

Empirical Essays on Wages

Inauguraldissertation zur Erlangung des akademischen Grades eines

Doktors der Wirtschaftswissenschaften

der Universität Mannheim

von Diplom-Volkswirt Johannes Gernandt

geboren am 2. Oktober 1978 in Frankfurt am Main

2009

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Tag der mündlichen Prüfung: 15. Dezember 2009

ACKNOWLEDGMENT

First and foremost I would like to thank Friedhelm Pfeiffer, my lecturer at the University of Mannheim, who motivated me to work as a student researcher at the ZEW and later supported me in writing this thesis. Each visit to his office next door led to fruitful discussions. His expertise, insight and suggestions shaped my research skills and prepared me for further challenges. I would also like to thank my supervisor Wolfgang Franz who provided reliable support whenever it was needed. Further, his book and his seminar at the University of Mannheim encouraged me to focus my academic research interest on the field of labour economics, which lead to the dissertation at hand. Also I have to thank professors Paul Gans, Walter Oechsler and Carsten Trenkler for participating at the commission.

I am indebted to my colleagues at the ZEW for valuable comments. Special thanks goes to my co-authors and friends Alisher Aldashev and Stephan Thomsen – we spent a lot of time together talking not only about scientific questions, but also working very efficiently on issues of immigration “along the way”. I also wrote papers together with Katja Coneus, Michael Gebel, Michael Maier, Friedhelm Pfeiffer, Julie Rat-Wirtzler and Marianne Saam – collaborations which were always pleasant, amicable and fruitful. During my time at the ZEW there were several student researchers and interns who supported me – I am indebted to Philipp Eisenhauer, Heidi Hellerich, Jan Huntgeburth, Tim Landvoigt, Carina Leesch, Falco Möller, Ana Maria Montoya Gomez, Carmen Nagy and Ruben Seiberlich. The different chapters of this thesis benefited from valuable comments put forth during seminars and conferences by several persons, who are mentioned and thanked at the beginning of the respective studies.

I am especially grateful to colleagues I met at the ZEW and who became friends during that time as Alisher Aldashev, Denis Beninger, Markus Clauss, Katja Coneus, Stephan Dlugosz, Philipp Eisenhauer, Benjamin Engelstätter, Michael Gebel, Michael Grünewald, Benedikt Lang, Gunnar Lang, Andrea Mühlenweg, Grit Mühler, Karsten Reuß, Waldemar Rotfuss, Stefanie Schubert, Holger Stichnoth, Stephan Thomsen, Thomas Walter and Ralf Wilke.

Finally, and most importantly, I would like to thank my family for their support at any time in my life.

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List of Abbreviations

€	Euro
Abs	absolute
Adj.	Adjusted
AIEL	Associazione Italiana Economisti del Lavoro (Italian Association of Labour Economists)
DIW	Deutsches Institut für Wirtschaftsforschung (German Institute for Economic Research)
e.g.	Exempli gratia (for example)
EALE	European Association of Labour Economists
ECHP	European Community Household Panel
EEA	European Economic Association
ESPE	European Society for Population Economics
et al.	Et alii (And others)
EU	European Union
i.e.	Id est (that is)
i.i.d	Indepent identically distributed
IAB	Institut für Arbeitsmarkt- und Berufsforschung (Institute for Employment Research)
IABS	IAB- Beschäftigtenstichprobe (IAB- Survey)
LIAB	Linked Employer- Employee Data of the IAB
LPS	Legalized Population Survey
N	Number of observations
No.	Number
nr	Results not reported in the table
OECD	Organisation for Economic Co-operation and Development
PADAE	Prime Age Dependent and Always Employed
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
PSID	Panel Study of Income Dynamics

rc	Rank change
ref.	reference
SOEP	German Socio-Economic Panel
SOLE	Society of Labor Economists
Std.-dev.	Standard deviation
TIMSS	Trends in International Mathematics and Science Study
UK	United Kingdom
U.S.	United States
vs.	Versus
ZEW	Zentrum für Europäische Wirtschaftsforschung (Centre for European Economic Research)
€	Euro
allg.	allgemein
Aufl.	Auflage
d.h.	das heißt
EU	Europäische Union
FH	Fachhochschule
i.e.S.	im engeren Sinn
ISCED	International Standard Classification of Education
LFS	Labour Force Survey
Log.	logarithmiert
Spez.	Spezifikation
u.a.	unter anderem
U.S.	United States
UNESCO	United Nations Educational, Scientific and Cultural Organization
vgl.	vergleiche
vgleich.	vergleichende
z.B.	zum Beispiel

1. Introduction

1.1 Motivation

In 2005, about 75 percent of the German national income consisted of earned income. For wage earner households it even amounted to about 85 percent (source: Statistisches Bundesamt). Wages are thus the main contributor to an individual's livelihood. They also function as a reference parameter, as each individual approximately knows his or her own wage, the rough wage of friends and relatives, and can read up on wages of persons standing in the public spotlight in newspapers. The great majority is thus able to compare wages and can reflect on issues such as fairness, opportunities and wage distribution in society. This is particularly relevant in Germany, where the wage acts as a proxy for the job-status or the general rank in society. In any case, a high wage can be converted into commodities that improve an individual's general lifestyle, such as better food, better medical care, higher education, independence, and so on.

For the individual and even at the household level, the net wage is most significant, as this is the amount of money available for consumption and investment. However, when dealing with economic questions, the gross hourly wage is more helpful, as it is not influenced by taxes, variation in working hours, or the wage of the spouse. For this reason the gross hourly wage is used as dependent variable as often as possible in the following chapters.

Until the mid 1990s the wage distribution in Germany was relatively stable, particularly when compared to Anglo-Saxon countries. However, this was soon to change. What led to this change? Were all groups affected by the same amount or did some face larger wage changes? Were there opportunities of moving upwards on the wage distribution? Were these opportunities available to all persons?

What can an individual do in order to earn higher wages? It is common sense that education, especially higher education, leads to higher wages and also to higher employment chances over one's life-cycle, particularly in times of change, e.g. globalization, increasing international division of labour and skill-biased technical change. But by no means does every form of higher education offer the same opportunities. Graduates in the humanities field have been facing the lowest wages and the highest unemployment rates among all academics. Why? Is this a special phenomenon only occurring in Germany or is it the same in other

countries, e.g. Great Britain?

Another group with an increasing population share in Germany and also of increasing public interest are persons with migration background. How many people does this group cover? How much do they earn? Is there wage discrimination? Does education achieved in the host country lead to higher wages compared to an education achieved in the home country? Do better language skills lead to higher wages?

Using these questions and topics as guidelines, the dissertation at hand aims to give answers based on an empirical econometric approach, which looks at wages and their determining factors in Germany.

1.2 Data and Methods

Empirical studies win or lose validity with the quality of the underlying data. The following analyses are based on the German Socio-economic Panel (SOEP), the German Microcensus and the British Labour Force Survey. The results are also compared with studies using other German datasets like the IABS, the LIAB and the Quarterly Wage Survey of the German Federal Statistical Office. The SOEP is a representative panel survey consisting of about 20,000 persons in 11,000 households in 2007. It was established in 1984 and a new wave is added every year. Along with a lot of socio-economic questionnaires on education, family background, migration status, occupation, job situation, language usage and so on, persons are asked about their gross wage in the last month and the hours worked. In this manner, it is possible to calculate gross hourly wages independent of overtime or part-time work. Although the SOEP is not restricted by the social security contribution ceiling, it also includes self-employed workers as well as civil-servants; thus allowing to observe the whole wage distribution, which is not the case for the IABS and the LIAB data, two other big German micro datasets. While participation in the SOEP is voluntary, every year 1% of the German population have to participate in the Microcensus, so the advantage of this data is the higher number of persons, which allows for the analysis of small sub-groups such as humanities graduates. Unfortunately, as it is not possible to calculate gross hourly wages, only net monthly incomes are reported here. The British Labour Force Survey is designed analogously to the Microcensus and thus makes it possible to compare the situation in Germany with that of Great Britain.

To analyse the questions at hand I use a large toolbox of econometric methods, such as ordinary least squares estimation, maximum likelihood estimation, (ordered) probit estimation, panel estimation methods, as well as several wage decomposition techniques. I also control for selection in several steps. The decomposition of wage differentials between two groups subdivides the overall difference into a price and an endowment effect. Another application of this method is to decompose the wage gap of native Germans and persons with migration background. The problem in this case is that the sets of covariates are unequal in both groups (time of residence is equal to the age for all native Germans and thus has to be dropped for natives) and that one has to modify the decomposition method to observe an unbiased variance-covariance matrix - as done in chapter 6. Wages are only observable if persons participate (want to work) and are employed (find a job) on the labour market, so this is something of a double-hurdle that has to be overcome before it is possible to achieve a wage. Even if persons are employed, there is further selection into occupation and economic sector. Controlling for this 4-time selection is not trivial but seems to be important because former direct influences on wages, e.g. the language skills of foreigners, only affect wages indirectly via selection into better paid jobs after controlling for selection – this is done in chapter 7.

1.3 Results

The bracket that connects the six conceptual chapters is the individual wage; the topics in detail are wage distribution, wage mobility and wages for two special groups: graduates in the humanities field and persons with migration background.

For a long time the wage distribution in Germany was characterized as more or less stable. This changed, beginning with the economic downturn in 1992/93 when wage inequality started to increase in both parts of Germany – in West Germany wage inequality was mainly driven below the median and in East Germany above. This increase affected all groups: females and males, foreigners, self-employed and even the core workforce of prime-age dependent employed male workers, but was significantly higher for persons with lower tenure or, in other words, for persons with less job experience or those who just entered the labour market. Up to 40 percent of this group faced real hourly wage losses between 1994 and 2005 in West Germany. At the same time, wage mobility in Germany decreased. Thus, individuals faced a more stable wage distribution, with lower chances of moving upwards. However, mobility did exist for some groups: Younger workers, better educated workers and persons

not working in blue-collar occupations had higher chances of moving upwards. Joint explanation of mobility and inequality make for a good description of the situation on the German labour market – higher inequality coupled with lower mobility. This means that while the wage gap in the German society widened, the chances of moving upwards decreased.

Highly educated persons, defined as persons with a degree from a university or a technical college, earn the highest wages in Germany and also have higher chances of moving upwards in the wage distribution. However, this group is heterogeneous in the sense of labour market outcomes. The group in the weakest position are humanities graduates; they earn the lowest wages of all academics, face the highest unemployment rates and are more often in precarious employment. This situation is comparable to Great Britain.

An important sub-group of the population living in Germany are persons with migration background. First of all, the definition of this group is inconclusive. While in traditional immigration countries like the U.S. a lot of studies use ethnic categories such as blacks, whites and Hispanics, it has been common practice to use nationality in Germany. Beginning with the large inflow of resettlers from Eastern Europe in the late 1980s and the early 1990s, as well as the new naturalization law in 2000, this definition does not suitably describe the whole group of interest. Nowadays about 19 percent of the population in Germany have a migration background, while only 9 percent are foreigners. This share will increase in the near future as about one third of the children below the age of six in Germany today have such a migration background. These are the future working (or unemployed) cohorts of the German labour market. With regard to their wage prospects, the group of German citizens with migration background is closer to foreigners than to native Germans – there are no significant wage differences between foreigners and the group encompassing all persons with migration background. Apart from this, there are significant wage differences between native Germans and foreigners and German citizens with migration background. These differences are mainly driven by price effects. Education has a strong influence on wages, persons with an apprenticeship degree earn higher wages than persons without any degree and persons with a university degree earn higher wages than persons with an apprenticeship degree. For persons with migration background, it is of particular importance in which country and in what form of education system the degree was achieved. Persons with a degree achieved in Germany can expect higher wages than persons with a degree from their home country. Another important prerequisite for participating successfully in the German labour market is the knowledge of the German language. Better language skills indirectly lead to higher wages through improved

participation and employment opportunities in better paying industries and occupations.

1.4 Structure of the Dissertation

The dissertation at hand consists of six parts. Each part is an autonomous paper written on my own or with the help of co-authors between 2006 and 2009 during my time at the ZEW. The first part, “Rising Wage Inequality in Germany”, takes a look at the development of wage inequality in Germany between 1984 and 2005. This period saw an increase in wage inequality, mainly below the median for West Germany. The chapter was written together with Friedhelm Pfeiffer and is published in the *Journal of Economics and Statistics (Jahrbücher für Nationalökonomie und Statistik)*. The second part, “Decreasing Wage Mobility in Germany”, is published as a ZEW Discussion Paper (status: December 2009¹). Mobility in Germany seems to decrease while inequality increases simultaneously. The third part, “Soziale Ungleichheit von Geisteswissenschaftlern im Beruf”, written in German together with Michael Gebel reveals that within the group of persons with a university or a technical college degree, the humanities graduates achieve the lowest wages and also face insecure employment situations. This part is published in the anthology “Findigkeit in unsicheren Zeiten, Ergebnisse des Expertenwettbewerbs Arts and Figures – GeisteswissenschaftlerInnen im Beruf“, edited by Heike Solga, Denis Huschka, Patricia Eilsberger and Gert G. Wagner. The fourth part, “Wage Prospects for People with Migration Background in Germany”, gives a definition of persons with migration background in Germany and their wage prospects compared to native Germans, and within the group of migrants. This part is a joint work, written with Alisher Aldashev and Stephan L. Thomsen, and is a revision of a ZEW Discussion Paper (status: December 2009). The fifth part, “The Immigrant Wage Gap in Germany”, written together with Alisher Aldashev and Stephan L. Thomsen decomposes wage differences between native Germans and immigrants. This part has been published as a ZEW Discussion Paper (status: December 2009). The last part, “Language Usage, Participation, Employment and Earnings – Evidence for Foreigners in West Germany with Multiple Sources of Selection”, analyses the effect of German language skills on wages for foreigners. This part is also a joint work with Alisher Aldashev and Stephan L. Thomsen and has been published in *Labour Economics*.

¹ All papers which have not yet been published in a refereed journal or in an anthology (3 out of 6) have been sent to a journal, decision pending; status: December 2009.

2. Rising Wage Inequality in Germany

This part is joint work with Friedhelm Pfeiffer and is published in the *Journal of Economics and Statistics* 227 (4), 358-380.

Abstract: The paper investigates the evolution of wages and wage inequality in Germany based on samples from the German Socio-Economic Panel (SOEP) 1984 to 2005. Real gross hourly wages for prime age dependent male workers increased on average by 23 percent between 1984 and 1994 in West Germany and the wage distribution was fairly stable. Between 1994 and 2005 average wages increased by 7 percent in West Germany and 18 percent in East Germany. In this period wage inequality, measured by the ratio of the ninetieth to tenth percentile of the wage distribution, increased from 2.5 to 3.1 in West Germany and from 2.4 to 3.2 in East Germany. In West Germany rising wage inequality occurred mainly in the lower part of the wage distribution, whereas in East Germany wage inequality predominantly increased in the upper part of the wage distribution. In West Germany the group of workers with low tenure experienced higher increases in wage inequality compared to the group of workers with high tenure.

Keywords: Wage Inequality, Skill Structure, Real Wages, Tenure.

JEL-classification: J21, J24, J31

Acknowledgements: Friedhelm Pfeiffer acknowledges financial support from the German Research Foundation under grants PF 331/2, PF 331/4 (“Microeconomic Methods to Assess Heterogeneous Returns to Education”) and PF 331/3 (“Wages, Rent-Sharing and Collective Wage Bargaining”). For helpful comments we would like to thank Denis Beninger, Bernhard Boockmann, Alfred Garloff, Blaise Melly, Grit Mühler, Reinhold Schnabel, participants at AIEL, EALE, EEA, ESPE and Verein für Socialpolitik conferences as well as two anonymous referees. For fine research assistance we thank Gunhild Berg, Philipp Eisenhauer and Tim Landvoigt. Remaining errors are ours.

2.1 Introduction

The issue of rising wage inequality has attracted a considerable amount of research in international labour economics.² For a long time rising wage inequality in Great Britain and the U.S. has been contrasted with a stable wage distribution in Europe and especially in Germany. The issue has been highlighted by Krugman (1994) who argued that rising wage inequality and low unemployment rates in the U.S. and rising unemployment combined with a stable wage distribution in Europe are the two sides of the same coin. It was suggested that the stability of the German wage distribution might reflect institutional factors such as social transfers, union bargaining power in the German system of central wage bargaining or the public educational expansion of the seventies.

However, as a result of its strong trade orientation, Germany experienced an increase in the demand for high skilled workers and a decrease in the demand for the low skilled, which is a development common to most industrialized countries. Findings by Fitzenberger (1999), Franz and Steiner (2000) and Möller (2005) among others (compare the summary of studies on wage inequality in Germany in the appendix) suggest that wages in Germany have always been flexible to some degree. More specifically in the recent decades wages below the median seem to have experienced a higher dispersion and inequality increased in East Germany after unification.

In this paper we analyse the evolution of wage inequality based on the German Socio-Economic Panel (SOEP) from 1984 to 2005. Our contribution to the literature on rising wage inequality is threefold: First, the paper provides evidence for the recent clear increase in wage inequality (the ratio of wages of high wage workers as measured by the ninetieth percentile of the wage distribution and low wage workers as measured by the tenth percentile of the wage distribution for all workers was 2.47 in 1994, 2.76 in 2000 and 3.08 in 2005 in West Germany) and discusses some possible explanations. Second, we separately investigate the evolution of wage inequality both for East and for West Germany in order to account for the different economic transition processes after unification. Third, based on the Juhn et al. (1993) decomposition method, the role of tenure, self-employment, education, nationality and gender for the rise in inequality in each part of Germany is analysed. To the best of our knowledge the relationship between tenure and rising inequality has not been investigated so far, although it seems to be central from an economic point of view. Point estimates of price

² See Acemoglu (2002, 2003), Autor et al. (2005, 2008), Blau and Kahn (1996), DiNardo et al. (1996), Gottschalk and Smeeding (1997), Juhn et al. (1993), Katz and Autor (1999) and Prasad (2004), among others.

and composition effects are presented, together with confidence intervals.

Still the majority of studies on wage inequality in Germany are based on various samples taken either from the two percent sample of the social pension fund register data (so called IABS) or from the SOEP. Both data have pros and cons which shall be sketched briefly.³ One advantage of the SOEP is that it includes all groups of workers (wage and self-employed workers as well as civil servants) and information on hours of work is available. One disadvantage is that the number of observations is low (compared to the IABS). Studies for specific groups of workers such as the top one percentile ones or physicians are not possible. Another concern is representativeness. For instance, successful or high wage worker information on hours and earnings may be missing more often (high wage workers may shrink away from specifying their earnings, successful workers may have higher opportunity costs from participation in a survey) which can result in an underestimation of inequality in the upper part of the wage distribution.

One advantage of the IABS is that it is a large representative sample of dependent wage workers starting in 1975. One disadvantage is that hours of work are not available. Therefore studies based on the IABS focus on daily instead of hourly wages. This may result in an overestimation of wage inequality if hours of work become more dispersed over time. Another limitation is that periods as a self-employed worker or a civil servant are not available in the IABS, as a rule. In Germany about 20 percent of employed workers are either self-employed or civil servants. They are not obliged to join the social pension fund and therefore are not in the IABS data. It is beyond the scope of our paper to evaluate the pros and cons of these two or other data (such as the Structure of Earnings Surveys or the Taxpayer Panel) for the analysis of wage inequality. Nevertheless on occasion we will discuss similarities and differences taking samples from the SOEP that are alike the IABS. Keeping in mind the pros and cons of the SOEP mentioned above is helpful for comparison reasons.⁴

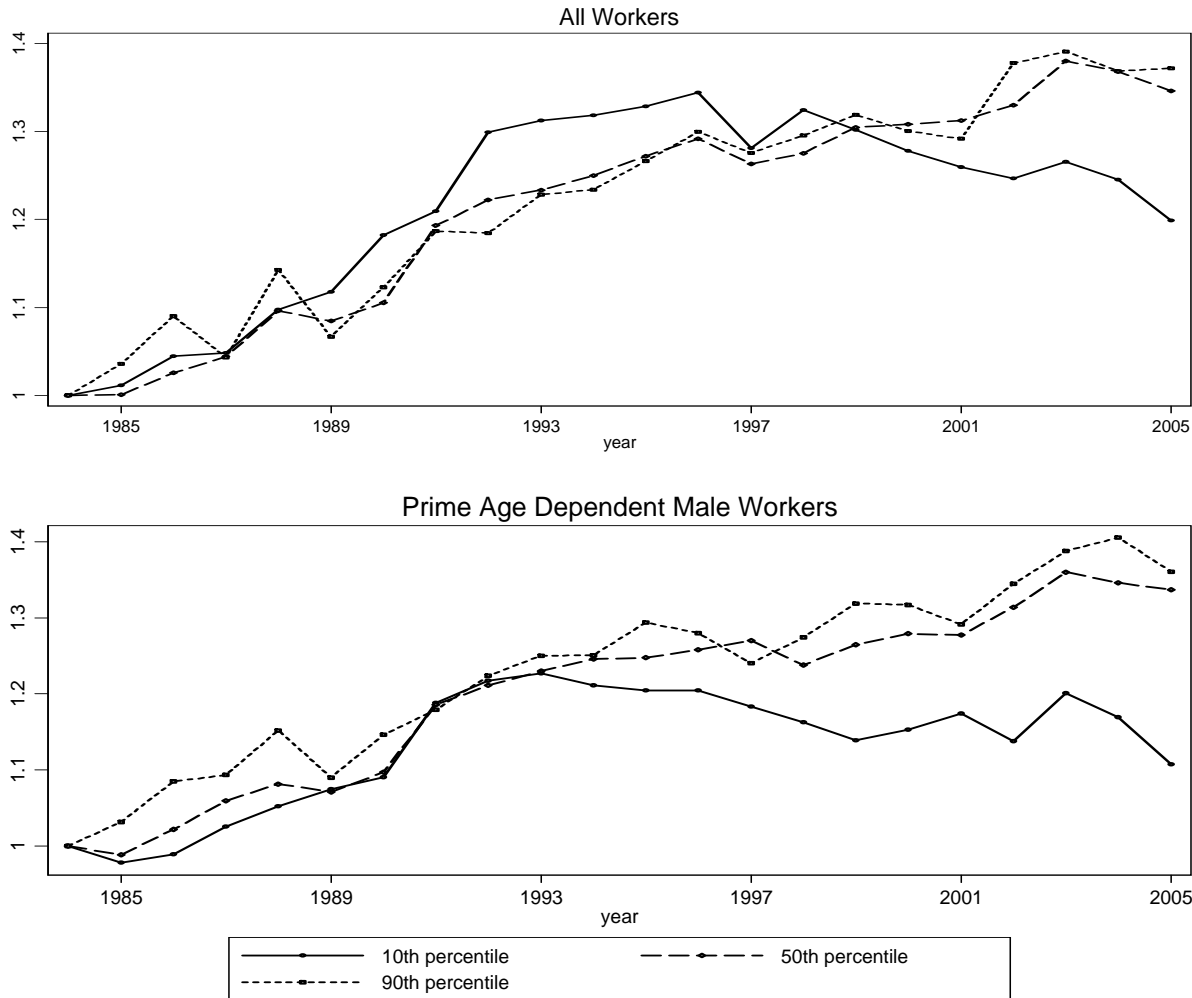
Our measures of wage inequality are the ninetieth to tenth percentile of the real gross hourly wage, as well as its two sub-intervals, the ninetieth to fiftieth, and fiftieth to tenth percentile of

³ A detailed comparison is not intended here in order to save space. The interested reader may find more information on the IABS in Bender et al. (2000) and on the SOEP in Haisken-DeNew and Frick (2005). For further discussion of pros and cons compare Dustmann et al. (2009), Fitzenberger (1999) or Pfeiffer (2003), among others.

⁴ Comparing results with national and international studies based on incomplete data can be exhausting. For example, in the U.S. wage inequality is higher (the ninetieth to tenth percentile of real gross hourly wage was 4.4 in 2004), but remained stable between 1994 and 2004 (Mishel et al., 2006). In Spain inequality is also higher (3.6 in 2002), although it has been decreasing since 1995 (Izquierdo and Lacuesta, 2006). The role of data design for understanding international differences needs some more research, see also Part 2.4 below.

the wage distribution (see section 2.2 below). Figure 2.1 and Figure 2.2 show the evolution of wages between 1984 and 2005 for West Germany and between 1994 and 2005 for East Germany, respectively.

Figure 2.1: The Evolution of Real Wages at the 10th- 50th- and 90th-Percentile, West German Workers 1984-2005



Source: SOEP 1984-2005; own calculations based on cross-section weights; all wages for the three percentiles are normalized to 1 in 1984. Real wages at the tenth percentile increased from 5.77 € in 1984 over 7.48 € in 1994 to 6.91 € in 2005 for all workers and from 7.48 € in 1984 over 9.37 € in 1994 to 9.03 € in 2005 for prime age dependent males. At the fiftieth percentile wages grew from 9.36 € in 1984 over 11.74 € in 1994 to 12.86 € in 2005 for all workers and from 10.48 € in 1984 over 13.23 € in 1994 to 14.69 in 2005 for prime age males. At the ninetieth percentile wages increased from 14.97 € in 1984 over 18.45 € in 1994 to 21.25 € in 2005 for the full sample and from 16.04 € in 1984 over 19.77 € in 1994 to 22.67 € in 2005 for the prime age dependent males.

Two samples of workers have been drawn from the SOEP, one comprising all workers including the self-employed, and one only for the group of prime age dependent male workers (age group 25 to 55; the latter can be compared more easily with results from the IABS; for more details see section 2.2). The findings suggest that wage inequality in Germany started to

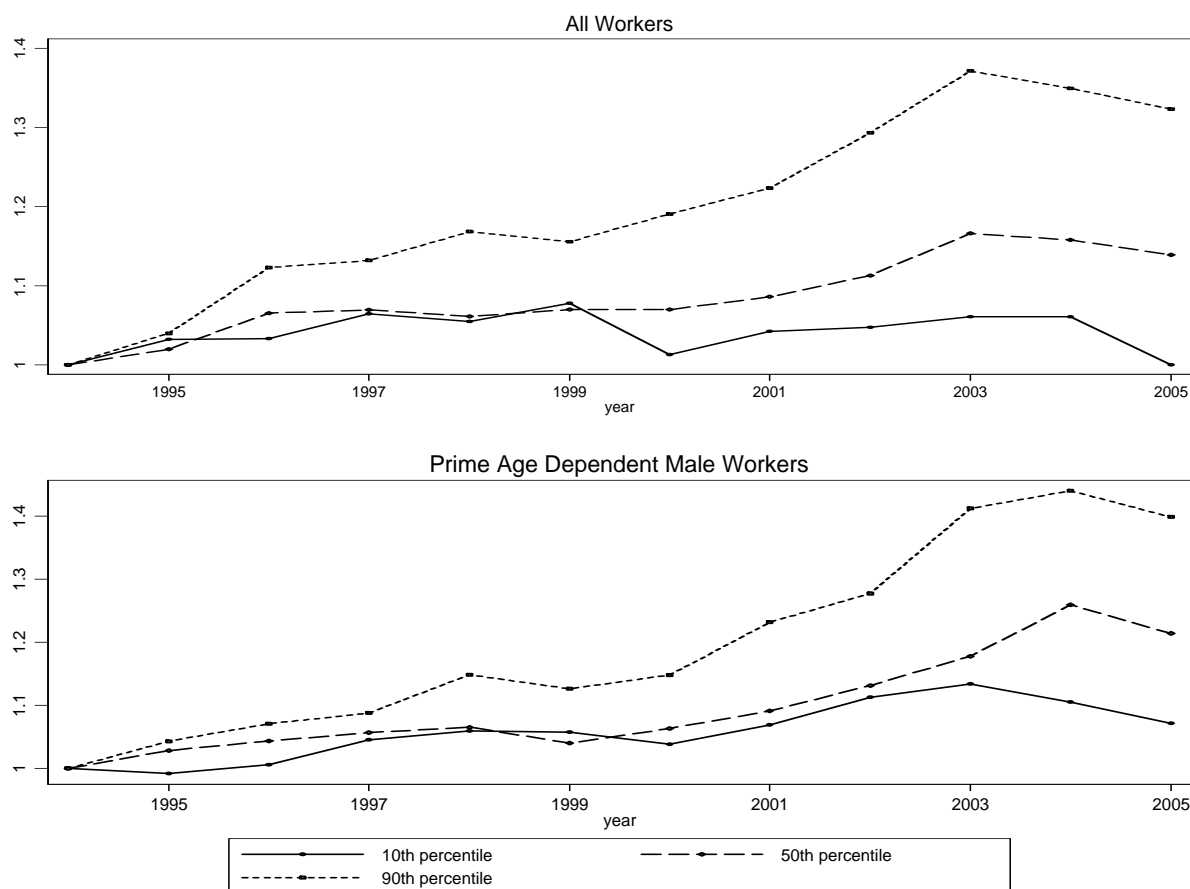
increase after the economic downturn 1992/93.⁵ The significant rise in wage inequality in Germany is a phenomenon that seems not to be exclusive to specific groups of workers as for example the self-employed, women or foreigners. However, the increase in wage inequality was higher for workers with lower tenure compared to workers with higher tenure. Wages therefore seem to react more flexible for entrants and workers with low tenure compared to incumbent workers, which is in line with the literature on wage rigidity in Germany, see Franz and Pfeiffer (2005, 2006), among others.

Between 1994 and 2005 the average hourly wage of prime age dependent male workers increased by 23.4 percent in East Germany and by 9.8 percent in West Germany. For this group, the ratio of the ninetieth to the tenth percentile of the wage distribution increased from 2.3 to 2.9 in East Germany and from 2.1 to 2.5 in West Germany. With respect to West Germany, this implies a strong increase in inequality in a period with only very moderate average wage growth. Between 1984 and 1994 the wage distribution was stable even though average wage growth was 23.7 percent for prime age dependent males.

Based on samples taken from the SOEP the evolution of wages and wage inequality in East Germany differs considerably from that in West Germany. During the transition process towards a market economy, mean wages as well as wage dispersion rose faster. In East Germany, rising inequality mainly concerns wages above the median wage, while in West Germany dispersion forces were stronger below the median. This is in line with an explanation that rising wage inequality in East Germany to a greater extent results from firm competition for (high) qualified workers who else might migrate to West Germany. Wage inequality in West Germany seems to be, to a greater extent, the result from an increased supply of low wage workers. This is a careful interpretation from the findings based on the SOEP. Clearly more research is needed that should be directed to assess recent wage dynamics with better data especially for the top deciles of the wage distribution.

⁵ After the unification boom the German economy experienced a severe recession with employment losses in the private sector of 1.97 percent in 1992/93, 1.56 percent in 1993/94 and 1 percent in 1994/95 (Pfeiffer (2003) based upon "DIW Vierteljährliche Gesamtrechnung").

