openness to experience, Conscientiousness, Extraversion, Agreeableness, Neuroticism as well as positive reciprocity and negative reciprocity. υ_{ij} is a time-invariant, person-specific random component. ε_{ijt} is an individual-specific error term that is assumed to be uncorrelated across individuals and time and uncorrelated with υ_{ij} and X_{it}. A full set of year dummies is included to control for the macroeconomic situation.

As Heckman (1981) pointed out, the inclusion of lagged dependent variables leads to an initial conditions problem. Because the initial employment state of an individual is influenced by his previous employment history and his observable and unobservable characteristics, not addressing this endogeneity may lead to biased results. Wooldridge (2005) suggested tackling the initial conditions problem in dynamic nonlinear panel data models by explicitly modelling the joint distribution of all endogenous variables conditional on the initial value and the observed history of the strictly exogenous explanatory variables.[59] His approach follows Mundlak (1978) and Chamberlain (1984) and allows for correlation of the time-invariant, person-specific component υ_{ij} with the observed characteristics in the model. We follow Wooldridge (2005) and model

$$\upsilon_{ij} = Y_{i0}\delta_j + \overline{X}_i\zeta_j + \eta_{ij}, \tag{2}$$

where Y_{i0} is the employment state of an individual in the year 2006; $\overline{X}_i$ are Mundlak terms consisting of the individual-specific, time-averaged values of the four

57 See, e.g., Cappellari and Jenkins (2008b) and Clark and Kanellopoulos (2013).

58 We include Locus of Control measured by three dummy variables instead of the continuous variable to allow for a more flexible functional form.

59 Several studies use the Wooldridge approach, such as the studies by Contoyannis et al. (2004); Stewart (2007); Arulampalam and Stewart (2009); Michaud and Tatsiramos (2011); Clark and Kanellopoulos (2013); Drakos and Konstantinou (2013); and Mosthaf (2014). While Akay (2012) conducts Monte Carlo experiments and finds that the Wooldridge method can be biased in panels shorter than five periods, Rabe-Hesketh and Skrondal (2013) present different possibilities to avoid this bias. Although we use a six-period panel, we follow Rabe-Hesketh and Skrondal (2013) to rule out possible bias.

time-varying explanatory variables age, age squared, number of doctor visits, and marital status; η_{ij} are random effects that are orthogonal to the other explanatory variables in the model and are assumed to be normally distributed. Furthermore, to more accurately control for the influence of the previous employment history on the initial employment state than in the standard Wooldridge approach, we follow Mosthaf (2014) and include a vector H_i in our model that contains the individual amount of full-time work experience and the individual amount of unemployment experience measured in years. Substituting equation (2) into (1) and including H_i in equation (1) yields

$$Y^*_{ijt} = X_{it}\beta_j + Y_{it-1}\alpha_j + NC_i\gamma_j + Y_{i0}\delta_j + \overline{X}_i\zeta_j + H_i\psi_j + \eta_{ij} + \varepsilon_{ijt}. \tag{3}$$

To investigate whether state dependence in low pay varies with different scores of Locus of Control, we later include interaction terms between the lagged employment states and the Locus of Control dummy variables ($Y_{it-1} * NC_i$). As suggested by Wooldridge (2005), we additionally include interaction terms between the employment state in the first observation period and Locus of Control ($Y_{i0} * NC_i$) to consistently control for heterogeneity in state dependence. Including the interaction terms in equation (3) yields

$$Y^*_{ijt} = X_{it}\beta_j + Y_{it-1}\alpha_j + NC_i\gamma_j + Y_{i0}\delta_j + \overline{X}_i\zeta_j + H_i\psi_j + Y_{it-1} * NC_i\tau_j + Y_{i0} * NC_i\kappa_j + \eta_{ij} + \varepsilon_{ijt}. \tag{4}$$

We assume that ε_{ijt} has a type I extreme value distribution, which leads to a dynamic multinomial logit model with random effects. Therefore, the probability of an individual *i* to be in employment state *j* in time period $t > 0$ is

$$P(Y_{ijt} \mid X_{it}, Y_{it-1}, NC_i, Y_{i0}, \overline{X}_i, H_i, Y_{it-1} * NC_i, Y_{i0} * NC_i, \eta_{ij}) = \frac{exp(X_{it}\beta_j + Y_{it-1}\alpha_j + NC_i\gamma_j + Y_{i0}\delta_j + \overline{X}_i\zeta_j + H_i\psi_j + Y_{it-1} * NC_i\tau_j + Y_{i0} * NC_i\kappa_j + \eta_{ij})}{\sum_{k=1}^{3} exp(X_{it}\beta_k + Y_{it-1}\alpha_k + NC_i\gamma_k + Y_{i0}\delta_k + \overline{X}_i\zeta_k + H_i\psi_k + Y_{it-1} * NC_i\tau_k + Y_{i0} * NC_i\kappa_k + \eta_{ik})} \tag{5}$$

We use higher-wage employment as the reference category in the multinomial logit model. Therefore, for the model to be identified, we set β_1, α_1, γ_1, δ_1, ζ_1, ψ_1, τ_1, κ_1 and η_{i1} to zero. We estimate the model by applying adaptive a Gauss-Hermite quadrature with eight quadrature points.[60]

60 Increasing the number of quadrature points in this type of estimation may lead to more precise estimates because the likelihood is evaluated more accurately when the number of quadrature points is higher. To assess the robustness of our results, we reran our models using 12 quadrature points. However, the estimates only differed at the third decimal place.

4.5 Results

Table 4.2 shows the results of the different specifications of dynamic multinomial logit models with random effects for the probability of West German men to be higher-paid, low-paid or not working. The employment state "not working" is heterogeneous and is included mainly to control for the possibly endogenous selection of individuals into this employment state. Therefore, results with respect to this employment state should be interpreted with caution.

4.5.1 The impact of Locus of Control on the probability to be low-paid or higher-paid

In model 1, we include the three Locus of Control dummy variables along with the other variables discussed in the previous section except for the interaction terms, the Big Five and reciprocity.[61] The results for this model are shown in the first two columns of Table 4.2. The parameters of the variance-covariance matrix are highly significant, indicating the existence of unobserved heterogeneity even after controlling for Locus of Control. The highly significant coefficients of the lagged employment states "Low wage in $t-1$" and "Not working in $t-1$" indicate that there is state dependence in low pay and in the "not working" employment state. Furthermore, the significant positive coefficients of the employment states in the initial observation period demonstrate the importance of controlling for the initial conditions problem. In addition, the individual amount of unemployment experience prior to 2006 is positively correlated with the probability of being low-paid or not working instead of being higher-paid in period t.

The results for the Locus of Control dummy variables show that compared to the reference group of individuals with an external Locus of Control, individuals with a medium Locus of Control or an internal Locus of Control have a significantly lower probability of being low-paid instead of higher-paid. Individuals with a medium or an internal Locus of Control also have a lower probability of not working instead of being higher-paid. However, the time-invariant variables in such models might be correlated with the random effects, i.e., they do not necessarily represent causal relationships.

To examine whether our results are robust towards the inclusion of other non-cognitive skills, we augmented our model by adding the Big Five taxonomy and by including the measures of positive reciprocity and negative reciprocity (see

61 As a robustness check, we reran all our models using the continuous Locus of Control variable instead of the three dummy variables. However, this change did not alter our findings.

model 2 in Table 4.2). The coefficients from this augmented model 2 are similar to the coefficients from model 1, which included only Locus of Control. Therefore, the positive impact of Locus of Control on the probability of being higher-paid instead of low-paid or not working is corroborated after controlling for other non-cognitive skills. Interestingly, we find an impact for some of these additional non-cognitive skills on the probability of being low-paid instead of higher-paid: the individual scores of Conscientiousness, Agreeableness, and negative reciprocity are positively related to the probability of being low-paid instead of higher-paid.

The coefficients from multinomial logit models cannot be interpreted concerning their economic significance. Therefore, we fix the random effects at their mean value zero, and then calculate the average predicted probabilities to be higher-paid, low-paid or not working from model 2 for the three different Locus of Control categories. This approach leads to predictions for typical individuals. The average predicted probability to be higher-paid is 0.774 for individuals with an external Locus of Control, while for individuals with a medium Locus of Control, this probability is 0.898. Finally, for individuals with an internal Locus of Control, the probability to be higher-paid is 0.937. The 95%-confidence intervals of these probabilities do not overlap between the different Locus of Control categories, indicating that the probability to be higher-paid is significantly higher for individuals with an internal Locus of Control.[62]

4.5.2 The impact of Locus of Control on the probability to escape low pay

From a dynamic perspective, it is also important to know whether state dependence in low pay varies with individual scores of Locus of Control, i.e., whether individuals with an internal Locus of Control are more likely to exit the low-wage sector by moving to higher-wage employment. To investigate this question, we now interact Locus of Control with the lagged employment state and the employment state in the first observation period. Model 3 in Table 4.3 gives the results for this interacted version of model 1, i.e., it does not include any non-cognitive skills other than Locus of Control. Model 4 gives the results for the interacted version of model 2, i.e., it tests for robustness by additionally including the Big Five measures and reciprocity as well as interactions between these non-cognitive skills and the lagged employment states.

Except for variables which have been interacted, the coefficients of model 3 are similar to the corresponding coefficients in model 1 in Table 4.2. As mentioned

62 For individuals with an external Locus of Control, the confidence intervals range from 0.762 to 0.786, while for individuals with a medium Locus of Control this range is 0.890 to 0.907. For individuals with an internal Locus of Control, the confidence intervals are from 0.930 to 0.943.

earlier, "Higher wage in $t-1$" is the reference category for the dummy variables "Low wage in $t-1$" and "Not working in $t-1$". These two variables are the reference categories for their interactions with Locus of Control and therefore describe the individuals in the reference group, i.e., individuals with an external Locus of Control.

The coefficient of "Low wage in $t-1$" is positive and statistically significant. This finding indicates that for individuals with an external Locus of Control, being low-paid in period $t-1$ increases the probability of being low-paid in period t instead of being higher-paid in period t. The coefficients for the interactions between Locus of Control and lagged low pay status are negative but not statistically significant at conventional levels; this indicates that compared to the reference group of individuals with an external Locus of Control who were low-paid in $t-1$, individuals with a medium or an internal Locus of Control have a lower (yet statistically insignificant) risk of being low-paid in period t if they have been low-paid in $t-1$. Therefore, from this model we cannot infer that the probability of escaping low pay is significantly different for individuals with different scores of Locus of Control.

However, the results of model 4 in Table 4.3 show that the inclusion of the Big Five measures and reciprocity and their interactions with the lagged employment states partly changes our results. First, the coefficient for "Low wage in $t-1$" has lost its significance and now exhibits a fairly high standard error. This indicates that after controlling for the impact of the Big Five and reciprocity, within the group of individuals with an external Locus of Control the probability of being low-paid in period t does not differ anymore significantly between the individuals who were low-paid in $t-1$ and the individuals who were higher-paid in $t-1$. However, compared to the individuals with an external Locus of Control who were low-paid in $t-1$, individuals with an internal Locus of Control who were low-paid in $t-1$ have a significantly higher probability to be higher-paid in period t (see the interaction term between having an internal Locus of Control and "Low wage in $t-1$"). This indicates that state dependence in low pay is lower for individuals with an internal Locus of Control, i.e., that these individuals have a higher probability of escaping low pay.

We quantify the impact of Locus of Control on the probability of escaping low pay by using the same technique as in the previous section 4.5.1. We use the results of model 4 and fix the random effects at their mean value zero to calculate the average predicted probabilities to be in a specific employment state, conditional on the lagged employment state and Locus of Control. The results are presented in Table 4.4. We are mainly interested in the probabilities of being higher-paid in period t conditional on being low-paid in period $t-1$

and Locus of Control. These probabilities are presented together with their 95 %-confidence intervals in the first column of Table 4.4. Conditional on being low-paid in year $t-1$, individuals with an external Locus of Control have a probability of 0.432 to be higher-paid in year t. For individuals with a medium Locus of Control, this probability is 0.484, while for individuals with an internal Locus of Control the probability to be higher-paid in period t is 0.646. The confidence intervals of the probabilities for individuals with a medium Locus of Control overlap with the confidence intervals for the individuals with an external Locus of Control and with the confidence intervals of the individuals with an internal Locus of Control as well. However, the confidence intervals of the individuals with an external Locus of Control and the confidence intervals of the individuals with an internal Locus of Control do not overlap. This indicates that the probability of low-wage workers to be higher-paid in the next year is clearly higher for individuals with an internal Locus of Control than for individuals with an external Locus of Control. In sum, this evidence indicates that having an internal Locus of Control facilitates escaping low wages.

4.6 Conclusions

This chapter has investigated the impact of non-cognitive skills, in particular Locus of Control, on the wage mobility of male workers at the low-wage margin in West Germany. We apply dynamic multinomial logit models with random effects and investigate whether Locus of Control influences the probability of being higher-paid or low-paid as well as the probability of escaping low wages by moving up to higher-paid employment.

We find a significant amount of state dependence in low pay even after controlling for Locus of Control and other non-cognitive skills, such as the Big Five and reciprocity. Compared to individuals with an external Locus of Control, individuals with a more internal Locus of Control have a significantly higher probability of being higher-paid instead of low-paid. Conditional on being low-paid, individuals with an internal Locus of Control additionally have a significantly higher probability of moving to higher-paid employment in the following year than individuals with an external Locus of Control. This indicates that individuals who strongly believe that they control the events in their life have a lower probability of being low-paid. In addition, this also indicates that conditional on being low-paid, individuals who strongly believe that they control the events in their life additionally have a better chance of escaping low wages by moving to higher-wage employment compared to individuals with an external Locus of Control.

Our results suggest that having an internal Locus of Control is an important non-cognitive skill in the context of low wages because this skill may help individuals to avoid low-wage jobs and may help individuals to move from low-paid jobs to higher-paid jobs. Labour market policy instruments targeting low-wage workers have to take this finding into account because these heterogeneities can result in different reactions to applied measures. In particular, individuals with a more external LoC may need a higher level of external assistance. In addition, the determination of Locus of Control in childhood or early adulthood may be a starting point for long-term labour market policy measures aimed at improving individual wage mobility. In this context, it would additionally be important to analyse the broader impact of non-cognitive skills on labour market dynamics and to include women, who were not included in this study due their heterogeneous employment trajectories. Furthermore, it would be important to study whether the impact of non-cognitive skills on wage mobility additionally varies with job and firm characteristics. However, these topics are left for future research.

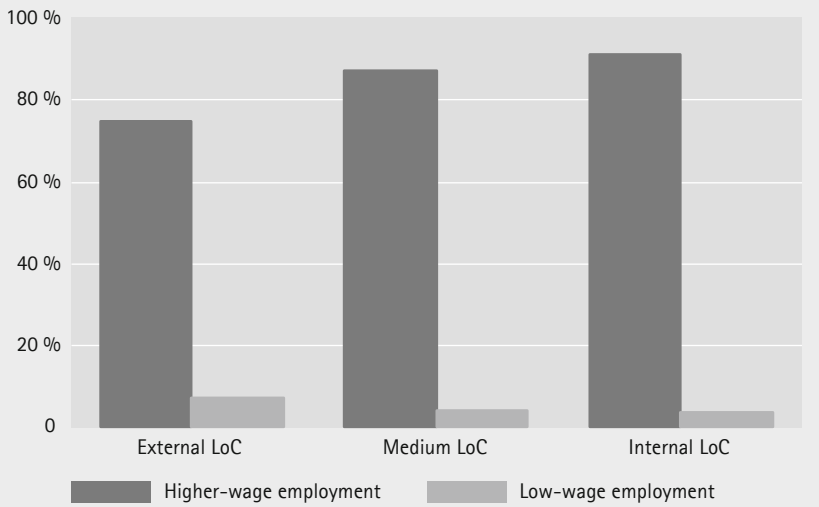
4.7 Figures and tables to chapter 4

Table 4.1: Descriptive statistics of the sample

	Higher wage	Low wage	Not working
Non-cognitive skills			
Locus of Control			
Measured as continuous variable (scale from 1 to 7)	4.88	4.53	4.27
Measured by three dummy variables			
external (yes = 1)	0.18	0.34	0.43
medium (yes = 1)	0.37	0.33	0.33
internal (yes = 1)	0.45	0.33	0.24
Big Five personality traits (scale from 1 to 7)			
Openness	4.42	4.38	4.37
Conscientiousness	5.94	5.96	5.73
Extraversion	4.72	4.65	4.61
Agreeableness	5.27	5.44	5.17
Neuroticism	3.60	3.84	4.10
Reciprocity (scale from 1 to 7)			
Positive	5.88	6.03	5.86
Negative	3.26	3.64	3.57
Individual characteristics			
No German citizen (yes = 1)	0.12	0.21	0.25
Age (in years)	45.14	41.18	48.68
Number of annual doctor visits	7.24	7.29	16.66
Married (1 = yes)	0.75	0.55	0.63
General elementary education (1 = yes)	0.09	0.15	0.20
Middle vocational educ./Abitur (1 = yes)	0.52	0.70	0.60
Higher vocational educ. and higher educ. (1 = yes)	0.39	0.15	0.20
Full-time work experience until 2006 (in years)	20.89	15.34	18.91
Unemployment experience until 2006 (in years)	0.34	1.71	3.66
Overall (N = 10,456)	86.27 %	4.61 %	9.12 %

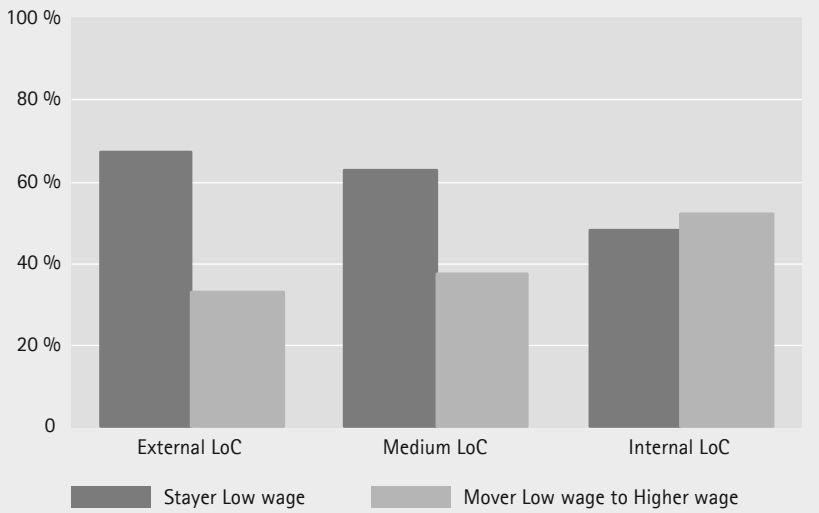
Note: own calculations based on SOEPv28, pooled (2007–2011).

Figure 4.1: Employment state by Locus of Control (percentages)



Note: own calculations based on SOEPv28, pooled (2007–2011).

Figure 4.2: Wage mobility of low-wage workers by Locus of Control (percentages)



Note: own calculations based on SOEPv28, pooled (2007–2011).

Table 4.2: Models 1–2, dynamic multinomial logit models with random effects, no interactions

	Model 1		Model 2	
	Low wage in t	Not working in t	Low wage in t	Not working in t
Lagged employment state (ref.: Higher wage in $t-1$)				
Low wage in $t-1$	1.000***	0.815***	1.004***	0.842***
	(0.246)	(0.310)	(0.245)	(0.312)
Not working in $t-1$	1.214***	3.136***	1.201***	3.177***
	(0.301)	(0.309)	(0.301)	(0.314)
Non-cognitive skills				
Medium Locus of Control (1 = yes)	-0.800***	-0.677***	-0.780***	-0.660***
	(0.249)	(0.227)	(0.249)	(0.228)
Internal Locus of Control (1 = yes)	-0.635***	-0.819***	-0.628**	-0.804***
	(0.246)	(0.233)	(0.261)	(0.247)
Openness	–	–	-0.004	-0.048
			(0.091)	(0.084)
Conscientiousness	–	–	0.291**	0.118
			(0.125)	(0.110)
Extraversion	–	–	-0.110	-0.018
			(0.094)	(0.087)
Agreeableness	–	–	0.223**	-0.110
			(0.110)	(0.100)
Neuroticism	–	–	0.075	-0.088
			(0.087)	(0.080)
Positive reciprocity	–	–	0.088	0.024
			(0.118)	(0.106)
Negative reciprocity	–	–	0.148**	0.104*
			(0.067)	(0.063)
Other individual characteristics				
No German citizen (1 = yes)	0.497*	0.498**	0.398	0.507**
	(0.258)	(0.241)	(0.260)	(0.241)
Age	-0.255	-0.184	-0.259	-0.168
	(0.303)	(0.325)	(0.303)	(0.325)
Age squared	0.008***	0.012***	0.008***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)
Number of annual doctor visits	-0.006	0.005	-0.007	0.005
	(0.007)	(0.004)	(0.007)	(0.004)
Married (1 = yes)	-0.326	0.907	-0.335	0.898
	(0.490)	(0.591)	(0.492)	(0.584)
General elementary education (1 = yes)	-0.367	-0.129	-0.370	-0.132
	(0.297)	(0.271)	(0.295)	(0.268)
Higher vocational education	-1.065***	-0.724***	-1.015***	-0.695***
and higher education (1 = yes)	(0.268)	(0.235)	(0.266)	(0.233)
Individual averages $\bar{X}_t$				
Indiv. average of age	-0.012	-0.007	-0.009	-0.026
	(0.311)	(0.334)	(0.311)	(0.333)
Indiv. average of age squared	-0.006*	-0.008**	-0.006	-0.008**
	(0.003)	(0.004)	(0.003)	(0.004)
Indiv. average of number of annual doctor visits	0.021**	0.041***	0.023**	0.041***
	(0.011)	(0.009)	(0.011)	(0.009)
Indiv. average of married	-0.010	-1.281**	0.023	-1.273**
	(0.544)	(0.628)	(0.545)	(0.620)

Table 4.2 (cont.): Models 1–2, dynamic multinomial logit models with random effects, no interactions

	Model 1		Model 2	
	Low wage in t	Not working in t	Low wage in t	Not working in t
Initial employment state (ref.: Higher wage in $t=0$)				
Low wage in $t=0$	4.605***	2.706***	4.514***	2.640***
	(0.451)	(0.477)	(0.444)	(0.474)
Not working in $t=0$	4.147***	4.164***	4.114***	4.109***
	(0.519)	(0.624)	(0.516)	(0.633)
Full-time work experience until 2006, in years	0.002	-0.079***	-0.010	-0.083***
	(0.027)	(0.022)	(0.027)	(0.022)
Unemployment experience until 2006, in years	0.205***	0.258***	0.195***	0.250***
	(0.062)	(0.055)	(0.061)	(0.054)
Constant	1.669	-1.975	-1.919	-1.873
	(2.424)	(2.344)	(2.673)	(2.532)
Variance η_2	5.107 (0.891)***		4.885 (0.861)***	
Variance η_3	4.082 (1.017)***		3.844 (1.003)***	
Covariance η_2, η_3	3.937 (0.793)***		3.768 (0.773)***	
AIC	4675.422		4672.823	
Log Likelihood	-2286.7112		-2271.4117	
Observations	10,456		10,456	

Notes: own calculations based on SOEPv28, pooled (2007–2011). Standard errors in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Reference groups: external Locus of Control, middle vocational education/Abitur. Full set of year dummies included.

Table 4.3: Models 3–4, dynamic multinomial logit models with random effects, with interactions

	Model 3		Model 4	
	Low wage in *t*	Not working in *t*	Low wage in *t*	Not working in *t*
Lagged employment state (ref.: Higher wage in *t*–1)				
Low wage in *t*–1	1.397***	0.863*	-0.137	-1.630
	(0.392)	(0.456)	(2.434)	(2.925)
Not working in *t*–1	1.047**	2.911***	-4.399	1.193
	(0.487)	(0.438)	(3.583)	(3.006)
Non-cognitive skills				
Medium Locus of Control (1 = yes)	-0.896***	-0.893***	-0.808**	-0.928***
	(0.322)	(0.291)	(0.321)	(0.294)
Internal Locus of Control (1 = yes)	-0.638**	-0.896***	-0.492	-1.047***
	(0.305)	(0.285)	(0.324)	(0.311)
Openness	–	–	-0.111	0.036
			(0.113)	(0.107)
Conscientiousness	–	–	0.394**	0.227
			(0.169)	(0.147)
Extraversion	–	–	-0.151	0.035
			(0.121)	(0.114)
Agreeableness	–	–	0.288**	-0.293**
			(0.142)	(0.130)
Neuroticism	–	–	0.200*	-0.138
			(0.109)	(0.102)
Positive reciprocity	–	–	0.066	0.039
			(0.155)	(0.137)
Negative reciprocity	–	–	0.213**	0.005
			(0.085)	(0.083)
Interactions between non-cognitive skills and Low wage in *t*–1				
Medium Locus of Control * Low wage in *t*–1	-0.405	0.121	-0.555	0.076
	(0.520)	(0.620)	(0.541)	(0.642)
Internal Locus of Control * Low wage in *t*–1	-0.728	-0.177	-1.364**	-0.532
	(0.494)	(0.627)	(0.573)	(0.702)
Openness * Low wage in *t*–1	–	–	0.418**	0.360
			(0.202)	(0.250)
Conscientiousness * Low wage in *t*–1	–	–	-0.119	-0.167
			(0.281)	(0.347)
Extraversion * Low wage in *t*–1	–	–	0.276	0.267
			(0.189)	(0.250)
Agreeableness * Low wage in *t*–1	–	–	0.028	0.386
			(0.241)	(0.310)
Neuroticism * Low wage in *t*–1	–	–	-0.256	-0.239
			(0.191)	(0.231)
Positive reciprocity * Low wage in *t*–1	–	–	0.113	-0.133
			(0.270)	(0.324)
Negative reciprocity * Low wage in *t*–1	–	–	-0.097	0.160
			(0.132)	(0.167)

Table 4.3 (cont.): Models 3–4, dynamic multinomial logit models with random effects, with interactions

	Model 3		Model 4	
	Low wage in t	Not working in t	Low wage in t	Not working in t
Interactions between non-cognitive skills and Not working in $t-1$				
Medium Locus of Control * Not working in $t-1$	0.237	0.801	-0.099	0.917
	(0.680)	(0.565)	(0.720)	(0.603)
Internal Locus of Control * Not working in $t-1$	0.367	-0.110	-0.200	0.121
	(0.681)	(0.563)	(0.766)	(0.643)
Openness * Not working in $t-1$	–	–	0.091	-0.171
			(0.246)	(0.205)
Conscientiousness * Not working in $t-1$	–	–	-0.143	-0.746**
			(0.373)	(0.322)
Extraversion * Not working in $t-1$	–	–	0.728***	0.557**
			(0.280)	(0.238)
Agreeableness * Not working in $t-1$	–	–	0.245	0.368
			(0.332)	(0.265)
Neuroticism * Not working in $t-1$	–	–	-0.209	0.212
			(0.245)	(0.202)
Positive reciprocity * Not working in $t-1$	–	–	0.271	0.044
			(0.334)	(0.277)
Negative reciprocity * Not working in $t-1$	–	–	0.204	0.401**
			(0.198)	(0.177)
Other individual characteristics				
No German citizen (1 = yes)	0.491*	0.509**	0.344	0.511**
	(0.259)	(0.240)	(0.259)	(0.243)
Age	-0.234	-0.176	-0.208	-0.091
	(0.305)	(0.327)	(0.307)	(0.331)
Age squared	0.008***	0.011***	0.008**	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)
Number of annual doctor visits	-0.006	0.005	-0.006	0.006
	(0.007)	(0.004)	(0.007)	(0.004)
Married (1 = yes)	-0.387	0.924	-0.383	0.882
	(0.494)	(0.593)	(0.505)	(0.594)
General elementary education (1 = yes)	-0.360	-0.120	-0.428	-0.161
	(0.297)	(0.270)	(0.295)	(0.273)
Higher vocational education	-1.089***	-0.725***	-1.044***	-0.675***
and higher education (1 = yes)	(0.269)	(0.235)	(0.267)	(0.234)
Individual averages $\bar{X}_t$				
Indiv. average of age	-0.033	0.003	-0.045	-0.102
	(0.314)	(0.336)	(0.316)	(0.340)
Indiv. average of age squared	-0.005	-0.008**	-0.005	-0.007*
	(0.003)	(0.004)	(0.003)	(0.004)
Indiv. average of number of annual doctor visits	0.021*	0.042***	0.019*	0.041***
	(0.011)	(0.009)	(0.011)	(0.009)
Indiv. average of married	0.043	-1.293**	0.030	-1.265**
	(0.548)	(0.629)	(0.556)	(0.630)
Initial employment state (ref.: Higher wage in $t=0$)				
Low wage in $t=0$	3.834***	2.254***	5.724	1.872
	(0.653)	(0.654)	(3.680)	(3.867)
Not working in $t=0$	4.128***	4.082***	13.893***	7.537**
	(0.697)	(0.730)	(4.008)	(3.588)
Full-time work experience until 2006, in years	-4.6e-04	-0.081***	-0.016	-0.088***
	(0.027)	(0.022)	(0.028)	(0.023)
Unemployment experience until 2006, in years	0.211***	0.262***	0.218***	0.265***
	(0.062)	(0.056)	(0.063)	(0.057)

Table 4.3 (cont.): Models 3–4, dynamic multinomial logit models with random effects, with interactions

Interactions between non-cognitive skills and Low wage in $t=0$				
Medium Locus of Control * Low wage in $t=0$	1.114	0.817	1.091	0.775
	(0.773)	(0.815)	(0.782)	(0.829)
Internal Locus of Control * Low wage in $t=0$	0.986	0.190	1.381	0.483
	(0.763)	(0.853)	(0.846)	(0.948)
Openness * Low wage in $t=0$	–	–	-0.079	-0.264
			(0.289)	(0.318)
Conscientiousness * Low wage in $t=0$	–	–	0.071	0.303
			(0.402)	(0.444)
Extraversion * Low wage in $t=0$	–	–	-0.605**	-0.520
			(0.285)	(0.329)
Agreeableness * Low wage in $t=0$	–	–	0.294	0.187
			(0.343)	(0.383)
Neuroticism * Low wage in $t=0$	–	–	0.026	0.156
			(0.310)	(0.340)
Positive reciprocity * Low wage in $t=0$	–	–	-0.308	0.030
			(0.394)	(0.428)
Negative reciprocity * Low wage in $t=0$	–	–	0.183	0.067
			(0.199)	(0.217)
Interactions between non-cognitive skills and Not working in $t=0$				
Medium Locus of Control * Not working in $t=0$	0.123	-0.316	0.086	-0.444
	(0.790)	(0.685)	(0.823)	(0.729)
Internal Locus of Control * Not working in $t=0$	–0.359	0.451	-0.396	0.388
	(0.836)	(0.716)	(0.903)	(0.793)
Openness * Not working in $t=0$	–	–	0.029	-0.122
			(0.302)	(0.263)
Conscientiousness * Not working in $t=0$	–	–	-0.386	0.265
			(0.410)	(0.367)
Extraversion * Not working in $t=0$	–	–	-0.123	-0.399
			(0.309)	(0.276)
Agreeableness * Not working in $t=0$	–	–	-0.703*	-0.215
			(0.377)	(0.321)
Neuroticism * Not working in $t=0$	–	–	-0.146	-0.121
			(0.270)	(0.239)
Positive reciprocity * Not working in $t=0$	–	–	-0.172	0.017
			(0.376)	(0.333)
Negative reciprocity * Not working in $t=0$	–	–	-0.545**	-0.373*
			(0.238)	(0.212)
Constant	1.675	-2.278	-3.028	-1.567
	(2.434)	(2.353)	(2.804)	(2.676)
Variance η_2	5.096 (0.889)***		4.630 (0.825)***	
Variance η_3	4.011 (1.030)***		3.783 (1.048)***	
Covariance η_2, η_3	3.900 (0.797)***		3.781 (0.780)***	
AIC	4694.494		4724.907	
Log Likelihood	-2280.2468		-2225.4537	
Observations	10,456		10,456	

Notes: own calculations based on SOEPv28, pooled (2007–2011). Standard errors in parentheses. Significance levels: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Reference groups: external Locus of Control, middle vocational education/Abitur. Full set of year dummies included.

Table 4.4: Predicted probabilities to be in a given employment state in *t*, conditional on Locus of Control and employment state in *t* – 1, from model 4

	External Locus of Control								
	Higher wage in *t*			Low wage in *t*			Not working in *t*		
Higher wage in *t* – 1	0.962	(0.953)	(0.972)	0.016	(0.010)	(0.023)	0.021	(0.014)	(0.028)
Low wage in *t* – 1	0.432	(0.333)	(0.532)	0.413	(0.303)	(0.523)	0.154	(0.096)	(0.213)
Not working in *t* – 1	0.107	(0.078)	(0.137)	0.068	(0.040)	(0.096)	0.825	(0.786)	(0.864)
	Medium Locus of Control								
	Higher wage in *t*			Low wage in *t*			Not working in *t*		
Higher wage in *t* – 1	0.981	(0.976)	(0.986)	0.010	(0.006)	(0.014)	0.009	(0.006)	(0.012)
Low wage in *t* – 1	0.484	(0.378)	(0.591)	0.419	(0.314)	(0.523)	0.097	(0.052)	(0.143)
Not working in *t* – 1	0.171	(0.124)	(0.219)	0.059	(0.031)	(0.087)	0.770	(0.718)	(0.822)
	Internal Locus of Control								
	Higher wage in *t*			Low wage in *t*			Not working in *t*		
Higher wage in *t* – 1	0.986	(0.982)	(0.990)	0.008	(0.005)	(0.011)	0.006	(0.003)	(0.009)
Low wage in *t* – 1	0.646	(0.543)	(0.748)	0.298	(0.199)	(0.396)	0.056	(0.026)	(0.087)
Not working in *t* – 1	0.238	(0.183)	(0.292)	0.065	(0.032)	(0.099)	0.697	(0.637)	(0.757)

Notes: own calculations based on SOEPv28, pooled (2007–2011). 95 %-confidence intervals in parentheses.

4.8 Appendix to chapter 4

Table 4.5: Measurement of Locus of Control in the SOEP questionnaire

Locus of Control	
How my life goes depends on me.	Internal LoC
If a person is socially or politically active, he/she can have an effect on social conditions.	Internal LoC
One has to work hard in order to succeed.	Internal LoC
Compared to other people, I have not achieved what I deserved.	External LoC
I frequently have the experience that other people have a controlling influence over my life.	External LoC
The opportunities that I have in life are determined by the social conditions.	External LoC
I have little control over the things that happen in my life.	External LoC
Source: SOEP questionnaire, SOEPv28.	

Table 4.6: Measurement of the Big Five inventory in the SOEP questionnaire

I see myself as someone who ...	
is original, comes up with new ideas	Openness to experience
values artistic experiences	Openness to experience
has an active imagination	Openness to experience
does a thorough job	Conscientiousness
does things effectively and efficiently	Conscientiousness
tend to be lazy (reversed)	Conscientiousness
is communicative, talkative	Extraversion
is outgoing, sociable	Extraversion
is reserved (reversed)	Extraversion
is sometimes somewhat rude to others (reversed)	Agreeableness
has a forgiving nature	Agreeableness
is considerate and kind to others	Agreeableness
worries a lot	Neuroticism
gets nervous easily	Neuroticism
is relaxed, handles stress well (reversed)	Neuroticism
Source: SOEP questionnaire, SOEPv28.	