Figure 2.2: The Evolution of Real Wages at the 10th- 50th- and 90th-Percentile, East German Workers 1994-2005



Source: SOEP 1994-2005; own calculations based on cross-section weights; all wages for the three percentiles are normalized to 1 in 1994. Real wages at the tenth percentile was 5.31 € in 1994 and in 2005 for all workers and increased from 5.74 € in 1994 to 6.01 € in 2005 for prime age dependent males. At the fiftieth percentile wages grew from 8.38 € in 1994 to 9.56 € in 2005 for all workers and from 8.58 € in 1994 to 9.88 in 2005 for prime age males. At the ninetieth percentile wages increased from 12.75 € in 1994 to 17.00 € in 2005 for the full sample and from 12.99 € in 1994 to 17.62 € in 2005 for the prime age dependent males.

The rest of the paper is organized as follows: Section 2.2 describes the samples taken from the SOEP, undertakes some comparisons with the Quarterly Wage Survey of the German Federal Statistical Office and introduces to major changes in the structure of the German workforce. Section 2.3 discusses the evolution of wages and wage inequality while section 2.4 focuses on the findings from the decomposition of wage changes. Section 2.5 concludes.

2.2 Data and Changes in the Structure of the German Workforce

Two samples were drawn from the 22 waves of the German Socio-Economic Panel (SOEP, see Haisken-DeNew and Frick, 2005) 1984 to 2005, both separately for West and for East Germany. First, a full sample was taken containing all workers aged 16 to 65 years including the self-employed. All observations with missing information on at least one variable of

interest were dropped. The variable real gross hourly wage is obtained for all workers including the self-employed by calculating the ratio of last months' salary and hours worked. All wages are deflated with the Consumer Price Index for Germany (base year 2000, source: Statistisches Bundesamt 2006). Hourly wages are trimmed at the two percent highest and lowest observations to reduce the risk of measurement error from extreme values. Further issues in reported hours for measured wage inequality are discussed in section 2.4 below. With this sample the evolution of wage inequality in Germany is analysed based on all individuals participating in the workforce, including women, part-time workers and the self-employed.

Second, a restricted sample was drawn containing only prime age dependent male workers, at the age between 25 and 55 years (about 45 percent of the full sample). Table 2.A2 in the appendix contains detailed summary statistics on wages, hours and earnings for the chosen samples for West Germany, and Table 2.A3 for East Germany. This restricted sample is chosen to facilitate comparisons with previous studies which concentrate on the populations of dependent workers who are part of the German system of social pension fund (for instance Dustmann et al., 2009; Kohn, 2006; Möller, 2000, 2005). Furthermore we would like to answer the question whether rising wage inequality is also prevalent in the group of workers with the highest commitment to the labour market which are prime age dependent males. For those (see Table 2.A2), average hourly wages in West Germany were 11.27 € in 1984 (compared to 10.00 € in sample one), 13.94 € in 1994 (12.38 € in sample one) and 15.31 € in 2005 (13.61 € in sample one). Weekly hours worked were 43.45 in 1984 (40.53 in sample one), 42.15 in 1994 (38.80 in sample one) and 43.20 in 2005 (37.41 in sample one).

A comparison of our results based on the SOEP with the Quarterly Wage Survey of the German Federal Statistical Office (see Statistisches Bundesamt, 1995, 2006) reveals similar trends in wage inequality. The Quarterly Wage Survey contains average wages for blue-collar unskilled workers and blue-collar skilled workers and wages for white-collar skilled and unskilled workers from manufacturing. Between 1994 and 2004 the wage gap of male blue-collar skilled and unskilled workers increased from 26.5 percent in 1994 to 33.3 percent in 2004 in West Germany and from 19.5 percent to 29.4 percent in East Germany, confirming rising wage inequality. Furthermore, the wage gap of male white-collar skilled and unskilled workers increased from 53.5 percent in 1994 to 62.6 percent in 2004 in West Germany and from 40.2 percent to 63.6 percent in East Germany.

In the subsequent econometric analysis (section 2.4 below) it is necessary to estimate wages as a function of educational qualification, tenure, potential experience, sex (female), self-employment and nationality (foreigner) of workers. The evolution of these variables reflects changes in the socio-economic composition of the German workforce. In West Germany the share of highly educated workers⁶ doubled between 1984 and 2005. Prime age dependent male workers are better educated compared to workers in the full sample. In both samples, the average duration of years of schooling increased by about 1 year (to 12.30 years in sample one and to 12.35 in the sample of prime age dependent males in 2005).

Female participation increased from 37 to 47 percent, while the share of foreigners fluctuates around 8 percent. About 6 percent of the workers in the overall sample are self-employed.⁷ Self-employment has been rising continuously since 1994. The share of people whose tenure is seven years (the median) or longer (“high tenure”) decreased in the sample of prime age dependent West German males from 64 percent in 1984 to 58 percent in 2005. In this sample the average years of tenure was 11.46 in 1984 and 11.77 in 2005. For workers with high tenure, average wages increased by 42 percent between 1984 and 2005 (1984: 11.57 €, 1994: 14.61 €, 2005: 16.43 €), while for workers with low tenure, average wages increased by 28 percent between 1984 and 2005 (1984: 10.73 €, 1994: 12.88 €, 2005: 13.74 €).

In East Germany average wages in 2005 amount to 77 percent (71 percent in 1994) of average wages in West Germany in sample one and to 72 percent (64 percent in 1994) in the sample of prime age dependent male workers.⁸ East German prime age dependent males work on average 1.4 hours more than West Germans, while in the sample of all workers the difference is 3.8 hours in 2005. Compared to West Germany there are more workers with high education. Female participation rates are higher, although the West German ones are converging to East German levels. The share of foreigners in East Germany does not exceed one percent.

There was a continuous rise in the share of self-employed workers (3.68 percent in 1994, 7.09 percent in 2005) after the transition to a market economy and the permission of private enterprises in East Germany. The share of individuals with high tenure increased by about 50 percent in the sample of prime age dependent males (1994: 26 percent; 2005: 37 percent). Not

⁶ These are workers with a degree from a technical college or university.

⁷ Shares for weighted data with cross sectional weights.

⁸ In sample one, average wages in East Germany (West Germany) amount to 8.82 € (12.38 €) in 1994 and to 10.52 € (13.61 €) in 2005. For prime age dependent males average wages amount to 8.96 € (13.94 €) in 1994 and to 11.06 € (15.31 €) in 2005 in East Germany (West Germany), see Table 2.A2 and 2.A3 in the appendix.

surprisingly the average number of tenure (9.90 for the full sample in 2005) is still lower compared to West Germany. The ratio of the officially registered unemployed in the workforce⁹ increased from 15.7 percent in 1994 to 20.6 percent in 2005 in East Germany and from 9.1 percent in 1984 and 1994 to 11.0 percent in 2005 in West Germany.

2.3 The Evolution of Wage Inequality

West Germany 1984, 1994, 2005

This section presents the evidence on the development of wage inequality in the SOEP samples for West Germany. Table 2.1 displays the central measure for wage inequality, the ratio of the ninetieth to tenth percentile in the wage distribution. In the sample of all workers the measure of inequality first decreased from 2.59 in 1984 to 2.47 in 1994, indicating a moderate wage compression, and then increased to 3.08 in 2005, indicating rising inequality. According to the 95 percent confidence interval this difference is significant (Table 2.1, in brackets).

Wage inequality is lower in the sample of prime age dependent male workers and for foreigners, although the increase in wage inequality is also present in those subgroups. The ninetieth to tenth percentile in the group of prime age dependent male workers was 2.11 in 1994 and 2.51 in 2005. To compare the basic finding of rising wage inequality in the group of dependent male workers from the SOEP with results from Kohn (2006) based on the IABS the eightieth to twentieth wage percentile was calculated. Between 1992 and 2001 this ratio increased by 5 log points, in this SOEP sample. According to Kohn (2006) in this period the eightieth to twentieth wage percentile of daily wages increased by 9 log points. As argued above (see the introduction) the comparison suggests that the finding based on the SOEP may underestimate the rise in wage inequality. The increase might have been 9 instead of 5 log points. However, one needs to keep in mind that the IABS findings refer to daily and not hourly wages. According to the SOEP data in that period the dispersion (standard deviation) of hours of work increased from 7.19 (1992) to 7.71 (2001), with a slight rise in the mean (42.58; 43.17) (see Table 2.A2). Therefore, the IABS may overestimate the rise in (hourly) wage inequality (while the SOEP may underestimate it).

Wage inequality is highest for the self-employed, but the numbers do not indicate a clear

⁹ Statistisches Bundesamt (2006), unemployment rate for dependent employed civil workers.

trend in the period under investigation. Wage inequality is significantly lower for workers with seven or more years of tenure (see “high tenure” in Table 2.1). For the group of workers with “low tenure” the tendency of rising wage inequality since 1994 is strongest.

Table 2.1: Wage Inequality in West Germany: 90th to 10th Wage Percentiles

	All Worker			Prime Age Dependent Male Worker		
	1984	1994	2005	1984	1994	2005
All	2.59 (2.52 – 2.67) N=4,772	2.47 (2.39 – 2.54) N=3,913	3.08 (3.00 – 3.15) N=5,522	2.14 (2.07 – 2.22) N=2,322	2.11 (2.04 – 2.18) N=1,797	2.51 (2.42 – 2.60) N=2,298
Females	2.46 (2.32 – 2.60) N=1,752	2.37 (2.28 – 2.45) N=1,619	3.16 (3.03 – 3.30) N=2,576	.	.	.
Foreigners	2.13 (2.03 – 2.23) N=1,306	2.07 (1.95 – 2.19) N=860	2.92 (2.60 – 3.23) N=554	1.74 (1.64 – 1.85) N=652	1.83 (1.71 – 1.95) N=399	2.28 (2.20 – 2.95) N=253
Self-employed	5.25 (4.51 – 5.99) N=223	3.63 (3.21 – 4.06) N=182	4.28 (3.65 – 4.92) N=338	.	.	.
High tenure	2.39 (2.29 – 2.48) N=2,625	2.26 (2.16 – 2.36) N=2,051	2.60 (2.50 – 2.71) N=3,009	2.07 (2.00 – 2.14) N=1,506	1.99 (1.92 – 2.05) N=1,099	2.25 (2.15 – 2.35) N=1,344
Low tenure	2.57 (2.48 – 2.66) N=2,147	2.46 (2.33 – 2.58) N=1,862	3.32 (3.16 – 3.47) N=2,513	2.13 (2.02 – 2.25) N=816	2.18 (2.06 – 2.29) N=698	2.86 (2.69 – 3.03) N=954

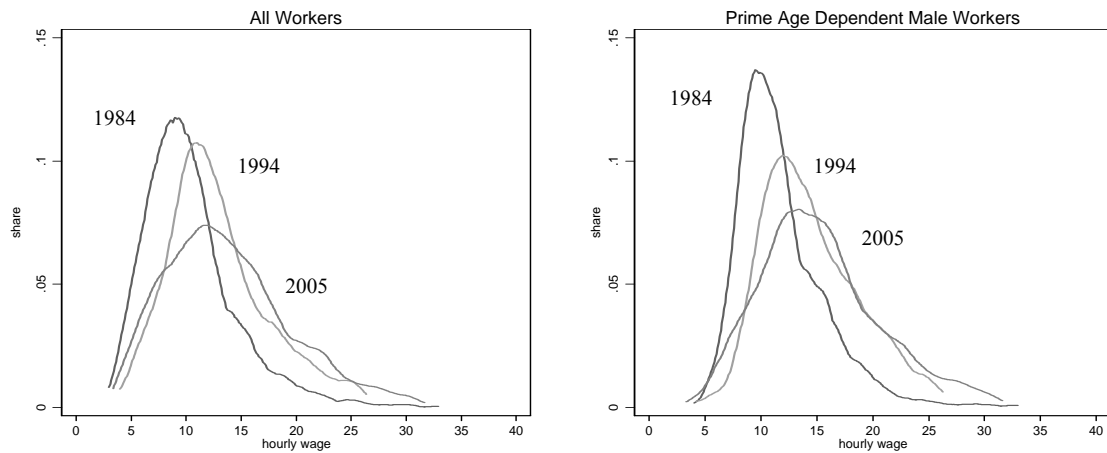
Source: Samples from SOEP 1984-2005, see text; in brackets: 95% bootstrapped confidence interval with 1,000 replications, N= number of observations; own calculations.

Figure 2.3 illustrates the wage distributions for workers in the overall and in the restricted samples for the years 1984, 1994 and 2005. For 1984 and, to some degree, for 1994 the figures indicate the well-known compressed distribution of German wages which is skewed to the right and shaped like a log-normal distribution. The 2005 figure, however, shows more dispersion and symmetry. Apparently, compared to 1994, a higher share of workers receives both very low and also relatively high wages.

A comparison between twenty percentiles of the wage distribution for 1994 and 2005 in the full sample (Figure 2.4) reveals that real wages below the twenty-fifth percentile decreased, and that wages above the median grew at roughly similar rates. This suggests that the rise in inequality has been stronger below the median, which is in line with findings from Kohn (2006) and Möller (2005). In the group of prime age dependent male workers real wages below the twentieth percentile decreased (see Figure 2.4) while the rise was highest for the top percentile. For self-employed workers wage growth was more diverse at all percentiles.

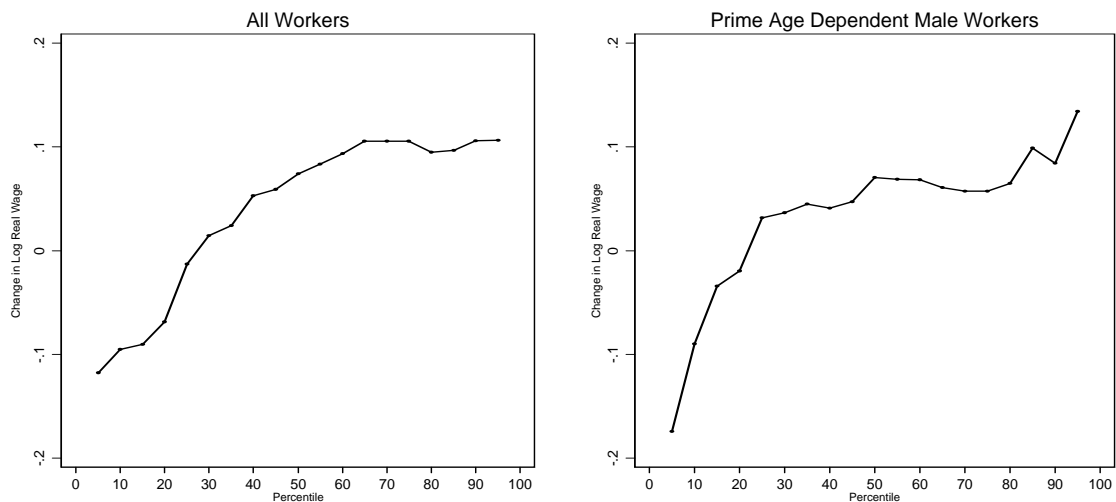
Foreigners experienced a rise in inequality which confirms the findings of Riphahn (2003).

Figure 2.3: The Distribution of Wages in West Germany 1984, 1994, 2005



Source: SOEP 1984-2005 (for the samples see chapter 2.2); weighted data; based on kernel density estimation; own calculation.

Figure 2.4: Wage Growth by Percentile, West Germany 1994-2005



Source: SOEP 1994-2005 (for the samples see chapter 2.2); weighted data; own calculation.

Interestingly, however, wage growth for workers with low and high tenure differs to a higher degree. Between 1994 and 2005 wage growth for the “high tenure” group of workers exceeds growth rates for the “low tenure” group in all percentiles below the seventieth percentile of the wage distribution and in the subgroup for prime age dependent males in all percentiles, Figure 2.5.

Figure 2.5: Wage Growth by Percentile, High vs. Low Tenure, West Germany 1994-2005



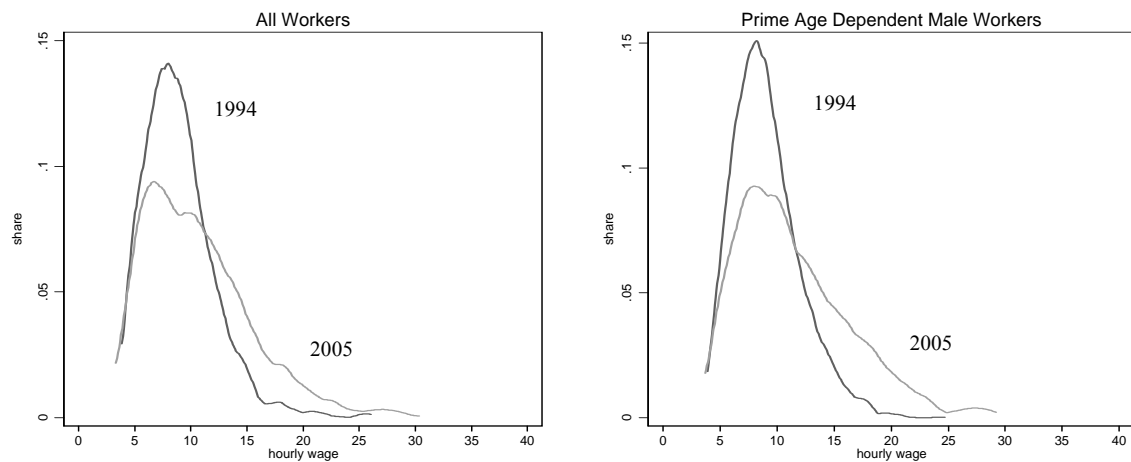
Source: SOEP 1994-2005; weighted data; own calculations.

The differences are significant. There is no percentile with a wage decrease for the “high tenure” group of prime age dependent males. In comparison, real wages of workers with low tenure decreased below the fortieth percentile of the wage distribution. According to these results tenure seems to be an important dimension of wage inequality and wage flexibility. Wage growth in the group of workers with low tenure shows more inequality and dispersion compared to the “high tenure” group. These results suggest that the adjustment of wages to labour market conditions primarily takes place among entrants to the labour market. In the group of workers with high tenure, adjustment to market conditions for labour mainly takes place through reduction of employment or hours of work, not primarily through wage cuts.

East Germany 1994, 2005

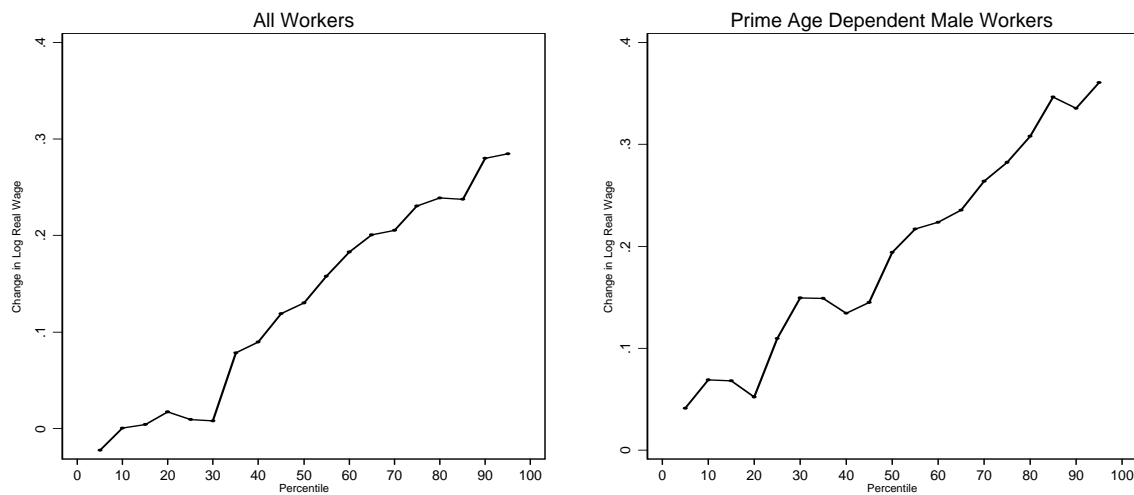
This section reports our results on the evolution of wages and wage inequality in East Germany. To allow a direct comparison with the findings on West Germany, the period of observation is 1994 to 2005. Figure 2.6 illustrates the evolution of wages in East Germany for the whole wage distributions and Figure 2.7 shows the wage growth for twenty percentiles. Rising wage inequality is present and concentrated to some extent in the upper tail of the wage distribution.

Figure 2.6: The Distribution of Wages in East Germany, 1994, 2005



Source: SOEP 1994-2005 (for the samples see chapter 2.2); weighted data; based on kernel density estimation; own calculation.

Figure 2.7: Wage Growth by Percentile, East Germany



Source: SOEP 1994-2005 (for the samples see chapter 2.2); weighted data; own calculation.

Table 2.2 reports wage inequality as measured by the ninetieth to tenth percentile for the different samples and subgroups of workers (females, self-employed, low and high tenure), including 95 percent confidence intervals. In the first sample, the ninetieth to tenth percentile was 2.40 in 1994 and 3.20 in 2005. The 95 percent confidence intervals do not overlap, indicating rising wage inequality.

For males and females the increase in wage inequality is rather similar. As in West Germany, wage inequality is highest among the self-employed. Along the tenure dimension results differ in East and West Germany. In East Germany inequality is similar in the “high tenure” and “low tenure” groups. Tenure is still lower in East Germany, since firm foundation emerged

after unification, only 14 years ago. Firms are smaller in East Germany and smaller firms show a higher degree of employment volatility and a lower inclination in central wage bargaining (see Pfeiffer, 2003). This may explain why the tenure differences found for West Germany are not yet visible in the East German samples.

Table 2.2: Wage Inequality in East Germany: 90th to 10th Wage Percentiles

	All Workers			Prime Age Dependent Male Workers		
	1984	1994	2005	1984	1994	2005
All	.	2.40 (2.32 – 2.48) N=1,710	3.20 (3.07 – 3.34) N=1,820	.	2.26 (2.15 – 2.38) N=797	2.93 (2.73 – 3.14) N=698
Females	.	2.42 (2.30 – 2.53) N=769	3.04 (2.83 – 3.26) N=886	.	.	.
Self-employed	.	4.79 (n.a.) N=63	4.42 (3.78 – 5.06) N=129	.	.	.
High tenure	.	2.24 (2.10 – 2.37) N=596	3.10 (2.90 – 3.29) N=1,025	.	2.21 (2.02 – 2.40) N=285	2.90 (2.64 – 3.16) N=386
Low tenure	.	2.40 (2.29 – 2.52) N=1,114	2.91 (2.74 – 3.08) N=795	.	2.27 (2.12 – 2.43) N=512	2.70 (2.45- 2.96) N=312

Source: Samples from SOEP 1994-2005, see text; in brackets: 95% confidence interval, calculated by bootstrapping (1,000 replications), N= number of observations, own calculations. Since the share of foreigners is very low in this sample, they are excluded in the table.

2.4 Findings from Decomposition

This section presents the findings from a decomposition analysis based on the method introduced by Juhn et al. (1993). Changes in wage inequality are decomposed into changes in prices for observable characteristics (in our study: age, tenure, educational qualification, sex, self-employment and foreigner), changes in the composition of the workforce concerning these variables over time and unobserved or residual wage inequality. For this purpose, linear wage equations are estimated with the SOEP. The estimated coefficients are interpreted as returns to the observable variables, and changes in the observables over time are interpreted as changes in the composition of the workforce. In real data the counterfactual decomposition results do not need to add up to one. Therefore the residual component is calculated as the difference between the observed percentage change in wage inequality and the estimated price and quantity components from the wage equation. To obtain reasonable results for this

decomposition analysis the error term has to be independent and normally distributed.¹⁰

Growing residual wage inequality might result from increasing inequality in the distribution of unobserved skills. For instance in the U.S. a rise in the variances of wages occurred primarily for high educated workers (Lemieux, 2006). Unlike the U.S., in the West German sample from the SOEP the variance of real wages increased in all education groups, from 10.15 in 1994 to 20.82 in 2004 for individuals with the lowest educational degree and from 25.92 to 35.53 for individuals with a degree from a (technical) university.

Increasing residual wage inequality might also result from growing measurement errors in the hours of work available in the data. For instance, recent studies by Autor et al. (2005) and Lemieux (2006) indicate a different quality of hours and wage information in different U.S. surveys. The IABS contains no information on hours worked and daily earning might be an incomplete or misleading measure of wages (see section 2.2 above). In the SOEP data wages are calculated as the ratio of self-reported monthly earnings and hours worked. Self-reported hours of work may contain errors. One question then is whether these errors changed over time. The standard deviation of hours of work in the sample of West German prime age dependent male workers increased from 7.4 in 1984 to 7.7 in 2005 (see Table 2.A2 in the appendix), while the standard deviation of monthly earning strongly increased. The findings from official wage statistics and from this study therefore indicate that the rise in wage inequality is not just the result of a rise in the error of reported hours of work.

We try to confirm the argument with a simulation exercise. In this exercise a normal error with a continuously rising standard deviation was added to the reported hours of work in the sample from 1984 and the corresponding wage inequality was calculated. To increase the ratio of the ninetieth to the tenth wage percentile from 2 in 1994 to 2.5 (the value in 2005) the standard deviation of the hours (actual plus simulated error) has to increase to 11. Compared to this huge increase in the variation of hours, a rise to 7.7 (the value from the sample 2005) had only a minor impact on the ratio of ninetieth to tenth wage percentile.

In order to get a reasonable empirical wage equation non-linearities are allowed for. Tenure is divided into thirteen¹¹, potential experience into seventeen categories¹². All wage equations

¹⁰ If the location model is inappropriate the decomposition can produce misleading results. For alternatives to this approach, like the quantile decomposition methods see Dustman et al. (2009), Kohn (2006), Machado and Mata (2005), Melly (2006) or for a kernel reweighting approach see DiNardo et al. (1996), among others. For quantile decomposition methods number of observations needs to be appropriate.

have been estimated separately for East and West Germany, for the full sample and the restricted sample of prime age dependent male workers as well as for various subgroups, for example workers with low and high tenure.¹³ The following discussion of the empirical findings concentrates on the ninetieth to tenth wage differentials as well as its two sub-groups, the ninetieth to fiftieth and the fiftieth to tenth differentials.

West Germany 1984, 1994, 2005

The decomposition confirms findings on wage inequality from section 2.3 and may be helpful in clarifying the role of some explanatory factors for rising wage inequality. Table 2.3 summarizes the findings for the full sample and the restricted sample of prime age dependent male workers. To read Table 2.3, look, for example, at its first row: The wage dispersion between the ninetieth and the tenth percentile (column one) decreased in total (column two) by 0.050 log points or 4.88 percent ($(e^{-0.05} - 1) * 100 = -4.88$). The total wage growth is decomposed into a quantity effect (column 3), a price effect (column 4) and a residual effect (column 5).

The findings can be summarized as follows:

- Even though wage inequality increased significantly over the whole period, the increase was concentrated on the period between 1994 and 2005. For the period between 1984 and 1994 our findings confirm the stability of the German wage distribution.
- In the full sample of workers there is an asymmetry in the increase of wage inequality between 1994 and 2005: Wage inequality increased somewhat in the upper part of the wage distribution. The total increase in the ninetieth to fiftieth percentile was 0.050 log points. Compared to that the increase is quantitatively more pronounced in the lower part of the wage distribution. The total increase in the fiftieth to tenth percentile that is in the lower part of the wage distribution was 0.171 log points. These results are in line with findings by Möller (2005) for West Germany, based on the IABS 1984 to 2001.
- In the period of stability, the decade 1984 to 1994, composition effects alone would have caused increasing wage inequality while in total wage inequality decreases. So price and composition forces seem to have worked in the opposite direction. In the period of rising inequality, the decade 1994 to 2005, the estimated composition effects have been

¹¹ The groups range from 0-3 years over 3-6 years to 33-36 years, the group with highest duration are those employees who stayed with the same employer for more than 36 years.

¹² The groups range from 0-3 years over 3-6 years to 45-48 years, the highest group is “more than 48 years”.

¹³ All wage equations are available from the authors upon request.

responsible for moderate changes in the evolution of wages in the sample of prime age dependent males. Price effects dominate. Price changes for observed characteristics explain one quarter to one third of overall rising inequality.

- For prime age males with low tenure prices have the highest influence for changes between the 90th and 10th and above the median.
- Results differ between the full sample of all workers, including the self-employed and women, and the restricted sample of prime age dependent male workers. However, these differences are moderate. There was slightly less wage dispersion in the period between 1994 and 2005 in the sample of prime age dependent male workers. For woman in the overall sample composite and price effects are quantitatively similar, while price effects are more important in the sample of male dependent worker (assessed by the point estimates).
- According to Kohn (2006) the increase in wage inequality below the median (between 1992 and 2001) is predominantly concentrated among women. In our analysis this is not the case. Even if we restrict our observation period from 1992 to 2001 and estimate the wage equation separately for women and men, increasing wage inequality is concentrated below the median for males and females (results available upon request).
- According to the best of our knowledge confidence intervals are not reported for others decompositions studies for Germany. The reported confidence intervals suggest that the distinction between price, composition and residual effects has a moderate degree of statistical explanation power. One reason for the moderate precision is presumably the relatively low number of observations in the SOEP.

Table 2.3: Decomposition Results for West Germany

All Workers				
Differential	Total	Composition	Prices	Unobserved
1984-1994 (base year 1984)				
90-10	-0.050 (-0.093 – -0.006)	0.020 (-0.012 – 0.058)	-0.043 (-0.074 – -0.016)	-0.027 (-0.053 – -0.002)
90-50	-0.018 (-0.036 – 0.000)	0.037 (0.012 – 0.066)	-0.033 (-0.059 – -0.011)	-0.022 (-0.037 – -0.008)
50-10	-0.032 (-0.072 – 0.009)	-0.017 (-0.046 – 0.014)	-0.010 (-0.029 – 0.009)	-0.005 (-0.022 – 0.012)
1994-2005 (base year 1994)				
90-10	0.221 (0.181 – 0.261)	0.018 (-0.009 – 0.046)	0.060 (0.032 – 0.087)	0.143 (0.115 – 0.170)
90-50	0.050 (0.027 – 0.073)	-0.025 (-0.047 – -0.003)	0.017 (-0.004 – 0.038)	0.058 (0.040 – 0.076)
50-10	0.171 (0.135 – 0.207)	0.043 (0.018 – 0.069)	0.043 (0.024 – 0.062)	0.085 (0.064 – 0.106)
1994-2005 (base year 1994), only females				
90-10	0.286 (0.230 – 0.341)	0.053 (0.010 – 0.095)	0.066 (0.022 – 0.112)	0.167 (0.120 – 0.212)
90-50	0.098 (0.057 – 0.139)	0.014 (-0.023 – 0.051)	0.026 (-0.011 – 0.065)	0.058 (0.033 – 0.080)
50-10	0.188 (0.146 – 0.229)	0.038 (0.006 – 0.070)	0.040 (0.013 – 0.067)	0.109 (0.073 – 0.146)
1994-2005 (base year 1994), only foreigners				
90-10	0.342 (0.221 – 0.463)	0.036 (-0.029 – 0.102)	0.150 (0.060 – 0.238)	0.156 (0.068 – 0.246)
90-50	0.132 (0.068 – 0.196)	0.030 (-0.026 – 0.086)	0.045 (-0.026 – 0.116)	0.057 (0.017 – 0.098)
50-10	0.210 (0.103 – 0.317)	0.006 (-0.058 – 0.070)	0.105 (0.039 – 0.169)	0.099 (0.024 – 0.175)
Prime Age Dependent Male Workers				
Differential	Total	Composition	Prices	Unobserved
1984-1994 (base year 1984)				
90-10	-0.016 (-0.067 – 0.034)	0.030 (-0.007 – 0.067)	-0.022 (-0.055 – 0.014)	-0.024 (-0.054 – 0.003)
90-50	-0.025 (-0.064 – 0.013)	0.015 (-0.019 – 0.050)	-0.021 (-0.050 – 0.011)	-0.019 (-0.040 – -0.001)
50-10	0.009 (-0.026 – 0.043)	0.015 (-0.014 – 0.044)	-0.001 (-0.022 – 0.020)	-0.005 (-0.024 – 0.015)
1994-2005 (base year 1994)				
90-10	0.173 (0.123 – 0.224)	-0.014 (-0.049 – 0.021)	0.080 (0.038 – 0.120)	0.107 (0.076 – 0.140)
90-50	0.031 (-0.010 – 0.073)	-0.016 (-0.049 – 0.017)	0.016 (-0.013 – 0.045)	0.031 (0.011 – 0.051)
50-10	0.142 (0.103 – 0.181)	0.002 (-0.024 – 0.028)	0.064 (0.035 – 0.091)	0.076 (0.048 – 0.106)
1994-2005 (base year 1994), only “low tenure”				
90-10	0.273 (0.194 – 0.351)	0.038 (-0.015 – 0.090)	0.118 (0.048 – 0.188)	0.117 (0.060 – 0.174)
90-50	0.074 (0.016 – 0.131)	-0.003 (-0.050 – 0.048)	0.056 (-0.004 – 0.109)	0.021 (-0.008 – 0.052)
50-10	0.199 (0.141 – 0.258)	0.041 (-0.006 – 0.083)	0.063 (0.020 – 0.110)	0.095 (0.048 – 0.143)

Source: SOEP 1984-2005 (for the samples see chapter 2.2); Juhn et al. (1993) decomposition method; in brackets: 95% confidence interval; calculated by bootstrapping (1,000 replications); own calculations.