Table 4.7: Measurement of reciprocity in the SOEP questionnaire

Reciprocity	
If someone does me a favor, I am prepared to return it.	Positive reciprocity
I go out of my way to help somebody who has been kind to me before.	Positive reciprocity
I am ready to undergo personal costs to help somebody who helped me before.	Positive reciprocity
If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost.	Negative reciprocity
If somebody puts me in a difficult position, I will do the same to him/her.	Negative reciprocity
If somebody offends me, I will offend him/her back.	Negative reciprocity

Source: SOEP questionnaire, SOEPv28.

5 Union decline and the coverage wage gap in Germany[63]

5.1 Introduction

Most information on the union-nonunion wage differential in Germany – strictly, the wage gap between covered and uncovered workers – pertains to the 1990s or early 2000s. Yet, as is widely known, German unions have been in retreat both during and subsequent to these intervals. It is the very breadth of decline that makes investigation of the more recent interval more compelling. First, union density has fallen sharply. The decline can be dated from the mid-1980s, the sudden rise in membership after 1989 proving to be little more than a diversion. Accordingly, union density declined from 36 % in 1991 in the aftermath of unification to 19.3 % in 2009 (see Fitzenberger et al., 2011; Addison et al., 2007; Bispinck et al., 2010). By way of qualification, Hirsch and Schnabel's (2014) measure of union bargaining power, based on a right-to-manage model of collective bargaining, suggests that the fall off in union strength occurred mostly after 2002, remaining fairly stable in the 1990s despite a fairly uniform drop in density over the entire period.

Second, overall collective bargaining coverage as a share of employment fell in West Germany (East Germany) from 76 % (63 %) in 1998 to 65 % (51 %) in 2009 (see Bispinck et al., 2010).[64] The corollary was a continuing rise in the bargaining free sector.

Third, the decline in collective bargaining coverage was not deflected by a growth in "orientation" in the uncovered sector, nor was it to receive any support from the "extension principle." Orientation refers to a process whereby uncovered firms claim to shadow the terms of sectoral agreements. The coverage of orienting firms in the private sector rose from 17.9 % of employment in 2000 to 22.4 % in 2010. This rising trend only partially compensated for the decline in *sectoral* bargaining: the share of employees covered by sectoral agreements fell from 59.9 % to 49.3 % over the same interval. Moreover, these are simple frequencies. The wages paid by orienting firms have been shown to lie well below those set under collective bargaining (see Addison et al., 2012b). As far as the extension of collective agreements to employees and employers not bound by the relevant sectoral agreement is concerned, this, too, has evinced pronounced decline. For example, considering just the extension of primary collective agreements under the 1949 Collective Agreement Act, their number fell from 408 (or 5.4 % of all such agreements) to just 245 (1.5 %) in 2009 (Bispinck et al., 2010).

63 This chapter is based on Addison et al. (2012a), which is joint work with John T. Addison, Paulino Teixeira, and Lutz Bellmann.

64 The link between density and coverage by a collective agreement is noted in section 5.2.

Finally, German sectoral collective bargaining has been buffeted by decentralization in the form of opening clauses and pacts for employment and competitiveness (see, respectively, Bispinck, 2004; Seifert and Massa-Wirth, 2005). Abstracting from the issue of whether the process has been destabilizing or fragmenting – so-called "internal erosion" (on which, see Hassel, 1999, inter al.) – the very extensive contractual innovations in question involved such elements as hardship clauses allowing firms in economic difficulties to deviate from sectorally-agreed provisions, temporary cuts in pay to safeguard jobs, the introduction of profit-related pay substituting for previously guaranteed elements of the remuneration package, and concession bargaining more generally (see, for example, Haipeter and Lehndorff, 2009).

The very scale of these developments in Europe's largest economy makes Germany an interesting case for consideration. One primary interest is of course macroeconomic in scope. Specifically, has increasingly decentralized bargaining produced greater flexibility (i.e. improved) responsiveness of wages to their underlying determinants thereby benefiting employment, or, by analogy with concerns expressed after the collapse of the Swedish model, have the advantages associated with a coordinated system of bargaining been so compromised as to lead to the opposite outcome?[65] There is also a European-wide dimension to these developments, given the role of Germany in shaping EU social policy and institutions.

Our own concerns are less far ranging given the unsettled nature of research into the union premium, let alone its course through time. The focus of the present treatment is, then, to discover what has been happening to the union wage gap in the first decade of the 2000s. It offers a critical albeit partial first step in the analysis of the consequences of the decline in unionism. It is partial because an estimate of average wage differences does not inform us about the distribution of wages. A small premium may be consistent with a large effect in the lower reaches of the distribution. Even if declines in the wage gap are unlikely to be undone by distributional effects, the latter require explicit consideration in future research. But, to repeat, basic knowledge of the effect of unions on average wages is itself underdeveloped and remains the basis of the present inquiry.

The chapter proceeds as follows. We first review the state of play on the union wage gap, drawing upon the German (and, briefly, the US) literature. We then outline our unique dataset, namely the cross sectional version of the linked employer-employee data supported by the German Institute for Employment Research. Our analysis is based on two (three-year) clouds of data at each end

65 A related issue is whether the erosion of the industrial relations architecture might lead to 're-stabilization from above' and hence greater involvement of the nation state in wage fixing via national minimum wages and/or heightened use of extension provisions.

of the sample period 2000–2010, exploiting changes in establishment collective bargaining status over time. Our estimates of union wage effects are obtained by comparing the wage growth of workers employed by plants joining or leaving collective bargaining with that of workers employed by establishments that did not change their collective bargaining status – never members and always members, respectively. These counterfactuals are then reversed for robustness. Our main finding is that joining a sectoral agreement is found always to produce higher wages, while leaving one no longer produces wage losses if the transition is to a firm agreement. Leaving a firm agreement to non-coverage also leads to wage reductions, while joining one from non-coverage seems decreasingly favourable. The reverse counterfactuals in turn yield correspondingly smaller estimates (in absolute value) of wage development than reported for the initial counterfactuals.

5.2 A review of the literature on the collective bargaining premium

Recent studies of the magnitude of the collective bargaining premium in Germany use either the German Structure of Earnings Survey (GSES) or the Linked Employer-Employee Dataset of the Institute for Employment Research (LIAB). The thrust of studies using the GSES has been upon distributional issues, while those based on the LIAB have more often (though not exclusively) considered the effects of collective bargaining on wages and rent sharing.[66] Furthermore, the GSES studies lack a longitudinal capacity, limiting inferences that can be made about causality. Note, finally, that the wage gap in Germany refers to coverage rather than membership since German constitutional law – specifically Article 9 of the Basic Law (*Grundgesetz*) – does not allow collective agreements to discriminate against non-union members.

The main GSES studies that also examine the wage gap in addition to distributional issues are: (a) Stephan and Gerlach (2005) who use a regional manufacturing subsample from Niedersachsen (Lower Saxony) of the GSES for the 1990, 1995, and 2001 waves; (b) Fitzenberger et al. (2013) who use the full survey for 2001 but focus on prime-age male employees in West Germany; and (c) Antonczyk (2010) who deploys the same GSES sample for 2001 but who seeks to account for the endogeneity of collective bargaining.[67] Stephan and Gerlach's

66 The main exception is the study by Dustmann et al. (2009), which examines ***a number of explanations*** for the growth in German wage inequality over the last decades, including changes in collective bargaining.

67 See also the interesting analysis of the 1995 and 2005 waves of the GSES by Heinbach and Spindler (2007), using the Machado-Mata decomposition technique (see Machado and Mata, 2005, for further information on this technique).

multi-level model provides estimates of the wage of an average worker in an average firm applying individual contracts (i.e. a no collective bargaining regime), and of the differentials that would apply had that worker been employed in an otherwise average firm with either an industry collective agreement or a firm-level agreement. In 1990 the estimated wage premium was 4% in the case of sectoral contracts and 3% for firm-level contracts. Higher coverage premia are reported for the later sample years: respectively 9% and 12% in 1995, and 7% and 11% in 2001.[68, 69]

The study by Fitzenberger et al. (2013) is notable for its consideration of the wages of uncovered workers in covered firms and the role of (exogenous) union density in the relevant labour market segment in addition to firm coverage effects. The authors' OLS results indicate that firms applying a collective agreement pay higher wages on average; specifically, the greater the share of workers in a firm covered by a collective contract, the higher are wages on average – and somewhat more so in the case of firm-level than sectoral agreements. For its part, an increase in union density reinforces the positive effects of higher coverage at firm level (while lowering wages in the uncovered sector). That said, individual coverage by a collective agreement in a covered firm shows a negative impact on the wage level, and the authors' separate quantile regression analysis shows that this effect is elevated at higher quantiles of the conditional wage distribution. In other words, collective bargaining coverage serves to reduce wage inequality – reminding us that the main thrust of analyses based on the GSES is upon distributional issues.[70]

Antonczyk (2010) seeks to measure the causal effect of collective bargaining in 2001 – actually, sectoral bargaining alone – on wages, using two instrumental variables measured at district level; specifically, the share of Protestants and Catholics (the expectation being that Catholics are more likely to favour unionism), and historic gross union density (i.e. employed *and* unemployed union members as a share of employees). These variables are meant to provide exogenous variation in the treatment variable. Antonczyk reports the average treatment effect on wages or union wage effect, namely the expected gain from coverage of a randomly assigned individual with a given set of observable characteristics.[71] The upshot of this procedure is that the simple ceteris paribus coverage premium shrinks from 3.6 log points to just 0.8 log points, the bulk of the unadjusted differential

68 Similar results for a different state (Baden-Württemberg) are reported by Bechtel et al. (2004).

69 Stephan and Gerlach also report that the rates of return to human capital as well as the gender wage gap are lower in firms with collective agreements than in companies with individual contracts.

70 See also Fitzenberger and Kohn (2005), and Antonczyk et al. (2010b).

71 He also reports the average treatment effect on the treated – or idiosyncratic gain for the individual receiving the treatment – which is roughly twice the average treatment effect.

seemingly reflecting the fact that individuals undergoing treatment have higher unobserved productivity than those undergoing the treatment.

Studies using the LIAB are sparse and, as noted earlier, are less concerned with distributional issues than with the effects of coverage on levels of wages and rents. The principal study is by Gürtzgen (2012), using data from the 1995–2008 LIAB for West German mining and manufacturing establishments. Gürtzgen presents OLS, establishment fixed effects, and spell fixed effects estimates of a wage equation where the dependent variable is the log daily wage. In the establishment fixed effects specification, the collective bargaining coverage premium is identified from establishments that change their contract status. The spell fixed effects specification first differences log wages within each individual-establishment cell, removing unobserved firm *and* worker heterogeneity. Raw coverage differentials of 20 log points for sectoral bargains and 29 log points for firm bargaining are reduced by 70 % and 80 %, respectively, in the OLS specification with the full set of controls. More importantly, these much reduced coverage premia vanish once the non-random selection of firms into bargaining regime is controlled for and also under spell differencing designed to control for the possibility that plants changing their bargaining status might at the same time also experience a change in unobserved worker skills.

Finally, in the most contentious part of her analysis, Gürtzgen turns to the role of time-specific unobservables, the concern being that establishments that change their coverage status might be subject to different time-specific unobservables than are those maintaining the original contract status. To investigate this endogeneity issue, she adopts a trend-adjusted difference-in-difference estimator, analysing separate transitions from one bargaining regime to another (six cases in all) and allowing for differences in changes in time-specific shocks by subtracting the differential in wage growth in pre-transition intervals. Gürtzgen concludes from these comparisons of the wage growth of individuals experiencing a change in contract status with the wage growth of individuals employed by stable plants that there is no "true" wage effect of exiting sectoral bargaining to non-coverage. Although such individuals may experience wage losses, this outcome is indicative of the correlation of the transition with (more) negative demand shocks. The interpretation of firm collective bargaining transitions is altogether more nuanced, however, with some transitions leading to positive differentials and others giving rise to negative differentials, so that the small insignificant premium for firm-level collective bargaining reported in the main estimation exercise represents the net effect of these different influences. This latter part of Gürtzgen's analysis is rather speculative. The problem resides of course in implementing the adjusted difference-in-difference estimator (on which more below).

We conclude this section with some contextual remarks on the evolving US literature. While the preponderance of American research has focused on the union membership premium – and also unlike the research reviewed here has continued to obtain some very large estimates of that particular premium using *both* cross sectional and longitudinal analysis of individual wage data[72] – some more recent studies offer a closer match with the German literature in focusing on the wage effects of establishments becoming unionized. We refer to studies of union representation elections comparing establishments in which unions became recognized by a close margin of the vote with those in which they barely lost, and where evidence of a discontinuous relation between the vote share and wages is deemed to be the causal impact of unionization. Such regression discontinuity studies by DiNardo and Lee (2004) and Frandsen (2012) produce German-type estimates of the wage gap, and attribute the results of past US research using individual data to the contribution of unobserved firm heterogeneity.

Yet lest we draw premature conclusions about likely convergence in the two literatures, it should also be noted that recent US studies in the more conventional event-study tradition still find large effects of new unionization on publicly-traded firms' equity values. Lee and Mas (2012), in particular, obtain estimates of lost market value attendant upon unionization that translate into a union coverage premium of 10%. Importantly, these authors further argue that such equity losses are increasing in the union vote share in representation elections.

Against this backdrop, the present exercise which seeks to obtain estimates of the course of the union wage gap at a time of unambiguously declining union authority and controlling for unobserved firm and worker heterogeneity gains additional purchase.

5.3 The data

The present study uses the LIAB Cross-Sectional Model Version 2 1993–2010 (LIAB QM2 9310) of the linked employer-employee data supported by the Institute for Employment Research in Nuremberg (IAB). The LIAB data are created at the Research Data Centre (FDZ) of the Federal Employment Agency by linking the establishment data from the annual waves of the IAB Establishment Panel with information on individuals from the social security records of the German Federal Employment Agency.

The IAB Establishment Panel is a large-scale annual establishment survey that covers up to 16,000 establishments every year, beginning in 1993 in West Germany

72 See the excellent survey by Hirsch (2004).

and extended in 1996 to the former East Germany. The participating establishments are surveyed on a large number of employment policy-related subjects. These include employment development, business policy and business development, collective bargaining, personnel structure and recruitment, remuneration, and working time. The survey is unique in Germany, since it is representative for all industries and establishment sizes nationwide and is conceived as a longitudinal survey. Therefore, it enables researchers to analyse developments over time and to conduct longitudinal studies of individual establishments as well (for further information on the IAB Establishment Survey, see Fischer et al., 2009).

The information on individual workers in the LIAB dataset comes from the social security records of the German Federal Employment Agency and covers all employees of the establishments surveyed in the IAB Establishment Panel. Specifically, it includes both employees who are liable to social security and also employees who are marginally part-time employed. For these employees, several demographic characteristics such as gender, age, nationality, level of education, occupational group, employment status and place of residence are provided. Furthermore, the data contain the individual daily wage of an employee. The latter is measured with high accuracy by the authorities since this wage information is decisive in calculating an individual's social security payments.

In sum, the LIAB dataset is a unique data source for analysing both the supply side and the demand side the German labour market along various dimensions. Due to its coverage, it is one of the best-suited datasets for investigating the effects of collective bargaining coverage on the wages of individual workers in Germany. Several versions of the LIAB data including cross-sectional and longitudinal subsamples can be accessed for scientific purposes at the FDZ in Nuremberg.

We have undertaken several modifications to adapt the data to fit our research purposes. In the first place, in order to improve the quality of the linkage between the survey data and the administrative data, we adopted the procedure that is followed by the FDZ for some of the longitudinal versions of the LIAB, erasing observations that exhibit a bad linkage quality. In the FDZ procedure, a link is defined as having a bad quality if the number of employees and apprentices that an establishment has reported in the IAB Establishment Panel deviates significantly from the number of employees and apprentices that is calculated from the administrative data (for information on this procedure, see Jacobebbinghaus, 2008: p. 53).

Second, other modifications concern the key wage variable that is central to our analysis. In the LIAB data, the reported individual wage of a worker is the gross daily wage. Fringe benefits are included only if they are subject to social security. Since there exists an upper contribution limit in the German social security system

– set annually for West and East Germany by the German government – the gross daily wages in these data are top-coded; in our dataset, this affects about 15 % (10 %) of the observations for West (East) Germany. We therefore imputed the wages above the contribution limit, using the procedure suggested by Gartner (2005). First, we estimated a Tobit regression of log daily wages on individual and establishment characteristics separately for both parts of the country and for each single year. Following Gartner (2005), we then constructed a truncated normal distribution by using the predicted values from the Tobit estimation as moments and by setting the lower truncation point equal to the contribution limit. Finally, we replaced censored wage observations by values randomly drawn from this truncated normal distribution. Furthermore, we deflated wages using the Consumer Price Index published by the German Federal Statistical Office; specifically, all wages are expressed in year 2000 values.

Third, because only a very broad measure of individual working hours is contained in the dataset – in particular, for part-time workers, whether working hours are less or greater than 18 per week – we restricted our analysis to full-time employed workers who are subject to social security. We further excluded those full-time workers who were recorded as receiving an implausibly low daily wage (of less than 16 €). In addition, we excluded observations from the following sectors/enterprises: agriculture, hunting, fishing and forestry, public administration, and not-for-profit entities.

Note that since we are using the cross-sectional version of the LIAB, we are unable to track a worker if he/she leaves one establishment for another that is not covered by the IAB Establishment Survey, or if he/she exits to non-employment. The same problem arises if a worker remains in an establishment that subsequently, and for whatever reason, no longer participates in the IAB Establishment Survey. Unfortunately, there is no way of circumventing this limitation of the data. Making use of one of the available longitudinal versions of the LIAB, or constructing our own LIAB-variant, would not suffice as the key information on the collective bargaining status of an establishment in a given year will not be available if the establishment fails to take part in the IAB Establishment Survey in that year (the reader is referred to Heining et al., 2013, for more information on the LIAB dataset).