A comparison with studies based on the IABS that use quantile decomposition techniques

may be helpful here. For instance, according to Dustmann et al. (2009) changes in the composition of the workforce can explain 40 percent of the increase in wage inequality in the upper part of the wage distribution (that is between the eighty-fifth percentile and the median) and 15 percent in the lower part of the wage distribution (that is between the median and fifteenth percentile).

Based on the SOEP our study indicates significant rising wage inequality, thus adding to the evidence that the increased wage dispersion in Germany is not a spurious empirical effect. The findings are in line with evidence from recent studies based on larger samples of German register data for dependent workers, although there are some qualifications. Increasing wage inequality in West Germany seems to be neither the result of rising participation of women or self-employment workers nor of changes in the share of foreigners. In addition we find that a larger part of the rise in inequality occurred in the group of workers with low tenure which has not been reported so far for Germany (confirming however findings from Spain, Izquierdo and Lacuesta, 2006). This result is in line with empirical research on downward wage rigidity in recessions. In Germany incumbent workers enjoy a higher degree of protection against wage competition. Adjustment takes place to a greater extent through reductions in hours and labour while wage reductions more often occur in the group of entrants and workers with low tenure (see Fehr and Götte, 2005; Kaiser and Pfeiffer, 2001; Pfeiffer, 2003; among others).

East Germany 1994, 2005

Which factors account for rising wage inequality in East Germany? Are there differences between East and West Germany? The results of the decomposition (see Table 2.4) can be summarized as follows:

- The overall measure (ninetieth to tenth differential) indicates a slightly stronger rise in wage inequality in the sample of East compared to West German workers, Table 2.4, which is in line with Kohn (2006). This is a consequence of the transition from a socialist to a market economy after unification. The process of adjustment and convergence to the West German wage distribution is still not complete, and its consequences for the evolution of wage inequality are still unfolding (see also Franz and Steiner, 2000).

Table 2.4: Decomposition Results for East Germany 1994-2005

All Workers				
Differential	Total	Composition	Prices	Unobserved
1994-2005 (base year 1994)				
90-10	0.288 (0.236 – 0.340)	0.016 (-0.022 – 0.054)	0.105 (0.054 – 0.155)	0.167 (0.125 – 0.210)
90-50	0.155 (0.109 – 0.202)	0.006 (-0.029 – 0.043)	0.079 (0.036 – 0.120)	0.071 (0.041 – 0.100)
50-10	0.132 (0.089 – 0.176)	0.010 (-0.027 – 0.045)	0.027 (-0.007 – 0.060)	0.096 (0.068 – 0.126)
1994-2005 (base year 1994), only females				
90-10	0.230 (0.145 – 0.314)	0.017 (-0.042 – 0.087)	0.084 (0.002 – 0.159)	0.129 (0.064 – 0.189)
90-50	0.107 (0.027 – 0.187)	0.032 (-0.022 – 0.100)	0.043 (-0.030 – 0.107)	0.031 (-0.016 – 0.075)
50-10	0.123 (0.054 – 0.192)	-0.015 (-0.073 – 0.040)	0.040 (-0.016 – 0.100)	0.095 (0.052 – 0.143)
Prime Age Dependent Male Workers				
Differential	Total	Composition	Prices	Unobserved
1994-2005 (base year 1994)				
90-10	0.259 (0.175 – 0.343)	-0.010 (-0.060 – 0.038)	0.189 (0.112 – 0.265)	0.080 (0.020 – 0.144)
90-50	0.165 (0.097 – 0.233)	-0.023 (-0.073 – 0.027)	0.158 (0.095 – 0.219)	0.030 (-0.006 – 0.067)
50-10	0.094 (0.026 – 0.163)	0.014 (-0.036 – 0.060)	0.031 (-0.022 – 0.084)	0.050 (0.006 – 0.097)
1994-2005 (base year 1994), only “low tenure”				
90-10	0.174 (0.057 – 0.291)	0.004 (-0.072 – 0.081)	0.149 (0.044 – 0.254)	0.021 (-0.063 – 0.105)
90-50	0.103 (0.010 – 0.195)	-0.038 (-0.118 – 0.041)	0.136 (0.044 – 0.224)	0.005 (-0.046 – 0.059)
50-10	0.071 (-0.014 – 0.156)	0.042 (-0.028 – 0.112)	0.013 (-0.057 – 0.087)	0.016 (-0.053 – 0.081)

Source: SOEP 1994-2005 (for the selection of samples see chapter 2.2); since the share of foreigners is very low in this sample, they are excluded in the table; in brackets: 95% confidence interval, calculated by bootstrapping (1,000 replications); own calculations.

- In contrast to West Germany a large part of rising inequality occurred in the upper tail of the wage distribution, 54 in comparison to 23 percent in West Germany (for the full sample). The total increase in the ninetieth to fiftieth percentile of the wage distribution for prime age dependent males was 0.165 log points; the total increase in the fiftieth to tenth percentile of the wage distribution was 0.094 log points.
- Composition effects seem to be of minor importance in the East German samples with the exception of the lower part of the distribution for prime age dependent males. Price effects are significant especially in the upper part of the wage distribution (assessed by point estimates). For prime age dependent male workers decomposition results suggest that price effects are quantitatively more important than residual effects.
- The differences in wage inequality between tenure groups are less pronounced in East compared to West Germany.

- Again the reported confidence intervals suggest that the distinction between price, composition and residual effects has a moderate degree of statistical explanation power.

One economic explanation for the finding that there is no tenure difference in the East German data and a strong tenure difference in the West German data is the competition for high wage workers between both German regions. This competition together with the well known mobility of high wage workers (especially from East to West Germany) contributed to wage dynamics and inequality in the upper part of the wage distribution in East Germany. The relatively higher degree of rising wage inequality in East compared to West Germany seems to be due to a higher extent of wage inequality in the upper part of the wage distribution in East Germany. Interestingly the pattern of wage inequality in East Germany after unification has some similarities with the period of rising wage inequality in the U.S. that started after the computer revolution in the seventies (see Juhn et al., 1993).

2.5 Concluding Remarks

This paper contributes to the ongoing debate on international trends in wage inequality. Based on the SOEP from 1984 to 2005 the evolution of wage inequality is investigated separately for East and West Germany. Despite the strong trade orientation of the German economy and rising wage inequality abroad, the German wage distribution was fairly stable for a long time. However, our findings, based on the SOEP data, hint at rising wage inequality which started after the economic downturn 1992/93 in both parts of Germany.

The recent significant increase in wage inequality in Germany, measured with the SOEP, seems to be a robust phenomenon, unrelated to specific groups of workers, for example the self-employed, women or foreigners, although there is a need for differentiation. Our decomposition results indicate that price effects are more important for East compared to West German workers, assessed by the point estimates. Rising wage inequality in East Germany seems to be quantitatively more pronounced among high wage workers and in West Germany among workers with low tenure. In times of high unemployment firms' adjustment takes place primarily through reductions of employment and hours of work. Competition through high unemployment in West Germany seems to have had a stronger impact on wage inequality among entrants and workers with low tenure. In East Germany rising inequality seems to be due to a higher extent of wage inequality for high wage workers, which presumably is a result of competition for (highly) qualified workers who otherwise migrate to

West Germany.

Prominent additional explanations in the literature on rising wage inequality refer to the non-neutral nature of technical change, a rising demand for cognitive, non-routine abilities, to world-wide factor competition, decreasing social transfers and union power (German unions lost 2.8 million of their members between 1994 and 2004), changes in unobserved skills and rising inequality in abilities resulting from the German educational system of early tracking. The computer revolution fostered general education and analytical and cognitive non-routine skills while vocational education and non-cognitive manual and routine skills lost ground.

Future research could be directed more specifically to these different explanations and reasons for the evolution of wages and inequality in Germany. In addition more research is needed to assess recent wage dynamics with better data especially for the top deciles of the wage distribution. Since residual wage changes account for two thirds of the rise in wage inequality in West Germany, future research is needed with improved information on hitherto not observed characteristics. For instance, the content of the chosen categories of education might differ over time as well as the economic value of tenure in an employee-employer relationship. Last but not least, the consequences of rising wage inequality for individual well-being, for employment as well as for the evolution of unemployment need to be investigated in greater detail.

2.6 References for Chapter 2

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2.7 Appendix to Chapter 2

Table 2.A1: Selected Studies on Wage Inequality in Germany

Study	Time	Data	Results
Bellmann and Gartner (2003)	1975-2000	IABS, BLH	Increasing wage dispersion in the 1990s in West Germany, especially within high wage sectors.
Dustmann, Ludsteck and Schönberg (2009)	1975-2004	IABS, LIAB	Increasing Wage Inequality in the 1980s, but only at the top of the wage distribution, in the early 1990s wage inequality also started to increase below the median.
Fitzenberger (1999)	1975-1990	IABS	The wage dispersion within skill groups is stable over time for low skilled workers but increases for medium and high skilled workers. After controlling for age and cohort effects there is increasing wage inequality within the group of low skilled workers.
Fitzenberger, Hujer, MaCurdy and Schnabel (2001)	1976-1984	IABS	Wage compression at the lower part of the wage distribution which seems constant over the surveyed time. The main findings are that wages of workers with intermediate education levels, among them especially those of young workers, deteriorated slightly relative to high and low education levels.
Franz and Steiner (2000)	1990-1997	SOEP	In East Germany wage distribution was compressed under socialism. After unification there is rising wage inequality in East Germany, strongest in the first years.
Kohn (2006)	1975-2001	IABS	Rising wage inequality, especially in East Germany, starting in the mid 1990s.
Möller (2005)	1975-2001	IABS	Rising wage inequality, especially below the median, starting in the mid 1990s.
Pfeiffer (2003)	1975-1995	IABS	Wage rigidity is present due to central wage bargaining; for 50 percent of workers wages would have been lower without rigidity; the wage sweep-up is higher for German workers in large firms, rises with tenure and is higher in the middle part of the wage distribution.
Prasad (2004)	1984-1997	SOEP	Relatively stable wage distribution in Germany. Returns to education and experience remained stable. Some evidence for a modest increase in wage inequality at mid 1990s.
Steiner and Hölzle (2000)	1990-1997	SOEP	Relatively stable wage distribution in Germany. Earnings and wage inequality in East Germany increased after reunification.
Steiner and Wagner (1998)	1984-1990	SOEP, IABS	Modest increase in earnings inequality when calculated on the basis of the IABS, while earnings remained constant or slightly decreased on the basis of the SOEP.

Table 2.A2: Means of Real Wages and Hours, West Germany

	All Workers				Prime Age Dependent Male Workers			
	Observations	Real gross monthly salary	Weekly hours worked	Real gross hourly wage	Observations	Real gross monthly salary	Weekly hours worked	Real gross hourly wage
2005	5,522	2,285.65 (1,275.54)	37.41 (12.77)	13.61 (5.56)	2,298	2,867.47 (1,107.58)	43.20 (7.71)	15.31 (5.32)
2004	5,799	2,337.45 (1,309.48)	37.55 (12.65)	13.88 (5.64)	2,467	2,926.00 (1,136.93)	43.09 (7.64)	15.66 (5.40)
2003	5,994	2,346.46 (1,312.35)	37.49 (12.64)	13.93 (5.61)	2,560	2,945.67 (1,134.20)	42.89 (7.75)	15.80 (5.30)
2002	6,266	2,301.85 (1,269.00)	37.83 (12.65)	13.58 (5.42)	2,698	2,861.53 (1,088.89)	43.16 (7.42)	15.27 (5.12)
2001	6,773	2,244.55 (1,196.82)	38.08 (12.57)	13.19 (5.03)	2,981	2,774.87 (1,023.93)	43.17 (7.71)	14.83 (4.76)
2000	7,490	2,257.83 (1,194.23)	38.31 (12.44)	13.22 (5.06)	3,333	2,765.09 (1,031.04)	43.24 (7.55)	14.75 (4.79)
1999	4,123	2,239.72 (1,138.00)	38.52 (11.79)	13.08 (4.94)	1,857	2,683.38 (986.05)	42.69 (7.32)	14.49 (4.74)
1998	3,946	2,237.40 (1,089.29)	38.97 (11.42)	12.99 (4.75)	1,814	2,674.92 (966.30)	42.97 (7.65)	14.39 (4.59)
1997	3,732	2,187.06 (1,046.01)	38.95 (11.41)	12.71 (4.54)	1,686	2,626.61 (899.89)	42.74 (7.51)	14.22 (4.25)
1996	3,801	2,197.03 (1,054.24)	38.68 (10.99)	12.85 (4.63)	1,720	2,626.61 (930.44)	42.36 (7.52)	14.33 (4.45)
1995	3,880	2,179.26 (1,024.08)	39.03 (10.98)	12.68 (4.67)	1,790	2,606.06 (919.42)	42.57 (7.54)	14.17 (4.45)
1994	3,913	2,120.33 (983.24)	38.80 (10.71)	12.38 (4.27)	1,797	2,540.88 (829.60)	42.15 (7.00)	13.94 (4.07)
1993	4,017	2,107.15 (982.96)	38.82 (10.71)	12.33 (4.39)	1,810	2,549.52 (858.18)	42.22 (7.20)	13.97 (4.16)
1992	4,002	2,094.90 (954.47)	39.01 (10.58)	12.22 (4.35)	1,825	2,546.29 (813.98)	42.58 (7.19)	13.85 (4.02)
1991	4,124	2,048.40 (941.38)	39.21 (10.78)	11.88 (4.26)	1,892	2,493.01 (800.44)	42.65 (7.33)	13.55 (3.97)
1990	4,072	1,955.06 (911.89)	39.47 (10.00)	11.27 (4.14)	1,943	2,345.79 (818.53)	42.60 (6.94)	12.72 (4.00)
1989	4,160	1,920.93 (884.29)	40.20 (10.11)	10.88 (3.95)	1,956	2,312.31 (794.47)	43.36 (6.95)	12.33 (3.78)
1988	4,147	1,938.64 (995.41)	39.86 (10.67)	11.19 (4.92)	1,947	2,332.27 (883.92)	43.08 (7.01)	12.60 (4.66)
1987	4,371	1,854.53 (897.42)	40.04 (10.44)	10.54 (3.98)	2,011	2,242.45 (811.94)	43.27 (6.98)	11.98 (3.86)
1986	4,240	1,854.13 (929.45)	40.55 (10.58)	10.58 (4.81)	2,004	2,222.76 (850.81)	43.60 (7.47)	11.91 (4.60)
1985	4,347	1,800.09 (912.00)	40.61 (10.97)	10.32 (5.02)	2,061	2,139.69 (808.08)	43.59 (7.71)	11.58 (4.89)
1984	4,772	1,766.44 (846.17)	40.53 (10.55)	10.00 (3.96)	2,322	2,109.10 (726.22)	43.45 (7.35)	11.27 (3.65)

Standard deviation in brackets.

Source: Samples from SOEP 1984-2005, see text; own calculations.

Table 2.A3: Means of Real Wages and Hours, East Germany

	All Workers				Prime Age Dependent Male Workers			
	Observations	Real gross monthly salary	Weekly hours worked	Real gross hourly wage	Observations	Real gross monthly salary	Weekly hours worked	Real gross hourly wage
2005	1,820	1,878.80 (961.29)	41.25 (10.09)	10.52 (4.78)	698	2,124.25 (925.17)	44.58 (7.39)	11.06 (4.63)
2004	1,923	1,930.98 (979.70)	41.54 (10.16)	10.70 (4.72)	739	2,174.55 (981.13)	44.54 (7.68)	11.30 (4.68)
2003	1,967	1,931.36 (947.14)	41.81 (9.79)	10.64 (4.57)	761	2,167.30 (928.19)	44.78 (7.15)	11.23 (4.56)
2002	2,050	1,882.83 (890.51)	42.15 (9.81)	10.30 (4.29)	802	2,084.13 (876.38)	44.97 (7.71)	10.73 (4.20)
2001	2,220	1,831.92 (856.01)	42.33 (10.12)	10.04 (4.16)	882	2,016.24 (806.59)	45.31 (7.57)	10.38 (4.02)
2000	2,336	1,812.73 (830.79)	42.46 (10.11)	9.90 (4.01)	931	1,984.44 (804.70)	45.43 (7.88)	10.14 (3.80)
1999	1,668	1,792.09 (762.24)	42.80 (9.52)	9.71 (3.78)	691	1,919.96 (715.47)	45.56 (8.16)	9.83 (3.58)
1998	1,632	1,785.58 (738.21)	43.02 (9.38)	9.67 (3.77)	694	1,937.78 (693.97)	45.62 (8.04)	9.93 (3.55)
1997	1,610	1,793.09 (739.08)	43.62 (9.32)	9.56 (3.61)	690	1,922.98 (683.73)	46.15 (7.92)	9.73 (3.32)
1996	1,673	1,762.72 (720.55)	43.16 (9.31)	9.50 (3.53)	728	1,893.92 (648.47)	46.00 (7.72)	9.63 (3.27)
1995	1,749	1,697.36 (699.52)	43.36 (9.63)	9.12 (3.45)	770	1,831.71 (659.33)	46.23 (7.96)	9.24 (3.13)
1994	1,710	1,653.03 (647.18)	43.45 (8.63)	8.82 (3.12)	797	1,762.10 (592.33)	45.71 (7.21)	8.96 (2.85)

Standard deviation in brackets.

Source: Samples from SOEP 1994-2005, see text; own calculations.

3. Decreasing Wage Mobility in Germany

This part is published in a former version as ZEW Discussion Paper 09-044.

Abstract: Using data from the German Socio Economic Panel (SOEP) for the years 1984 to 2007, this paper analyses the amount, the development and the explanations of wage mobility, as well as volatility in West Germany, measured by ranks in the wage distribution. Individual wage mobility decreased between 1984/1987 and 2004/2007, while inequality increased steadily from the mid 1990s onwards. Mobility is highest in the middle section of the distribution. Better qualified persons, younger persons and employees of larger firms have higher chances of moving upwards. Wages are more volatile in the low-wage sector and for individuals moving downwards in the wage distribution.

Keywords: Wage Mobility, Ranks, Inequality, Distribution, SOEP.

JEL-classification: J31, J60, D31

Acknowledgements: I would like to thank my colleagues from the ZEW who participated at an internal seminar for their helpful comments, especially Nicole Görtzgen and Friedhelm Pfeiffer for several additional hints. For fine research assistance I thank Heidi Hellerich, Falco Möller, Ana Maria Montoya Gomez and Ruben Seiberlich. All remaining errors are my own.

3.1. Introduction

Inequality is a topic of wide interest in the economic literature and in the public discussion. While wage inequality in the U.S. started to increase rapidly in the mid 1980s (see e.g. Acemoglu, 2002, 2003; Autor et al., 2008; DiNardo et al., 1996), the situation in continental Europe, especially in Germany, was characterised as more or less stable for a long time. This changed, in the mid 1990s, when wage inequality began to increase there, as well (see e.g. Dustmann et al., 2009; Gernandt and Pfeiffer, 2007; Kohn, 2006). These studies look at sequences of cross-section wage inequality and thus provide sequences of snapshots of the inequality measured. Although they try to analyse the reasons behind the evolution of inequality over time with decomposition methods, such methods may have some shortcomings in the face of unobserved individual effects. Therefore in this paper, I try to investigate wage mobility more directly, looking at selected longitudinal samples of workers.

One shortcoming of such snapshots is that they do not encompass a wide range of an individual's options, particularly the chance to move, e.g. to leave low-wage areas. This raises the question of wage mobility. How much mobility is there? What opportunities for wage mobility did there exist in Germany during the last years? Wage mobility can at least partly offset the increase in cross-section inequality and thus leads to a better understanding of inequality and poverty in a society. If wages are immobile, rising cross-section inequality is associated with a rising inequality of lifetime earnings. On the other hand, the extreme case of total mobility would resemble a lottery re-starting at the beginning of every time period and repositioning the individual at random in the wage distribution – hence, apart from potential credit crunches, “snapshot inequality” would be no problem. Thus, mobility could lead to shared inequality among persons. In general, mobility can be regarded as positive because it reduces inequality. The downside, however, is that it leads to insecurity of further income and this potentially influences investment decisions, e.g. in education or family planning.

Several ways to measure wage mobility are practicable. One way is to calculate individual wage growth from one period to another e.g. from year to year. There is an extensive debate about wage rigidities in the sense that if wages as a whole are not flexible, downside wage rigidities are likely to occur. Cornelißen and Hübler (2008) use the SOEP from 1984 to 2004 and observe an annual nominal mean wage growth of 4.1%. Without downside wage rigidity, this would be only 0.9%. Pfeiffer (2003) uses the IABS from 1975 to 1995 and establishes individual nominal wage growth rates between 3% and 8%, which decrease over the time period. Another line in the literature is to analyse intergenerational wage mobility, e.g. how the wage of the son is related to the wage of his father (see e.g. Solon (1992) for the U.S. and Eisenhauer and Pfeiffer (2008) for Germany). These studies report a wage elasticity from about 0.3 in Germany and about 0.4 in the U.S.

It is not only the absolute amount of the wage that seems to be of importance for the individual but also the relative wage compared to other workers, e.g. measured by ranks within the wage distribution. Summers (1988) argues, and thus reinforces Keynes (1936), that the employee's productivity is affected by the absolute wage and also by the relative wage. Add on the so-called Easterlin paradox (Easterlin, 1974, 1995) that over the last decades, the real average income in Western industrialized countries increased substantially, while on the other hand, average satisfaction or happiness remained stable; it is established that the relative income position has a significant influence for individual happiness – a higher relative wage is positively correlated with happiness (see e.g. Clark et al., 2008; Clark and Oswald, 1996;

Luttmer, 2005). Using British labour data, as well as an experimental approach, Brown et al. (2008) find that the ordinal rank also has a significant effect on well-being. Thus, it is useful to look at the whole wage distribution. Besides the Easterlin paradox, Brown et al. (2008) provide two additional intuitive arguments: the first is derived from evolutionary biology, which states that females favour a mate within a hierarchy of possible sexual partners, ordered according to the possession of resources that will be available for offspring. Second, casual observations in the world of human beings show that people are interested in rankings, e.g. sport outcomes, incomes as described in newspapers, “rich lists” or even lists of economists (as in repec.org or in the German *Handelsblatt* ranking). In this sense, the absolute difference between the ranks is not so important for individuals - e.g. a gold medal for rank 1, nothing for rank 4 independent of the absolute output difference. On a labour market with continuous and repeated valuations of wage and effort combinations these intuitive arguments could be seen with a grain of salt.

The paper at hand follows this last approach: Wage mobility is measured by the degree to which ranks are reversed over time. The goal is to look at the individual turnover of persons within the wage distribution at the micro level to identify properties affecting wage mobility. I examine the wage position of individuals in the wage distribution which is divided into 100 wage percentiles, each percentile representing a rank. Finally, I look at the overall situation during 24 years (1984-2007) and the developments that have taken place over time. The main findings show that wage mobility has decreased over time, while inequality has increased. Mobility is highest in the middle section of the distribution and highest for persons aged 30-39 years. Individual upgrades in the wage distribution are more likely to occur for university graduates, younger workers and for persons working in the public sector, as well as for white-collar workers and less likely for persons who faced an unemployment period in the time of observation. Wages are more volatile in the low-wage sector and for individuals moving downwards in the wage distribution.

I begin with a literature overview (chapter 3.2) and a description of the data set used for the empirical part: the SOEP from 1984 to 2007 (chapter 3.3). I then look at three stages of mobility: absolute mobility measured by real wage development (chapter 3.4), relative mobility measured by individual movement upwards or downwards in the wage distribution (chapter 3.5) and finally, the income risk associated with mobility measured by wage volatility (chapter 3.6). Chapter 3.7 concludes and gives a short outlook. While the main part of the paper focuses on males, an additional part in the appendix gives some insights into the

situation for females.

3.2 Literature

There is evidence that well-being and happiness are not only affected by absolute wages but also by relative wages and the individual rank within the wage distribution. The first part of this chapter supports this approach using the argumentation of Brown et al. (2008) as a basis, while the second part reports empirical results of international comparative studies about wage mobility in Germany.

Textbook economics (e.g. Cahuc and Zylberberg, 2004; Franz, 2006) assume an individual utility function u , depending on the absolute wage (w_{abs}), hours (h) worked, characteristics of the individual worker (i) and characteristics of the job (j).

$$(3.1) \quad u = u(w_{abs}, h, i, j)$$

Based on this, some studies argue that it is not only the absolute wage, but also the relative wage that affects the utility, which is why individuals additionally compare their wages with the mean wage (w_{mean}) of a comparison group (see e.g. Clark and Oswald, 1996; Luttmer, 2005).

$$(3.2) \quad u = u(w_{abs}, w_{mean}, h, i, j)$$

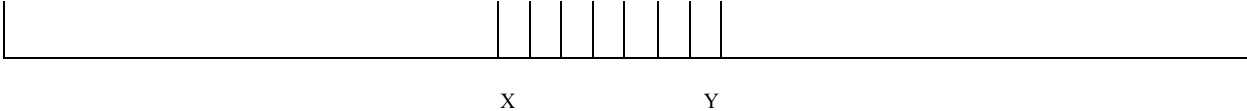
Based on the range frequency theory model (see Parducci, 1965, 1995), Brown et al. (2008) argue in a further step, that the ordinal position and the position within a wage distribution are also important. Individuals seem to be influenced by the end points and the variance of a wage distribution. Brown et al. (2008) use an empirical approach, using British labour data and, additionally, by conducting a laboratory experiment with students. In the experimental design, potential wages are arranged in such a manner that they create conceivable situations with the same utility, measured via equation (3.2) but with a different utility perception by the relevant individuals.

The situation in Figure 3.1, where the utility of wages X and Y in distribution A and B measured via equation (3.2) is identical, provides an ostensive example. In nearly all experimental situations, the test subjects favoured distribution A for wage Y and distribution B for wage X. While wage X in distribution B has the same absolute amount as wage X in

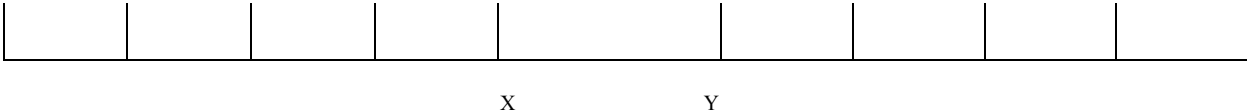
distribution A, and the mean wage in both distributions is also identical, the individual utility in the lower distribution is higher because more persons face lower absolute wages (only one person in distribution A to four persons in distribution B).

Figure 3.1: Hypothetical Wage Distributions

Distribution A



Distribution B



Source: Brown et al. (2008)

Thus, one needs to expand the utility function by the range (w_{range}), measuring the position within the distribution and with the rank (w_{rank}), measuring the ordinal position in the wage distribution.

$$(3.3) \quad u = u(w_{abs}, w_{mean}, w_{rank}, w_{range}, h, i, j)$$

Thus, the rank of the individual in the wage distribution has a positive effect on individual utility, with higher ranks characterizing a higher position in the wage distribution. In the study at hand, ranks are measured via 100 wage percentiles.

There exist some studies about wage mobility in Germany and in comparison with other countries. A first group compares Germany with the U.S. All studies in the group discussed here use the SOEP for Germany and the PSID for the U.S. as a data base. Higher mobility in the U.S. compared to Germany is established by van Kerm (2004), who looks at annual household income after tax and transfers between 1985 and 1997. Burkhauser et al. (1997) compare annual labour earnings mobility in Germany and in the U.S. in the 1980s. They report similar global mobility rates, as measured by quintile to quintile transition rates. Mobility is only higher for women in the U.S. In general, Burkhauser et al. (1997) report an “inverted-u” shape for mobility across initial wage quintiles. Jenkins and van Kerm (2006) for the period from 1985 to 1992, as well as Burkhauser and Poupore (1997) for the years 1983 to

1988 report a higher annual household net income mobility in Germany. Gottschalk and Spolaore (2002) analyse post tax and transfer family income between 1984 and 1993 and take a look at intergenerational family income mobility. They observe a higher mobility in Germany.

A second group compares Germany within Europe. The data base used in all of these studies is the European Community Household Panel (ECHP), the German part of this data set is based, once again, on the SOEP. Ayala and Sastre (2008) compare the mobility of the annual household income after tax and transfers for five European countries¹⁴, with Germany positioned below the mean. An expanded group of European countries¹⁵ is analysed by Pavlopoulos et al. (2008) and the European Commission (2004). Pavlopoulos et al. (2008) take a macroeconomically motivated look and try to explain the impact of economic conditions, welfare state regimes and employment regulation on wage mobility. For Germany, they determine a decreasing probability to move more than one decile in the annual labour earnings distribution between 1994/95 and 1999/00 – in other words, they find decreasing mobility. The study of the European Commission (2004) looks at gross hourly wages and establishes an average mobility in Germany.¹⁶ Sologon and O'Donoghue (2009) analyse the same 14 European countries using the ECHP for 1994 to 2001, focusing on real hourly wages for males born between 1940 and 1981. In their study mobility is measured by the ratio between permanent and transitory¹⁷ inequality and they analyse the development and not the absolute amount of the wage mobility as the study from the European Commission (2004) did. Once again, they establish decreasing wage mobility during the observation period in Germany.¹⁸

A last group looks at the situation in Germany exclusively, focusing on the development over time. Uhlendorff (2006) looks at gross hourly wages from 1998 to 2003, using the SOEP. He analyses mobility between the conditions of high pay, low pay and no pay (unemployed), and finds a “low pay no pay” circle. Hauser and Fabig (1999), also using the SOEP from 1990 to 1995, compare income mobility, as measured by monthly gross and net individual labour

¹⁴ Spain, Great Britain, Italy, Germany, France.