5.4 Preliminary data analysis

Our analysis is based on two (three-year) clouds of data – annual observations for 2000–2002 and 2008–2010 – rather than the full 2000–2010 panel. Given the establishment rotation in the IAB survey, that disqualifies us in practice from

following other than workers in permanent panel establishments over a relatively long period, little is lost from our more selective approach. Further, it has the advantage of contrasting in a possibly more direct way two presumably distinct periods, occurring at the beginning and at the end of the first decade of the present century, marked by a material decline in collective bargaining coverage and in union density (see Addison et al., 2011).

Table 5.1 presents the main longitudinal features of each subset of observations. Three main observations are in order. First, we observe approximately the same number of workers in each sub-period: 2.4 million in 2000–2002 and 1.9 million in 2008–2010. Second, the share of individuals appearing in each and every year of each cloud is more or less the same: 29.9 % in the first interval, 32.9 % in the second. Finally, the percentage of individuals who are observed at least twice over the two intervals is also approximately constant: 50.9 % and 55.8 % of the total, respectively. In sum, the two clouds of data are highly comparable both in terms of the number of workers being observed and in their longitudinal profile.

In Table 5.2 we look at the longitudinal pattern of individuals observed at least twice over the two observation windows. Here we want to know whether workers stay in the same establishment or switch employers. Clearly, either in the case of workers who are observed in three consecutive years or for those who are observed in just two years (consecutively or otherwise), job stayers massively dominate in each sub-period: on average, only 1 in 100 workers observed at least twice are job movers. It is this very nature of the LIAB data that forces us to identify the union wage effect based on the wage development of job stayers, in conjunction with observed changes in establishment collective bargaining status, as further elaborated upon in section 5.5 below.

Table 5.3 indicates exactly how often establishments switch their collective agreement status, reporting both one-year and two-year transitions. In the interests of economy, we aggregate firm and sectoral agreements into a single category. We thus identify 'any type of collective agreement' here, be it firm-level or industry-wide in scope. Examination of the two separate collective bargaining arrangements is remitted to Table 5.7 in the Appendix.

As shown in the table, between 2000 and 2001, for example, 424 out of 3,639 establishments (or 11.7 %) abandoned collective bargaining of either type while 441 out of 2,792 (15.8 %) joined a collective agreement from an initial state of no coverage. This means that the percentage of collective bargaining switchers in the total number of possible cases is 13.5 % (= [(424 + 441) / 6,431] * 100). There is therefore a considerable share of establishments whose collective bargaining status changes over time, comprising roughly equal numbers of joiners and leavers. Note further that approximately the same percentage of collective

bargaining switchers is observed in 2001–2002, at 12.8%. Similarly, for the years 2008–2009 and 2009–2010, the percentage of switchers is 11.5% and 6.8%, respectively. Two-year transitions are slightly higher than the one-year transitions, at 14.5% and 11.9% in the first and second sub-periods, respectively. Note that the two-year transition rates would be substantially higher than their one-year counterparts had the two samples been the same. They are not precisely because two-year transitions in practice require establishments to be in the sample for three consecutive years, with the implication that the corresponding sample tends to be populated by a substantially higher proportion of permanent panel stayers.

Our estimates of the collective bargaining wage gap were obtained by fitting an augmented Mincerian earnings function to the separate cross-sections of data. Specifically, we conditioned the wage gap on 24 (67) worker (establishment) covariates. The former included gender, age (and its square), years of service (and its square), citizenship status, education (6 levels), and occupation (12 levels). The latter comprised dummies for location, establishment age, the profit situation, the state of technology, works council status, firm size (and its square), and industry (40 2-digit), together with the share of female, fixed-term, foreign and skilled workers, and employee median age (see Table 5.8).

The results, shown in the first column of Table 5.4, indicate a positive wage gap of 7% to 14% in favour of workers covered by sectoral agreements, relative to the comparison group of workers in non-covered establishments. This is a sizeable wage gap, consistent with some earlier OLS studies. Of some interest here is the upward trend of this wage gap. Next, the evidence on sectoral versus firm-level agreements points to a wage gap favourable to the former: at 1.8% to 4.0%. Finally, the third column of the table points unequivocally to higher earnings under any form of collective bargaining than under individual bargaining, the margin amounting to some 6.3% to 12.5%. We next place our discussion of wage formation in a longitudinal context, allowing for unobserved establishment and worker heterogeneity.

5.5 Estimation strategy

Let us assume that the (log) gross daily wage for individual i in period t, y_{it}, is given by:

$$y_{it} = Z_{it}\beta + \delta U_{jt} + \lambda_t + \theta_i + \psi_j + \varepsilon_{it}, \quad (1)$$

where θ_i and ψ_j denote worker- and firm-specific time-invariant effects, respectively; Z_{it} is a vector of observed time-varying and time-invariant worker-

and firm-level characteristics, as noted in section 5.3; λ_t is a time dummy; U_{jt} is a dichotomous variable indicating the collective agreement status of firm j (so that δ denotes the collective bargaining wage premium); and ε_{it} is the error term of the model. As is conventional, we assume $E(\varepsilon_{it} | Z_{it}, U_{jt}, \theta_i, \psi_j) = 0$.[73]

Given that each observation window (i.e. 2000–2002 and 2008–2010) comprises a 2-year interval, one possible route controlling for worker and firm heterogeneity is to take a 2-year difference from model (1), to obtain:

$$y_{it} - y_{it-2} = (Z_{it} - Z_{it-2})\beta + \delta(U_{jt} - U_{jt-2}) + (\lambda_t - \lambda_{it-2}) + (\psi_{jt} - \psi_{jt-2}) + (\varepsilon_{it} - \varepsilon_{it-2}). \quad (2)$$

Clearly, in following this approach we are aiming to capture some medium-term effect of collective bargaining coverage. Thus, using the sample of job stayers, for whom by construction we have $(\psi_{jt} - \psi_{jt-2}) = 0$, model (2) yields:

$$y_{it} - y_{it-2} = (Z_{it} - Z_{it-2})\beta + \delta(U_{jt} - U_{jt-2}) + (\lambda_t - \lambda_{it-2}) + (\varepsilon_{it} - \varepsilon_{it-2}). \quad (3)$$

In other words, given that individuals stay in the same firm, identification of δ is achieved via workers whose establishments have changed their status from $t-2$ to t.

For movers, on the other hand, in general $(\psi_{jt} - \psi_{jt-2}) \neq 0$. This means that under the assumption that $(\psi_{jt} - \psi_{jt-2}) + (\varepsilon_{it} - \varepsilon_{it-2})$ is uncorrelated with $(U_{jt} - U_{jt-2})$, an OLS regression of model (2) will give an alternative estimate of the effect of collective bargaining coverage. Identification of δ in this case is via job movers whose establishments in $t-2$ and t have the same coverage status vis-à-vis job movers whose establishments have changed their status. Unfortunately, as was described in section 5.2, the number of job movers is too small to allow us to pursue this approach. Our empirical strategy will therefore perforce rely solely on job stayers.[74]

Since we do not want to impose symmetry on the effects of an establishment leaving/joining a collective agreement, implementation of our difference-in-differences approach is carried out by running the selected models across separate

73 Note that applying OLS to model (1), as was done in Table 5.3 in a purely cross-section fashion, is equivalent to assuming away worker and firm unobserved heterogeneity – or, alternatively, that ω_{it} is not correlated with U_{jt}, where $\omega_{it} = \theta_i + \psi_j + \varepsilon_{it}$.

74 It would also be possible to use the raw annual data and run the spell fixed-effects version of model (1). In this case, by first-differencing within each spell (only consecutive observations on job stayers are useable for estimation), we have $\Delta\theta_i = 0$ and $\Delta\psi_j = 0$, and therefore model (1) becomes $\Delta y_{it} = \Delta Z_{it}\beta + \delta\Delta U_{jt} + \Delta\lambda_t + \Delta\varepsilon_{it}$, where Δ denotes the first difference operator. For completeness, we will comment on the results from estimating this model in section 5.6. Note that by computing 3- and 4-year differences, for example, we would have both a substantial reduction in the number of workers (as the number of establishments with four and five consecutive observations is much smaller than the number of establishments with two) *and* a sharply increasing proportion of large establishments in the total number of establishments with available data. Model (3) in turn forces us to use only those establishments observed in three consecutive years.

subsamples of establishments. These comprise collective bargaining leavers and always members on the one hand, and collective bargaining joiners and never members on the other.

Our 2-year difference strategy of using the two groups of leavers and always members, on the one hand, and joiners and never members, on the other, and then regressing the changes in the wage outcome indicator on the corresponding change in collective bargaining status implicitly either assumes that any macro shock, proxied by a time dummy, has a similar impact on both treated and control groups (e.g. leavers and always members, respectively) or that the macro shock does not have any differentiated impact on the decision to leave/stay covered by a collective agreement in this particular case.

But one can obviously presume otherwise. Again taking the case of leavers versus always members, the beginning period characteristics may be such that, even after conditioning on the set of observables Z, selection into the treatment is not exogenous. In this case, δ in model (3) will tend to overestimate the causal effect of collective bargaining on worker earnings if, say, an adverse shock pressures covered establishments to leave an agreement rather than stay covered and where at the same time this shock has a negative impact on wages.

Had we observed, somewhere in the past, a group of establishments entirely similar to the group of leavers, and a group of establishments similar to the group of collective bargaining stayers, both confronting a similar macro shock, and where neither group had any possibility of changing its collective bargaining status in the pre-treatment interval, we would have been in a position to obtain a differential adjusted estimate of the causal effect of leaving collective bargaining. Formally, this modelling would necessarily entail the possibility that the macro effect is different across the treated (T) and control (C) groups. This would require λ_t in model (1) to be replaced by $k_i\lambda_t$, where $i \in g$ indicates that an individual belongs to group C or T.[75] In this case, the corresponding trend adjusted difference-in-differences estimator (*DADD*) after Bell et al. (1999) is given by:

$$\hat{\delta}_{DADD} = \{(\bar{y}^T_{t_2} - \bar{y}^T_{t_1}) - (\bar{y}^C_{t_2} - \bar{y}^C_{t_1})\} - \{(\bar{y}^T_{t*} - \bar{y}^T_{t_0}) - (\bar{y}^C_{t*} - \bar{y}^C_{t_0})\}, \quad (4)$$

where the second term in brackets is the difference-in-differences estimator obtained using the earlier interval (t_0, t_*); (t_1, t_2) is the selected treatment interval; and $\bar{y}^T_{t_j} = E(y_{it} - Z_{it}\beta \mid t = t_j,\ g = T)$ is the regression-adjusted mean outcome for the treated group (and similarly for the control group C). Note also that the

75 Clearly, the difference-in-differences model in (3) does not contemplate any such differential macro effect. Indeed, it assumes $k_T = k_C$.

'unadjusted' difference-in-differences estimator, $\hat{\delta}_{DD}$, is given solely by the first term in brackets, which can in turn be obtained by using the regression model (3) for the sample of job stayers.

Unfortunately, the trend adjusted estimator in (4) is difficult to implement. In the first place, it is very difficult to find a similar business cycle somewhere in past. Here, it is not simply a matter of searching for some pre-treatment period with, say, a similar GDP growth rate; rather, it is necessary to find a similar interval in which a comparable set of treated and untreated establishments are subject to a similar shock. In this context, the selection of a (preceding) 2-year interval, for example, is insufficient. And in going further back in time, the likelihood of finding similar groups decreases as establishments will change their workforce structures and technologies over time. Accordingly, more lies behind any observed differential change in wages than just a differential macro shock. More fundamentally, computation of the 'trend' will require, in the (t_0, t_*) interval, the selection of two sets of firms neither of which is exposed to the treatment, that is, with no real chance of changing their collective bargaining status. This requirement is highly unlikely to be met in practice in our sample.

In short, although one might believe that the change in collective agreement status is not fully exogenous, the facts of the matter are that going beyond the 'unadjusted' difference-in-differences estimator is likely to rely upon even stronger assumptions. In our implementation, therefore, we do not attempt to correct for the possibility that the macro effect may be distinct over the treated and control groups. That said, we will seek to check the robustness of our results using alternative control groups, noting that even though treated and untreated groups may seem to have distinct observable characteristics, it does not necessarily follow that the two groups will respond differently to a given shock or, conversely, that a common set of characteristics will generate an identical propensity to change collective bargaining status.

5.6 Two-year differences

Table 5.5 presents estimates of the collective bargaining premium in the two-year difference formulation, using the subset of job stayers. Establishments are grouped into separate samples of sectoral and firm-level agreement leavers and joiners *and* their corresponding comparison groups of sectoral and firm agreement stayers (i.e. always members and never members), as indicated in the first four columns of the table. The table thus gives the 2-year effect of collective bargaining – either sectoral or firm-level agreements – on those individuals who do not switch jobs between $t-2$ and t but who happen to be in establishments whose status has

changed versus individuals whose establishments do not switch status. To repeat, identification of the union/collective bargaining effect is obtained via changes in an establishment's collective agreement status, given that workers stay in the same establishment over the selected interval.

As can be seen from the table, workers whose establishments leave a sectoral agreement for no coverage have their wages reduced by 0.7 % over the 2000–2002 interval, compared with those whose establishments remain covered by a sectoral agreement. The corresponding effect for the 2008–2010 period is -0.4 %. If, in turn, a firm *leaves* a sectoral agreement and becomes covered by a firm agreement, the effect is less pronounced in the first sub-period, at -0.4 %, and eventually reversed in the second sub-period, at +0.8 %.

The evidence from workers whose establishments have joined sectoral agreements is stronger than that found for sectoral agreement leavers, at +0.7 % and +1.1 % in 2000–2002 and 2008–2010, respectively, in the scenario where the initial state is of no coverage by any type of collective agreement. These gains are even larger if the transition is from firm-agreement coverage, at +1.0 % and +2.3 %, respectively. Note that the latter result seems to contradict the evidence found for sectoral agreement leavers in the second row, last column, in the sense that from the perspective of worker wages it looks equally possible to have higher wages either from switching from sectoral to firm agreements or the other way around. Our preferred explanation for this apparent contradiction is that two sets of estimates might not be extracted from strictly comparable samples (on which more below).

The remaining four rows of the table examine the transitions between any type of coverage and firm agreements, on the one hand, and between any type of collective bargaining coverage and no coverage at all, on the other. Thus, in the fifth row, there is a reduction in wages for those workers whose establishments left a firm agreement to become 'uncovered', at -0.9 % and -0.7 % in the two selected intervals, respectively; while joining a firm agreement from no coverage, in the sixth row, is increasingly less favourable to worker wages, at 2.4 % in 2000–2002, and 0.2 % (and statistically insignificant) in 2008–2010. Again, there seems to be no evidence of any close symmetry between leaving and joining firm agreements, which reiterates the possibility that the corresponding samples may not be strictly comparable. Alternatively put, although our results suggest that establishments under firm-level agreements are expected to generate lower worker wages if they switch to no coverage, and to generate higher wages if they switch from no coverage to firm agreements, the lack of symmetry in these estimated effects suggests again that, for example, the wages of workers in non-covered establishments will not be necessarily similar – all else constant – to the wage

of a worker in an establishment with a firm agreement had the establishment been covered by this type of agreement. This is of course an important caveat that reminds us that our approach is quasi-experimental in nature, not a truly experimental exercise.

The last two rows offer perhaps more clear-cut results. Here we compare the situation of no coverage with any type of collective bargaining coverage and the evidence strongly points to a negative effect on wages after leaving a sectoral or firm agreement and a positive effect of joining any type of collective agreement. The respective losses and gains average -0.6% and +1.1%, and with a clear decreasing tendency in both transitions. Again, there is no sign of a close symmetry in the effects of leaving and joining, but there is nevertheless a strong indication that it is better for workers to be associated with covered than non-covered establishments.

Table 5.6 further exploits the possibility raised in Table 5.5 that we are not fully controlling for unobserved establishment heterogeneity. The presumption here is that a sectoral agreement joiner, say, may more closely resemble a sectoral agreement stayer than a sectoral agreement 'never member'. Table 5.6 thus compares, for the same sample, sectoral agreement joiners with sectoral agreement stayers. Although one may question this new approach – since it seems eminently reasonable to suppose that a sectoral agreement joiner and a sectoral agreement never member share the same beginning period collective agreement status for non-arbitrary reasons – the strategy is worthwhile pursuing as a form of robustness check on our findings. Table 5.6 thus changes the counterfactuals not only for sectoral agreement changers but for all other coverage transitions as well.

And indeed the results are quite striking. Thus, even if one admits, on the evidence provided in Table 5.5, that leaving a sectoral agreement has a negative impact on worker wages (taking therefore as a comparison group the subset of always covered), it can be seen from the first row of Table 5.6 that the wage development for workers whose establishments left a sectoral agreement is nevertheless comparatively more favourable than is the case where workers are in an establishment never covered by any type of agreement. Relative to the latter group, there is indeed an *average* gain of 1.0% in favour of the former.

The results in the second row of the table are more mixed, with the estimated effect for 2008–2010 indicating that whenever an establishment switches from a sectoral agreement to a firm-level agreement, worker wages go up at higher rate than the wages of those workers in establishments always covered by a firm agreement. This seems consistent with the evidence in Table 5.4 of a positive gap favourable to sectoral agreements relative to firm agreements. The condition for this interpretation is the assumption that sectoral agreements have a long-

lasting effect on wage developments, one that cannot be totally offset even after two years.

The results for sectoral agreement *joiners* in the third row follow the same script: whenever an establishment joins a sectoral agreement, wages presumably go up (based again on the evidence provided by Table 5.5) but by less than would have occurred had the workers been in an establishment that remained consistently covered by a sectoral agreement over the corresponding sample period. Indeed, the loss amounts to 1.1 %, on average.[76] In turn, the results in the fifth row suggest that firm agreements have some long-lasting effects, too, as workers in establishments leaving firm agreements continue to receive higher wage increases than their counterparts in never covered plants. For its part, the evidence from the sixth row is more mixed, with a positive effect in the first sub-period and a negative effect in the second.

Next, turning to the aggregate category (i.e. coverage by any type of collective agreement), the seventh row shows that although the evidence from Table 5.5 would lead us to expect a fall in wages after an establishment leaves a collective agreement of either type, it remains the case that the wage change will still be comparatively more favourable than that obtained by workers in establishments never covered by a collective agreement. Indeed, an average wage gain of 0.9 % is anticipated as compared with the negative average value of -0.6 % recorded in Table 5.5.

Conversely, while workers in an establishment joining a collective agreement are expected to have, say, a 1 % increase in their wage over a period of two years relatively to those in an establishment never covered by any form of collective agreement (see the last row of Table 5.5), the corresponding results with the different counterfactual in the last row of the Table 5.6 offer a more qualified story. They show that the wage increase for joining plants is comparatively smaller than the wage increases received by workers in those always covered establishments. And if anything there is an increasing gap in this regard, amounting to some -1.3 % by the end of our sample period in 2008–2010.

Finally, in the interests of completeness, we present in Table 5.9 in the Appendix the results from implementing the spell fixed-effects case (see footnote 74 above). The table provides detailed results for the same counterfactuals as in Table 5.5; that is, it compares joiners with never members and leavers with always members. Here, we propose only to offer a brief summary of these findings.

76 The results in the fourth row of the table suggest that joining a sectoral agreement from an initial state of having a firm agreement is more favourable to wage development than being always covered by a sectoral agreement. This finding contradicts the estimates in the fourth row of Table 5.5. The probable reason is sample size, which is quite different in the two experiments likely invalidating the comparison.

Presumably, with Table 5.5 as our template, the estimated effects obtained in Table 5.9 in the Appendix should tend to be smaller in absolute value and perhaps even exhibit perverse signs given the essentially immediate or short-run effects captured by one-year changes. On the other hand, given that we are now using one-year differences, the number of observations is substantially larger because the number of establishments with two consecutive observations in the panel is much higher than the number of establishments with three observations in a row. The former sample is roughly five times bigger than the latter. Alternatively put, although we might expect the one-year effects to be somewhat messy, their statistical significance might not be that low. Even if one does not reject the hypothesis that the effects of, in this case, leaving an agreement should measurably increase through time the 'instantaneous' impact of the transition may yet be non-negligible.

And that does indeed seem to be the case. After one year, the effect of leaving either a sectoral agreement or a firm agreement or any collective agreement is negative, falling in the -0.4% to -2.1% range (see the first, second, fifth, and seventh rows of the Appendix table). In turn, the effects of joining (again either a sectoral, firm, or any type of collective agreement) are much less clear-cut, especially in the second sub-period, where the coefficients are negative or non-significant in all four possible cases (see the third, fourth, sixth, and eighth rows). In the first sub-period the corresponding coefficients vary from 0.3% to 1.2%.

These results might lead us to conclude that the effects of an establishment leaving a collective agreement on wages are more rapid than the effects of joining. However, the number of perverse signs for worker wage changes in establishments that join a collective agreement would seem to devalue the one-year difference/spell fixed effects strategy. All things considered, then, we prefer to base our conclusions on the firmer ground of estimates derived from two-year differences.

5.7 Conclusions

That over the last two decades collective bargaining coverage has declined, and that the trend persists, seems to be beyond dispute. Much less clear-cut, however, is the impact of this decline on wage development. Indeed, the literature lacks a critical value: an updated estimate of the union/collective bargaining premium. This is provided in the present treatment which covers a period of a near standstill in German wages.

Whatever the reasons behind the erosion of collective bargaining coverage, we would not anticipate an elevated union wage premium, since unions should have become weaker rather than stronger. As a matter of fact, joining any type of

agreement from a position of non-coverage has proven decreasingly favourable to wages, while the reverse transition has become decreasingly unfavourable. On the other hand, and looking at the two types of collective agreements separately, leaving sectoral agreements to non-coverage does involve losses (albeit decreasing), while joining a sectoral agreement from non-coverage entails wage gains at a slightly increasing rate. The concatenation of these results obviously implies that workers in establishments that have switched to firm agreements from non-coverage are gradually losing the wage advantage.

Our results are not directly comparable with those of previous studies because of differences in methodology. Nevertheless, they are consistent with the findings of studies seeking to tackle the causality issue in that the collective bargaining premium is smaller than more conventional estimates. More importantly of course, and unlike the former, the present study is able to chart *movements* in the collective bargaining premium over the course of the first decade of the 2000s. And in terms of broad movements into and out of collective bargaining, these changes are in the main consistent with the decline in union influence implied by diminishing coverage over that interval.

That being said, the transitions between firm and sectoral collective agreements do not seem to offer any clear-cut conclusions, with indications that establishments switching from firm to sectoral agreements tend increasingly to register wage gains, while at the same time switching from sectoral to firm agreements seems also to be increasingly beneficial. This apparent contradiction seems to be due to the lack of comparability in the selected estimation samples, which is not altogether surprising given the non-experimental nature of our exercise.

More interesting are the results generated by the reverse counterfactuals. Here, the most important finding is that although we generally expect workers to have higher wages after their establishments join a collective agreement, and lower wages after leaving, the gains – or losses – tend to be smaller (in absolute terms) if one compares the treated group (i.e. joiners or leavers) with never members or always members, rather than with the initially selected control groups of always members and never members. This finding confirms the presence of some persistence in the effects of collective bargaining coverage, an anticipated result given the rules governing the German industrial relations as described in section 5.2. Against this backdrop, we distinctly prefer our two-year estimates to any estimate based on a one-year spell fixed effects procedure.

5.8 Tables to chapter 5

Table 5.1: Longitudinal pattern of observed workers

Year of observation			Number of workers	Number of establishments
2000–2002				
2000	2001	2002		
Yes	Yes	Yes	721,321	6,279
Yes	Yes	No	327,829	6,687
Yes	No	Yes	48,503	4,210
Yes	No	No	549,528	9,192
No	Yes	Yes	127,890	5,207
No	Yes	No	142,360	5,972
No	No	Yes	491,841	7,236
Total = 2,409,272				
2008–2010				
2008	2009	2010		
Yes	Yes	Yes	627,027	6,858
Yes	Yes	No	260,129	6,649
Yes	No	Yes	77,968	3,901
Yes	No	No	461,133	9,060
No	Yes	Yes	98,996	5,563
No	Yes	No	93,982	5,715
No	No	Yes	288,995	7,652
Total = 1,908,231				

Notes: own calculations based on LIAB. Workers necessarily populate one of the seven distinct patterns, but their establishments are not necessarily distinct.

Table 5.2: Longitudinal pattern of workers observed at least twice over the observation window

Profile	Year			Number of workers	Number of establishments
Workers with three consecutive observations					
	2000	**2001**	**2002**		
1	A	A	A	716,844	5,222
2	A	A	B	2,168	1,441
3	A	B	B	2,282	1,679
4	A	B	C	26	68
	2008	**2009**	**2010**		
1	A	A	A	623,732	6,081
2	A	A	B	1,524	1,122
3	A	B	B	1,754	1,291
4	A	B	C	17	51
Workers with two consecutive observations					
	2000	**2001**	**2002**		
5	A	A		325,473	6,176
6	A	B		2,356	1,735
7		A	A	126,438	4,754
8		A	B	1,451	1,207
	2008	**2009**	**2010**		
5	A	A		258,711	6,282
6	A	B		1,418	1,134
7		A	A	98,133	5,233
8		A	B	863	826
Workers with two non-consecutive observations					
	2000	**2001**	**2002**		
9	A		A	43,142	2,672
10	A		B	3,695	1,869
	2008	**2009**	**2010**		
9	A		A	74,832	2,799
10	A		B	2,092	1,202

Notes: own calculations based on LIAB. A, B, and C are establishment identifiers.

Table 5.3: Two- and one-year establishment collective bargaining transitions

One-year transitions			
	$t+1=2001$		
$t=2000$	Anycb = 0	Anycb = 1	Total
Anycb = 0	2,351	441	2,792
Anycb = 1	424	3,215	3,639
Total	2,775	3,656	6,431
	$t+1=2002$		
$t=2001$	Anycb = 0	Anycb = 1	Total
Anycb = 0	2,046	270	2,316
Anycb = 1	405	2,548	2,953
Total	2,451	2,818	5,269
	$t+1=2009$		
$t=2008$	Anycb = 0	Anycb = 1	Total
Anycb = 0	3,385	412	3,797
Anycb = 1	412	2,931	3,343
Total	3,797	3,343	7,140
	$t+1=2010$		
$t=2009$	Anycb = 0	Anycb = 1	Total
Anycb = 0	3,340	106	3,446
Anycb = 1	323	2,555	2,878
Total	3,663	2,661	6,324
Two-year transitions			
	$t+2=2002$		
$t=2000$	Anycb = 0	Anycb = 1	Total
Anycb = 0	1,842	304	2,146
Anycb = 1	426	2,415	2,841
Total	2,268	2,719	4,987
	$t+2=2010$		
$t=2008$	Anycb = 0	Anycb = 1	Total
Anycb = 0	2,836	230	3,066
Anycb = 1	461	2,280	2,741
Total	3,297	2,510	5,807

Notes: own calculations based on LIAB. Anycb denotes the presence of any collective bargaining – either sectoral or firm-level bargaining.

Table 5.4: OLS wage regressions

	Collective bargaining status								
	Dummy variable equal to 1 if worker is in an establishment covered by a sectoral agreement; 0 if the establishment is not covered by any type of agreement			Dummy variable equal to 1 if worker is in an establishment covered by a sectoral agreement; 0 if the establishment is covered by a firm-level agreement			Dummy variable equal to 1 if worker is in an establishment covered by any type of collective agreement; 0 otherwise		
	2000–2002								
	2000	2001	2002	2000	2001	2002	2000	2001	2002
δ	0.070***	0.075***	0.070***	0.018***	0.021***	0.022***	0.064***	0.069***	0.063***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	769,988	593,733	637,147	756,738	596,214	688,990	867,881	680,347	787,919
	2008–2010								
	2008	2009	2010	2008	2009	2010	2008	2009	2010
δ	0.091***	0.115***	0.140***	0.035***	0.040***	0.039***	0.081***	0.102***	0.125***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	656,425	485,264	467,885	677,988	472,299	427,984	818,831	587,493	540,864

Notes: own calculations based on LIAB. For each cross-section the fitted model is given by $y_i = Z_i\beta + \delta U_j + \omega_i$ [see model (1) in the text]. Standard errors are given in parentheses. Significance level: *** $p < 0.01$.

Table 5.5: Estimates of the collective bargaining premium, two-year differences, job stayers

Sample				Period: 2000–2002		Period: 2008–2010	
Experiment	*Treatment and control groups*	*Collective bargaining status in*		δ	N	δ	N
		t–2	*t*				
Scb leavers vs. Scb stayers	*Treated group (leavers)*	*Scb = 1*	*Anycb = 0*	-0.007*** (0.002)	375,397	-0.004** (0.002)	289,320
	Control group (stayers)	*Scb = 1*	*Scb = 1*				
	Treated group (leavers)	*Scb = 1*	*Fcb = 1*	-0.004** (0.001)	378,843	0.008*** (0.001)	295,414
	Control group (stayers)	*Scb = 1*	*Scb = 1*				
Scb joiners vs. Scb never members	*Treated group (joiners)*	*Anycb = 0*	*Scb = 1*	0.007*** (0.002)	46,000	0.011*** (0.002)	66,228
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				
	Treated group (joiners)	*Fcb = 1*	*Scb = 1*	0.010*** (0.002)	57,847	0.023*** (0.002)	86,543
	Control group (never members)	*Fcb = 1*	*Fcb = 1*				
Fcb leavers vs. Fcb stayers	*Treated group (leavers)*	*Fcb = 1*	*Anycb = 0*	-0.009*** (0.002)	54,849	-0.007** (0.003)	83,443
	Control group (stayers)	*Fcb = 1*	*Fcb = 1*				
Fcb joiners vs. Fcb never members	*Treated group (joiners)*	*Anycb = 0*	*Fcb = 1*	0.024*** (0.002)	44,297	0.002 (0.002)	64,992
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				
Anycb leavers vs. Anycb stayers	*Treated group (leavers)*	*Anycb = 1*	*Anycb = 0*	-0.009*** (0.001)	447,074	-0.003** (0.002)	393,166
	Control group (stayers)	*Anycb = 1*	*Anycb = 1*				
Anycb joiners vs. Anycb never members	*Treated group (joiners)*	*Anycb = 0*	*Anycb = 1*	0.014*** (0.001)	50,956	0.007*** (0.002)	69,194
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				

Notes: own calculations based on LIAB. The fitted model is given by model (3) in the text. Anycb is a dummy variable equal to 1 if a worker is in an establishment covered by any type of collective agreement, 0 otherwise; Scb (Fcb) is a dummy variable equal to 1 if a worker is in an establishment covered by a sectoral (firm) agreement, 0 otherwise. Standard errors are given in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.6: Estimates of the collective bargaining premium, two-year differences, but with different counterfactuals, job stayers

Sample				Period: 2000–2002		Period: 2008–2010	
Experiment	*Treatment and control groups*	*Collective bargaining status in*		δ	N	δ	N
		t–2	*t*				
Scb leavers vs. Scb never members	*Treated group (leavers)*	*Scb = 1*	*Anycb = 0*	0.009*** (0.002)	46,317	0.011*** (0.002)	69,656
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				
	Treated group (leavers)	*Scb = 1*	*Fcb = 1*	-0.001 (0.001)	61,863	0.010*** (0.002)	93,590
	Control group (never members)	*Fcb = 1*	*Fcb = 1*				
Scb joiners vs. Scb always members	*Treated group (joiners)*	*Anycb = 0*	*Scb = 1*	-0.009*** (0.002)	375,080	-0.013*** (0.002)	285,892
	Control group (always members)	*Scb = 1*	*Scb = 1*				
	Treated group (joiners)	*Fcb = 1*	*Scb = 1*	0.009*** (0.002)	374,827	0.021*** (0.002)	288,368
	Control group (always members)	*Scb = 1*	*Scb = 1*				
Fcb leavers vs. Anycb never members	*Treated group (leavers)*	*Fcb = 1*	*Anycb = 0*	0.004* (0.002)	42,749	0.007*** (0.002)	65,604
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				
Fcb joiners vs. Fcb always members	*Treated group (joiners)*	*Anycb = 0*	*Fcb = 1*	0.014*** (0.002)	56,397	-0.015*** (0.003)	82,830
	Control group (always members)	*Fcb = 1*	*Fcb = 1*				
Anycb leavers vs. Anycb never members	*Treated group (leavers)*	*Anycb = 1*	*Anycb = 0*	0.007*** (0.001)	49,725	0.010*** (0.001)	73,234
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				
Anycb joiner vs. Anycb always members	*Treated group (joiners)*	*Anycb = 0*	*Anycb = 1*	-0.002 (0.001)	448,305	-0.013*** (0.002)	389,124
	Control group (always members)	*Anycb = 1*	*Anycb = 1*				

Notes: own calculations based on LIAB. The fitted model is given by model (3) in the text. Anycb is a dummy variable equal to 1 if a worker is in an establishment covered by any type of collective agreement, 0 otherwise; Scb (Fcb) is a dummy variable equal to 1 if a worker is in an establishment covered by a sectoral (firm) agreement, 0 otherwise. Standard errors are given in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.9 Appendix to chapter 5

Table 5.7: Two- and one-year establishment transitions by type of collective bargaining

Two-year transitions					
t = 2002 / t = 2000		Fcb = 1	Anycb = 0, Scb = 0	Scb = 1	Total
Fcb = 1	Scb = 0	189	104	81	374
Anycb = 0	Scb = 0	77	1,829	224	2,130
Scb = 1		88	318	2,057	2,463
Total		354	2,251	2,362	4,967
t = 2010 / t = 2008		Fcb = 1	Anycb = 0, Scb = 0	Scb = 1	Total
Fcb = 1	Scb = 0	244	96	69	409
Anycb = 0	Scb = 0	51	2,776	172	2,999
Scb = 1		83	282	1,884	2,249
Total		378	3,154	2,125	5,657
One-year transitions					
t = 2001 / t = 2000		Fcb = 1	Anycb = 0, Scb = 0	Scb = 1	Total
Fcb = 1	Scb = 0	249	110	95	454
Anycb = 0	Scb = 0	99	2,334	331	2,764
Scb = 1		113	305	2,758	3,176
Total		461	2,749	3,184	6,394

Notes: own calculations based on LIAB. Anycb is a dummy variable equal to 1 if a worker is in an establishment covered by any type of collective agreement, 0 otherwise; Scb (Fcb) is a dummy variable equal to 1 if a worker is in an establishment covered by a sectoral (firm) agreement, 0 otherwise.

Table 5.7 (cont.): Two- and one-year establishment transitions by type of collective bargaining

One-year transitions					
t = 2002		Fcb = 1	Anycb = 0	Scb = 1	Total
t = 2001		Scb = 0			
Fcb = 1	Scb = 0	217	80	82	379
Anycb = 0		70	2,030	196	2,296
Scb = 1		69	319	2,180	2,568
Total		356	2,429	2,458	5,243
t = 2009		Fcb = 1	Anycb = 0	Scb = 1	Total
t = 2008		Scb = 0			
Fcb = 1	Scb = 0	330	95	97	522
Anycb = 0		95	3,368	307	3,770
Scb = 1		128	310	2,376	2,814
Total		553	3,773	2,780	7,106
t = 2010		Fcb = 1	Anycb = 0	Scb = 1	Total
t = 2009		Scb = 0			
Fcb = 1	Scb = 0	358	46	40	444
Anycb = 0		22	3,283	82	3,387
Scb = 1		27	180	2,130	2,337
Total		407	3,509	2,252	6,168

Notes: own calculations based on LIAB. Anycb is a dummy variable equal to 1 if a worker is in an establishment covered by any type of collective agreement, 0 otherwise; Scb (Fcb) is a dummy variable equal to 1 if a worker is in an establishment covered by a sectoral (firm) agreement, 0 otherwise.