¹⁵ Germany, Great Britain, Italy, Denmark, Luxembourg, Finland, the Netherlands, Ireland, Austria, Spain, Greece, Portugal, France and Belgium.

¹⁶ They arrange the countries in 3 groups: High Mobility is observed in Great Britain, Luxembourg, Denmark and Finland; lowest mobility in Spain, Italy, Greece, Portugal, France and Belgium; and average mobility in the Netherlands, Germany, Ireland and Austria.

¹⁷ Permanent earnings reflect personal characteristics, education and training while transitory earnings reflect factors which only affect earnings during a certain period, such as temporary shocks.

¹⁸ And also decreasing mobility in Austria, France, Great Britain, Ireland, Luxembourg, Italy, Greece, Portugal and Finland while wage mobility increases in Denmark, Belgium, Spain and the Netherlands.

income, between East and West Germany. They depict higher wage mobility in East Germany, in particular for the first years after unification. They argue that the tax and benefit system in Germany serves to reduce income mobility. Kaltenborn and Klös (2000) examine gross monthly labour income using the SOEP from 1984 to 1996. They find that it is easier to move upwards than downwards, especially for younger people – another result of the study at hand. Low-wage earners also have a chance to leave this sector – a probability which increased between 1984 and 1996. Additionally, there are several short reports from the IAB, mostly written in German (e.g. Schank et al., 2009), which use official German Labour Data from the Agency of Labour. The main topics discussed here are the low-wage sector and potential minimum wages. Schank et al. (2009) use the administrative linked employer-employee data (LIAB) of the German Federal Employment Agency. They establish that only one out of eight employees who earned a low wage in 1998/99 left this sector in 2005. Younger and better qualified persons have a particularly good chance to move upwards, while women are less successful. Company size and job changes positively affect the chance to move upwards. While these results are exclusive for the low-wage sector, the study at hand confirms higher upward mobility for younger and better qualified employees and also for persons employed in larger firms over the whole wage distribution.

The paper at hand ties in with these studies by looking at a longer time period, using 24 waves of the SOEP from 1984 to 2007 and thus analysing wage mobility and development over time. The trend of decreasing wage mobility in Germany, reported in the literature so far, is confirmed. Moreover, the paper at hand will analyse individual socio-economic and environmental conditions for all persons of the wage distribution and their effect on wage mobility, as this has been lacking in the literature for Germany to the best of my knowledge. While most of the cited studies are restricted to males, I also analyse wage mobility for females in a separate section in the appendix.

The contribution of this empirical work is motivated by a paper by Raferzeder and Winter-Ebmer (2007) about wage mobility and mobility risk in Austria. I attempt to replicate their estimation design for Germany, thus the results are comparable. Additionally, the paper at hand exploits some advantage of the German data set (the SOEP), which allows to observe not only employment spells, but also periods of unemployment. Raferzeder and Winter-Ebmer (2007) use Austrian data for the period 1994-2001, concentrating on a balanced panel of males who were employed in every period under observation. The initial position in the wage distribution is important. The lower the starting position, the higher is the chance to

move upwards in Austria. Moreover, wages are more volatile at the lower end of the distribution and most stable in the highest quintile. Workers in larger firms and white-collar employees are more likely to move upwards. Job changes increase an individual's wage mobility.

3.3 Data

The data base is the German Socio-Economic Panel (SOEP) from 1984 to 2007. The SOEP is a representative national longitudinal data set, which surveys households and individuals (Haisken-DeNew and Frick, 2005; Wagner et al., 2007). In 2007, there are about 11,000 households with more than 20,000 persons sampled in the SOEP. An advantage of this survey data compared to administrative data like the IABS, the LIAB or the data Raferzeder and Winter-Ebmer (2007) used is first, that wages are not censored by the social security contribution ceiling and so here it is possible to observe the whole wage distribution and second, the chance to calculate hourly wages and so it is possible to account for part-time employees on the one hand and overtime worked on the other hand.

I restrict the data to West German males aged between 20 and 65 years who participate in the labour market. This procedure has been chosen for several reasons: Firstly, persons below 20 are often still in education and males older than 65 are normally retired. Secondly, the goal of this paper is to compare wage mobility over a long period of time. Before 1990, there were no observations of East-Germans in the SOEP and in the years after unification there existed an exceeding wage mobility caused by the transformation from a former socialistic economy to a capitalistic market economy. However, the analysis of this transformation is not the purpose of this paper. Thirdly, the main part focuses on males only because my aim is to compare these results to those of Raferzeder and Winter-Ebmer (2007). With regard to females, one would have to control for factors such as family situation and children, which are responsible for female career paths diverging from those of males. Despite that I use the advantage of the SOEP data and expand the approach by Raferzeder and Winter-Ebmer (2007). I take a look at the situation for females in a separate step in the appendix, where I conduct the same analysis as for males. Moreover, I exclude persons who are still in the education system, interns, already retired persons, or those cooperating in a family business, because their wages, even if they are observed, are not comparable over time, particularly not with normal working periods. As output variable the real gross hourly wage is analysed. The hourly wage is obtained for all workers, including the self-employed, by dividing the gross wage in the

month prior to the interview by the reported working hours of the last week, which are then extrapolated to monthly hours. I deflate all wages by the consumer price index to the price level of 2005 (source: Statistisches Bundesamt, 2008). To avoid problems of potential misreporting of hours worked and/or self-reported wages, I exclude all persons with hourly wages of less than € 1 and more than € 100.¹⁹ For all analyses, I arrange the data in 4-year time periods (1984/1987, 1988/1991, 1992/1995, 1996/1999, 2000/2003, 2004/2007) and treat these periods as balanced panels. The challenge is to choose a time period which is not too short, in order to observe the development and adjustment processes for individuals. However, due to the design of the balanced panels, one loses observations via panel mortality with every further time period. 4-year periods seem to meet these two requirements. Thus it is possible to observe a wage, or at least an unemployment spell, for every person in every year.

A potential problem in analysing wage mobility lies in the selection into employment, in the sense that, particularly with regard to the low-wage sector, one observes wage changes for a positively selected group of workers who are employed at least at the beginning and the end of the observation period because only for these persons wages are observable in the data. Hence, decreases are only observable if the worker is still employed, but the transition to unemployment could also be registered as a form of wage reduction – to zero wages.²⁰ 7.5% (2.8%) of the low- (high-) wage workers in 2004 were unemployed in 2007. Nevertheless, the wage structure in this sense seems to be relatively stable; in all groups, the main part remains unchanged between 2004 and 2007 (see Table 3.1). In the other periods, there is some movement, especially from low-wage to high-wage (see Tables 3.A1a-e in the appendix). In the data, the transition to unemployment is lowest in 1988/1991 and highest in 1992/1995.²¹ The low-wage barrier is defined as 2/3 of the median in the 4-year time periods and is about € 11 per hour in 2004/2007.

A look at the job status and the changes between 2004 and 2007 shows a relatively stable situation (see Table 3.2). Public sector employees in particular do not change their occupation, about 98% stay in their sector. Blue-collar, white-collar, or self-employed workers have persistent rates at approximately 85% to 88%. Being unemployed in 2004 provided the highest probability to leave this status compared to the other occupations and a

¹⁹ In 2004/2007 I lose 21 of 2,771 persons due to this restriction. In the other time periods it is about the same range.

²⁰ Unemployment benefits are not included in wages.

²¹ This is in line with the annual unemployment rates in West Germany: 8.1% in 1984, 7.9% in 1987, 7.9% in 1988, 5.9% in 1991, 5.9% in 1992, 8.1% in 1995, 8.9% in 1996, 8.6% in 1999, 7.6% in 2000, 8.4% in 2003, 8.5% in 2004 and 7.5% in 2007 (Sachverständigenrat, 2008).

switch to employment, mostly to the blue-collar sector, but hardly ever to the public sector. The situation in other periods is comparable to the one above (see Tables 3.A2a-e in the appendix).

Table 3.1: Wage and Employment Status 2004 vs. 2007

		2007		
		Unemployed	Low-wage	High-wage
2004	Unemployed	133 (58.85%)	59 (26.11%)	34 (15.04%)
	Low-wage	26 (7.49%)	224 (64.55%)	97 (27.95%)
	High-wage	61 (2.80%)	153 (7.03%)	1963 (90.17%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.2: Job Status 2004 vs. 2007

		Unemployed	Blue-collar	2007		
				White-collar	Public Sector	Self-employed
2004	Unemployed	133 (58.85%)	63 (27.88%)	20 (8.85%)	1 (0.44%)	9 (3.98%)
	Blue-collar	43 (4.66%)	815 (88.39%)	52 (5.64%)	1 (0.11%)	11 (1.19%)
	White-collar	35 (3.10%)	70 (6.21%)	993 (88.03%)	6 (0.53%)	24 (2.13%)
	Public Sector	0	1 (0.36%)	3 (1.08%)	273 (98.20%)	1 (0.36%)
	Self-employed	9 (4.59%)	8 (4.08%)	11 (5.61%)	0	168 (85.71%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

3.4 Absolute Mobility, Wage Development

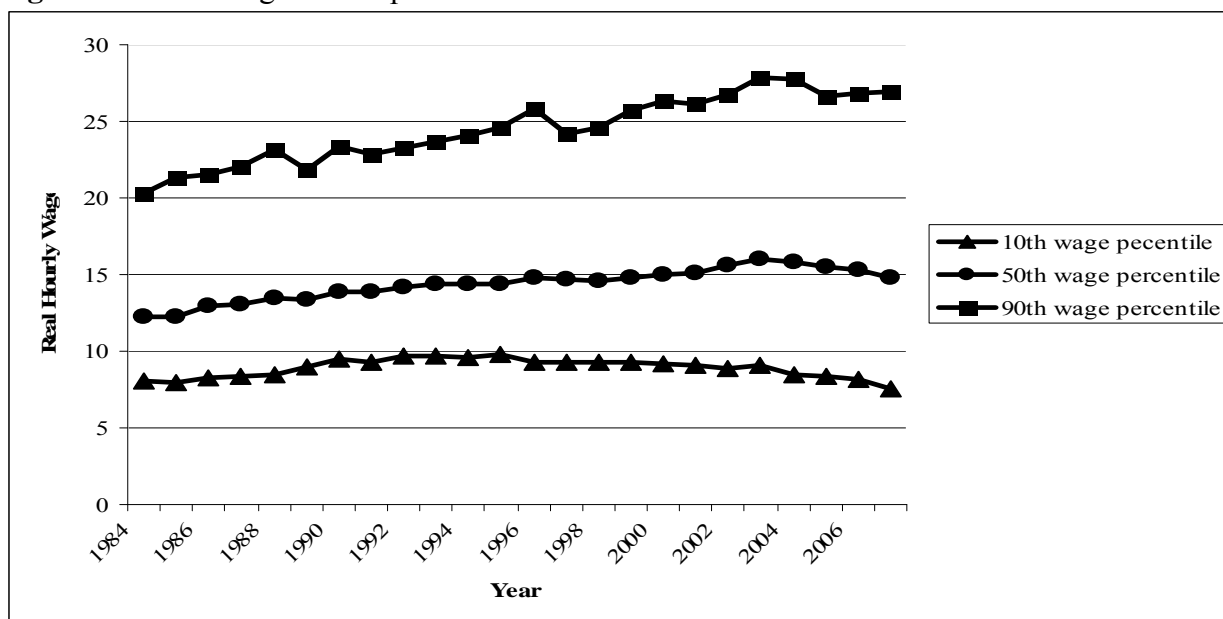
Before analysing rank mobility and volatility in detail, this chapter gives a short overview of the real gross hourly wage development from 1984 to 2007 for West German males aged between 20 and 65 years.²²

Figure 3.2 shows the wage development difference between three percentiles (10th, 50th and 90th percentile). While wages increase at the top of the distribution, wages are stable and even decrease from the mid-nineties on for the 10th percentile, which can be identified as rising wage inequality. The real hourly wage at the 10th percentile amounted to € 9.82 in 1995 and then decreased to € 7.57 in 2007, representing a real wage loss of 25%, while the wage at the 90th percentile increased from € 24.56 to € 26.90 (plus 10%) during the same time period. The

²² Data is restricted in the same way as described in the data section, with the exception of the 4-year balanced panel restriction, which is not necessary here.

real median wage remained fairly stable in this time, with a slight increase from € 14.41 to € 14.77.²³

Figure 3.2: Wage Development between 1984 and 2007



Source: Samples from SOEP 1984-2007; weighted data; own calculation, see text.

These findings suggest that wage inequality in Germany started to increase after the economic downturn in 1992/93 and also wage mobility started to decrease at that time (see Table 3.3 in the next chapter) - the ratio of the ninetieth to tenth percentile increased from 2.5 in 1995, to 3.1 in 2005, to 3.5 in 2007, while the standard deviation of rank differences as a proxy for mobility decreased from 21.51 in 1992/1995 to 17.06 in 2004/2007. This constitutes a stretching of the wage distribution, and chances for upward mobility are reduced.

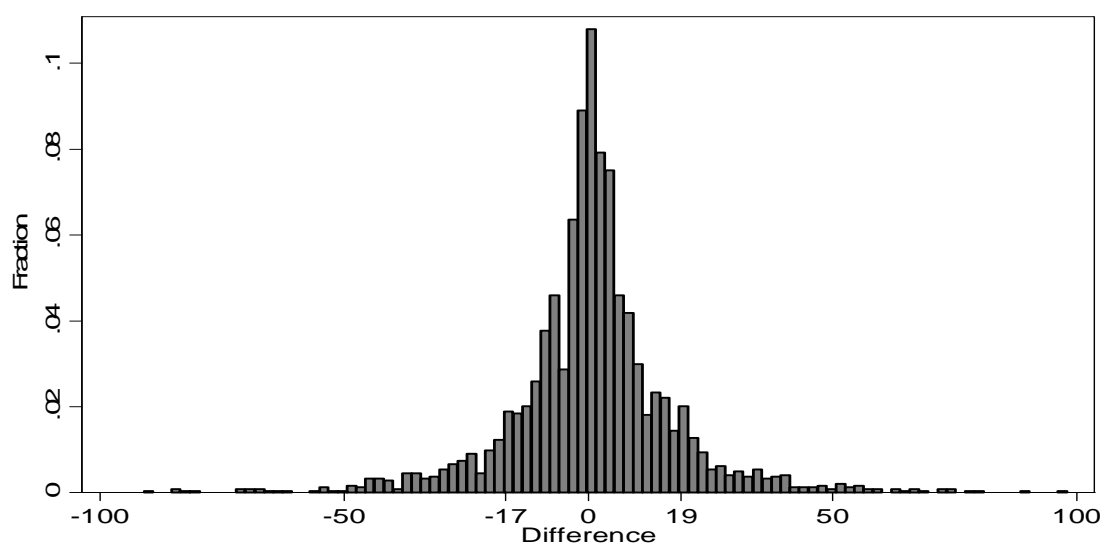
3.5 Wage Mobility

Wage mobility is defined as the number of ranks through which a person moves between the start and the end year of a period. For example, if a person's wage is in percentile 20 in 2004 and in percentile 35 in 2007, there is an upward movement of 15 percentiles, or ranks, respectively. The difference varies, by definition, between plus 99 for a jump from the bottom to the top of the distribution and minus 99 for the opposite direction. In total, it is clear that for every person moving up in the relative wage distribution, there must be another person moving down, so the mean difference is around 0. By definition, to observe this mobility

²³ All wages are deflated to the 2005 price level.

measure there has to be a wage reported in the first year as well as in the last year.²⁴ The 100 ranks are unequal concerning the range from the highest to the lowest wage. A potential problem in this sense is that absolute wage differences within ranks are larger at the ranks on the tails of the distribution. Therefore, one has to be careful in interpreting wage mobility in these areas because one needs a higher absolute wage change for a rank change. For example, in 2004 the wages between € 1.07 and € 5.26 are attached to the first rank and wages between € 50.00 and € 86.67 to the highest rank. Anyhow, in the middle of the distribution the ranks are much smaller. Hence the difference within the 8th and 95th rank is always below 5 percent, and for 31 out of these 87 ranks, the difference lies below 1 percent. These “small” ranks are distributed unsystematically all over the distribution and there are no more than three small ranks neighboured – thus there is no trend towards particular small ranks in the middle.²⁵ In absolute values these differences are about € 0.25 at the mean between the 8th and 95th rank.²⁶

Figure 3.3: Earnings Mobility between 2004 and 2007



Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.3 gives an overview of this difference for the period between 2004 and 2007 (for all other periods, see Figures 3.A3a-e in the appendix). The figures show a trend towards more

²⁴ I tried to model the transfer into unemployment in the last year as a selection, via a two-step Heckman selection procedure. The result showed no selection at all, coefficients did not change, either. In addition, I allocated a fictive 0th percentile to all unemployed persons, and repeated the estimation. Once again, there was no evidence of a selection in unemployment.

²⁵ Ranks with a difference below 1% in 2004: 8, 14, 17, 20, 23-25, 27-28, 30, 32-33, 36-37, 39, 42-43, 48, 50-52, 54-55, 58, 60-62, 64-66, 71.

²⁶ Ranks with an absolute wage difference below € 0.10 in 2004: 8, 14, 17, 20, 25, 27, 28, 32, 33, 36, 37, 39, 43, 48. Above the median absolute wage differences are larger; the following ranks show wage differences below € 0.25: 50-58, 60-69, 71, 72.

compressed distributions over time. While there do exist some extreme values, 80% of the persons show wage leaps between minus 17 and plus 19 ranks with a mass point at zero. Table 3.3 gives an overview of the wage development, employment rates and the standard deviation of the wage rank difference – as a proxy for mobility. While median wages and also wage inequality increase, wage mobility decreases over time. The standard deviation was 22.66 between 1984 and 1987 and only 17.06 between 2004 and 2007. In 1992/1995 with 21.51 the standard deviation shows the second highest level, and this is also the period where wage inequality started to increase. Afterwards, the decrease from the mid-nineties till now is constant. Employment rates in the sample decrease slightly from 93% to 89%.

Table 3.3: Mobility in Several Time Periods

Time Period	Yearly Observations (Balanced Panel)	Employment Rate	Real Gross Hourly Wage, Median	Standard Deviation of Rank Differences, Mobility
2004-2007	2,750	0.89	16.11	17.06
2000-2003	2,900	0.91	16.02	18.94
1996-1999	1,986	0.91	15.18	19.75
1992-1995	1,831	0.91	14.75	21.51
1988-1991	2,006	0.94	14.09	20.77
1984-1987	1,910	0.93	13.04	22.66

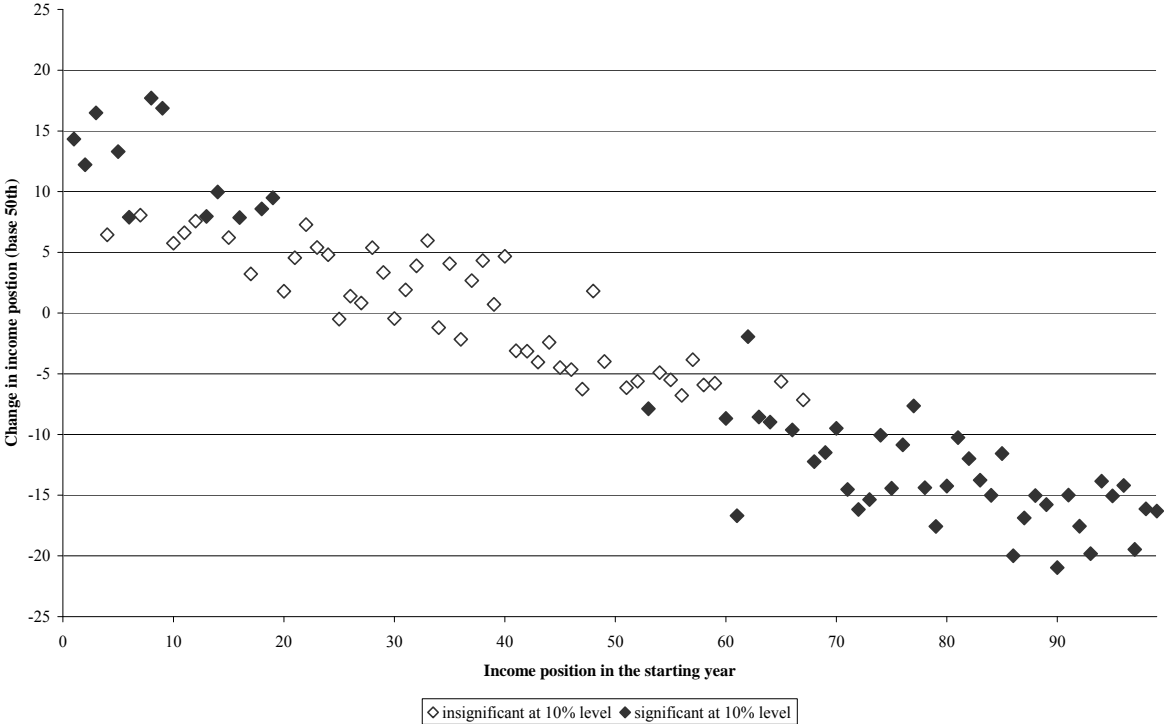
Source: Samples from SOEP 1984-2007; weighted data; own calculation, see text.

After documenting these stylized facts, the next and even more interesting questions are: What drives wage mobility? Are special groups predetermined for relative wage gains or losses? Does every employee in Germany have the same opportunities, e.g. is the “American Dream” possible; to turn from dishwasher to millionaire?

Tables 3.4 and 3.A4 in the appendix show the relation of explaining variables like age, age squared, the starting wage percentile, industry, occupation, job changes, firm size, unemployment, job status and migration background on the chances and the extent of a jump within ranks in the relative wage distribution between the start and the end year. The first column of Table 3.4 shows the results for the latest observable time period (2004/2007), the second column is a subsample of these data, restricted only to prime age dependent and always employed persons (PADAE) for a sensitivity check, the third column shows the results for 1992/1995 and the fourth column the results for the first period observable in the SOEP data (1984/1987). Like Raferzeder and Winter-Ebmer (2007), I adapt a simple ordinary least squares regression technique to do this. For the possibility and the extent of a jump, the starting position is important. Hence, I control for all percentiles (results are not reported in Table 3.4 but are portrayed graphically in Figure 3.4). The results are not surprising; starting at the bottom the only possibility is to remain in the same place or to move upwards and the

opposite applies to those positioned at the top of the distribution (see Figure 3.4).

Figure 3.4: Coefficients for the Wage Percentiles 2004/2007, Base Category: 50th Percentile



Source: Samples from SOEP 1984-2007, Reference category is the 50th wage percentile.

Positive jumps are particularly common for persons in their thirties. The coefficient of 2.31 for the period 2004/2007 shows that, compared to the reference group of persons above the age of 50, persons aged between 30 and 39 years move an average of 2.31 ranks upwards in the wage distribution compared to the reference group - not necessarily at the cost of the older groups. Persons who have an academic education defined as a university or technical college degree also have higher chances of climbing up the relative wage distribution by about 4 ranks in 2004/2007.

With regard to industries and occupations, there is a clear picture: industries making high demands on their employees also seem to provide better opportunities of upgrading the individual position in the wage distribution. The same holds true for occupations. Here the highest chances of moving upwards are observed for professionals, while elementary occupations lead to a downward move of 8 ranks compared to professionals. This is the same tendency for all time periods from 1984 onwards while effects are more pronounced in earlier periods.

The effect of a job change is inconclusive. In general, the opportunity of moving upwards is higher in larger firms. Working in a firm with more than 200 employees increases the chances of moving upwards significantly, by about two and a half ranks, compared to workers with less than 19 colleagues. An unemployment disruption between the start and the end year has a high negative conjunction on the flow. Unemployment in the second year (e.g. 2005 in the period 2004/2007) leads to downward movement of 9.80 ranks and unemployment in the third year (e.g. 2006 in the period 2004/2007) to a downward movement of 16.29 ranks in contrast to the reference group of employed persons, in other words, unemployment in both middle years leads to a downward movement of about 25 ranks in the time period 2004/2007. Job status also has a significant effect on mobility. Compared to blue-collar workers, the chances of moving upwards in the period 2004/2007 are higher for white-collar workers (3.57 ranks), for employees of the public sector (5.18 ranks) and for self-employed persons (7.60 ranks). Migration background has no significant effect in the time period of 2004/2007.

For a sensitivity check, I restrict the group of interest to dependent employees of prime age (25-55 years), who are employed throughout all periods (reported only for 2004/2007). The relation of the variables (now excluding by definition unemployment and self-employment) on the change in the relative income distribution does not change – the 95 percent confidence intervals overlap (not reported in the table), see the second column in Table 3.4.

Results for other time periods are in line and show, with a few exceptions, the same direction (Table 3.4 and Table 3.A4 in the appendix). While the job status and industry sector is not significant in early periods, the migrational background significantly leads to a downwards slip of the wage distribution of 5.77 ranks in 1984/1987 and 2.74 ranks in 1992/1995. In all years, an academic education leads to significantly higher chances of upward movement but the impact of the effect is highest in 1984/1987 with 9.38 ranks, decreases to 2.78 in 2000/2003 and then increases again to 4.26 in the last period but is still only about half as strong compared to the beginning. One reason for this could be the increasing supply of academically trained workers in this time caused by the so-called educational expansion in Germany beginning in the 1960s.

Table 3.4: Change in Relative Income Position

	2004/2007	2004/2007 PADAE	1992/ 1995	1984/1987
Wage Percentile (Starting Year) (Base: 50th)	nr	nr	nr	nr
Age (Base: 50-)				
-29	-1.15	-1.63	1.31	-0.55
30-39	2.31 ***	1.52	2.10	3.21 **
40-49	1.08	0.75	1.89	3.14 **
Academic Education	4.26 ***	4.59 ***	6.12 ***	9.38 ***
Industry (Base: Administration, Education)				
High-tech Industry	4.26 ***	5.06 ***	0.32	4.49 *
Traffic, Distribution	3.88 **	4.59 ***	-3.97	-3.17
Financial Services	4.08 **	5.15 ***	-0.26	7.60 **
Others	nr	nr	nr	nr
Occupation (Base: Professionals)				
Clerks	-5.38 ***	-5.45 ***	-5.58 **	-6.57 **
Service Workers	-7.37 ***	-6.33 ***	-8.70 **	-9.53 **
Craft Workers	-6.34 ***	-6.81 ***	-8.46 ***	-5.41 *
Plant and Machine Operators	-7.72 ***	-8.08 ***	-10.29 ***	-8.00 **
Elementary	-7.98 ***	-8.30 ***	-10.79 ***	-11.30 ***
Others	nr	nr	nr	nr
Job Change in				
Year 1	-0.08	-1.15	-1.65	-
Year 2	-2.34 *	-1.68	2.46	-0.22
Year 3	1.58	2.13	-3.87	-1.82
Year 4	-2.03	-0.91	1.79	-
Firm Size (Base: -19)				
20-199	0.27	0.13	1.43	3.20 *
200-1999	2.74 **	2.48 **	1.02	6.40 ***
2000-	2.59 **	2.72 **	2.79	9.19 ***
Unemployed in				
Year 2	-9.80 ***	-	-7.39	-4.17
Year 3	-16.29 ***	-	-12.60 ***	-6.08
Job Status (Base: Blue-collar)				
White-collar	3.57 ***	3.01 **	3.22 *	5.96 ***
Public sector	5.18 ***	4.69 **	-1.84	2.72
Self-employed	7.60 ***	-	-3.80	5.41
Migration Background	0.32	-0.31	-2.74 **	-5.77 ***
Constant	0.84	1.16	4.43	19.12
N	2,291	1,871	1,497	1,486
Adj. R-squared	0.21	0.19	0.25	0.33

Source: Samples from SOEP 1984-2007; nr – results not reported in the table; PADAE - Prime age dependent (in starting year) and always employed; Others – all other groups are separately accounted for in the estimation; *** - significant at the 1% level, ** - at the 5% level, * - at the 10% level; own calculation, see text.

Comparisons between countries are difficult because the amount of the wage inequality influences the absolute borders of the percentiles. Hence, in countries with a narrow wage distribution, smaller absolute wage changes are necessary to move several relative wage percentiles. Overall, the OECD (2008a) reports a 90th to 10th wage percentile ratio of 3.27 for Austria and 3.98 for Germany in the 2000s, so the wage distribution is more compressed in Austria. Nevertheless, it is feasible to compare the results at hand with those of Raferzeder and Winter-Ebmer (2007) for Austria between 1994 and 2001. They use the same methodical approach as does the study at hand. The most significant predictors for upward mobility in

Austria are age, education, and the status at the beginning of the period. In Austria, the youngest workers (below 29) have the highest chances of moving upwards (plus 12 ranks); in Germany the highest chances are observed in the older group of males aged 30-39 years. This could be caused by an earlier entry to the labour market in Austria. While the amount of tertiary educated persons is comparable in both countries, persons are aged between 22 and 26 in Austria and 24 to 27 in Germany when they graduate (OECD, 2008b) and so Austrians face a higher job experience in earlier ages. Academic education also leads to an upgrade of 6 ranks, comparable to the situation in Germany. Firm size also has the same effect as in Germany – larger firms offer better opportunities of moving upwards. Likewise, the status at the beginning of the period tells the same story as in Germany, a start at the bottom offers higher chances of moving upwards, despite that Raferzeder and Winter-Ebmer (2007) only control for wage quartiles in Austria. A disadvantage of the Austrian study is that unemployment spells are not included in the data set and so no comparison of the results concerning this point is possible.

3.6 Wage Volatility

The next logical step would be to ask how stable these jumps are in the wage distribution. How much volatility is there? Volatility measures the wage fluctuations occurring during a period of four years, e.g. between 2004 and 2007. One has to bear in mind that here wage volatility is measured in terms of rank positions.²⁷ Thus, it could be possible for a person to start and end in the same rank, in this case one would observe no mobility, but rather, jumps in the wage distribution within the period, which is defined as volatility here. Volatility could be interpreted as a proxy for insecurity with potential impact on some long lasting investment decisions such as education or family planning – it thus captures the more negative side of earnings mobility, especially if one assumes that employees are risk averse, which seems plausible (see Kihlstrom and Laffont, 1979).

To measure volatility one has to sum up the absolute (abs) rank change (rc) of the wage distribution in the 4-year period (e.g. for 2004/2007: 2004 to 2005, 2005 to 2006 and 2006 to 2007) plus 1 and divide it by the absolute rank change between the start and the end year (e.g. for 2004/2007: 2004 to 2007) plus 1.

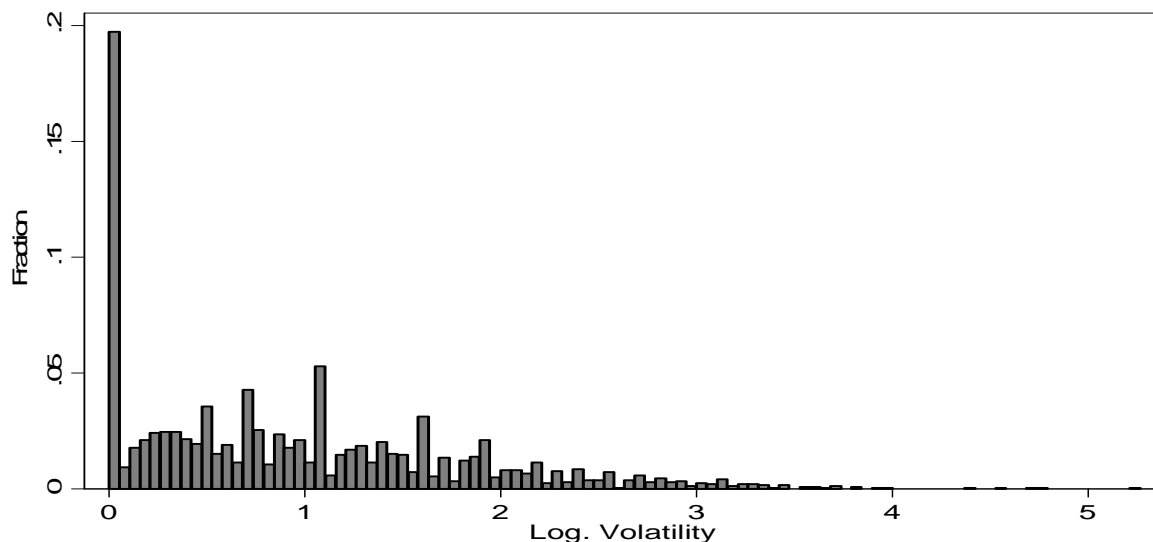
²⁷ So changes in the upper part of the distribution require a larger change of absolute wage compared to the bottom of the distribution because wage percentiles, and therefore ranks in my definition, are more expanded at the top. This was also discussed in more detail at the beginning of the last chapter and does not seem to be a general problem.

$$(3.4) \quad \text{Volatility} = \frac{1 + \sum_{t=2005}^{2007} \text{abs}(rc_t - rc_{t-1})}{1 + \text{abs}(rc_{2007} - rc_{2004})}$$

By definition, wage volatility must be at least 1 for showing no volatility. For the period of 2004/2007, I observe values ranging from 1 to 193. Higher values represent higher wage volatility. Volatility is equal to 1 if wage development in the time period (e.g. between 2004 and 2007) maintains the same direction or occurs only in one year. Volatility is also 1 if there is no wage mobility in the sense that the individual rank is the same in every year.

Figure 3.5 shows the distribution of the log volatility for the period 2004/2007 (for all other periods, see Figure 3.A5a-e in the appendix). About 20% of the persons in the sample at hand face no volatility.

Figure 3.5: Log. Wage Volatility 2004-2007



Source: Samples from SOEP 1984-2007; own calculation, see text.

In Germany volatility is highest in the first period 1984/1987, then decreases, increases again in the period of an economic downturn in 1992/1995 and then stabilizes between 4 and 4.2. Persons with downward mobility are affected by a higher volatility than persons moving upwards in all periods, the only exception being the period 2000/2003. This means that the way down is more volatile while the way up is more straightforward. On comparing low-wage earners and the rest of the employees, there seems to be higher volatility in the low-wage sector with one exception in 1988/1991 (see Table 3.5).

Table 3.5: Volatility in 4-year Periods

	84/87	88/91	92/95	96/99	00/03	04/07
Overall	4.85	4.08	4.56	4.01	4.19	4.17
Low-wage	5.41	3.81	5.83	4.59	4.76	4.77
High-wage	5.12	4.36	4.30	4.18	4.08	4.12
Moving Upwards	3.89	3.66	3.70	3.30	3.84	3.50
Moving Downwards	4.67	4.01	4.33	4.02	3.57	3.74

Source: Samples from SOEP 1984-2007; own calculation, see text.

Once again, results are compared with those of the Austrian study by Raferzeder and Winter-Ebmer (2007). In Austria, workers in the lowest income quartiles face the highest earnings volatility over time – this result is in line with the findings of this paper for Germany. The authors further assume that higher volatility in this lower part is mainly caused by persons who climb the job ladder, which does not seem to be the case for Germany, as the study at hand observes a higher volatility for persons moving downward. For the U.S., Shin and Solon (2008) report that earnings volatility is countercyclical with a higher volatility during the recession, a finding that is in line with the results for Germany if one identifies the period of 1992/1995 as a recession period. Earnings volatility for male workers increased during the 1970s, showed no clear tendency afterwards and increased again in the 2000s in the U.S.

3.7 Conclusion

The study at hand takes a look at wage mobility and volatility as measured by individual ranks in the wage distribution. In addition to the absolute wage and the mean wage in a group, the relative position within the wage distribution also affects an individual's well-being and thus constitutes a further component in a wider defined utility function. Higher mobility could diminish the effects of rising wage inequality.

The empirical results are based on SOEP data which has the advantage, among others, of allowing one to observe unemployment periods. It is these unemployment periods between jobs in particular that are responsible for downward mobility. In Germany, individual wage mobility decreased between 1984/1987 and 2004/2007, particularly after the economic downturn in 1992/1993. Wage inequality, however, has increased steadily from this time onwards. Hence, it seems that changes in wage mobility intensify cross-section inequality, which potentially leads to even higher life time inequality or in other words, as the wage distribution widens, the individual's mobility is reduced. However, one has to be careful comparing the results of this chapter with these of chapter 2 because used methods and definitions are different. While chapter 2 focuses on absolute hourly wages at the 10th, the

50th and the 90th wage percentile in several cross-sections, this chapter looks at hourly wage rank mobility over 100 percentiles in several 4-year balanced panels.

Mobility is highest in the middle section of the distribution, while wages seem to be more stable at the bottom and the top of the distribution. Mobility is highest for persons aged between 30-39 years. Individual upgrades in the wage distribution are more likely to occur for younger workers and for persons working in the public sector, as well as for white-collar workers and persons with academic education. Overall wage volatility decreases and wages are more volatile in the low-wage sector and for individuals moving downwards in the wage distribution.

This could be of political interest as persons who are discouraged or even concerned about their future chances may not invest optimally into their human capital. On the other hand, the results show that education is still a means of moving upwards via an academic degree or indirectly by working in a professional occupation or outside the blue-collar sector, which motivates individuals to embark on further education in order to progress upwards. Another point is that the mere subjective feeling of unfairness can lead to confusion and concern in a society. Thus, politics are obliged to offer equal chances for everyone. An indicator for such chances could be wage mobility, particularly in times of rising wage inequality.

Further empirical research for the time period after the economic recession in 2008/2009 on the effects of the crisis on wages, particularly with regard to inequality and mobility would be highly interesting. Moreover, the reforms of the German labour market (e.g. Hartz IV from January 2005 on) with effects especially in the low-wage sector are potentially better to identify in new data waves; particularly with regard to wage mobility over time for persons affected by these treatments. This would provide insight into whether these persons are locked in the low-wage sector or whether the reform chances allow for a new start in the labour market, thus enabling them to leave the low-wage sector after some time.

3.8 References for Chapter 3

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3.9 Appendix to Chapter 3

Appendix 3A: Tables and Figures

Table 3.A1a: Wage and Employment Status 2000 vs. 2003

		2003		
		Unemployed	Low-wage	High-wage
2000	Unemployed	127 (66.84%)	31 (16.32%)	32 (16.84%)
	Low-wage	49 (13.07%)	148 (39.47%)	178 (47.47%)
	High-wage	109 (4.67%)	94 (4.03%)	2,132 (91.31%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A1b: Wage and Employment Status 1996 vs. 1999

		1999		
		Unemployed	Low-wage	High-wage
1996	Unemployed	80 (47.62%)	29 (17.26%)	59 (35.12%)
	Low-wage	21 (11.48%)	70 (38.25%)	92 (50.27%)
	High-wage	79 (4.83%)	63 (3.85%)	1,493 (91.31%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A1c: Wage and Employment Status 1992 vs. 1995

		1995		
		Unemployed	Low-wage	High-wage
1992	Unemployed	66 (70.97%)	8 (8.60%)	19 (20.43%)
	Low-wage	16 (12.90%)	40 (32.26%)	68 (54.84%)
	High-wage	105 (6.51%)	44 (2.73%)	1,465 (90.77%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A1d: Wage and Employment Status 1988 vs. 1991

		1991		
		Unemployed	Low-wage	High-wage
1988	Unemployed	67 (49.63%)	13 (9.63%)	55 (40.74%)
	Low-wage	2 (1.24%)	37 (22.98%)	122 (75.78%)
	High-wage	52 (3.04%)	38 (2.22%)	1,620 (94.74%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A1e: Wage and Employment Status 1984 vs. 1987

		1987		
		Unemployed	Low-wage	High-wage
1984	Unemployed	68 (52.31%)	13 (10.00%)	49 (37.69%)
	Low-wage	5 (3.62%)	34 (24.64%)	99 (71.74%)
	High-wage	63 (3.84%)	53 (3.23%)	1,526 (92.94%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A2a: Job Status 2000 vs. 2003

		2003				
		Unemployed	Blue-collar	White-collar	Public Sector	Self-employed
2000	Unemployed	127 (66.84%)	42 (22.11%)	14 (7.37%)	2 (1.05%)	5 (2.63%)
	Blue-collar	112 (9.28%)	986 (81.69%)	98 (8.12%)	0	11 (0.91%)
	White-collar	42 (3.86%)	59 (5.42%)	960 (88.15%)	7 (0.64%)	21 (1.93%)
	Public Sector	0	1 (0.38%)	7 (2.69%)	252 (96.92%)	0
	Self-employed	4 (2.60%)	5 (3.25%)	18 (11.69%)	0	127 (82.47%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A2b: Job Status 1996 vs. 1999

		1999				
		Unemployed	Blue-collar	White-collar	Public Sector	Self-employed
1996	Unemployed	80 (47.62%)	57 (33.93%)	25 (14.88%)	1 (0.60%)	5 (2.98%)
	Blue-collar	82 (8.60%)	813 (85.22%)	47 (4.93%)	3 (0.31%)	9 (0.94%)
	White-collar	16 (2.62%)	39 (6.39%)	534 (87.54%)	2 (0.33%)	19 (3.11%)
	Public Sector	1 (0.63%)	0	1 (0.63%)	156 (98.11%)	1 (0.63%)
	Self-employed	1 (1.14%)	8 (9.09%)	14 (15.91%)	0	65 (73.86%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A2c: Job Status 1992 vs. 1995

		1995				
		Unemployed	Blue-collar	White-collar	Public Sector	Self-employed
1992	Unemployed	66 (70.97%)	22 (23.66%)	3 (3.23%)	1 (1.08%)	1 (1.08%)
	Blue-collar	92 (9.78%)	777 (82.57%)	58 (6.16%)	2 (0.21%)	12 (1.28%)
	White-collar	26 (4.59%)	42 (7.42%)	479 (84.63%)	5 (0.88%)	14 (2.47%)
	Public Sector	1 (0.59%)	2 (1.18%)	5 (2.96%)	160 (94.67%)	1 (0.59%)
	Self-employed	1 (1.85%)	7 (12.96%)	7 (12.96%)	0	39 (72.22%)

Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A2d: Job Status 1988 vs. 1991

		1991				
		Unemployed	Blue-collar	White-collar	Public Sector	Self-employed
1988	Unemployed	67 (49.63%)	54 (40.00%)	12 (8.89%)	1 (0.74%)	1 (0.74%)
	Blue-collar	41 (3.75%)	987 (90.30%)	57 (5.22%)	2 (0.18%)	6 (0.55%)
	White-collar	12 (2.52%)	25 (5.24%)	426 (89.31%)	6 (1.26%)	8 (1.68%)
	Public Sector	0	0	5 (2.40%)	203 (97.60%)	0
	Self-employed	1 (2.22%)	1 (2.22%)	9 (20.00%)	0	34 (75.56%)

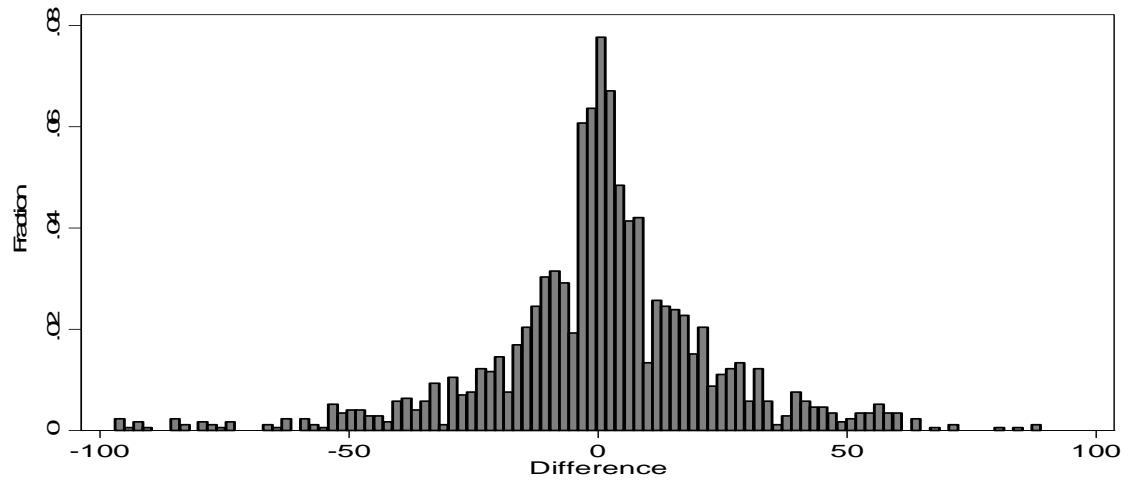
Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A2e: Job Status 1984 vs. 1987

		1987				
		Unemployed	Blue-collar	White-collar	Public Sector	Self-employed
1984	Unemployed	68 (52.31%)	45 (34.62%)	16 (12.31%)	0	1 (0.77%)
	Blue-collar	55 (5.31%)	926 (89.38%)	47 (4.54%)	1 (0.10%)	7 (0.68%)
	White-collar	11 (2.28%)	35 (7.26%)	427 (88.59%)	4 (0.83%)	5 (1.04%)
	Public Sector	0	3 (1.45%)	2 (0.97%)	202 (97.58%)	0
	Self-employed	2 (3.64%)	5 (9.09%)	4 (7.27%)	0	44 (80.00%)

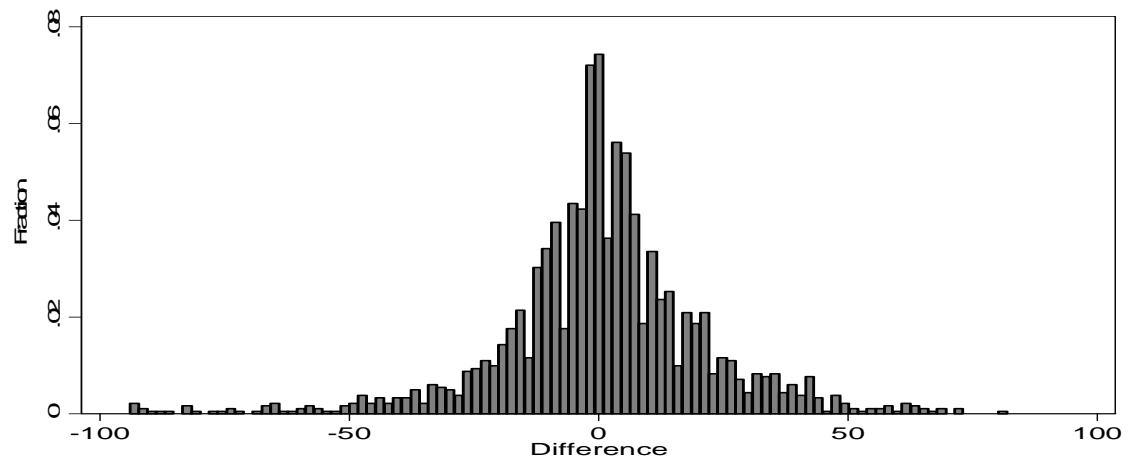
Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A3a: Earnings Mobility between 1984 and 1987



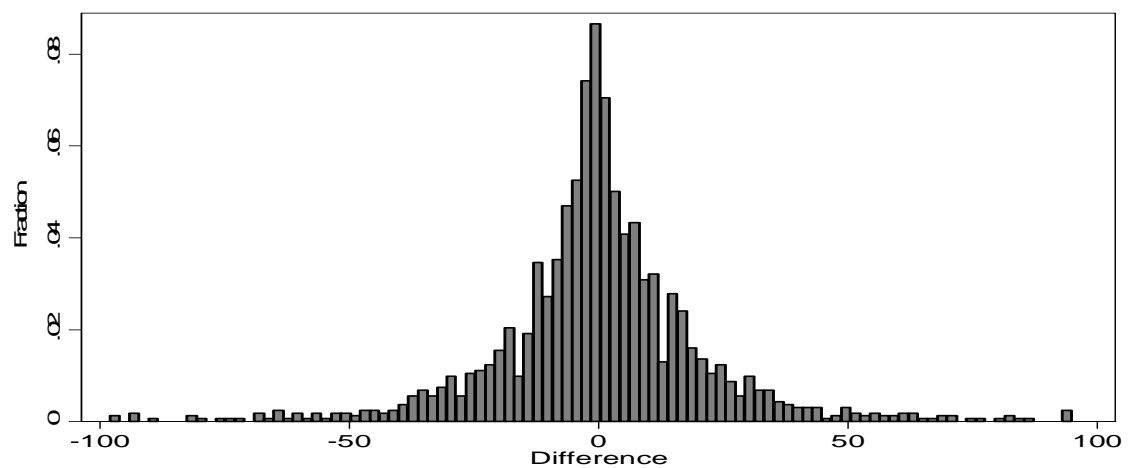
Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A3b: Earnings Mobility between 1988 and 1991



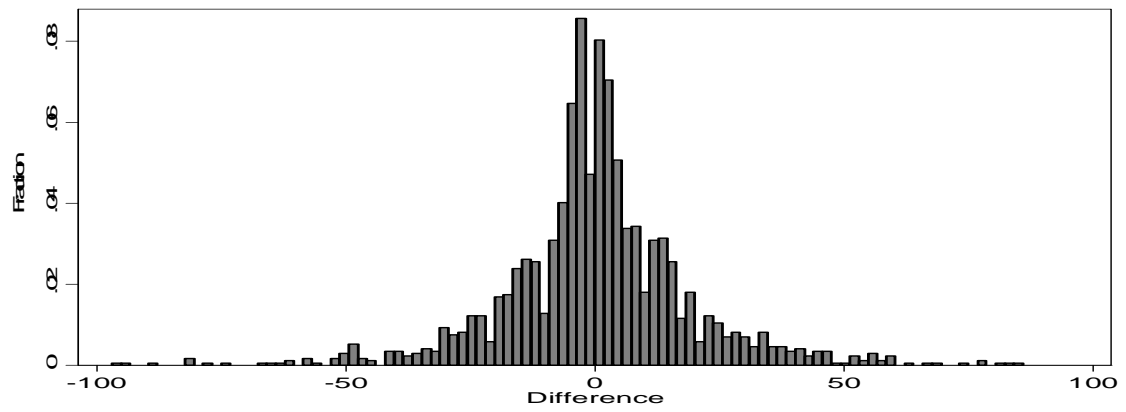
Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A3c: Earnings Mobility between 1992 and 1995



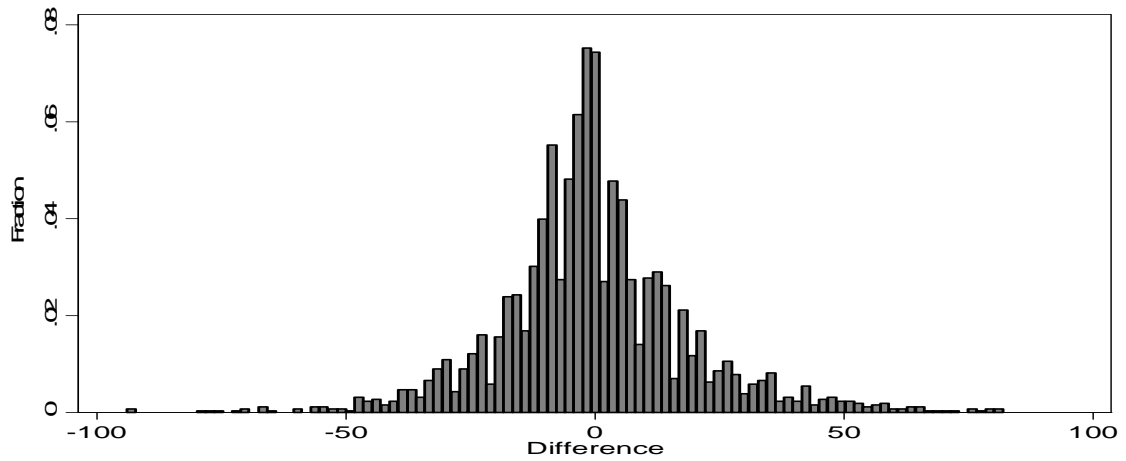
Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A3d: Earnings Mobility between 1996 and 1999



Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A3e: Earnings Mobility between 2000 and 2003



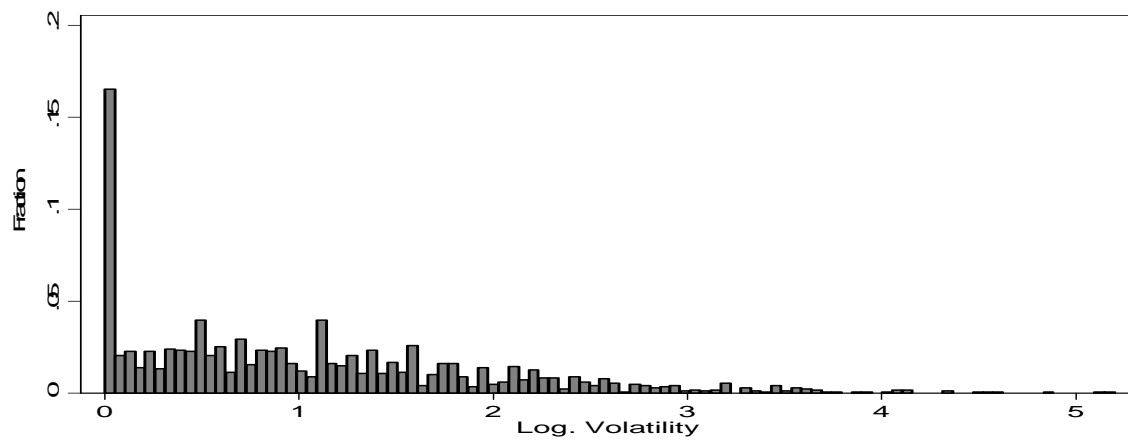
Source: Samples from SOEP 1984-2007; own calculation, see text.

Table 3.A4a: Change in Relative Income Position

	1988/1991	1996/1999	2000/2003
Wage Percentile (Start Year) (Base: 50th)	nr	nr	nr
Age (Base: 50-)			
-29	2.31	1.11	-0.29
30-39	1.12	1.94	0.28
40-49	0.84	-0.00	-0.34
Academic Education	4.76 **	3.08 *	2.78 **
Industry (Base: Administration, Education)			
High-tech Industry	5.27 **	4.24 **	4.25 **
Traffic, Distribution	1.49	-0.68	-0.62
Financial Services	3.90	6.82 ***	3.89 **
Others	nr	nr	nr
Occupation (Base: Professionals)			
Clerks	-6.94 ***	-5.51 **	-4.30 **
Service Workers	-8.03 ***	-15.69 ***	-9.97 ***
Craft Workers	-3.12	-7.11 ***	-9.14 ***
Plant and Machine Operators	-8.28 ***	-6.07 **	-8.77 ***
Elementary	-8.65 ***	-8.98 ***	-8.99 ***
Others	nr	nr	nr
Job Change in			
Year 1	-1.33	-1.92	-3.16 **
Year 2	2.33	-1.26	3.94 ***
Year 3	-0.22	-3.07 *	2.02
Year 4	1.09	2.82	-1.39
Firm Size (Base: -19)			
20-199	3.58 **	4.86 ***	0.04
200-1999	5.52 ***	6.33 ***	1.43
2000-	7.09 ***	7.55 ***	3.77 ***
Unemployed in			
Year 2	-26.81 ***	-3.88	0.85
Year 3	13.32 **	-16.10 **	-9.20 **
Job Status (Base: Blue-collar)			
White-collar	5.07 ***	3.76 **	1.13
Public sector	2.63	5.46 **	-1.24
Self-employed	9.14 **	0.61	3.88 *
Migrational Background	-1.40	-1.90 *	0.64
Constant	-14.45	-8.19	1.93
N	1,485	1,561	2,339
Adj. R-squared	0.32	0.20	0.19

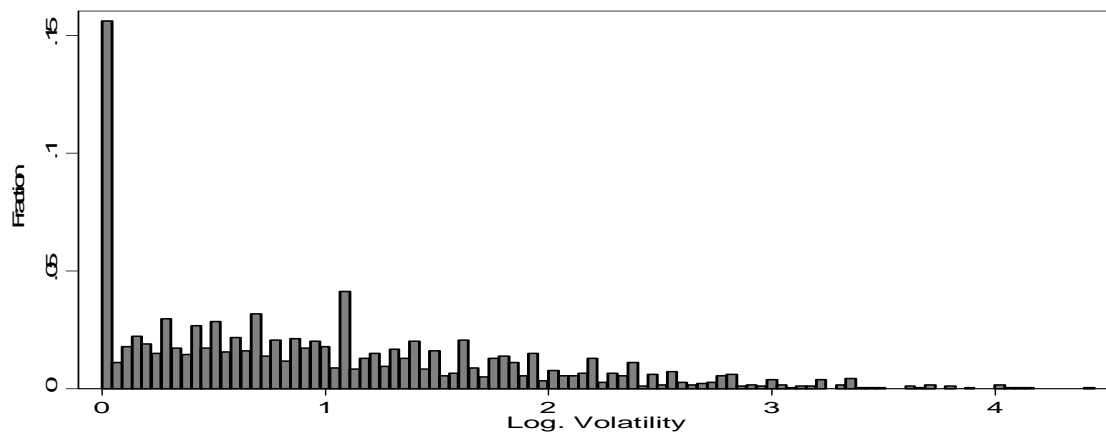
Source: Samples from SOEP 1984-2007; nr – results not reported in the table; Others – all other groups are separately accounted for in the estimation; *** - significant at the 1% level, ** - at the 5% level, * - at the 10% level; own calculation, see text.

Figure 3.A5a: Log. Wage Volatility 1984-1987



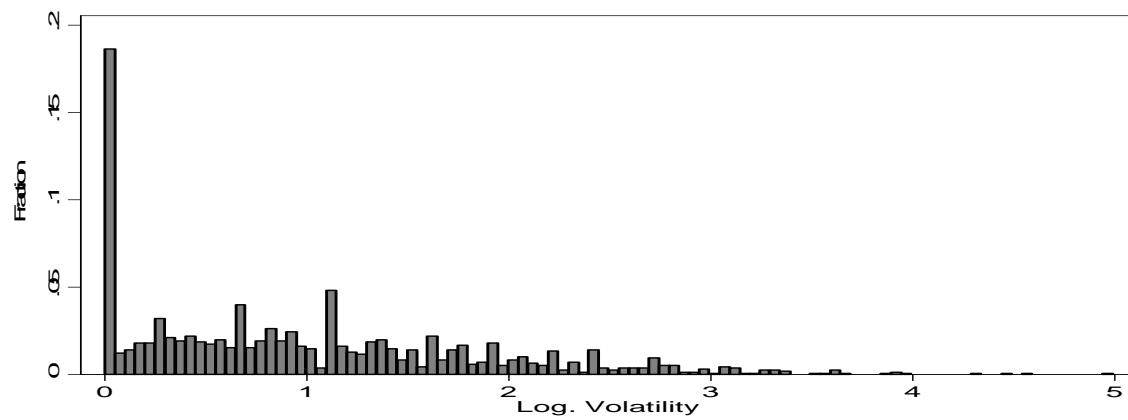
Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A5b: Log. Wage Volatility 1988-1991



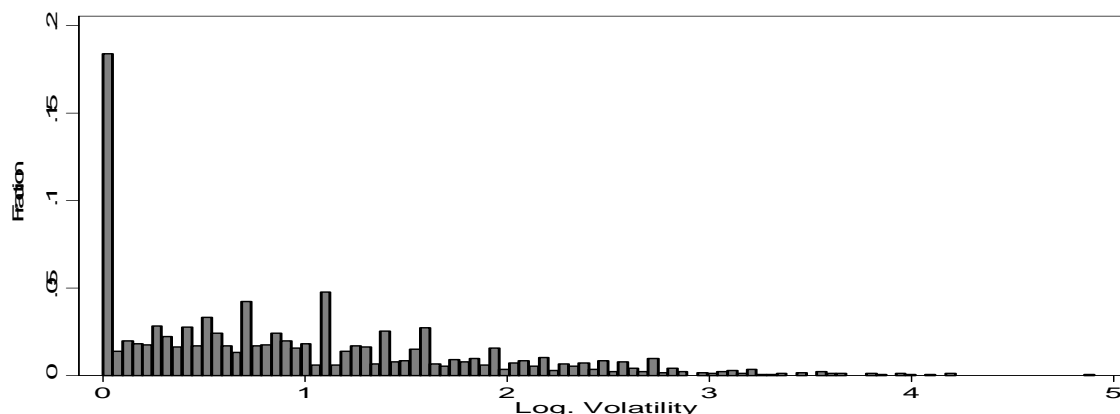
Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A5c: Log. Wage Volatility 1992-1995



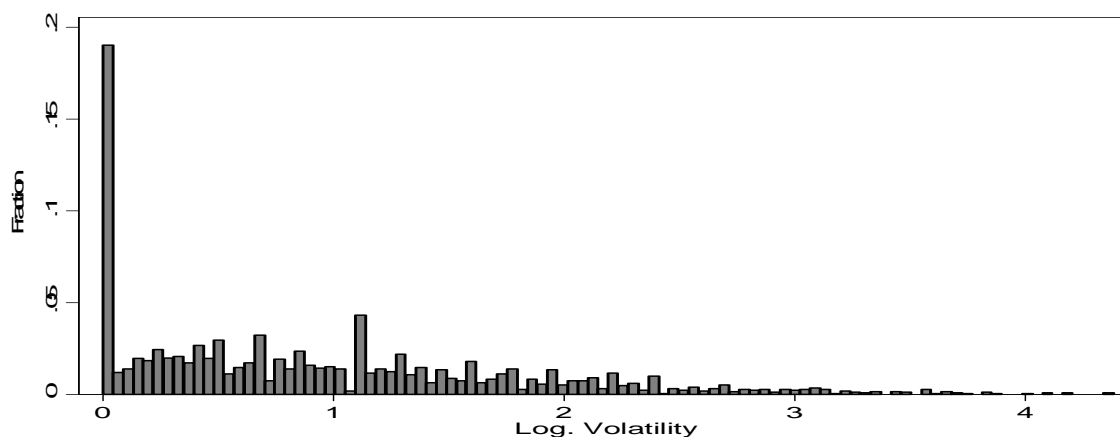
Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A5d: Log. Wage Volatility 1996-1999



Source: Samples from SOEP 1984-2007; own calculation, see text.