Table 5.8: Description of variables

Variable	Definition
Individual characteristics	
Log daily wage	Log of the daily wage of a full-time employee which is top coded due to the contribution limit in the German social security system
Log imputed daily wage	Log of the daily wage of a full-time employee; values above the contribution limit have been imputed using the procedure by Gartner (2005) (see data section for further information)
Female	Dummy = 1 if female
Age	Age in years
Age squared	Age in years, squared
Foreign	Dummy = 1 if foreign citizenship
Secondary/intermediate school leaving certificate without completed vocational training	Dummy = 1 if yes
Secondary/intermediate school leaving certificate with completed vocational training	Dummy = 1 if yes
Upper secondary school leaving certificate (general or subject-specific aptitude for higher education) without completed vocational training	Dummy = 1 if yes
Upper secondary school leaving certificate (general or subject-specific aptitude for higher education) with completed vocational training	Dummy = 1 if yes
Degree from specialized college of higher education	Dummy = 1 if yes
College or university degree	Dummy = 1 if yes
Unskilled manual occupation	Dummy = 1 if yes
Skilled manual occupation	Dummy = 1 if yes
Technician	Dummy = 1 if yes
Engineer	Dummy = 1 if yes
Unskilled service occupation	Dummy = 1 if yes
Skilled service occupation	Dummy = 1 if yes
Semiprofessional	Dummy = 1 if yes
Professional	Dummy = 1 if yes
Unskilled commercial and administrative occupation	Dummy = 1 if yes
Skilled commercial and administrative occupation	Dummy = 1 if yes
Manager	Dummy = 1 if yes
Occupation unknown	Dummy = 1 if yes
Tenure	Tenure in years
Tenure squared	Tenure in years, squared
Establishment characteristics	
Establishment founded before 1990	Dummy = 1 if yes
Profit situation in last fiscal year „good" or „very good"	Dummy = 1 if yes. This information is derived from the establishment's reply to the question „Please give your assessment of the profit situation of your business in the last fiscal year (2007)". The five possible answers are: Profitability was „very good"; „good"; „satisfactory"; „sufficient"; „unsatisfactory".

Table 5.8 (cont.): Description of variables

Variable	Definition
Technical state of plant and machinery „state of the art" or „nearly state of the art"	Dummy = 1 if yes. This information is derived from the establishment's reply to the question „How do you assess the overall technical state of the plant and machinery, furniture and office equipment of this establishment compared to other establishments in the same industry?" The five possible answers are: „state-of-the-art"; „nearly state-of-the-art"; „medium"; „nearly obsolete"; „obsolete".
Share of foreign workers	
Share of high-skilled and skilled workers	
Share of fixed-term workers	
Share of female workers	
Median age of the workforce	
Establishment covered by any collective bargaining agreement	Dummy = 1 if yes
Establishment covered by a sector-level collective bargaining agreement	Dummy = 1 if yes
Establishment covered by a firm-level collective bargaining agreement	Dummy = 1 if yes
Existence of a works council	Dummy = 1 if yes
Establishment size	Number of employees
Establishment size squared	Number of employees, squared
Industry (omitted category: machinery and equipment)	40 dummy variables
German federal state in which establishment is located (omitted category: North Rhine-Westphalia)	15 dummy variables

Table 5.9: Estimates of the collective bargaining premium, spell fixed-effects, annual data, job stayers

Sample				Period: 2000–2002		Period: 2008–2010	
Experiment	*Treatment and control groups*	*Collective bargaining status in*		δ	N	δ	N
		t–2	*t*				
Scb leavers vs. Scb stayers	*Treated group (leavers)*	*Scb = 1*	*Anycb = 0*	-0.007*** (0.002)	1,341,088	-0.021*** (0.001)	1,022,416
	Control group (stayers)	*Scb = 1*	*Scb = 1*				
	Treated group (leavers)	*Scb = 1*	*Fcb = 1*	-0.007*** (0.001)	1,348,578	-0.002 (0.001)	1,034,444
	Control group (stayers)	*Scb = 1*	*Scb = 1*				
Scb joiners vs. Scb never members	*Treated group (joiners)*	*Anycb = 0*	*Scb = 1*	0.003* (0.002)	190,094	-0.011*** (0.002)	273,148
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				
	Treated group (joiners)	*Fcb = 1*	*Scb = 1*	0.001 (0.001)	198,341	-0.011*** (0.002)	215,575
	Control group (never members)	*Fcb = 1*	*Fcb = 1*				
Fcb leavers vs. Fcb stayers	*Treated group (leavers)*	*Fcb = 1*	*Anycb = 0*	-0.014*** (0.002)	185,519	-0.004* (0.002)	203,057
	Control group (stayers)	*Fcb = 1*	*Fcb = 1*				
Fcb joiners vs. Fcb never members	*Treated group (joiners)*	*Anycb = 0*	*Fcb = 1*	0.012*** (0.002)	181,618	0.001 (0.002)	270,964
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				
Anycb leavers vs. Anycb stayers	*Treated group (leavers)*	*Anycb = 1*	*Anycb = 0*	-0.010*** (0.001)	1,617,132	-0.018*** (0.001)	1,310,721
	Control group (stayers)	*Anycb = 1*	*Anycb = 1*				
Anycb joiners vs. Anycb never members	*Treated group (joiners)*	*Anycb = 0*	*Anycb = 1*	0.008*** (0.001)	206,589	-0.005*** (0.001)	287,286
	Control group (never members)	*Anycb = 0*	*Anycb = 0*				

Notes: own calculations based on LIAB. The fitted model in first differences is given by footnote 74 in the text. Anycb is a dummy variable equal to 1 if a worker is in an establishment covered by any type of collective agreement, 0 otherwise; Scb (Fcb) is a dummy variable equal to 1 if a worker is in an establishment covered by a sectoral (firm) agreement, 0 otherwise. Standard errors are given in parentheses. Significance levels: * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

6 Summary and conclusive remarks

This dissertation provides empirical evidence on different aspects of wage dynamics in Germany over the last decade. A major part of the dissertation is dealing with the wage growth and the wage mobility of low-wage workers, while a smaller part is investigating the development of the union wage premium.

In chapter 2, I analyze the real wage growth and the career patterns of low-wage workers by using multivariate regression models with endogenous selection. Inter alia, I find that a large part of those low-wage workers from 2000/2001 who had escaped low pay by 2004 were still higher-paid two years later. This indicates that the upward wage mobility of low-wage workers is not merely a transitory phenomenon but can lead to longer-lasting higher wage levels for these workers. Furthermore, I find that a significant part of the employer heterogeneity which is associated to the upward wage mobility of low-wage workers is not captured by the firm variables which are usually included in studies on low-pay mobility. The latter result has motivated the work on the following chapter of this dissertation.

The impact of employer characteristics on the real wage growth of individual workers low-wage workers and higher-wage workers is investigated in chapter 3. By applying endogenous switching regression models, I find that compared to other firms, large firms and firms with high export shares or low proportions of fixed-term workers provide higher wage growth for low-wage workers. However, a number of other potential firm-level determinants are impacting only on the wage growth of higher-wage workers but not on the wage growth of low-wage workers. Two main insights can be derived from the analyses in this chapter. First, in order to identify further employer characteristics which are associated to the individual wage growth of low-wage workers, future research should turn to an in-depth analysis of firm heterogeneity. Second, the fact that the wage growth of low-wage workers and higher-wage workers is influenced by different sets of employer characteristics indicates that policy measures aiming at increasing the wage growth of low-wage workers need to be specifically tailored for these workers. In addition, this also suggests that future research should analyze the determinants of individual wage growth at different quantiles of the wage distribution in order to shed further light on the economic forces underlying labour market polarization and rising wage inequality.

In chapter 4 I analyze the impact of Locus of Control and other non-cognitive skills on transitions of workers between higher pay, low pay and non-employment.[77] Dynamic multinomial logit regressions model with random effects indicate that

77 This chapter is based on joint work with Daniel D. Schnitzlein.

West German men which exhibit an internal Locus of Control have a significantly lower probability of being low paid compared to men which exhibit an external Locus of Control. In addition, men with an internal Locus of Control also have an higher probability of escaping low pay. In other words, men who strongly believe that they control the events in their life have a lower risk of being low-paid and better chances to escape low-wage employment. Therefore, having an internal Locus of control is an important non-cognitive skill for men in the context of low wages. This result is relevant for labour market policy in a twofold way. First, labour market policy makers need to take into account the possible differences in the individual extent of Locus of Control between individual low-wage workers, as these differences may impact on the reaction of these workers to labour market instruments. Second, early childhood intervention programs aimed at internalizing the individual Locus of Control of children from disadvantaged families may be a starting point for long-term labour market policy measures.

In contrast to the previous chapters of this dissertation, the focus of chapter 5 is not on low-wage workers but on workers from all wage groups. In this chapter I provide an updated estimate of the union wage premium in Germany by using different fixed-effects regression models.[78] I find that although union density and collective bargaining coverage continuously declined over the last decade, a small union wage gap still exists. Even though this result does not allow inference concerning the distribution of wages,[79] it provides basic information for the further inquiry of the effects of the decline of unionism on wages in Germany. For example, it will be important to investigate the relative change of the magnitude of the union wage premium at different parts of the wage distribution, e.g., for low-wage workers and for higher-wage workers.

This dissertation provides several new insights on wage dynamics in Germany, with a special focus on the upward wage mobility of low-wage workers. Although less than one-fifth of the low-wage workers in Germany manage to escape low pay, a major part of the former low-wage workers is able to stay in higher-paid employment after moving up. This result from chapter 2 indicates that policy measures aiming at supporting low-wage workers to reach higher-paid employment may have significant payoffs, because increasing the number of low-wage workers who move up may subsequently also increase the number of workers who remain in higher-wage employment after moving up. As suggested by Andersson et al. (2005), one possible way to help low-wage workers to reach higher-wage employment is to improve their access to firms which provide

78 The study underlying this chapter has been co-authored with John T. Addison, Paulino Teixeira, and Lutz Bellmann.

79 For example, this small average wage premium may be consistent with a large effect at the bottom of the wage distribution.

better chances for wage growth. While the literature has already identified some establishment characteristics that increase the individual upward wage mobility of low-wage workers, the results of chapter 3 show that further research is necessary in order to identify a larger number of typical characteristics of such firms. Furthermore, chapter 3 also demonstrates that one cannot apply the existing theoretical and empirical knowledge about the factors that influence the wage growth of individual workers to the wage growth of individual *low-wage* workers. In addition, chapter 4 shows that non-cognitive skills may constitute a further starting point for policy measures aiming at supporting low-wage workers and increasing their upward wage mobility.

The wage mobility of individual workers can reduce inequality over the working life and is an important component of a flexible and efficient labour market (Atkinson et al., 1992). In the context of low pay, policy measures aiming at increasing the upward wage mobility of individual workers can be seen as a possible means of partly compensating for the existence of a large low-wage sector. While in times of high unemployment the major focus of labour market policy is on bringing more people into work, in times of comparatively low unemployment labour market policy may therefore focus on increasing the upward wage mobility of individual low-wage workers. This dissertation provides possible starting points for policy efforts aiming at increasing this wage mobility and presents avenues for further research. Because in international comparison Germany exhibits a relatively high incidence of low pay, a relatively high extent of wage inequality and a relatively low probability of low-wage workers escaping low pay (e.g., Salverda and Mayhew, 2009), it is likely that the topics covered in this dissertation will remain high on the agenda of researchers and policy-makers in the future.

Bibliography

Acemoglu, Daron; Pischke, Jörn-Steffen (1999): Beyond Becker. Training in Imperfect Labour Markets. In: The Economic Journal 109 (February), pp. F112–F142.

Addison, John T.; Bryson, Alex; Teixeira, Paulino; Pahnke, André; Bellmann, Lutz (2011): The State of Collective Bargaining and Worker Representation in Germany: The Erosion Continues. IZA Discussion Paper 5030, Bonn.

Addison, John T.; Schnabel, Claus; Wagner, Claus (2007): The (Parlous) State of German Unions. In: Journal of Labor Research 28 (1), pp. 3–18.

Addison, John T.; Teixeira, Paulino; Evers, Katalin; Bellmann, Lutz (2012b): Is the Erosion Thesis Overblown? Evidence from the Orientation of Uncovered Employers. IZA Discussion Paper 6658, Bonn.

Addison, John T.; Teixeira, Paulino; Stephani, Jens; Bellmann, Lutz (2012a): Union Decline and the Coverage Wage Gap in Germany. Estudos Do GEMF 19/2012, Coimbra.

Akay, Alpaslan (2012): Finite-Sample Comparison of Alternative Methods for Estimating Dynamic Panel Data Models. In: Journal of Applied Econometrics 27 (7), pp. 1189–1204.

Alda, Holger; Bender, Stefan; Gartner, Hermann (2005): The Linked Employer-Employee Data Set Created from the IAB Establishment Panel and the Process-Produced Data of the IAB (LIAB). In: Journal of Applied Social Science Studies 125, pp. 327–336.

Almlund, Mathilde; Duckworth, Angela L.; Heckman James J.; Kautz, Tim (2011): Personality Psychology and Economics. In: Hanushek, Eric A.; Machin, Stephen; Woessmann, Ludger (eds.) (2011): Handbook of the Economics of Education Volume 4. Amsterdam et al.: Elsevier/North Holland, pp. 1–181.

Andersson, Fredrik; Holzer, Harry J.; Lane, Julia I. (2005): Moving Up or Moving On: Who Advances in the Low-Wage Labor Market? New York: Russell Sage Foundation Publications.

Antecol, Heather; Cobb-Clark, Deborah A. (2013): Do Psychosocial Traits Help Explain Gender Segregation in Young People's Occupations? In: Labour Economics 21 (April), pp. 59–73.

Antonczyk, Dirk (2010): Using Social Norms to Estimate the Effect of Collective Bargaining on the Wage Structure. Mimeographed, Albert-Ludwigs-Universität, Freiburg. http://www.empiwifo.uni-freiburg.de/discussion-papers/Antonczyk/Antonczyk_JobMarketPaper.pdf., accessed on 25 September 2013.

Antonczyk, Dirk; DeLeire, Thomas; Fitzenberger, Bernd (2010a): Polarization and Rising Wage Inequality: Comparing the U.S. and Germany. ZEW Discussion Paper 10-015, Mannheim.

Antonczyk, Dirk; Fitzenberger, Bernd; Sommerfeld, Katrin (2010b): Rising Wage Inequality, the Decline of Collective Bargaining, and the Gender Wage Gap. In: Labour Economics 17 (5), pp. 835–847.

Arbeitsgruppe Regionale Standards (ed.) (2005): Regionale Standards, Ausgabe 2005. https://www.destatis.de/DE/Methoden/DemografischeRegionaleStandards/RegioStandards.html?nn=173768, accessed on 25 September 2013.

Aretz, Bodo; Gürtzgen, Nicole (2012): What Explains the Decline in Wage Mobility in the German Low-Wage Sector? ZEW Discussion Paper 12-041, Mannheim.

Arulampalam, Wiji; Stewart, Mark B. (2009): Simplified Implementation of the Heckman Estimator of the Dynamic Probit Model and a Comparison with Alternative Estimators. In: Oxford Bulletin of Economics and Statistics 71 (5), pp. 659–681.

Asplund, Rita; Persson, Inga (2000): Low Pay – A Special Affliction of Women. In: Gregory, Mary; Salverda, Wiemer; Bazen, Stephen (eds.) (2000): Labour Market Inequalities. Problems and Policies of Low-Wage Employment in International Perspective. Oxford and New York: Oxford University Press, pp. 53–81.

Asplund, Rita; Sloane, Peter J.; Theodossiou, Ioannis (eds.) (1998): Low Pay and Earnings Mobility in Europe. Cheltenham: Edward Elgar Publishing.

Atkinson, Anthony B.; Bourguignon, François; Morrisson, Christian (1992): Empirical Studies of Earnings Mobility. Chur: Harwood Academic Publishers.

Barón, Juan D.; Cobb-Clark, Deborah A. (2010): Are Young People's Educational Outcomes Linked to their Sense of Control? IZA Discussion Paper 4907, Bonn.

Bayaz-Ozturk, Gulgun; Burkhauser, Richard V.; Couch, Kenneth A. (2011): Trends in Intragenerational Income Mobility in the Western States of Germany and the United States (1984–2006). In: Journal of Applied Social Science Studies 131, pp. 359–368.

Bechtel, Stephan; Mödinger, Patrizia; Strotmann, Harald (2004): Tarif- und Lohnstrukturen in Baden-Württemberg: Entwicklung und Einfluss der Tarifbindung auf Verdiensthöhe und Streuung. In: Statistisches Landesamt Baden-Württemberg (Hrsg.) (2004): Statistische Analysen 7. Stuttgart: Statistisches Landesamt Baden-Württemberg.

Becker, Anke; Deckers, Thomas; Dohmen, Thomas; Falk, Armin; Kosse, Fabian (2012): The Relationship Between Economic Preferences and Psychological Personality Measures. In: Annual Review of Economics 4 (1), pp. 453–478.

Behrens, Martin (2009): Unterscheiden sich Mitglieder von Betriebs- und Personalräten vom Rest der Belegschaften? In: Industrielle Beziehungen 16 (4), pp. 303–326.

Bell, Brian; Blundell, Richard; Reenen, John Van (1999): Getting the Unemployed Back to Work: The Role of Targeted Wage Subsidies. International Tax and Public Finance 6, pp. 339–360.