Figure 3.A5e: Log. Wage Volatility 2000-2003



Source: Samples from SOEP 1984-2007; own calculation, see text.

Appendix 3B: Wage Mobility and Volatility for Females

In contrast to the study of Raferzeder and Winter-Ebmer (2007), the data at hand also allows to analyse females and to compare the results with those for males. I adopt the same definitions and procedures described in the former sections. Employment rates for females are far below the levels for males. Nevertheless, they increased sharply from 45% in 1984/1987 to 66% in 2004/2007, while employment rates for males decreased slightly from 93% to 89% during this time. In absolute terms, there are more females in the data, but with regard to the lower employment rates, particularly in the 1980s, there are fewer observations of wages, resulting in higher confidence intervals and thus in several insignificant coefficients for the change in relative income positions in Table 3.A7. The main result in the sense of this study is that wage mobility, measured by the standard deviation of the rank wage differences, also decreases for females by about 4 points, compared to about 5.5 points for males. While in the

first four time periods mobility is higher for males, in 2000/2003 and 2004/2007 mobility is higher for females.

Table 3.A6a: Mobility in Several Time Periods, Females

Time Period	Yearly Observations (Balanced Panel)	Employment Rate	Real Gross Hourly Wage, Median	Standard Deviation of Rank Differences, Mobility
2004-2007	3,141	0.66	12.44	18.52
2000-2003	3,375	0.63	12.40	19.60
1996-1999	2,165	0.60	12.12	18.53
1992-1995	2,078	0.58	11.61	20.12
1988-1991	2,101	0.54	10.85	20.50
1984-1987	2,234	0.45	9.98	22.41

Source: Samples from SOEP 1984-2007; weighted data; own calculation, see text.

I iterate the regression of characteristics to the amount of wage mobility as done in section 3.5 for males. The age effect is higher for females. Compared to the reference group of persons older than 50, younger females face higher upward moves than males. Academic education also leads to upward mobility for females, highest in the period 1992/1995 with about 10 ranks and then decreasing to about 4 while it is not significant in 1996/1999 and the two earliest periods. Industry effects and occupation effects have the same signs as for males but are more pronounced. Particularly females doing elementary jobs face a 14 ranks (compared to 8 ranks for males) higher downward movement compared to females with a professional occupation in 2004/2007. Females also face higher chances of moving upwards in larger firms, the effect being highest in the second largest group, with a firm size between 200 and 1,999 employees, while for males, the effects are highest in firms with more than 2,000 employees. At least in 2004/2007 not being a blue-collar worker has a higher effect for females compared to males.

Overall, wage volatility for females lies at the same level as for males in most years, and in some time periods (1988/1991, 1992/1995 and 1996/1999) it is slightly higher. It also decreases over time. Volatility is higher for low-wage earners in all time periods and even higher compared to males in 1984/1987 and 1988/1991. The wage volatility for females moving upwards is higher compared to males in all periods, with the exception of 1988/1991.

Table 3.A7a: Change in Relative Income Position, Females

	2004/2007	2004/2007 PADAE	1992/ 1995	1984/1987
Wage Percentile (Starting Year) (Base: 50th)	nr	nr	nr	nr
Age (Base: 50-)				
-29	2.74 *	3.57 **	0.99	1.68
30-39	3.75 ***	2.02	3.37 *	3.80
40-49	2.32 **	1.75	4.44 **	2.08
Academic Education	4.27 ***	4.23 ***	9.74 ***	4.52
Industry (Base: Administration, Education)				
High-tech Industry	6.73 ***	5.51 ***	2.07	6.07 *
Traffic, Distribution	5.63 ***	5.78 ***	10.60 ***	-0.69
Financial Services	6.39 ***	4.78 **	1.58	4.33
Others	nr	nr	nr	nr
Occupation (Base: Professionals)				
Clerks	-6.33 ***	-7.65 ***	-8.02 **	-9.33 *
Service Workers	-10.27 ***	-11.21 ***	-12.69 ***	-18.01 ***
Craft Workers	-9.95 ***	-7.43 **	-9.21 *	-13.86 **
Plant and Machine Operators	-9.89 ***	-10.16 ***	-12.07 **	-20.00 ***
Elementary	-14.13 ***	-15.63 ***	-15.11 ***	-23.01 ***
Others	nr	nr	nr	nr
Job Change in				
Year 1	-1.94	-1.94	-2.02	-
Year 2	1.33	1.29	5.12 **	4.31
Year 3	-2.96 *	-1.06	-0.91	-1.54
Year 4	-3.36 **	-3.48 *	-1.35	-
Firm Size (Base: -19)				
20-199	-0.90	0.47	6.27 ***	3.50 *
200-1999	3.37 ***	4.23 ***	9.11 ***	6.81 ***
2000-	1.57	2.58 **	6.75 ***	6.47 ***
Unemployed in				
Year 2	-12.41 ***	-	12.47 **	3.01
Year 3	-0.80	-	-13.55 ***	-7.87 *
Job Status (Base: Blue-collar)				
White-collar	4.14 ***	5.27 ***	4.41 *	3.28
Public sector	6.88 ***	5.00 **	2.28	-0.85
Self-employed	9.03 ***	-	19.30 ***	-12.14
Migration Background	-1.81	-1.62	-3.06 *	-1.24
Constant	-2.82	-1.77	-1.40	-10.80
N	1,823	1,520	875	718
Adj. R-squared	0.26	0.25	0.33	0.36

Source: Samples from SOEP 1984-2007; nr – results not reported in the table; PADAE - Prime age dependent (in starting year) and always employed; Others – all other groups are separately accounted for in the estimation; *** - significant at the 1% level, ** - at the 5% level, * - at the 10% level; own calculation, see text.

Table 3.A7b: Change in Relative Income Position, Females

	1988/1991	1996/1999	2000/2003
Wage Percentile (Start Year) (Base: 50th)	nr	nr	nr
Age (Base: 50-)			
-29	2.49	3.91 **	4.16 ***
30-39	2.69	2.74	4.18 ***
40-49	1.65	2.21	3.06 **
Academic Education	1.53	0.94	4.65 ***
Industry (Base: Administration, Education)			
High-tech Industry	-1.17	0.92	3.86
Traffic, Distribution	-1.99	3.03	4.61 *
Financial Services	3.52	0.18	4.07 *
Others	nr	nr	nr
Occupation (Base: Professionals)			
Clerks	-11.64 **	-5.66 **	-7.17 ***
Service Workers	-12.36 **	-8.76 **	-10.27 ***
Craft Workers	-16.37 ***	-7.67 *	-12.01 ***
Plant and Machine Operators	-18.41 ***	-9.31 **	-12.75 ***
Elementary	-20.61 ***	-9.78 ***	-12.23 ***
Others	nr	nr	nr
Job Change in			
Year 1	-1.17	1.40	-2.81 *
Year 2	0.31	5.59 **	2.88 *
Year 3	3.27	-10.00 ***	1.84
Year 4	3.46	-2.47	1.87
Firm Size (Base: -19)			
20-199	6.43 ***	1.62	3.36 ***
200-1999	9.12 ***	3.58 **	5.52 ***
2000-	7.96 ***	5.63 ***	5.81 ***
Unemployed in			
Year 2	-12.53 *	-0.51	-12.99 ***
Year 3	0.76	-8.52 *	-6.50 **
Job Status (Base: Blue-collar)			
White-collar	5.58 *	3.98 **	5.48 ***
Public sector	5.60	3.37	5.58 **
Self-employed	4.72	3.25	4.21
Migrational Background	-2.32	0.92	0.84
Constant	7.17	-5.67	2.07
N	581	947	1,626
Adj. R-squared	0.35	0.22	0.25

Source: Samples from SOEP 1984-2007; nr – results not reported in the table; Others – all other groups are separately accounted for in the estimation; *** - significant at the 1% level, ** - at the 5% level, * - at the 10% level; own calculation, see text.

Table 3.A8a: Volatility in 4-year Periods, Females

	84/87	88/91	92/95	96/99	00/03	04/07
Overall	4.85	4.51	4.89	4.85	4.18	4.24
Low-wage	5.98	4.68	5.64	4.54	4.36	4.51
High-wage	4.25	4.42	4.53	4.97	4.07	4.10
Moving Upwards	4.01	3.35	4.13	3.85	3.89	3.54
Moving Downwards	4.29	3.90	3.94	4.45	3.68	4.05

Source: Samples from SOEP 1984-2007; own calculation, see text.

4. Soziale Ungleichheit von Geisteswissenschaftlern im Beruf

Dieser Teil ist eine gemeinsame Arbeit mit Michael Gebel und wurde veröffentlicht in: Heike Solga, Denis Huschka, Patricia Eilsberger, Gert G. Wagner (Herausgeber), *Findigkeit in unsicheren Zeiten*, Ergebnisse des Expertisenwettbewerbs "Arts und Figures – GeisteswissenschaftlerInnen im Beruf", Opladen & Farmington Hills, 157-174.

Zusammenfassung: Die Expertise befasst sich mit der Situation für Geisteswissenschaftler auf dem deutschen Arbeitsmarkt im Vergleich zu anderen Akademikern und zum Arbeitsmarkt in Großbritannien. Datengrundlage sind der Mikrozensus und der British Labour Force Survey. Geisteswissenschaftler erzielen in Deutschland, auch wenn man auf individuelle Eigenschaften und institutionelle Gegebenheiten kontrolliert, niedrigere Nettoarbeitseinkommen als andere Akademiker. Darüber hinaus sind sie überproportional von Arbeitslosigkeit betroffen, sind zu einem hohen Anteil befristet beschäftigt und haben den zweithöchsten Teilzeitanteil aller Akademikergruppen. Das Risiko bildungsinadäquater Beschäftigung ist vergleichbar mit anderen Akademikergruppen. Bezüglich der relativen Einkommensposition und der relativen Betroffenheit von Arbeitslosigkeit sind Geisteswissenschaftler in Deutschland und Großbritannien vergleichbar.

Schlüsselwörter: Löhne, Hochschulbildung, Lohnverteilung.

JEL-Klassifikation: J31, I23, J24

4.1 Einleitung

Im Zentrum der folgenden Analyse stehen die Arbeitsmarktchancen von Geisteswissenschaftlern. Die bisherige akademische Forschung konzentriert sich insbesondere auf die Arbeitsmarktlage verschiedener Fachrichtungen im Vergleich und vermeidet einen expliziten Fokus auf eine spezifische Fachgruppe wie z.B. die der Geisteswissenschaftler (u.a. Daymont und Andrisani, 1984; Kalmijn und van der Lippe, 1997; van de Werfhorst und Kraaykamp, 2001). Absolventenstudien für einzelne Fachgruppen haben den Nachteil, dass sie sich auf eine oder wenige Universitäten und Abgangskohorten konzentrieren und damit an mangelnder Repräsentativität leiden. Die folgende Analyse soll daher durch eine möglichst repräsentative Studie der Arbeitsmarktchancen der Fachgruppe der Geisteswissenschaftler in Deutschland diese Forschungslücke schließen.

Wir evaluieren Arbeitsmarktchancen von Geisteswissenschaftlern anhand des erzielten Einkommens und des Arbeitslosigkeitsrisikos. In einem theoretischen Ansatz werden zunächst verschiedene Erklärungsansätze zur Arbeitsmarktlage von Geisteswissenschaftlern aus der neueren ökonomischen und soziologischen Forschung systematisch zusammengetragen. Zur empirischen Analyse werten wir den deutschen Mikrozensus für das Jahr 2005 aus. Um die Arbeitsmarktchancen von Geisteswissenschaftlern zusätzlich aus relativer Perspektive evaluieren zu können, verwenden wir zum einen andere Akademikergruppen innerhalb des deutschen Arbeitsmarktes als Vergleichsgruppe. Zum anderen soll ein europäischer Vergleich zwischen Deutschland und Großbritannien Auskunft über die relative Positionierung von Geisteswissenschaftlern in Deutschland geben. Insbesondere versprechen die unterschiedlichen institutionellen Gegebenheiten im Bildungssystem und auf dem Arbeitsmarkt weitere Erkenntnisgewinne.

Unser Forschungsbeitrag hat folgende Struktur: Im zweiten Kapitel (4.2) geben wir eine Übersicht über verschiedene theoretische Erklärungsansätze zu der Arbeitsmarktlage von Geisteswissenschaftlern. Kapitel 4.3 beschreibt die verwendeten Daten des Mikrozensus und gibt insbesondere Auskunft über deskriptive Charakteristika einzelner Subgruppen von Geisteswissenschaftlern. In Kapitel 4.4 wird die Arbeitsmarktsituation für Geisteswissenschaftler in Deutschland bezüglich Einkommen und Arbeitslosigkeit analysiert. Kapitel 4.5 vergleicht die Situation von Geisteswissenschaftlern in Deutschland mit Großbritannien. Eine abschließende Zusammenfassung findet sich in Kapitel 4.6.

4.2 Theoretische Erklärungsansätze

Während zahlreiche Theorien zum Zusammenhang zwischen Bildungsniveau und Arbeitsmarkterfolg existieren und getestet wurden (vgl. theoretische Übersicht von Bills, 2003; empirische Übersicht von Card, 1999), sind die kausalen Mechanismen zwischen der Bildungsfachrichtung wie beispielsweise dem Studium der Geisteswissenschaften und dem späteren Arbeitsmarkterfolg weniger exakt nachgezeichnet. Es gibt jedoch einige empirische Forschungsarbeiten, die explizit zeigen, dass neben dem Bildungsniveau auch die Bildungsfachrichtung entscheidend für die soziale Ungleichheit auf dem Arbeitsmarkt ist (Daymont und Andrisani, 1984; Kalmijn und van der Lippe, 1997; van de Werfhorst und Kraaykamp, 2001). Während das Bildungsniveau die „vertikale Dimension“ zeichnet, differenziert die Bildungsfachrichtung entlang einer „horizontalen Dimension“ (Davies und Guppy, 1997: 1418-9). Unterschiede zwischen Fachrichtungen zeigen sich auf dem

Arbeitsmarkt und auch in anderen Lebensbereichen, z.B. bei politischen Einstellungen (Nilsson und Ekehammar, 1986), dem Lebensstil und Konsummustern (van de Werfhorst und Kraaykamp, 2001). Allerdings herrscht in der Forschung Uneinigkeit hinsichtlich der zugrundeliegenden Wirkungsmechanismen.

Erstens lassen sich fachspezifische Arbeitsmarktchancen in Anlehnung an die Humankapitaltheorie (Becker, 1964; Mincer, 1974) erklären. Laut dieser Theorie erhöhen Bildungsinvestitionen die allgemeine Produktivität eines Individuums und damit dessen Arbeitsmarktchancen. Zwar differenziert die Humankapitaltheorie zwischen in der Schule erworbenem allgemeinem Humankapital und im Berufsleben „on the job“ akquiriertem spezifischen Humankapital, aber diese Unterscheidung wird der Heterogenität der Schulbildung in Form unterschiedlicher Studienfächer nicht gerecht. Als Erweiterung der Humankapitaltheorie wird angenommen, dass sich das erworbene Humankapital auch zwischen einzelnen Bildungsfachrichtungen unterscheidet (van de Werfhorst und Kraaykamp, 2001). Demnach akquirieren die Individuen fachrichtungsspezifische Fähigkeiten in den einzelnen Fachrichtungen, die unterschiedliche Produktivitätseffekte und damit Arbeitsmarkterfolge induzieren. Gemäß Bourdieu (1984) sind beispielsweise sozialwissenschaftliche Studiengänge mit dem Erwerb von ökonomischem Humankapital assoziiert, während Geisteswissenschaftler kulturelles Humankapital akkumulieren. Während ökonomische Ressourcen leichter in ökonomischen Erfolg auf dem Arbeitsmarkt transferiert werden können, erleichtern kulturelle Ressourcen den intellektuellen kulturellen Konsum und helfen beim Zugang zum kulturellen Arbeitsmarktsegment, sind jedoch außerhalb dessen nicht förderlich für die Produktivität (van de Werfhorst, 2002). Folglich sind geringere Arbeitsmarkterfolge zu erwarten, da das kulturelle Arbeitsmarktsegment weniger ein hohes Einkommen bzw. Beschäftigungsstabilität sondern eher hohe kulturelle Renditen generiert. Des Weiteren unterscheiden van de Werfhorst und Kraaykamp (2001) kommunikatives Humankapital, das insbesondere in sozialen Berufen und in der Lehrerausbildung erworben wird sowie technisches Humankapital. Kommunikative Ressourcen erzeugen zwar stärkere „social skills“, aber ihr Arbeitsmarktwert ist ähnlich wie der des kulturellen Kapitals beschränkt. Technisches Humankapital hingegen, das insbesondere in den Naturwissenschaften und Ingenieurwissenschaften erworben wird, ist stark an der Nachfrage am Arbeitsmarkt orientiert und garantiert daher relativ höhere Löhne ähnlich wie das ökonomische Humankapital.

Zweitens können fachspezifische Arbeitsmarkterfolge mit den arbeitsmarktrelevanten

Charakteristika der Studenten der einzelnen Fächer zusammenhängen. Wenn sich Studenten auf Basis ihrer individuellen Charakteristika wie z.B. ihrer Fähigkeiten oder ihrer Motivation in die Studiengänge selbst selektieren oder wenn Bildungsinstitutionen Studenten auf Basis dieser Charakteristika auswählen, dann ergeben sich Arbeitsmarktunterschiede nicht nur aufgrund des erlernten fachspezifischen Wissens sondern auch der individuellen Fähigkeiten, die bereits vor der Studienwahl ausgeprägt sind. Im Gegensatz zur Humankapitaltheorie, die von fachspezifischen Produktivitätseffekten ausgeht, nehmen diese „Signalling“- oder „Sorting“-Ansätze an, dass sich Studenten bereits ex ante hinsichtlich ihrer Arbeitsmarktfähigkeiten unterscheiden (Arrow, 1973; Riley, 2001; Spence, 1973). Beispielsweise zeigt Arcidiacono (2004) mit U.S.-Daten, dass Studenten der Naturwissenschaften höhere intellektuelle Fähigkeiten sowohl in Mathematik als auch in verbalen Tests haben als Studenten der Geisteswissenschaften. Selbstselektionseffekte werden dadurch begründet, dass fähigere Individuen mit größerer Wahrscheinlichkeit diejenigen Fächer wählen, die die höchsten Arbeitsmarkterträge versprechen bzw. sie sehen sich eher in der Lage, die relativ höheren psychischen Kosten anspruchsvollerer Studiengänge zu meistern. Sortiereffekte ergeben sich, wenn Institutionen ex ante versuchen, die besten Kandidaten herauszufiltern. Treten solche Selbstselektions- oder Sortiereffekte auf, dann kann es zu einer Intensivierung der Effekte durch statistische Diskriminierung kommen (Aigner und Cane, 1977; Arrow, 1973). Demnach schließen Arbeitgeber aufgrund einer niedrigeren mittleren Qualität von Absolventen einer Fachrichtung auf die Qualität aller Absolventen dieser Fachgruppe, soweit die individuellen Fähigkeiten nicht direkt beobachtbar sind.

Drittens wird der unterschiedliche Arbeitsmarkterfolg von Geisteswissenschaftlern im Vergleich zu anderen Fächergruppen häufig mit dem einfachen ökonomischen Arbeitsangebots- und Arbeitsnachfrage-Modell erklärt. In diesem Modell ergeben sich ein niedriger Lohn bzw. schlechte Arbeitsmarktchancen durch ein relativ hohes Angebot von und/oder einer relativ niedrigen Nachfrage nach Absolventen einer bestimmten Fachrichtung. Existiert beispielsweise ein Überangebot an geisteswissenschaftlichen Absolventen im Vergleich zu den offenen Vakanzen für Geisteswissenschaftler, dann sind die Arbeitsmarktchancen schlechter als für Fachrichtungen mit weniger Absolventen pro Vakanz. Der Angebots- und Nachfragemechanismus kann durch institutionalisierte Zugangsbeschränkungen beeinflusst werden. In manchen Fachrichtungen, wie z.B. Medizin oder Jura, wird das Angebot an Studienplätzen künstlich verknappt durch Numeri clausi, Aufnahmeprüfungen oder höhere Studienkosten. Solche „sozialen Schließungsprozesse“ (Sorensen, 2000; Weeden, 2002) erlauben die Generierung von „Renten“ auf dem

Arbeitsmarkt, d.h. Erträge über dem markträumenden Lohn, der sich in Abwesenheit dieser institutionellen Beschränkungen bilden würde.

4.3 Datengrundlage und Untersuchungsstichprobe

Zur Analyse der Arbeitsmarktchancen von Geisteswissenschaftlern verwenden wir das „Scientific Usefile“ des Mikrozensus 2005. Beim Mikrozensus handelt es sich um eine repräsentative 1%-Haushaltsstichprobe der deutschen Wohnbevölkerung mit Informationen zu Bildung, Arbeitsmarktlage und weiteren sozialstrukturellen Merkmalen. Der große Stichprobenumfang erlaubt die Analyse kleiner Subpopulationen wie die der Geisteswissenschaftler.

Hinsichtlich der Definition, welche Studiengänge dem Schwerpunkt Geisteswissenschaften zuzuordnen sind, gibt es verschiedene Auffassungen. Wir orientieren uns in unserer Analyse an der Definition des Wissenschaftsrats (Wissenschaftsrat, 2006: 122-123), die sich ihrerseits an der Systematik des Statistischen Bundesamtes orientiert.²⁸ Demnach setzt sich die Studienrichtung Geisteswissenschaften aus den in Tabelle 4.1 aufgeführten Subgruppen zusammen. Die Zuordnung erfolgt auf Basis der im Mikrozensus verfügbaren Variable „Höchster beruflicher Abschluss: Hauptfachrichtung“. Generell wird die Analyse auf die Gruppe der Tertiärgebildeten, d.h. Fachhochschul- und Universitätsabsolventen beschränkt.

Als Referenzgruppe zur Evaluation der relativen Arbeitsmarktlage von Geisteswissenschaftlern dienen alternative tertiäre Fachrichtungen. Bezüglich der Definition einzelner Fachrichtungen herrscht ebenfalls Uneinigkeit in der Literatur. Wir verwenden zur Abgrenzung die Fächerklassifikation des ISCED-97 Schemas (UNESCO, 1997), das zum einen die Fächer nicht ad hoc, sondern vor dem Hintergrund der institutionellen Begebenheiten, definiert und zum anderen den Vorteil internationaler Vergleichbarkeit aufweist. Geisteswissenschaftler stellen 9,2% der Tertiärgebildeten im Mikrozensus (vgl. Tabelle 4.2). Größere Studiengruppen sind die Ingenieurwissenschaften mit 22,9% und die Sozialwissenschaften mit 23,2%. Auffallend ist insbesondere der relativ hohe Frauenanteil in der Gruppe der Geisteswissenschaftler von 59%, der nur von den Erziehungswissenschaftlern (66%) übertroffen wird. Damit grenzen sich die Geisteswissenschaften und Erziehungswissenschaften von den Männerdomänen Ingenieurwissenschaften und

²⁸ Im Gegensatz zur Definition des Statistischen Bundesamtes erkennt der Wissenschaftsrat die Theologie nicht als Teil der Geisteswissenschaften an.

Naturwissenschaften ab. Trotz Bildungsexpansion, die insbesondere den Frauenanteil im Tertiärbildungsbereich ansteigen ließ und damit zu einer Reduktion der Geschlechterungleichheit bezüglich des vertikalen Bildungsniveaus führte, scheint die Geschlechtersegregation nach horizontalen Bildungsfachrichtungen fortzubestehen (Charles und Bradley, 2002). Diese Persistenz wird durch kulturell verankerte Vorstellungen und geschlechtsspezifische Sozialisierungen im Bildungssystem erklärt, die nicht im Gegensatz zu Gleichberechtigungstendenzen stehen (Charles und Bradley, 2002).²⁹

Tabelle 4.1: Deskription der Geisteswissenschaftler, 2005

	N	FH	Uni	Promo- vierte	Frauen	Alter
Alle Geisteswissenschaftler	3.582	12,7%	78,6%	8,7%	58,8%	48,0
Sprach- und Kulturwissenschaften allg.	43	7,0%	83,7%	9,3%	65,1%	47,8
Philosophie	428	6,1%	76,6%	17,3%	30,8%	51,0
Geschichte	250	3,2%	77,6%	19,2%	40,1%	48,1
Bibliothekswissenschaft, Dokumentation, Publizistik	169	68,6%	27,2%	4,1%	78,1%	48,1
Allg. und vgleich. Literatur- und Sprachwissenschaft	175	5,1%	80,6%	14,3%	69,1%	43,8
Altphilologie, Neugriechisch	103	3,9%	79,6%	16,5%	59,2%	53,6
Germanistik	563	5,7%	86,2%	8,2%	70,2%	46,4
Anglistik, Amerikanistik	533	18,8%	77,3%	3,9%	76,9%	47,7
Romanistik	96	9,4%	85,4%	5,2%	78,1%	49,9
Slawistik, Baltistik, Finno-Ugristik	40	2,5%	85,0%	12,5%	75,0%	53,3
Außereuropäische Sprach- und Kulturwissenschaften	40	2,5%	82,5%	15,0%	57,5%	45,4
Kulturwissenschaften i.e.S.	91	4,4%	89,0%	6,6%	68,1%	41,7
Kunst, Kunstwissenschaft allg.	128	3,1%	81,3%	15,6%	64,1%	44,9
Bildende Kunst	163	18,4%	79,8%	1,8%	44,8%	48,3
Gestaltung	-	-	-	-	-	-
Darstellende Kunst, Film und Fernsehen, Theaterwissenschaft	156	15,4%	81,4%	3,2%	49,4%	47,7
Musik, Musikwissenschaft	604	13,9%	83,1%	3,0%	50,7%	49,2

Quelle: Mikrozensus, eigene Berechnung.

In Tabelle 4.1 werden detailliert die einzelnen geisteswissenschaftlichen Subgruppen nach Gesamtgröße, Bildungsniveau, Frauenanteil und Durchschnittsalter differenziert beschrieben. Insbesondere bei kleinen Fallzahlen sind jedoch die Ergebnisse mit Vorsicht zu interpretieren. Insgesamt können wir im Jahr 2005 3.582 Geisteswissenschaftler identifizieren. Große Untergruppen sind Philosophen, Germanisten und Musiker. In einigen Untergruppen übersteigt der Frauenanteil sogar 75 %.

²⁹ So ist beispielsweise die Geschlechtersegregation in skandinavischen Ländern besonders ausgeprägt, obwohl diese durch ein hohes Niveau an Gleichberechtigung charakterisiert sind (Bradley, 2000: 8-9).

4.4 Die Arbeitsmarktlage von Geisteswissenschaftlern in Deutschland

Zur Evaluation der Arbeitsmarktsituation von Geisteswissenschaftlern untersuchen wir neben der Arbeitslosenquote insbesondere das Einkommen als zentrale Dimension der sozialen Ungleichheit. Idealerweise dienen in empirischen Studien reale Bruttostundenlöhne als Verdienstgröße, da diese am wenigsten durch das Steuersystem beeinflusst werden. Im Mikrozensus werden jedoch nur Nettomonatseinkommen abgefragt. Arbeitsstundenangaben stehen im Mikrozensus zwar zur Verfügung, von einer Berechnung von Nettostundenlöhnen wird hier im Gegensatz zu anderen Studien (siehe z.B. Machin und Puhani, 2003) aber Abstand genommen, da begründet durch das Steuersystem der Einfluss einer zusätzlichen Arbeitsstunde auf das Nettoeinkommen nicht vergleichbar über die gesamte Einkommensverteilung ist. Aus diesem Grund betrachten wir in der weiteren Untersuchung zum Einkommen nur Personen, die Vollzeit erwerbstätig sind, unabhängig von den geleisteten Stunden.

Ein weiteres Problem bei der Einkommensanalyse mit dem Mikrozensus ist, dass das berichtete Nettomonatseinkommen nicht einzelnen Einkommensarten wie Arbeitseinkommen, Renten, öffentlichen Zahlungen oder Einkommen aus Vermögen oder Vermietung zuzuordnen ist, sondern als Gesamtsumme abgefragt wird. Um dies zu berücksichtigen, betrachten wir im Folgenden nur Personen mit Arbeitseinkommen als alleiniger Einkommensart. Das in Bandbreiten angegebene Einkommen approximieren wir jeweils mit dem Gruppenmittelwert und in der obersten Kategorie mit dem Randwert plus 10%. Insbesondere im mittleren Bereich der Lohnverteilung ist diese Annahme gerechtfertigt und führt zu einer plausiblen Abbildung der zugrunde liegenden Verteilung (Stauder und Hüning, 2004). Des Weiteren begrenzen wir die zu untersuchende Stichprobe auf Personen im Alter zwischen 25 und 55 Jahren. In dieser Phase ist von einer hohen Arbeitsmarktpartizipation auszugehen, insbesondere schließen wir so die Phase der Ausbildung und eventuelle Frühverrentungsphasen aus.

Tabelle 4.2 zeigt die durchschnittlichen Nettomonatseinkommen, die von verschiedenen Fachgruppen auf dem Arbeitsmarkt erzielt werden. Geisteswissenschaftler erhalten die niedrigsten Einkommen (1.874 €). Innerhalb der Gruppe der Geisteswissenschaftler weisen Absolventen philosophischer Studiengänge (2.114 €) und Geschichte (2.017 €) mit die höchsten Einkommen aus, wohingegen Absolventen bildender Künste die niedrigsten Einkommen erzielen (1.404 €). Ergänzend ist in Tabelle 4.2 die Arbeitslosenquote als weitere

Dimension der sozialen Ungleichheit auf dem Arbeitsmarkt ausgewiesen. So zeigt sich, dass Geisteswissenschaftler nicht nur bezüglich des Einkommens sondern auch bezüglich der Arbeitslosigkeit relativ schlecht abschneiden. Die Arbeitslosenquote der Geisteswissenschaftler ist mit 6,8% am höchsten und liegt 1,7 Prozentpunkte über dem Durchschnitt.