Bezzina, Eusebio (2012): In 2010, 17 % of Employees in the EU Were Low-Wage Earners. In: Eurostat Statistics in Focus 48/2012.

Bingley, Paul; Bjørn, Niels H.; Westergård-Nielsen, Niels (1995): Wage Mobility in Denmark 1984–1990. In: Steiner, Viktor; Bellmann, Lutz (eds.) (1995): Mikroökonomik des Arbeitsmarktes (Beiträge zur Arbeitsmarkt- und Berufsforschung 192). Nürnberg, pp. 171–208.

Bispinck, Reinhard; WSI-Tarifarchiv (2004): Kontrollierte Dezentralisierung. Eine Analyse der tariflichen Öffnungsklauseln in 80 Tarifbereichen. Elemente qualitativer Tarifpolitik, 55. Düsseldorf: Hans Böckler Stiftung.

Bispinck, Reinhard; Dribbusch, Heiner; Schulten, Thorsten (2010): German Collective Bargaining in a European Perspective. Continuous Erosion or Re-stabilization of Multi-Employer Agreements? WSI Diskussionspapier 171, Düsseldorf.

Blázquez Cuesta, Maite (2008): Low-Wage Employment and Mobility in Spain. In: LABOUR 22 (Special Issue), pp. 115–146.

Blázquez Cuesta, Maite; Budría, Santiago (2012): Unemployment Persistence: How Important are Non-cognitive Skills? SOEPpapers on Multidisciplinary Panel Data Research 513, Berlin.

Bolvig, Iben (2005): Within- and Between-Firm Mobility in the Low-Wage Labour Market. In: Bazen, Stephen; Lucifora, Claudio; Salverda, Wiemer (eds.) (2005): Job Quality and Employer Behaviour, Basingstoke and New York: Palgrave MacMillan, pp. 132–156.

Brenke, Karl (2009): Reallöhne in Deutschland über mehrere Jahre rückläufig. In: DIW Wochenbericht 33/2009, pp. 550–560.

Brixy, Udo; Kohaut, Susanne; Schnabel, Claus (2007): Do Newly Founded Firms Pay Lower Wages? First Evidence from Germany. In: Small Business Economics 29, pp. 161–171.

Bundesagentur für Arbeit (2010): Bericht der Statistik der BA. Beschäftigungsstatistik: Sozialversicherungspflichtige Bruttoarbeitsentgelte. Nürnberg.

Burkhauser, Richard V.; Feng, Shuaizhang; Jenkins, Stephen P. (2009): Using the P90/P10 Index to Measure U.S. Inequality Trends with Current Population Survey Data: A View from Inside the Census Bureau Vaults. In: Review of Income and Wealth 55 (1), pp. 166–185.

Cahuc, Pierre; Zylberberg, André (2004): Labor Economics. Cambridge, Massachusetts: The MIT Press.

Caliendo, Marco; Cobb-Clark, Deborah A.; Uhlendorff, Arne (forthcoming): Locus of Control and Job Search Strategies. In: Review of Economics and Statistics.

Cappellari, Lorenzo (2002): Do the "Working Poor" Stay Poor? An Analysis of Low Pay Transitions in Italy. In: Oxford Bulletin of Economics and Statistics 64 (2), pp. 87–110.

Cappellari, Lorenzo (2007): Earnings Mobility Among Italian Low-Paid Workers. In: Journal of Population Economics 20 (2), pp. 465–482.

Cappellari, Lorenzo; Jenkins, Stephen P. (2008a): Estimating Low Pay Transition Probabilities Accounting for Endogenous Selection Mechanisms. In: Journal of the Royal Statistical Society Series C 57 (2), pp. 165–186.

Cappellari, Lorenzo; Jenkins, Stephen P. (2008b): Transitions between Unemployment and Low Pay. In: Polachek, Solomon W.; Tatsiramos, Konstantinos (eds.) (2008): Research in Labor Economics Volume 28. Amsterdam: Elsevier, pp. 57–79.

Casali, Simone; Alvarez Gonzalez, Veronica (2010): 17 % of Full-Time Employees in the EU are Low-Wage Earners. In: Eurostat Statistics in Focus 3/2010.

Chamberlain, Garry (1984): Panel Data. In: Griliches, Zvi; Intriligator, Michael D. (eds.) (1984): Handbook of Econometrics Volume 2. Amsterdam: North Holland, pp. 1247–1318.

Clark, Ken; Kanellopoulos, Nikolaos C. (2013): Low Pay Persistence in Europe. In: Labour Economics 23 (August), pp. 122–134.

Cobb-Clark, Deborah A.; Schurer, Stefanie (2012): The Stability of Big-Five Personality Traits. In: Economics Letters 115 (1), pp. 11–15.

Cobb-Clark, Deborah A.; Schurer, Stefanie (2013): Two Economists' Musings on the Stability of Locus of Control. In: The Economic Journal 123 (August), pp. F358–F400.

Contoyannis, Paul; Jones, Andrew M.; Rice, Nigel (2004): The Dynamics of Health in the British Household Panel Survey. In: Journal of Applied Econometrics 19 (4), pp. 473–503.

Costa, Paul T.; McCrae, Robert R. (1988): Personality in Adulthood: A Six-Year Longitudinal Study of Self-Reports and Spouse Ratings on the NEO Personality Inventory. In: Journal of Personality and Social Psychology 54 (5), pp. 853–863.

DiNardo, John; Lee, David S. (2004): Economic Impacts of New Unionization on Private Sector Employers, 1984–2001. In: Quarterly Journal of Economics 119 (4), pp. 1383–1441.

Dorner, Matthias; Heining, Jörg; Jacobebbinghaus, Peter; Seth, Stefan (2010): Sample of Integrated Labour Market Biographies (SIAB) 1975–2008. FDZ Datenreport 01/2010 (EN), Nuremberg.

Drakos, Konstantinos; Konstantinou, Panagiotis T. (2013): Investment Decisions in Manufacturing: Assessing the Effects of Real Oil Prices and Their Uncertainty. In: Journal of Applied Econometrics 28 (1), pp. 151–165.

Dustmann, Christian; Ludsteck, Johannes; Schönberg, Uta (2009): Revisiting the German Wage Structure. In: The Quarterly Journal of Economics 124 (2), pp. 843–881.

Dustmann, Christian; Meghir, Costas (2005): Wages, Experience, and Seniority. In: Review of Economic Studies 72, pp. 77–108.

Dustmann, Christian; Pereira, Sonia (2008): Wage Growth and Job Mobility in the United Kingdom and Germany. In: Industrial and Labor Relations Review 61 (3), pp. 374–393.

Dustmann, Christian; Schönberg, Uta (2009): Training and Union Wages. In: The Review of Economics and Statistics 91 (2), pp. 363–376.

Dyrenforth, Portia S.; Kashy, Deborah A.; Donnellan, Brent M.; Lucas, Richard E. (2010): Predicting Relationship and Life Satisfaction from Personality in Nationally Representative Samples from Three Countries: The Relative Importance of Actor, Partner, and Similarity Effects. Journal of Personality and Social Psychology 99 (4), pp. 690–702.

Eichhorst, Werner; Gartner, Hermann; Krug, Gerhard; Rhein, Thomas; Wiedemann, Eberhard (2005): Niedriglohnbeschäftigung in Deutschland und im internationalen Vergleich. In: Allmendinger, Jutta; Eichhorst, Werner; Walwei, Ulrich (eds.): IAB Handbuch Arbeitsmarkt – Analysen, Daten, Fakten. Frankfurt: Campus Verlag, pp. 107–142.

Eriksson, Tor (1998): Long-Term Earnings Mobility of Low-Paid Workers in Finland. In: Asplund, Rita; Sloane, Peter J.; Theodossiou, Ioannis (eds.) (1998): Low Pay and Earnings Mobility in Europe. Cheltenham: Edward Elgar Publishing, pp. 32–46.

European Commission (2001): Quality in Work and Social Inclusion. In: European Commission (ed.): Employment in Europe 2001. Luxembourg, pp. 65–80.

European Commission (2004): Labour Market Transitions and Advancement: Temporary Employment and Low-Pay in Europe. In: European Commission (ed.) (2004): Employment in Europe 2004. Luxembourg, pp. 159–186.

Fischer, Gabriele; Janik, Florian; Müller, Dana; Schmucker, Alexandra (2009): The IAB Establishment Panel – Things Users Should Know. Journal of Applied Social Science Studies 129, pp. 133–148.

Fitzenberger, Bernd; Garloff, Alfred (2007): Labour Market Transitions and the Wage Structure in Germany. In: Journal of Economics and Statistics 227 (2), pp. 115–152.

Fitzenberger, Bernd; Kohn, Karsten (2005): Gleicher Lohn für gleiche Arbeit? Zum Zusammenhang zwischen Gewerkschaftsmitgliedschaft und Lohnstruktur in Westdeutschland 1985–1997. Zeitschrift für ArbeitsmarktForschung 38 (2/3), pp. 125–146.

Fitzenberger, Bernd; Kohn, Karsten; Lembcke, Alexander (2013): Union Density and Varieties of Coverage: The Anatomy of Union Wage Effects in Germany. In: Industrial and Labor Relations Review 66 (1), pp. 169–197.

Fitzenberger, Bernd; Kohn, Karsten; Wang, Qingwei (2011): The Erosion of Union Membership in Germany: Determinants, Densities, Decompositions. In: Journal of Population Economics 24 (1), pp. 141–165.

Frandsen, Brigham R. (2012): Why Unions Still Matter: The Effects of Unionization on the Distribution of Employee Earnings. Unpublished Paper, Massachusetts Institute of Technology. http://www.ewi-ssl.pitt.edu/econ/files/seminars/120224_sem_Brigham%20Frandsen.pdf, accessed on 25 September 2013.

Gartner, Hermann (2005): The Imputation of Wages above the Contribution Limit with the German IAB Employment Sample. FDZ-Methodenreport 2/2005, Nuremberg.

Gerlach, Knut; Jirjahn, Uwe (2001): Employer Provided Further Training: Evidence from German Establishment Data. In: Journal of Applied Social Science Studies 121, pp. 139–164.

Gerlach, Knut; Stephan, Gesine (2006): Bargaining Regimes and Wage Dispersion. In: Journal of Economics and Statistics 226 (6), pp. 629–645.

Gernandt, Johannes (2009): Decreasing Wage Mobility in Germany. ZEW Discussion Paper 09-044, Mannheim.

Gerner, Hans-Dieter (2010): Arbeitszeitverlängerung, Arbeitszeitkonten und Teilzeitbeschäftigung. Bielefeld: W. Bertelsmann Verlag.

Gerner, Hans-Dieter; Stegmaier, Jens (2009): Unsicherheit und betriebliche Weiterbildung. Eine empirische Analyse der Weiterbildungsaktivität unter Unsicherheit in KMU und Großbetrieben. In: Zeitschrift für Betriebswirtschaft Special Issue 6/2009, pp. 135–163.

Görzig, Bernd; Gornig, Martin; Werwatz, Axel (2004): Explaining East Germany's Wage Gap: The Impact of Structural Change. In: Post-Communist Economies 17 (4), pp. 449–464.

Greene, William H.; Hensher, David A. (2010): Modeling Ordered Choices. A Primer. Cambridge: Cambridge University Press.

Groves, Melissa O. (2005): How Important is Your Personality? Labor Market Returns to Personality for Women in the US and UK. In: Journal of Economic Psychology 26 (6), pp. 827–841.

Grün, Carola; Mahringer, Helmut; Rhein, Thomas (2011): Low-Wage Jobs: a Means for Employment Integration of the Unemployed? Evidence from Administrative Data in Germany and Austria. IAB Discussion Paper 01/2011, Bonn.

Gürtzgen, Nicole (2012): Estimating the Wage Premium of Collective Wage-Contracts – Evidence from Longitudinal Linked Employer-Employee Data. ZEW Discussion Paper No. 12-073, Mannheim.

Gürtzgen, Nicole; Heinze, Anja (2010): Should Low-Wage Workers Care about Where They Work? Assessing the Impact of Employer Characteristics on Low-Wage Mobility. ZEW Discussion Paper No. 10-054, Mannheim.

Haipeter, Thomas; Lehndorff, Steffen (2009): Collective Bargaining on Employment. Working Paper No. 3, Industrial Relations Department, International Labour Office, Geneva.

Hassel, Anke (1999): The Erosion of the German System of Industrial Relations. In: British Journal of Industrial Relations 37 (3), pp. 483–505.

Heckman, James J. (1981): The Incidental Parameters Problem and the Problem of Initial Conditions in Estimating a Discrete Time-Discrete Data Stochastic Process. In: Manski, Charles F.; McFadden, Daniel (eds.) (1981): Structural Analysis of Discrete Data with Econometric Applications. Cambridge: The MIT Press, pp. 179–195.

Heckman, James J.; Pinto, Rodrigo; Savelyev, Peter A. (2012): Understanding the Mechanisms Through Which an Influential Early Childhood Program Boosted Adult Outcomes. NBER Working Papers 18581, Cambridge.

Heckman, James J.; Stixrud, Jora; Urzua, Sergio (2006): The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior. In: Journal of Labor Economics 24 (3), pp. 411–482.

Heinbach, Wolf-Dieter; Spindler, Markus (2007): To Bind or Not to Bind Collectively? Decomposition of Bargained Wage Differences Using Counterfactual Distributions. IAW Discussion Paper No. 36, Tübingen.

Heineck, Guido (2011): Does It Pay to Be Nice? Personality and Earnings in the UK. In: Industrial and Labor Relations Review 64 (5), pp. 1020–1038.

Heineck, Guido; Anger, Silke (2010): The Returns to Cognitive Abilities and Personality Traits in Germany. In: Labour Economics 17 (3), pp. 535–546.

Heining, Jörg; Scholz, Theresa; Seth, Stefan (2013): Linked-Employer-Employee Data from the IAB: LIAB Cross-sectional Model 2 1993–2010 (LIAB QM2 9310). FDZ-Datenreport 02/2013 (EN), Nuremberg.

Hirsch, Barry T. (2004): Reconsidering Union Wage Effects: Surveying New Evidence on an Old Topic. In: Journal of Labor Research 25 (2), pp. 233–266.

Hirsch, Boris; Schnabel, Claus (2014): What Can We Learn from Bargaining Models about Union Power? The Decline in Union Power in Germany, 1992–2009. In: The Mancester School 82(3), pp. 347–362.

Holzer, Harry J. (2005): Employers in the Low-Wage Sector: Is Their Role Important? In: Bazen, Stephen; Lucifora, Claudio; Salverda, Wiemer (eds.) (2005): Job Quality and Employer Behaviour. Basingstoke and New York: Palgrave MacMillan, pp. 87–110.

Jacobebbinghaus, Peter (2008): LIAB-Datenhandbuch 3.0. FDZ-Datenreport 3/2008 (DE), Nürnberg.

Jacobebbinghaus, Peter; Seth, Stefan (2007): The German Integrated Employment Biographies Sample IEBS. In: Journal of Applied Social Science Studies 127, pp. 335–342.

Jacobebbinghaus, Peter; Seth, Stefan (2010): Linked Employer-Employee Data from the IAB: LIAB Cross-sectional Model 2 1993–2008 (LIAB QM2 9308). FDZ-Datenreport 5/2010 (EN), Nuremberg.

Jung, Sven; Schnabel, Claus (2011): Paying More than Necessary? The Wage Cushion in Germany. In: LABOUR 25 (2), pp. 182–197.

Kalina, Thorsten (2008): Niedriglohnbeschäftigung in Deutschland: Sprungbrett oder Sackgasse? In: ARBEIT 17 (1), pp. 21–37.

Kalina, Thorsten; Weinkopf, Claudia (2012): Niedriglohnbeschäftigung 2010: Fast jede/r Vierte arbeitet für Niedriglohn. IAQ-Report 01/2012.

Knabe, Andreas; Plum, Alexander (2013): Low-Paid Jobs – Springboard to High-Paid Ones? In: LABOUR 27 (3), pp. 310–330.

Lane, Julia (2009): Inequality and the Labor Market: Employers. In: Salverda, Wiemer; Nolan, Brian; Smeeding, Timothy M. (eds.) (2009): The Oxford Handbook of Economic Inequality. Oxford: Oxford University Press, pp. 204–229.

Lathouwer, Lieve de; Marx, Ive (2005): Low-Paid Employment, Work Incentives and Social Protection. In: Marx, Ive; Salverda, Wiemer (eds.): Low-wage Employment in Europe. Perspectives for Improvement. Leuven: Acco, pp. 71–80.

Lee, David S.; Mas, Alexandre (2012): Long-Run Impacts of Unions on Firms: New Evidence from Financial Markets, 1961–1999. In: Quarterly Journal of Economics 127 (1), pp. 333–378.

Lokshin, Michael; Sajaia, Zurab (2004): Maximum Likelihood Estimation of Endogenous Switching Regression Models. In: The Stata Journal 4 (3), pp. 282–289.

Long, Scott J.; Freese, Jeremy (2006): Regression Models for Categorical Dependent Variables Using Stata, 2nd Edition. Texas: The Stata Press.

Lucas, Richard E.; Donnellan, Brent M. (2011): Personality Development Across the Life Span: Longitudinal Analyses With a National Sample From Germany. Journal of Personality and Social Psychology 101 (4), pp. 847–861.

Lucifora, Claudio; Salverda, Wiemer (2009): Low Pay. In: Salverda, Wiemer; Nolan, Brian; Smeeding, Timothy M. (eds.): The Oxford Handbook of Economic Inequality. Oxford: Oxford University Press, pp. 257–283.

Machado, José A.F.; Mata, José (2005): Counterfactual Decomposition of Changes in Wage Distributions Using Quantile Regression. Journal of Applied Econometrics 20 (4), pp. 445–465.

Maddala, Gangadharrao Soundalyarao (1983): Limited-Dependent and Qualitative Variables in Econometrics. Cambridge: Cambridge University Press.