Tabelle 4.2: Tertiäre Fachrichtungen in Deutschland im Jahr 2005 und deren Einkommen und Arbeitslosenquote

	Anteil	Einkommen (€)	Arbeitslosenquote
Alle	100,0%	2369	5,1%
Agrarwissenschaften	3,2%	2032	6,3%
Dienstleistung.	2,0%	2117	6,7%
Erziehungswissenschaften	16,2%	2180	3,4%
Geisteswissenschaften	9,2%	1874	6,8%
Gesundheit	11,4%	2812	3,2%
Ingenieurwissenschaften	22,9%	2333	6,6%
Naturwissenschaften	11,0%	2411	5,0%
Sozialwissenschaften	23,2%	2496	4,9%
Theologie	0,9%	2104	0,9%

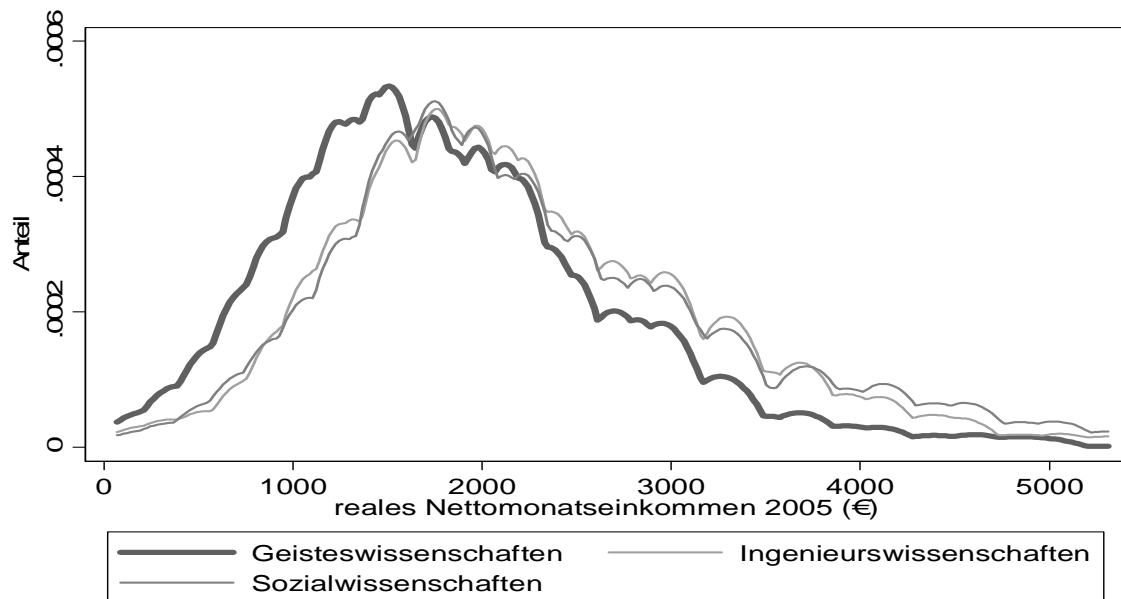
Quelle: Mikrozensus, eigene Berechnungen.

Abbildung 4.1 zeigt die gesamte Einkommensverteilung von Absolventen der Geisteswissenschaften im Vergleich zu den beiden größten Absolventengruppen Ingenieurwissenschaften und Sozialwissenschaften. So verdienen etwa nur ein Drittel aller Ingenieurwissenschaftler und Sozialwissenschaftler weniger als 1700 €, wohingegen dies für über die Hälfte der Geisteswissenschaftler der Fall ist. Am oberen Ende der Verteilung ist das Bild ähnlich. So haben lediglich 10% der Geisteswissenschaftler ein Einkommen von 3.100 € oder mehr, während bei Ingenieurwissenschaftlern und Sozialwissenschaftlern dieser Anteil mit 20% doppelt so hoch ist.

Somit scheint ein durchschnittlicher Einkommensunterschied zwischen Geisteswissenschaftlern und anderen Akademikergruppen gemäß den ersten deskriptiven Analysen als empirisch belegt. Eine Regression nach der Methode der kleinsten Quadrate des logarithmierten Einkommens auf die verschiedenen Studiengruppen ohne weitere Kontrollgrößen zeigt, dass Geisteswissenschaftler im Jahr 2005 23% weniger verdienen als Absolventen der Ingenieurwissenschaften, wohingegen Sozialwissenschaftler ein um 4% höheres Einkommen als Ingenieurwissenschaftler erzielen (vgl. Spezifikation 1 in Tabelle 4.3).³⁰

³⁰ Zusätzlich haben wir eine Intervallregression für die gruppierten Einkommensgrößen durchgeführt, die unsere Ergebnisse aus dem Schätzverfahren der kleinsten Quadrate bestätigt hat (Ergebnisse auf Anfrage von den Autoren erhältlich).

Abbildung 4.1: Einkommensverteilung 2005



Quelle: Mikrozensus, eigene Berechnungen.

Tabelle 4.3: Einflussgrößen auf das Nettomonatseinkommen in Deutschland, 2005

Abhängige Variable: Log. Nettomonatseinkommen	Spez. 1	Spez. 2
Hauptfachrichtung (Basis: Ingenieurwissenschaften)		
Geisteswissenschaften	-0,23 ***	-0,12 ***
Erziehungswissenschaften	-0,02	0,05 ***
Sozialwissenschaften	0,04 ***	0,12 ***
6 weitere Hauptfachrichtungen	ja	ja
Persönlicher Hintergrund (Basis: FH-Abschluss)		
Weiblich	-	-0,21 ***
Alter	-	0,06 ***
Alter zum Quadrat	-	-0,00 ***
Ausländer	-	-0,11 ***
Uni-Abschluss	-	0,10 ***
Promotion	-	0,26 ***
Region (Basis: Westdeutschland)		
Berlin	-	-0,13 ***
Ostdeutschland	-	-0,26 ***
Familiärer Hintergrund (Basis: keine Kinder)		
verheiratet	-	0,07 ***
1 Kind	-	0,04 ***
2 Kinder	-	0,12 ***
3 oder mehr Kinder	-	0,22 ***
Art der Beschäftigung		
Selbständig	-	0,08 ***
Öffentlicher Dienst	-	0,02 **
Jobwechsel im letzten Jahr	-	-0,15 ***
Betriebsgröße		
4 Kategorien	-	ja
Wirtschaftszweig		
8 Kategorien	-	ja
N	18.077	18.077
R2	0,02	0,24

Signifikanzniveau: *=10%, **=5%, ***=1%.

Quelle: Mikrozensus, eigene Berechnungen.

Wenn man zusätzlich auf den persönlichen Hintergrund kontrolliert, reduziert sich die Einkommensdifferenz auf 17%. Die einzelnen Variablen haben die erwarteten Vorzeichen und sind größtenteils auf dem 1% Niveau signifikant. So steigt das Einkommen konkav mit dem Alter, höherwertige Abschlüsse (Universitätsabschluss und Promotion im Vergleich zu Fachhochschulabschlüssen) spiegeln sich in einem höheren Einkommen nieder und Frauen und Ausländer erfahren die erwarteten Einkommenseinbußen. In Ostdeutschland und Berlin liegen die Nettoeinkommen unterhalb denen in Westdeutschland. Des Weiteren steigt das Nettoeinkommen für verheiratete Personen und mit der Anzahl der Kinder, was stark durch das Steuersystem begründet ist. Nach dem Hinzufügen weiterer Kontrollvariablen wie Art der Beschäftigung, Betriebsgröße und Wirtschaftszweig reduziert sich die Einkommensdifferenz zwischen Ingenieurwissenschaftlern und Geisteswissenschaftlern auf 12% (vgl. Spezifikation 2 in Tabelle 4.3). Somit kann die Hälfte der ursprünglich festgestellten Einkommensdifferenz auf eine im Bezug auf das Einkommen schlechtere Verteilung der Geisteswissenschaftler innerhalb verschiedener Kontrollgrößen zurückgeführt werden.

Tabelle 4.4: Einflussgrößen auf das Nettoeinkommen mit Interaktion, 2005

Abhängige Variable:	
Log. Nettomonatseinkommen	
Hauptfachrichtung (Basis: Ingenieurwissenschaften)	
Geisteswissenschaften	-0,05
Persönlicher Hintergrund (Basis: FH-Abschluss)	
Weiblich	-0,22 ***
Weiblich * Geisteswissenschaften	0,09 ***
Region (Basis: Westdeutschland)	
Berlin	-0,14 ***
Berlin * Geisteswissenschaften	0,16 ***
Ostdeutschland	-0,26 ***
Ostdeutschland * Geisteswissenschaften	0,09 **
Familiärer Hintergrund (Basis: keine Kinder)	
Verheiratet	0,07 ***
Verheiratet * Geisteswissenschaften	-0,02
Art der Beschäftigung	
Selbständig	0,12 ***
Selbständig * Geisteswissenschaften	-0,42 ***
Öffentlicher Dienst	0,01
Öffentlicher Dienst * Geisteswissenschaften	0,07 **
Betriebsgröße	
4 Kategorien	ja
4 Kategorien * Geisteswissenschaften	ja
Alle sonstige Variablen aus Spezifikation 2, Tabelle 3	ja
N	18.077
R ²	0,24

Signifikanzniveaus: *=10%, **=5%, ***=1%.

Quelle: Mikrozensus, eigene Berechnungen.

In einer weiteren Analyse werden zusätzlich in die Regression Interaktionsterme einiger erklärender Variablen mit den Ausprägungen Geisteswissenschaftler (0= nein, 1= ja)

aufgenommen, um den Effekt einzelner Merkmale auf das Einkommen getrennt für Geisteswissenschaftler und andere Akademikergruppen zu analysieren (vgl. Tabelle 4.4). Besonders auffallend ist hierbei der Effekt der Selbständigkeit. Während Selbständigkeit zu einem Einkommensanstieg von 12% führt, erfahren Geisteswissenschaftler zusätzlich einen Einkommensrückgang von 42%, so dass selbständige Geisteswissenschaftler in der Summe ein um 30% niedrigeres Einkommen hinnehmen müssen. Des Weiteren reduzieren sich die Einkommenseinbußen für Geisteswissenschaftler in Berlin bzw. verschwinden sogar ganz. Wenn Geisteswissenschaftler im öffentlichen Dienst beschäftigt sind, erhöht das ihr Einkommen, während für die übrigen Akademiker hier kein signifikanter Einfluss feststellbar ist. Ein Versuch einer dreifachen Interaktion von den Variablen „Geisteswissenschaftler“, „Berlin“ und „öffentlichen Dienst“ um z.B. für eine Beschäftigung im besonders ausgeprägten öffentlichen Sektor in Berlin zu kontrollieren, führt zu keinen signifikanten Ergebnissen.

4.5 Europäischer Vergleich: Geisteswissenschaftler in Großbritannien und Deutschland

Zur Evaluation der relativen Arbeitsmarktlage von Geisteswissenschaftlern führen wir zusätzlich einen Ländervergleich zwischen Großbritannien und Deutschland durch. Diese beiden Länder wurden bereits in vorangegangenen Studien zum Einfluss der Fachstudienrichtung auf den individuellen Arbeitsmarkterfolg ausgewählt (u.a. Kim und Kim, 2003; Machin und Puhani, 2003). Der Vergleich bietet sich an, um zu testen, ob die existierenden institutionellen und strukturellen Unterschiede zwischen Großbritannien und Deutschland einen Erklärungsbeitrag für die Arbeitsmarktlage von Geisteswissenschaftlern liefern können.

Zum einen spielt die institutionelle Ausgestaltung des Bildungssystems in Form der Standardisierung und Stratifizierung der Abschlüsse eine Rolle. Während Deutschland durch ein standardisiertes und stratifiziertes Bildungssystem, sowie einer engen Verbindung zwischen Bildungssystem und Arbeitsmarktsystem in Form berufsspezifischer Arbeitsmärkte charakterisiert ist (Allmendinger, 1989; Shavit und Müller, 1998), hat Großbritannien eher ein weniger stratifiziertes System sowie eine schwache Verbindung von Bildung und Arbeitsmarkt, da firmeninterne Arbeitsmärkte dominieren, deren Zugang nur schwach über Bildung reguliert wird (Shavit und Müller, 1998). Van de Werfhorst (2004) argumentiert hingegen, dass diese Klassifikationen eher für die Sekundärbildung passend sind und durch zusätzliche Charakterisierungen der Tertiärbildung ergänzt werden müssen. So lässt sich die Stratifizierungsdimension durch drei Unterscheidungen ergänzen. Erstens ist bei beruflich

orientierten Tertiärbildungen eine besondere Wirkung der Bildungsfachrichtung zu erwarten (Breen, 2005). Hingegen stellt zweitens das Bachelor-Master-System ein alternatives Signal der Unterscheidbarkeit dar und drittens trägt die Existenz von Haupt- und Nebenfächern zur Verwischung des Effekts der Bildungsfachrichtung bei. Folglich ist in Deutschland im Gegensatz zu Großbritannien von einer stärkeren Wirkung der Bildungsfachrichtung, wie z.B. Geisteswissenschaften, auszugehen, da die Tertiärbildung der jetzigen Arbeitsmarktteilnehmer durch ein starkes berufliches Segment sowie noch nicht so stark durch das erst jetzt entstehende Bachelor-Master-System charakterisiert ist. Hingegen gibt es sowohl in Deutschland in den Magisterstudiengängen als auch in Großbritannien die Möglichkeit der Nebenfachbelegung. Ein alternatives Argument, das für eine stärkere Rolle der Fachrichtung in Großbritannien spricht, ist der hohe Tertiäranteil im Bildungsbereich. Wenn viele Absolventen über Hochschulbildung verfügen, dann müssen Arbeitgeber zusätzliche Selektionskriterien, wie z.B. die Fachrichtung, hinzuziehen (Kim und Kim, 2003).

Zum anderen ist auch ein Effekt seitens der Regulierung des Arbeitsmarktes zu erwarten. So ist der Arbeitsmarkt in Großbritannien viel schwächer reguliert und offener als in Deutschland. In Kombination mit der in 2005 günstigeren wirtschaftlichen Lage in Großbritannien ist daher von größeren Arbeitsmarktchancen für Geisteswissenschaftler auszugehen. Hingegen spricht die Existenz eines größeren öffentlichen Sektors in Deutschland für eine bessere Arbeitsmarktintegration von Geisteswissenschaftlern, da der öffentliche Sektor ein klassisches Betätigungsfeld für Geisteswissenschaftler darstellt. Folglich ist der Gesamteffekt der institutionellen und strukturellen Länderunterschiede auf die Rolle der Bildungsfachrichtung und damit die relative Arbeitsmarktlage von Geisteswissenschaftlern unklar. Die folgende Analyse soll hierzu eine empirische Antwort liefern.

Zur empirischen Überprüfung der Länderunterschiede verwenden wir neben dem Mikrozensus den britischen Labour Force Survey (LFS). Viele Variablen des britischen LFS sind mit denen des Mikrozensus direkt vergleichbar, was nicht zuletzt in den Bestrebungen der EU begründet liegt, die nationalen Arbeitskräfteerhebungen der Mitgliedsstaaten zu harmonisieren. Die verbleibenden Unterschiede zwischen den Datensätzen versuchen wir durch die Verwendung internationaler Klassifikationsschemata zu beheben. So haben wir beispielsweise analog zum Mikrozensus im britischen LFS die Bildungsfachrichtung in das international vergleichbare ISCED-97 Schema (UNESCO, 1997) transformiert. Tabelle 4.5 gibt eine deskriptive Übersicht zur Verteilung der Tertiärgelbilden auf die einzelnen

Studienfachrichtungen. Im deutsch-britischen Vergleich zeigen sich deutliche Unterschiede in der Verteilung (vgl. Tabelle 4.3 und 4.5). So ist der Anteil der Ingenieurwissenschaften in Deutschland mehr als doppelt so hoch als in Großbritannien. Im Gegenzug dominieren die Naturwissenschaften stärker in Großbritannien. Während die Erziehungswissenschaften mehr Absolventen in Deutschland aufweisen, ergibt sich das umgekehrte Bild im Gesundheitsbereich.³¹ Besonders hervorzuheben ist die Tatsache, dass in Großbritannien die Gruppe der Geisteswissenschaftler einen ungefähr doppelt so großen Anteil an den Tertiärgebildeten repräsentiert als in Deutschland.

Tabelle 4.5: Tertiäre Fachrichtungen in Großbritannien im Jahr 2005 und deren Einkommen und Arbeitslosenquote

	Anteil	Nettoeinkommen	Arbeitslosenquote
Alle	100,0%	2.800	1,9%
Agrarwissenschaft	1,0%	2.496	1,1%
Dienstleistungen	0,3%	1.379	1,9%
Erziehungswissenschaft	7,7%	2.292	1,5%
Geisteswissenschaft	15,4%	2.406	2,5%
Gesundheit	17,8%	2.111	1,0%
Ingenieurwissenschaft	9,9%	3.665	1,9%
Naturwissenschaft	15,1%	3.417	2,3%
Sozialwissenschaft	24,9%	3.119	2,2%
Theologie	-	-	-
Kombinierte Studiengänge	7,8%	2.558	2,2%

Bemerkungen: Im britischen LFS lässt sich die Theologie nicht von den Geisteswissenschaften trennen. Zudem werden kombinierte Studiengänge unterschiedlicher Fachrichtungen erfasst, so dass diese nicht einer einzelnen Fachrichtung zugeordnet werden können.

Quelle: Britische LFS, eigene Berechnungen.

Um die Vergleichbarkeit zwischen dem deutschen Mikrozensus und dem britischen LFS zu gewährleisten, wird analog zu den vorherigen Analysen die Stichprobe auf Erwerbspersonen im Alter zwischen 25 und 55 Jahren mit Tertiärbildung beschränkt. Tabelle 4.5 weist das durchschnittliche Nettoeinkommen sowie das Arbeitslosigkeitsrisiko für Bildungsfachrichtungen in Großbritannien aus. Abgesehen von Niveauunterschieden zu Deutschland, die sich aus unterschiedlichen Systemen der Besteuerung und Sozialversicherung sowie durch unterschiedliche wirtschaftliche Lagen ergeben, ist die relative Positionierung der Geisteswissenschaftler in Großbritannien vergleichbar mit Deutschland (vgl. Tabelle 4.3 und 4.5). So liegen britische Geisteswissenschaftler unterhalb des Durchschnittswerts der Tertiärgebildeten, während Ingenieure, Sozialwissenschaftler und Naturwissenschaftler deutlich höhere Nettoeinkommen verbuchen können. Im Gegensatz zu

³¹ Allerdings können diese Verschiebungen zwischen relativ verwandten Fächergruppen auch durch die unterschiedlichen Originalklassifikationen in den einzelnen Ländern beeinflusst werden, die eine vollständige Vereinheitlichung gemäß ISCED behindern.

Deutschland verdienen jedoch Geisteswissenschaftler mehr als Absolventen des Gesundheitsbereiches, was durch die unterschiedlichen institutionellen Ausgestaltungen der nationalen Gesundheitssysteme erklärbar ist. In Übereinstimmung mit der Lage in Deutschland ist die Gruppe der Geisteswissenschaftler in Großbritannien am stärksten dem Arbeitslosigkeitsrisiko ausgesetzt.

Schließlich haben wir untersucht, ob die in der deskriptiven Analyse gefunden relativen Einkommenspositionen auch in multivariaten Analysen fortbestehen.³² Analog zur multivariaten Analyse mit dem Mikrozensus wird dazu das logarithmierte Nettoeinkommen auf die Bildungsfachrichtung, demographische persönliche Charakteristika, regionale Aspekte, familiären Hintergrund, sowie die Betriebsgröße und den Wirtschaftszweig regressiert. In die einfachste Spezifikation fließen nur die Hauptfachrichtungen ein, wobei insbesondere Geisteswissenschaftler neben Absolventen des Gesundheits- und Dienstleistungsbereichs die stärksten relativen Lohnabschläge im Vergleich zu den Ingenieurwissenschaftlern verbuchen müssen. Durch Kontrolle der individuellen und arbeitsmarktstrukturellen Charakteristika in einer zweiten Spezifikation reduziert sich der relative Lohnabschlag für Geisteswissenschaftler von 36% auf 9%, bleibt jedoch signifikant negativ fortbestehen. Dies ist im Einklang mit den Ergebnissen aus dem deutschen Mikrozensus. Folglich ergibt sich trotz der institutionellen Unterschiede im Bildungssystem und am Arbeitsmarkt als auch der wirtschaftlichen Lage eine ähnlich benachteiligte Position für Geisteswissenschaftler in Großbritannien.

4.6 Schlussfolgerungen

Im Mittelpunkt der Expertise steht die Situation von Geisteswissenschaftlern auf dem deutschen Arbeitsmarkt und im Vergleich zu Großbritannien im Bezug auf das monatliche Nettoeinkommen und das Arbeitslosigkeitsrisiko. Als Datengrundlage hierzu dienen der Mikrozensus 2005 für Deutschland und der britische LFS 2005 für Großbritannien.

In Deutschland erzielten Geisteswissenschaftler im Jahr 2005 niedrigere Einkommen als alle anderen Akademikern. So beträgt die Einkommenslücke zwischen Geisteswissenschaftlern und der größten Akademikergruppe, den Ingenieurwissenschaftlern, ohne Berücksichtigung persönlicher und institutioneller Eigenschaften, 23%, unter Berücksichtigung solcher Kontrollvariablen sinkt diese Differenz auf 12%. Insbesondere erfahren selbständige

³² Ergebnisse auf Anfrage von den Autoren erhältlich.

Geisteswissenschaftler hohe Einkommenseinbußen im Vergleich zu anderen Akademikern. Die Arbeitslosenquote der Geisteswissenschaftler ist im Jahr 2005 in Deutschland mit 6,8% die höchste Quote unter allen Akademikergruppen.

Im deutsch-britischen Vergleich zeigt sich ein deutlicher Unterschied in der Verteilung der einzelnen Studienrichtungen. So ist der Anteil an Geisteswissenschaftlern in Großbritannien mit 15,4% etwa doppelt so hoch wie in Deutschland. Dennoch sind Geisteswissenschaftler in Großbritannien ebenfalls im unteren Bereich der Einkommensverteilung zu finden und haben mit 2,5% die höchste Arbeitslosenquote aller Akademiker. Unter Berücksichtigung individueller Merkmale und institutioneller Gegebenheiten sinkt die Einkommensdifferenz zwischen Geisteswissenschaftlern und Ingenieurwissenschaftlern in Großbritannien von 36% auf 9%. Trotz der institutionellen Unterschiede im Bildungssystem und am Arbeitsmarkt als auch der wirtschaftlichen Lage ergibt sich damit eine ähnlich benachteiligte Position für Geisteswissenschaftler in Großbritannien.

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5. Wage Prospects for People with Migration Background in Germany

This part is joint work with Alisher Aldashev and Stephan L. Thomsen and is published in a former version as ZEW Discussion Paper 07-031.

Abstract: Less than half of the people with migration background living in Germany possess foreign citizenship. Hence, using citizenship to analyse economic issues of immigration may be problematic. This paper utilizes a wider definition covering all persons who immigrated to Germany to analyse the wage prospects for these people. To shed light on differences to the use of citizenship, estimates are presented in comparison to foreigners and German citizens. The results show that immigrants have similar wage prospects as foreigners. Moreover, wage prospects for native Germans do not differ much from those with German citizenship, so this provides an applicable approximation.

Keywords: Immigration, Wage Prospects, Education, Germany.

JEL-classification: J61, I12, J15

Acknowledgements: We thank Bernhard Boockmann for valuable comments and Philipp Eisenhauer for his research assistance. The paper has benefited from discussions at seminars at ZEW, University of Dortmund, Humboldt-University Berlin and EALE conference 2007 in Oslo. The paper is part of the ZEW project “Returns to Education and Wage Inequality for Persons with Migration Background in Germany”. The usual disclaimer applies.

5.1 Introduction

People are said to have migration background if they themselves or their parents are foreign born or possess foreign citizenship or did so in the past. According to this definition, in 2005 about 19 percent of Germany's population had migration background. More than half of the people with migration background i.e. about 10 percent of the population in Germany are German citizens. The share of foreigners living in Germany amounts to 9 percent (Statistisches Bundesamt, 2006). Two groups account for the vast majority of persons with migration background in Germany: The first group consists of persons from South European (including Turkey) and North African countries who were recruited from the 1950s to early 1970s and their family members and descendants. Many of these people still possess a foreign citizenship (in the following denoted *foreigners*), but there are also quite a few who have been

naturalized (in the following denoted *German citizens with migration background*). The second group comprises ethnic Germans from the former Soviet Union and Eastern European states who resettled mainly after the late 1980s (in the following denoted *resettlers*).³³ Ethnic Germans (and their family members and descendants) are equal by law to native Germans, and are granted with German citizenship at the time of immigration to Germany or shortly after it. However, for a number of reasons, e.g. language difficulties, different education systems in the home countries, possible limited or non-transferability of skills acquired in the home country to the German labour market, or cultural differences, they are likely to have different wage prospects from native Germans. Moreover, with regard to the fact that for people aged 25 or younger the share of persons with migration background is about one quarter and for children below six even about one third (Statistisches Bundesamt, 2006) it is of crucial relevance to analyse how people with migration background perform in Germany's economy. Moreover, the figures indicate that the share of people with migration background in the population of working age is going to rise.

In this paper, we focus on wage prospects for people with migration background. The analysis is descriptive by nature. In contrast to U.S. studies that distinguish races or ethnics (see, e.g. Altonji and Blank (1999) for an overview), many studies in Germany refer to citizenship only when analysing differences between immigrants.³⁴ Two reasons may be responsible for this; on the one hand, until the year 2000 Germany had quite strict naturalization laws preventing foreigners to become German citizens even after residing for a long time in Germany. Therefore, it was possible to approximate the issue of immigration quite well by citizenship. On the other hand, most available data sources report information on citizenship instead of immigration. Thus, identifying persons with migration background is not straightforward.

However, comparison of wage prospects of foreigners and German nationals only could be limited for a number of reasons. There may be substantial differences between native Germans and German citizens with migration background; hence, pooling of both groups by citizenship may exhibit different results on the outcomes of interest. A question that arises in this respect is whether the results obtained by studies comparing German citizens and foreigners could be generalised to the comparison of native Germans and persons with migration background. In the context of wages, this question is relevant if there is a

³³ Further groups that have to be mentioned are asylum-seekers, refugees and Jewish immigrants from Eastern Europe. In addition, there was a huge resettlement of ethnic Germans from Eastern Europe shortly after World War II. These groups are not identifiable in our data.

³⁴ To name only a few see e.g. Aldashev et al. (2009), Dustmann and van Soest (2002), Fertig and Schmidt (2001), Gang and Zimmermann (2000), Riphahn (2005).

systematic and significant variation between the wage profiles of foreigners and people with migration background, or between the wage profiles between foreigners and German citizens with migration background. In addition, it has to be analysed how much wage profiles between native Germans and German citizens differ.

There are a number of empirical studies that focus on wage prospects for foreigners and immigrants in Germany.³⁵ In an early study, Licht and Steiner (1994) test the assimilation hypothesis distinguishing permanent and temporary immigrants in Germany. Their results show that the remuneration of labour market experience is higher for natives than for foreigners and therefore no support for the assimilation hypothesis is established. Riphahn (2003a) analyses the educational attainment of the whole population of foreigners in Germany. Her results show that returns to degree are smaller compared to natives of the same age. The studies of Riphahn (2003b, 2005) provide additional analyses for second generation immigrants. Her results confirm the findings of the earlier study for that particular group. In line with these results are the findings of Constant and Massey (2005) studying wages of German guest-workers³⁶ with regard to the segmentation of the labour market. The results indicate that guest-workers are not capable of translating their human capital into a good first job and, therefore, the status gap between Germans and guest-workers is widening with the time spent in the labour market. In all of these studies citizenship is used to distinguish natives and non-natives. However, the figures from the first paragraph above elucidate that it is reasonable to utilize a more comprehensive definition of immigrants to take account of recent changes in Germany's immigrant population.

The empirical analysis is based on the waves 1995 to 2005 from the German Socio-Economic Panel (SOEP) for West Germany. The results show that persons with migration background earn lower wages compared to natives independently of gender or skill level. Moreover, the wage profiles of persons with migration background are fairly similar to those of foreigners what implies that data on foreigners could provide a proxy for the population of people with migration background. A further finding supports this result: For the years analysed here, the wage profiles of German citizens provide a good approximation of those of native Germans except for the high-skilled. Hence, using citizenship to approximate natives and non-natives seems to be reasonable when analysing wage issues – at least in the period under observation from 1995 to 2005.

³⁵ All the studies cited use data from the German Socio-Economic Panel (SOEP).

³⁶ Guest-workers are foreigners who were temporarily recruited to mitigate labour supply shortages in Germany during the late 1950s to early 1970s and who resided permanently in Germany thereafter.

The paper is organized as follows: Section 5.2 discusses the identification of people with migration background in the population of Germany. In section 5.3, we sketch the empirical model used for the estimation of the returns to education. The dataset and selected descriptive statistics are described in section 5.4. The results are shown in section 5.5. Finally, the last section provides the main conclusions.

5.2 Migration Background in Germany

Analysing the labour market perspectives of people with migration background requires a clear definition of this group in first place. Restricting the definition to foreigners and drawing the comparison of wage prospects between foreigners and German nationals could be limited if there are substantial differences between native Germans and German citizens with migration background, because the reference group (German citizens) would be rather heterogeneous. One possible definition of persons with migration background has been suggested by the Federal Statistical Office (Statistisches Bundesamt):

People are said to have a migration background if they themselves or their parents were born abroad and the persons themselves or their parents possess the citizenship of the foreign country, or did so in the past.³⁷

This definition seems to be quite appropriate for the German case as it attributes migration background to ethnic Germans and their family members, and encompasses naturalized foreigners as well.³⁸ Thus, we will use this definition in this paper.

Although the use of migration background relaxes the limitations of using only citizenship to study differences between natives and non-natives one has to consider that persons with migration background are not homogenous as a group. We take account of this heterogeneity by separately analysing the wage prospects for certain groups of persons with migration background. More precisely, we apply two levels of comparison. Table 5.1 summarizes the definition of groups in analysis. On the first level, we distinguish between native Germans (1) and people with migration background (2) only. On the second level, we consider three groups within people with migration background: (2a) Foreigners, i.e. people possessing citizenship other than German, (2b) People with migration background possessing German citizenship (but not resettlers), and (2c) resettlers.

³⁷ Translation of the definition provided in Statistisches Bundesamt (2006).

³⁸ Third generation immigrants are not incorporated if their parents possessed German citizenship at birth.

It may be worth noting that resettlers would belong to category (2b) with respect to the definition of migration background. However, to identify possible differences in the estimates for this particular group, using (2b) and (2c) as exclusive concepts seems reasonable.

Table 5.1: Definition of Groups in Analysis

1. Native Germans	Persons and their parents were born in Germany and possess German citizenship at birth.
2. Persons with migration background	
2a. Foreigners	Persons possessing citizenship other than German.
2b. German citizens	Naturalized persons (but not resettlers) and their descendants.
2c. German resettlers	Ethnic Germans, descendants and family members who possess German citizenship from the day of immigration.

Figure 5.1 provides a graphical illustration of the shares of the three sub-groups of persons with migration background distinguished here (for the year 2005). The whole pie represents all persons with migration background in Germany (19 percent of the population living in Germany). About 47 percent of those are foreigners. The remaining 53 percent are persons possessing German citizenship, 12 percent thereof are resettlers.

Figure 5.1: Groups of People with Migration Background, 2005



Source: Statistisches Bundesamt (2006), own view.