Mason, Geoff; Salverda, Wiemer (2010): Low Pay, Working Conditions, and Living Standards. In: Gautié, Jérôme; Schmitt, John (eds.): Low-Wage Work in the Wealthy World. New York: Russell Sage Foundation, pp. 35–90.

McCrae, Robert R.; Costa Jr., Paul T. (1999): A Five-Factor Theory of Personality. In: Pervin, Lawrence A. and John, Oliver P. (eds.) (1999): Handbook of Personality: Theory and Research. New York: Guilford, pp. 139–153.

McKnight, Abigail (1998): Low-wage Mobility in a Working-Life Perspective. In: Asplund, Rita; Sloane, Peter J.; Theodossiou, Ioannis (eds.) (1998): Low Pay and Earnings Mobility in Europe. Cheltenham: Edward Elgar Publishing, pp. 47–76.

Michaud, Pierre-Carl; Tatsiramos, Konstantinos (2011): Fertility and Female Employment Dynamics in Europe: The Effect of Using Alternative Econometric Modeling Assumptions. In: Journal of Applied Econometrics 26 (4), pp. 641–668.

Mosthaf, Alexander (2014): Do Scarring Effects of Low-Wage Employment and Non-Employment Differ Between Levels of Qualification? In: Scottish Journal of Political Economy 61(2), pp. 154–177.

Mosthaf, Alexander; Schank, Thorsten; Schnabel, Claus (2009): Low-Wage Employment Versus Unemployment: Which One Provides Better Prospects for Women?, Lehrstuhl für VWL, insbes. Arbeitsmarkt- und Regionalpolitik, Prof. Dr. Claus Schnabel, Discussion Paper No. 65, Friedrich-Alexander-Universität Erlangen-Nürnberg.

Mosthaf, Alexander; Schnabel, Claus; Stephani, Jens (2011): Low-Wage Careers: Are there Dead-End Firms and Dead-End Jobs? In: Journal for Labour Market Research 43 (3), pp. 231–249.

Müller, Gerrit; Plug, Erik (2006): Estimating the Effect of Personality on Male and Female Earnings. In: Industrial and Labor Relations Review 60 (1), pp. 3–22.

Mundlak, Yair (1978): On the Pooling of Time Series and Cross Section Data. In: Econometrica 46 (1), pp. 69–85.

Nienhüser, Werner (1998): Ursachen und Wirkungen betrieblicher Personalstrukturen. Stuttgart: Schäffer-Poeschel.

Oberschachtsiek, Dirk; Scioch, Patrycja; Seysen, Christian; Heining, Jörg (2009): Stichprobe der Integrierten Erwerbsbiografien IEBS: Handbuch für die IEBS in der Fassung 2008. FDZ Datenreport 03/2009.

OECD (1996): Earnings Inequality, Low-Paid Employment and Earnings Mobility. In: OECD (ed.) (1996): Employment Outlook 1996. Paris: OECD, pp. 59–108.

OECD (2011): Divided We Stand. Why Inequality Keeps Rising. Paris: OECD.

Pavlopoulos, Dimitris; Fouarge, Didier; Muffels, Ruud; Vermunt, Jeroen K. (2007): Job Mobility and Wage Mobility of High- and Low-paid Workers. In: Journal of Applied Social Science Studies 127, pp. 47–58.

Peter, Frauke H. (2013): Trick or Treat? Maternal Involuntary Job Loss and Children's Non-Cognitive Skills. DIW Discussion Paper 1297, Berlin.

Phimister, Euan; Theodossiou, Ioannis; Upward, Richard (2006): Is it Easier to Escape from Low Pay in Urban Areas? Evidence from the United Kingdom. In: Environment and Planning A 38, pp. 693–710.

Pouliakas, Konstantinos; Theodossiou, Ioannis (2010): Differences in the Job Satisfaction of High-Paid and Low-Paid Workers across Europe. In: International Labour Review 149 (1), pp. 1–29.

Pyke, Frank; Sengenberger, Werner (1992): Industrial Districts and Local Economic Regeneration. Geneva: International Institute for Labour Studies.

Rabe-Hesketh, Sophia; Skrondal, Anders (2013): Avoiding Biased Versions of Wooldridge's Simple Solution to the Initial Conditions Problem. In: Economic Letters 120 (2), pp. 346–349.

Reich, Michael (2008): Segmented Labor Markets and Labor Mobility. Cheltenham: Edward Elgar Publishing.

Richter, David; Metzing, Maria; Weinhardt, Michael; Schupp, Jürgen (2013): SOEP Scales Manual. SOEP Survey Papers 138: Series C, Berlin.

Riphahn, Regina T.; Schnitzlein, Daniel D. (2011): Wage Mobility in East and West Germany. IZA Discussion Papers 6246, Bonn.

Roberts, Brent W.; DelVecchio, Wendy F. (2000): The Rank-Order Consistency of Personality Traits from Childhood to Old Age: A Quantitative Review of Longitudinal Studies. In: Psychological Bulletin 126 (1), pp. 3–25.

Roberts, Brent W.; Walton, Kate E.; Viechtbauer, Wolfgang (2006): Patterns of Mean-Level Change in Personality Traits Across the Life Course: A Meta-Analysis of Longitudinal Studies. In: Psychological Bulletin 132 (1), pp. 1–25.

Rotter, Julian B. (1966): Generalized Expectancies for Internal Versus External Control of Reinforcement. In: Psychological Monographs: General and Applied 80 (1), pp. 1–28.

Salverda, Wiemer; Mayhew, Ken (2009): Capitalist Economies and Wage Inequality. In: Oxford Review of Economic Policy 25 (1), pp. 126–154.

Schank, Thorsten; Schnabel, Claus; Stephani, Jens (2009): Geringverdiener: Wem und wie gelingt der Aufstieg? In: Journal of Economics and Statistics 229 (5), pp. 584–614.

Schank, Thorsten; Schnabel, Claus; Wagner, Joachim (2007): Do Exporters Really Pay Higher Wages? First Evidence from German Linked Employer-Employee Data. In: Journal of International Economics 72, pp. 52–74.

Schank, Thorsten; Schnabel, Claus; Wagner, Joachim (2010): Higher Wages in Exporting Firms: Self-Selection, Export Effect, or Both? First Evidence from Linked Employer-Employee Data. In: Review of World Economics 146, pp. 303–322.

Schnabel, Claus (2013): Union Membership and Density: Some (Not So) Stylized Facts and Challenges. In: European Journal of Industrial Relations 19 (3), pp. 255–272.

Schnitzlein, Daniel D.; Stephani, Jens (2011): Lohnmobilität von jüngeren Geringverdienern in Deutschland. In: Vierteljahrshefte zur Wirtschaftsforschung 4/2011, pp. 13–30.

Schnitzlein, Daniel D.; Stephani, Jens (2013): Locus of Control and Low-Wage Mobility. SOEPpapers on Multidisciplinary Panel Data Research 589, Berlin.

Schömann, Klaus (1994): The Dynamics of Labor Earnings over the Life Course. A Comparative and Longitudinal Analysis of Germany and Poland. Berlin: Max-Planck-Institut für Bildungsforschung.

Schönberg, Uta (2007): Wage Growth Due to Human Capital Accumulation and Job Search: A Comparison between the United States and Germany. In: Industrial and Labor Relations Review 60 (4), pp. 562–586.

Seifert, Hartmut; Massa-Wirth, Heiko (2005): Pacts for Employment and Competitiveness in Germany. In: Industrial Relations Journal 36 (3), pp. 217–240.

Siebert, W. Stanley; Addison, John T. (1991): Internal Labour Markets: Causes and Consequences. In: Oxford Review of Economic Policy 7 (1), pp. 76–92.

Sinn, Hans-Werner; Meister, Wolfgang; Ochel, Wolfgang; Werding, Martin (2007): Reformkonzepte zur Erhöhung der Beschäftigung im Niedriglohnbereich. In: ifo Schnelldienst 4/2007, pp. 3–20.

Sloane, Peter J.; Theodossiou, Ioannis (1998): Methodological and Econometric Issues in the Measurement of Low Pay and Earnings Mobility. In: Asplund, Rita; Sloane, Peter J.; Theodossiou, Ioannis (eds.) (1998): Low Pay and Earnings Mobility in Europe. Cheltenham: Edward Elgar Publishing, pp. 3–12.

Specht, Jule; Egloff, Boris; Schmukle, Stefan C. (2011): Stability and Change of Personality Across the Life Course: The Impact of Age and Major Life Events on Mean-Level and Rank-Order Stability of the Big Five. In: Journal of Personality and Social Psychology 101 (4), pp. 862–882.

Specht, Jule; Egloff, Boris; Schmukle, Stefan C. (2013): Everything Under Control? The Effects of Age, Gender, and Education on Trajectories of Perceived Control in a Nationally Representative German Sample. In: Developmental Psychology 49 (2), pp. 353–364.

Spengler, Anja (2008): The Establishment History Panel. In: Journal of Applied Social Science Studies 128, pp. 501–509.

Stegmaier, Jens (2012): Effects of Works Councils on Firm-Provided Further Training in Germany. In: British Journal of Industrial Relations 50 (4), pp. 667–689.

Stephan, Gesine; Gerlach, Knut (2005): Wage Settlements and Wage Setting – Results from a Multi-Level Model. In: Applied Economics 37 (20), pp. 2297–2306.

Stephani, Jens (2012): Wage Growth and Career Patterns of German Low-Wage Workers. IAB-Discussion Paper 1/2012, Nuremberg.

Stephani, Jens (2013): Does It Matter Where You Work? Employer Characteristics and the Wage Growth of Low-Wage Workers and Higher-Wage Workers. IAB Discussion Paper 4/2013, Nuremberg.

Stephens, Mark W.; Delys, Pamela (1973): External Control Expectancies Among Disadvantaged Children at Preschool Age. In: Child Development 44 (3), pp. 670–674.

Stewart, Mark B. (2007): The Interrelated Dynamics of Unemployment and Low-Wage Employment. In: Journal of Applied Econometrics 22 (3), pp. 511–531.

Stewart, Mark B.; Swaffield, Joanna K. (1999): Low Pay Dynamics and Transition Probabilities. In: Economica 66 (1), pp. 23–42.

Taubman, Paul; Wachter, Michael L. (1986): Segmented Labor Markets. In: Ashenfelter, Orley; Layard, Richard (eds.) (1986): The Handbook of Labor Economics Volume 2. Amsterdam: Elsevier, pp. 1183–1217.

Topel, Robert (1991): Specific Capital, Mobility and Wages: Wages Rise with Job Seniority. In: Journal of Political Economy 99, pp. 145–176.

Uhlendorff, Arne (2006): From No Pay to Low Pay and Back Again? A Multi-State Model of Low Pay Dynamics. IZA Discussion Paper No.2482, Bonn.

Wagner, Gert G.; Frick, Joachim R.; Schupp, Jürgen (2007): The German Socio-Economic Panel Study (SOEP) – Scope, Evolution and Enhancements. In: Journal of Applied Social Science Studies 127, pp. 139–169.

Wang, Li-Ya; Kick, Edward; Fraser, James; Burns, Thomas J. (1999): Status Attainment in America: The Roles of Locus of Control and Self-Esteem in Educational and Occupational Outcomes. In: Sociological Spectrum 19, pp. 281–298.

Williams, Richard (2006): Generalized Ordered Logit/Partial Proportional Odds for Ordinal Dependent Variables. In: The Stata Journal 6 (1), pp. 58–82.

Winship, Christopher; Radbill, Larry (1994): Sampling Weights and Regression Analysis. In: Sociological Methods and Research 23 (2), pp. 230–257.

Wooldridge, Jeffrey M. (2005): Simple Solutions to the Initial Conditions Problem in Dynamic, Nonlinear Panel Data Models with Unobserved Heterogeneity. In: Journal of Applied Econometrics 20 (1), pp. 39–54.

Abstract

This book provides empirical evidence on different aspects of wage dynamics in Germany over the last decade. It consists of four independent essays. The first three essays are dealing with the wage growth and the wage mobility of low-wage workers. The fourth essay is investigating the development of the union wage premium.

In the first essay it is shown that the upward wage mobility of low-wage workers is not merely a transitory phenomenon but can lead to longer-lasting higher wage levels for these workers. Furthermore, a significant part of the employer heterogeneity which is associated to the upward wage mobility of low-wage workers is not captured by the firm variables which have been included in previous studies on low-pay mobility. The latter result has motivated the work on the second essay of this book.

The impact of employer characteristics on the real wage growth of individual workers low-wage workers and higher-wage workers is investigated in the second essay. The results indicate that the wage growth of low-wage workers and higher-wage workers is influenced by different sets of employer characteristics. Therefore, policy measures aiming at increasing the wage growth of low-wage workers need to be specifically tailored for these workers. In addition, this also suggests that the analysis of the determinants of individual wage growth at different quantiles of the wage distribution may shed further light on the economic forces underlying labour market polarization and rising wage inequality.

The third essay deals with the impact of Locus of Control and other non-cognitive skills on transitions of West German men between higher pay, low pay and non-employment. It is shown that men with an internal Locus of Control have an higher probability of escaping low pay. Labour market policy makers need to take into account the possible differences in the individual extent of Locus of Control between individual low-wage workers, as these differences may impact on the reaction of these workers to labour market instruments. In addition, early childhood intervention programs aimed at internalizing the individual Locus of Control of children from disadvantaged families may be a starting point for long-term labour market policy measures.

In contrast to the previous essays of this book, the focus of the fourth essay is not on low-wage workers but on workers from all wage groups. An updated estimate of the union wage premium in Germany shows that although union density and collective bargaining coverage continuously declined over the last decade, a small union wage gap still exists. Even though this result does not allow inference concerning the distribution of wages, it provides basic information for the further inquiry of the effects of the decline of unionism on wages in Germany.

Kurzfassung

Dieses Buch thematisiert verschiedene Aspekte der Lohndynamik in Deutschland. Es besteht aus vier voneinander unabhängigen Aufsätzen. Die ersten drei Aufsätze beschäftigen sich mit dem Lohnwachstum und der Aufstiegsmobilität von Geringverdienern. Der vierte Aufsatz analysiert die Entwicklung der Lohneffekte der Tarifbindung.

Im ersten Aufsatz wird gezeigt, dass die Aufstiegsmobilität von Geringverdienern kein lediglich temporäres Phänomen ist, sondern für diese Beschäftigten zu längerfristig höheren Lohnniveaus führen kann. Des Weiteren wird deutlich, dass ein signifikanter Teil jener betrieblichen Heterogenität, die die Lohnmobilität von Geringverdienern beeinflusst, nicht durch die von bisherigen Studien untersuchten Betriebsmerkmale erklärt werden kann.

Die Ergebnisse des zweiten Aufsatzes deuten darauf hin, dass das Lohnwachstum von Geringverdienern von anderen betrieblichen Einflussfaktoren abhängt als das Lohnwachstum von Besserverdienern. Maßnahmen, die auf die Erhöhung des Lohnwachstums von Geringverdienern abzielen, müssten daher speziell für diese Beschäftigten entworfen werden. Eine Untersuchung der Determinanten des individuellen Lohnwachstums an unterschiedlichen Stellen der Lohnverteilung könnte außerdem zum weitergehenden Verständnis der Polarisierung des Arbeitsmarktes und der wachsenden Lohnungleichheit beitragen.

Der dritte Aufsatz analysiert den Einfluss der Kontrollüberzeugung und anderer Persönlichkeitseigenschaften auf die Übergänge von westdeutschen Männern zwischen besser bezahlter Beschäftigung, Niedriglohnbeschäftigung und Nichtbeschäftigung. Es wird gezeigt, dass Geringverdiener mit einer internalen Kontrollüberzeugung bessere Aufstiegschancen haben als Geringverdiener mit einer externalen Kontrollüberzeugung. Dieses Ergebnis ist für die Arbeitsmarktpolitik in zweifacher Hinsicht von Bedeutung. Zum einen weist es darauf hin, dass die Arbeitsmarktpolitik etwaige Persönlichkeitsunterschiede von Geringverdienern berücksichtigen sollte, da diese Unterschiede auch unterschiedliche individuelle Reaktionen auf Arbeitsmarktmaßnahmen nach sich ziehen können. Zum anderen könnten Frühförderprogramme zur Erhöhung der internalen Kontrollüberzeugung von Kindern aus sozial schwachen Familien ein möglicher Ansatzpunkt langfristig ausgerichteter Arbeitsmarktpolitik sein.

Im Mittelpunkt des vierten Aufsatzes stehen nicht Geringverdiener, sondern Beschäftigte aus allen Lohngruppen. Eine aktualisierte Schätzung der Lohneffekte der Tarifbindung deutet darauf hin, dass trotz des kontinuierlichen Rückgangs des gewerkschaftlichen Organisationsgrads und der Tarifbindung im letzten Jahrzehnt weiterhin eine – wenn auch geringe – positive Lohnprämie der Tarifbindung existiert. Dieses Ergebnis liefert die Grundlage für eine tiefergehende Untersuchung der sinkenden Bedeutung des Gewerkschaftswesens für die Löhne in Deutschland im Rahmen zukünftiger Forschung.

Wage inequality in Germany has been rising significantly over the last decades. By now, about one fifth of all employees in Germany are working in the low-wage sector. At the same time, only a fraction of the low-wage workers manage to move up to better-paid jobs.

Jens Stephani investigates various research questions concerning the upward wage mobility of low-wage workers which have not been analysed previously: How big are the chances of low-wage workers to stay in higher-paid employment for a longer term after moving up? Which establishments provide above-average wage increases for low-wage workers? How important are personality traits for the chances of low-wage workers moving up?

In a separate chapter, Stephani analyses the extent to which the wage levels in establishments that are covered by collective bargaining agreements are still higher than the wage levels in uncovered establishments, despite the decline in unionism in Germany over the last decade.

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