5.3 Estimating the Wage Equation for People with Migration Background

The standard model to estimate the wage equation has been proposed by Mincer (1974). In his model, log wages are modelled as an additive function of years of a linear schooling term and a quadratic term of experience. However, assuming proportional effects of years of schooling may be to some extent unrealistic in heterogeneous educational systems like in Germany where credentials may be more important than years of schooling. This is the so-called “sheepskin effect” (see, e.g. Weiss, 1995), which basically means that, for example, returns to one year of university education differ from returns to a year of high school. This finding also holds for the difference between completed school degrees and years of schooling, i.e., leaving high-school without graduation after 13 years has a different value than graduating after this duration (for a detailed discussion see Card, 1999). We account for such non-linearities by a set of dummies for different types of completed education.

A problem which goes hand in hand with measuring education is identification of experience of individuals. In empirical applications, it is common to use potential rather than actual experience due to missing information or observability of actual experience. Since we do not have the information on the actual duration of schooling and the standard durations for different education types may not necessarily be applicable to immigrants having received education in their home countries, we use age (and age squared) instead of potential experience. In addition, we consider age-education interaction effects to estimate flexible education type specific wage profiles over the life-cycle.

We distinguish three skill groups in the analysis. The low-skilled are defined as persons belonging to the categories “no schooling”, “schooling (regular school system)”, or “schooling (non-regular school or abroad)”. Persons with “professional training (apprenticeship system)/civil servant” or “other professional training” are defined as medium-skilled; the high-skilled are defined as having “college or university degree” or “college or university degree (abroad)”.

The empirical analysis relies on the following panel model:

$$(5.1) \quad y_{it} = \beta_0 + \beta_1 Age_{it} + \beta_2 Age_{it}^2 + \sum_{j=1}^k \gamma_j skill\ level_{jit} + \sum_{j=1}^k \kappa_j skill\ level_{jit} \times Age_{it} + \sum_{j=1}^k \lambda_j skill\ level_{jit} \times Age_{it}^2 + \alpha X_{it} + u_{it},$$

where y_{it} is the log hourly wage of person i in period t , β_0 is a constant, β_1 and β_2 are the coefficients of age and age (squared). γ_j , κ_j and λ_j are the parameters for the returns to education category j to be estimated. X_{it} is the matrix of further covariates regarded in the estimation (to be described below) and α is the corresponding coefficient vector. u_{it} is the error term which can be decomposed into $u_{it} = v_i + \varepsilon_{it}$. Here, v_i represents a time-fixed component capturing individual heterogeneity and ε_{it} is the residual i.i.d. error term. We assume that v_i is uncorrelated with the explanatory variables and, hence, equation (5.1) can be estimated by the random effect panel method. This is similar to DeNew and Zimmermann (1994) who also apply random effect methods to estimate the effect of the share of foreign labour on German wages using SOEP. Fixed effects would not be as good because education as one of the explaining variables is more or less constant over time.³⁹ Building on the estimated coefficients we calculate counterfactual wages for every age and show wage profiles over the life-cycle.

Matrix X contains variables which are expected to affect the wage level and that also characterize differences between persons with migration background and native Germans. In detail, the variables comprise economic sectors, indicated by six categories (agriculture, industry, transportation, construction, trading services, social services and health), a dummy variable for self-employment and a dummy variable for part-time work (as being equal to 1 if the person works less than 30 hours a week). Moreover, we consider fixed year and regional effects (dummies for north, central and south) to take account of possible macroeconomic year-specific changes of the regional economy.⁴⁰ Relevant for the wage position of persons with migration background seems to be time of residence in Germany. With enduring time of residence potential experience increases as well and migrants' economic situation could be expected to become more similar (or assimilated) to native Germans. Therefore, we incorporate time of residence and its square (only used for persons with migration background) in our wage equation. To take account for gender effects, we run the regression in equation (5.1) separately for males and females.⁴¹

³⁹ In that context, Wooldridge (2002: 252) mentions that “with a large number of random draws from the cross section, it almost always makes sense to treat the unobserved effects [...] as random draws from the population”. Thus, using the random effect panel method seems to be adequate.

⁴⁰ Considering fixed year effects for macroeconomic conditions differs from calculating cohort effects conditional on year of birth.

⁴¹ The final specification was due testing of different sets of variables in order to improve precision of the estimates.

5.4 Dataset and Selected Descriptives

5.4.1 Dataset

For the empirical analyses we use 11 waves of the German Socio-Economic Panel (SOEP) from 1995 to 2005.⁴² The SOEP was launched in 1984 and is a wide-ranging representative longitudinal study of private households. It provides information on all household members, consisting of Germans living in all Federal Laender, foreigners, and recent immigrants to Germany. In 2005, there were nearly 12,000 households, and more than 21,000 persons sampled. Several features make the SOEP preferential to other datasets in Germany for the purpose at hand.

The SOEP offers individual information on country of birth, citizenship and whether or not the person has resettled, amongst others. In addition, a parental identifier is offered if the parents of the interviewed person have participated in any of the waves of the SOEP. In these cases, parental information can be added to the individual's information. This allows to define (and to identify) three mutually exclusive groups of persons with migration background in the analysis: First, foreigners are all persons who possess a non-German citizenship. Second, German citizens with migration background are naturalized foreigners or their dependents and third, resettlers are ethnic Germans or their dependents who were naturalized by law when they arrived in Germany. Finally, the remaining persons are defined as native Germans.

Moreover, the SOEP is not restricted to persons covered by the social security system, i.e. public officials and self-employed persons are included as well. It provides information on wages and hours worked. A minor disadvantage of the SOEP concerning migrants is the fact that illegal immigrants are not covered in the sample. However, for the purpose of analysing the wage prospects for persons with migration background this limitation could be assumed to be irrelevant. The SOEP is representative for migrants with the exception of the years between the end of the 1980s and the early 1990s when many new migration groups arrived in Germany. The survey expansion in 1994/95 of the SOEP takes this new development into account and, therefore, our analysis (starting in 1995) is not affected by the missing representation.

We limit our analysis to West Germany due to a small number of immigrants in East Germany. In addition, the sample is restricted to employed persons (dependent as well as the

⁴² For further details on SOEP see Haisken-DeNew and Frick (2005) and Wagner et al. (2007).

self-employed) aged 15 to 65 who report a wage. Further, to reduce the risk of measurement error from extreme values we trim the highest two percent and the lowest two percent observations on hourly wages. The outcome variable (real gross hourly wage) is obtained for all workers including the self-employed by dividing the gross wages in the month prior to the interview by the reported working hours of the last week that are extrapolated to monthly hours. Wages are deflated using the consumption price index based on the year 2000 to get real consumption wages of comparable purchasing power (source: Statistisches Bundesamt, 2008).⁴³

5.4.2 Selected Descriptives

To characterize the situation of people with migration background, Tables 5.2 and 5.3 provide means of selected variables for the years 1995 and 2005 distinguishing males and females as well as the different groups according to Table 5.1. For males, the average hourly wage is highest for native Germans (13.99 Euro in 1995, 15.70 Euro in 2005) while resettlers earned the lowest wages (10.64 Euro in 1995, 12.37 Euro in 2005). For all groups except for German citizens with migration background, real wages increased between 1995 and 2005 on average. In that group, wages remained fairly stable. In analogy to males, female native Germans earned the highest wages (10.77 Euro in 1995, 12.19 Euro in 2005) while in 1995 resettlers (8.62 Euro) and in 2005 foreigners (9.72 Euro) earned lowest wages.

Why are wages higher for native Germans than for the other groups? Clearly, differences in composition and educational attainment have to be expected. Native Germans seem on average to be higher educated compared to any of the immigrant groups. For foreigners and resettlers there is a general trend towards higher education. For German citizens with migration background the picture is more mixed. While the share of males with professional training decreased from 56 percent in 1995 to 41 percent in 2005 in this group, shares of persons with a lower but also with a higher education have increased. The share of people with migration background who completed professional training doubled between 1995 and 2005. Especially the group of resettlers experienced a large increase. Resettlers also have a larger share of persons with a college degree compared to native Germans even though these are mostly received abroad.⁴⁴ In addition, we observe average earnings to be higher for the

⁴³ It should be noted that the reported gross earnings in the month prior to the interview have not been adjusted for end-of-year bonuses, overtime-payments, holiday allowances etc.

⁴⁴ There is some empirical evidence for Germany that educational attainment differs substantially between the native population and persons with migration background. Schnepf (2006) compares a number of surveys on educational performance for selected OECD countries participating in PISA, TIMSS, and PIRLS. She finds that differences in performance between native and migrant students are particularly high in Germany. The results of

groups possessing larger shares of persons with education in Germany. This could mean that returns to degrees obtained in Germany are higher – what is the case as shown e.g. by Aldashev et al. (2008). Concerning education levels, males and females show similar composition of the labour force across groups.

Table 5.2: Means of Selected Characteristics - Males

Variable	Native Germans		People with migration background thereof:							
	1995	2005	Foreigners				With German citizenship		Resettlers	
			1995	2005	1995	2005	1995	2005	1995	2005
Hourly Wage	13.99	15.70	11.69	13.34	11.64	13.61	13.43	13.46	10.64	12.37
Age	38.88	42.54	37.40	40.13	37.74	40.73	35.83	39.21	36.92	39.89
Time of Residence	-	-	19.73	25.86	21.79	27.77	24.84	29.03	5.58	15.40
Education										
No schooling	0.01	0.00	0.11	0.04	0.15	0.06	0.02	0.03	0.01	0.01
Schooling (regular school system)	0.12	0.11	0.17	0.15	0.18	0.14	0.16	0.18	0.12	0.12
Schooling (abroad)	0.01	0.00	0.19	0.09	0.22	0.14	0.01	0.05	0.15	0.04
Professional training (apprenticeship system)/ civil servant	0.65	0.61	0.22	0.43	0.20	0.43	0.56	0.41	0.08	0.45
Professional training (abroad)	0.01	0.01	0.23	0.04	0.20	0.04	0.07	0.03	0.51	0.04
College or University degree	0.19	0.27	0.04	0.13	0.03	0.10	0.17	0.22	0.00	0.10
College or University degree (abroad)	0.00	0.00	0.04	0.12	0.02	0.09	0.02	0.09	0.13	0.25
Part-time work	0.03	0.04	0.03	0.06	0.02	0.07	0.06	0.06	0.01	0.05
Self-employment	0.06	0.09	0.03	0.06	0.03	0.06	0.06	0.09	0.01	0.01
Economic Sectors										
Agriculture	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.03
Industry	0.24	0.32	0.39	0.55	0.40	0.53	0.31	0.49	0.40	0.68
Transportation	0.13	0.08	0.18	0.07	0.18	0.07	0.20	0.09	0.17	0.04
Construction	0.09	0.08	0.05	0.07	0.05	0.09	0.03	0.06	0.06	0.03
Trading services	0.30	0.27	0.27	0.22	0.26	0.23	0.27	0.21	0.30	0.17
Social services and health	0.25	0.22	0.11	0.07	0.11	0.06	0.19	0.13	0.06	0.03
Region^a										
North	0.22	0.20	0.15	0.15	0.11	0.12	0.16	0.13	0.31	0.27
Centre	0.33	0.34	0.33	0.35	0.29	0.31	0.35	0.38	0.47	0.43
South	0.44	0.47	0.53	0.49	0.59	0.57	0.50	0.49	0.22	0.30
No. of obs.	1,969	3,070	974	684	721	358	109	200	144	130

^a North contains the Federal Laender of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre comprises the Federal Laender North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South contains Hesse, Bavaria and Baden-Wuerttemberg.

Schnepf (2006) are in line with the findings of Ammermüller (2007). See also OECD (2006). Moreover, the educational level of native Germans increases stronger over time than for the immigrants (Riphahn, 2005). In line with this, the share of foreigners in high-skilled labour amounts only to 3.3 percent in 2000 reported by Bauer and Kunze (2005). In addition, Gang and Zimmermann (2000) argue that the longer the immigrants stay in Germany the more likely they attain better education.

Table 5.3: Means of Selected Characteristics - Females

Variable	Native Germans		People with migration background thereof:									
	1995	2005	1995		2005		Foreigners		With German citizenship		Resettlers	
	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
Hourly Wage	10.77	12.19	9.06	9.92	9.03	9.72	9.69	10.31	8.62	9.80		
Age	37.47	41.53	37.16	40.05	36.84	40.75	36.72	38.58	39.24	40.63		
Time of Residence	-	-	19.86	24.71	21.41	26.51	27.70	27.53	5.85	16.98		
Education												
No schooling	0.01	0.00	0.17	0.05	0.22	0.09	0.03	0.01	0.06	0.01		
Schooling (regular school system)	0.20	0.13	0.16	0.20	0.16	0.17	0.26	0.28	0.11	0.13		
Schooling (abroad)	0.00	0.00	0.21	0.14	0.24	0.22	0.05	0.05	0.22	0.09		
Professional training (apprenticeship system)/ civil servant	0.65	0.64	0.21	0.36	0.18	0.31	0.55	0.44	0.06	0.37		
Professional training (abroad)	0.02	0.01	0.18	0.02	0.15	0.01	0.03	0.02	0.43	0.02		
College or University degree	0.12	0.21	0.03	0.13	0.03	0.09	0.07	0.16	0.00	0.17		
College or University degree (abroad)	0.00	0.00	0.04	0.11	0.02	0.10	0.01	0.06	0.12	0.22		
Part-time work	0.34	0.42	0.26	0.39	0.23	0.40	0.32	0.39	0.38	0.36		
Self-employment	0.04	0.06	0.02	0.03	0.02	0.03	0.04	0.03	0.00	0.02		
Economic Sectors												
Agriculture	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Industry	0.16	0.14	0.24	0.22	0.28	0.26	0.20	0.20	0.11	0.18		
Transportation	0.05	0.05	0.10	0.05	0.12	0.04	0.06	0.05	0.06	0.05		
Construction	0.05	0.01	0.04	0.01	0.04	0.01	0.04	0.01	0.02	0.00		
Trading services	0.29	0.37	0.16	0.39	0.16	0.40	0.19	0.39	0.17	0.35		
Social services and health	0.46	0.42	0.46	0.34	0.41	0.29	0.51	0.35	0.64	0.42		
Region^a												
North	0.21	0.21	0.13	0.15	0.12	0.10	0.08	0.13	0.24	0.27		
Centre	0.33	0.33	0.33	0.34	0.29	0.28	0.36	0.41	0.47	0.39		
South	0.46	0.46	0.54	0.51	0.58	0.62	0.57	0.46	0.28	0.35		
No. of obs.	1,451	2,780	583	573	418	269	76	177	89	127		

^a North contains the Federal Laender of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre comprises the Federal Laender North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South contains Hesse, Bavaria and Baden-Wuerttemberg.

On average, native Germans are older than persons with migration background. This could also explain higher wages of the natives due to higher levels of experience or seniority wage payment. Time of residence is shortest among the persons with migration background for resettlers (5.58 years in 1995 and 15.40 years in 2005). In addition, this group has the lowest wages on average, too, while it is highest for naturalized foreigners. These persons have on average lived for three fourth of their life in Germany. Unlike native Germans, people with migration background, especially resettlers, are more concentrated in the industrial sector. Moreover, foreigners and German citizens with migration background are overrepresented in the south while resettlers are overrepresented in the centre of Germany compared to native Germans. Compared to males, females and in particular females with migration background work less often in the industrial sector; in contrast, female participation rates are higher in

trading services and social services and health. The share of self-employed is largest for native Germans and German citizens with migration background (6 percent in 1995 and 9 percent in 2005); only a small share of resettlers is self-employed.

5.5 Results

Regarding the substantially larger numbers of persons with migration background compared to people possessing a foreign citizenship in the population of Germany, there may be doubts on the transferability of results obtained from a distinction by citizenship to the whole population of persons with migration background. In that context, one has to bear in mind that the reference group contains naturalized immigrants, i.e. naturalized foreigners and ethnic Germans, which exhibits effects on the empirical estimates.⁴⁵ Hence, the first issue we want to analyse is how comparable are the wages of persons with migration background and foreigners. To answer this question, we construct the wage profiles with 95 percent confidence limits (shaded grey) for the average individual⁴⁶ aged 25 to 60 with a distinction for gender for the following groups: persons with migration background compared to native Germans (Figure 5.2) and persons with migration background compared to foreigners (Figure 5.3).⁴⁷ The profiles are constructed based on the estimation results presented in Tables 5.A1 and 5.A2 in the appendix, using the group-means of the explanatory variables.

The underlying estimates of the wage regressions are in line with expectation.⁴⁸ There is a positive, but decreasing effect of age on wages independently of gender. An analogue figure could be established for time of residence in Germany. In addition, there are positive returns to educational levels. With regard to economic sectors, the highest wages are paid in the industrial sector. Regional differences indicate that highest wages are paid in the south of Germany.

⁴⁵ Although naturalized immigrants possess all rights and duties as every German citizen, their economic integration may differ due to language difficulties, different education, or cultural differences for instance.

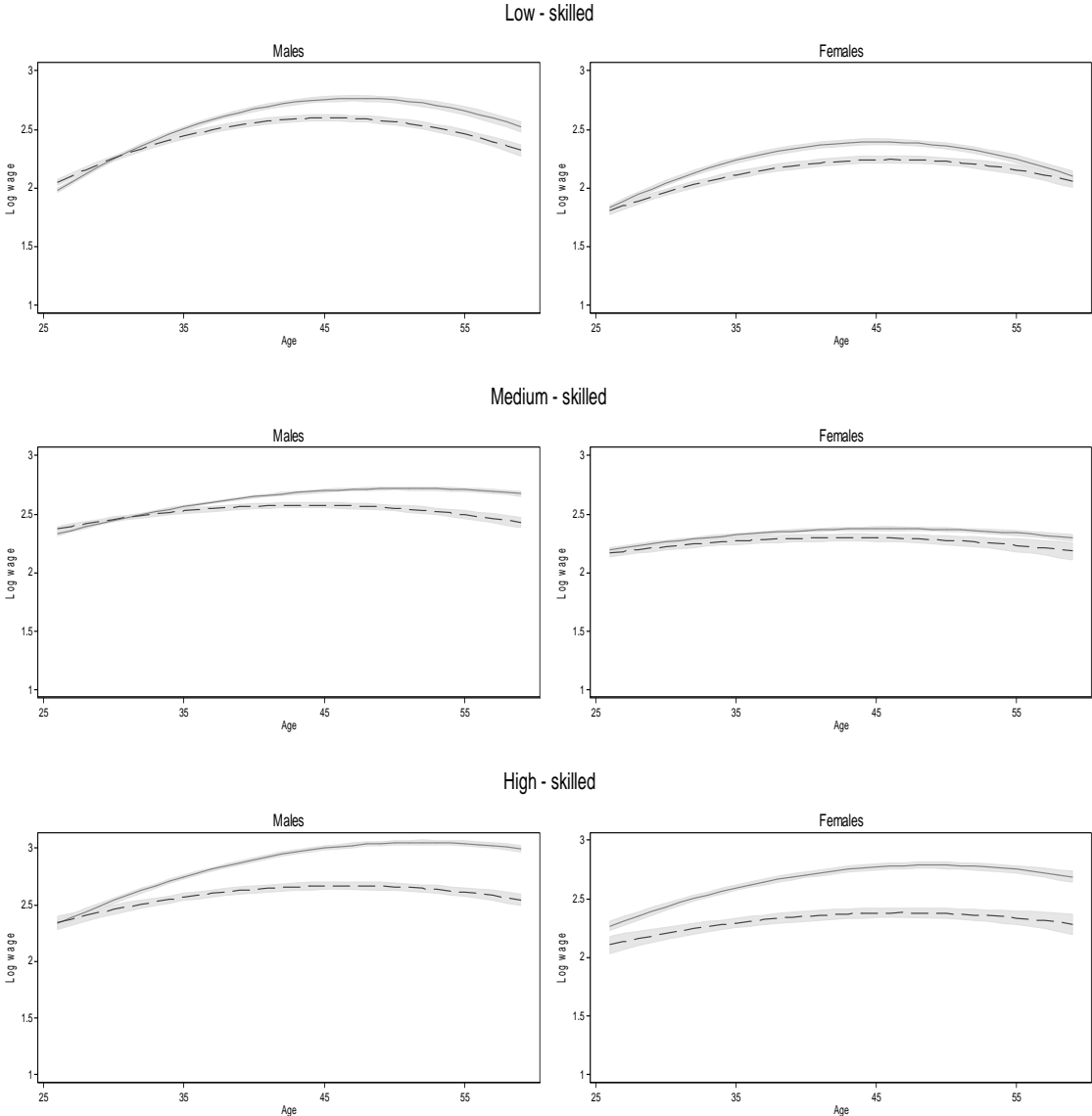
⁴⁶ Another possibility would be to calculate profiles for a single representative worker. The problem with this approach is that we only have at most 11 yearly observations for a single worker, which is too low to show the wage development over the life-cycle from the end of the education period till retirement (35 years). To solve this problem we had to calculate counterfactual representative workers. We decided not to do so and instead use the definition at hand.

⁴⁷ As noted above, native Germans are a sub-group of German citizens. The age interval has been chosen to exclude apprenticeship training or time of studies at university on the left side and early retirement issues on the right side. For the sake of completeness, Figure 5.A1 in the appendix compares the wage prospects of foreigners to that of native Germans.

⁴⁸ In addition, we have also estimated a number of different specifications of the wage regressions, for example, without interaction terms or with age effects and interaction terms only. Nevertheless, the parameter estimates of the coefficients do not change much but the overall fit of the model presented here is better.

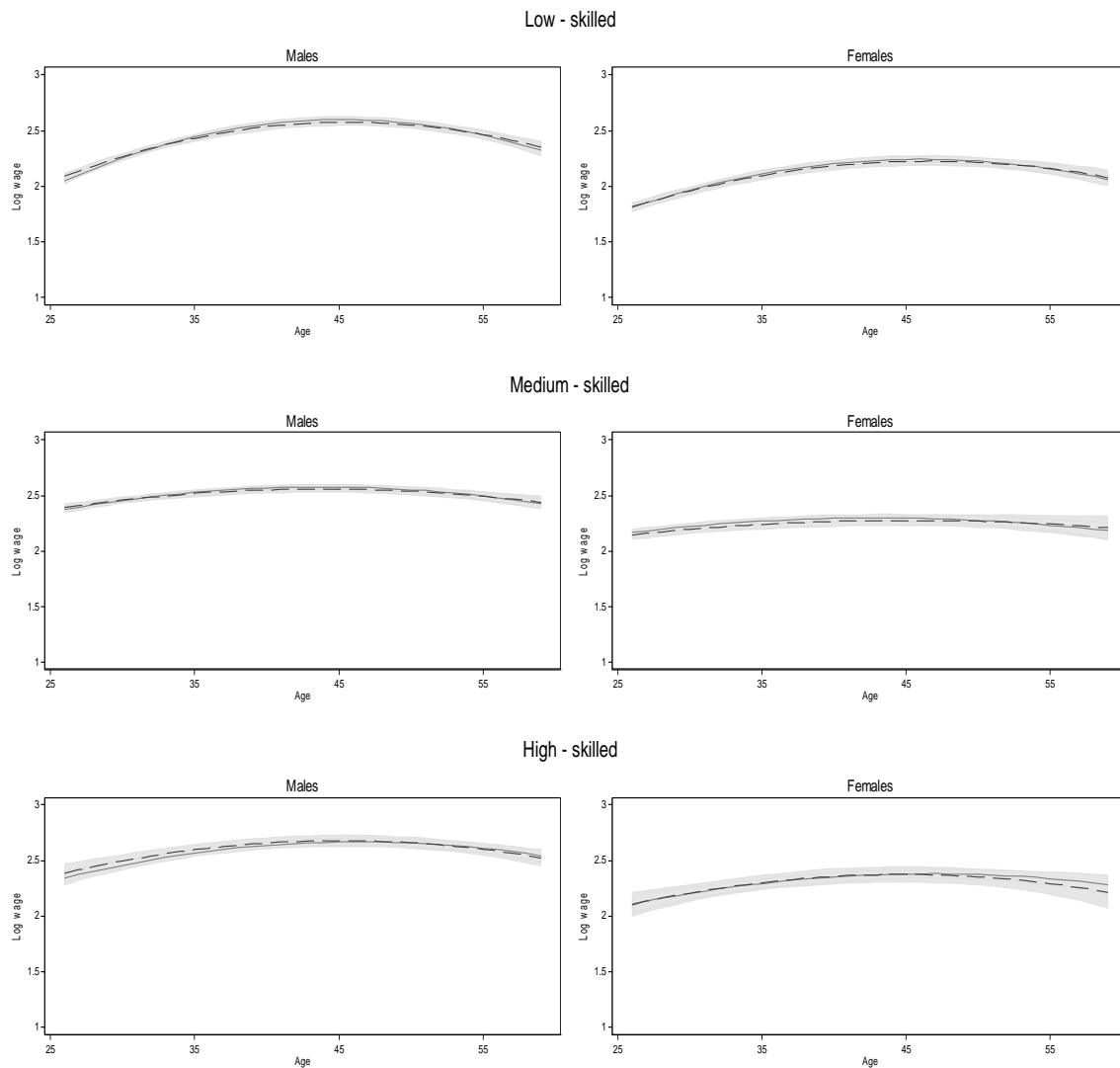
It becomes evident from Figure 5.2 that persons with migration background independently of gender and skill level have significantly lower wage prospects than native Germans over the life-cycle. These differences are particularly strong for the low- and the high-skilled. In contrast to that differences for the medium-skilled are clearly smaller; for females, only small differences beginning in the late 30s could be established. The estimated differences within skill-groups could be determined by differences in composition of persons with migration background and native Germans. For example, persons with migration background work more often in industry and are located in the south (see Tables 5.2 and 5.3). Moreover, the longer the persons live in Germany (variable time of residence) the higher are the wage prospects.

Figure 5.2: Wage Profiles: Native Germans vs. Persons with Migration Background



Solid Line (-) refers to native Germans, dashed line (- -) refers to persons with migration background. 95 percent confidence limits are shaded grey.

Figure 5.3: Wage Profiles: Persons with Migration Background vs. Foreigners



Solid Line (-) refers to persons with migration background, dashed line (- -) refers to foreigners. 95 percent confidence limits are shaded grey.

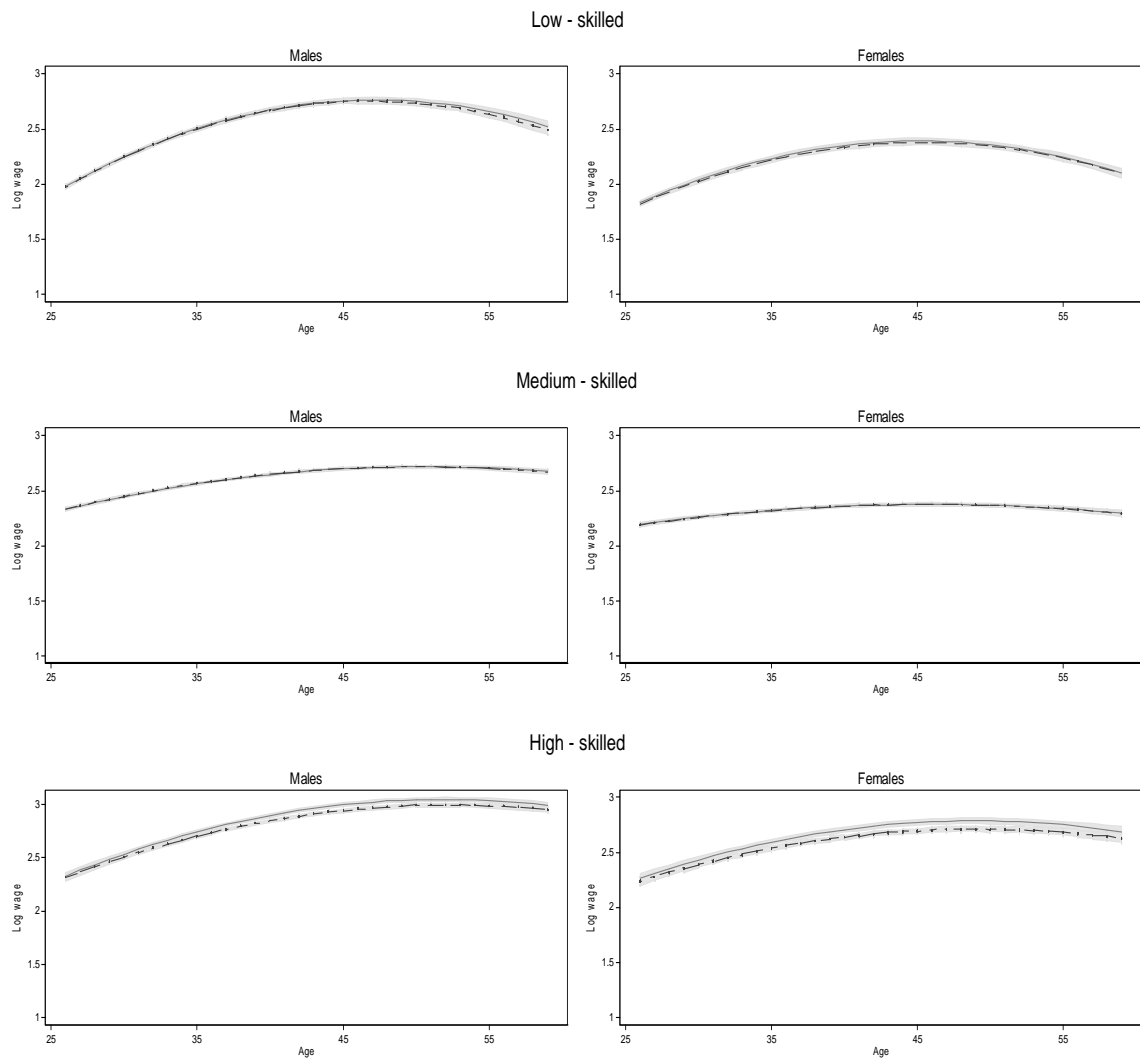
Given the differences between persons with migration background and native Germans, the question is how people with migration background differ from foreigners. Figure 5.3 compares the wage profile of the average foreigner to the average individual with migration background. The wage profiles of both groups are very similar in all six classes displayed. Neither gender nor skill differences could be established between foreigners and persons with migration background. The wage similarities between both groups indicate that when analysing wages one could possibly pool both groups into one. Moreover, it also implies that we could generalise mean wage prospects of foreigners to be valid for the whole group of persons with migration background – at least in our period of observation from 1995 to 2005. However, the robustness of this finding has to be checked for future periods due to demographic change.

The second issue we want to analyze in this context is the possible bias of the reference group. The wage profile of the average native German could possibly differ from that of the average German citizen since the latter contains additional effects of naturalized immigrants. In analogy to the figures shown so far, we study this question by comparison of the wage profiles with respect to gender and the three different skill levels (Figure 5.4).⁴⁹ Except for the high-skilled, the wage profiles of natives do not differ from those of German citizens. Hence, the group of German citizens provides a reasonable proxy for native Germans when analyzing wages of low- and medium-skilled individuals in West Germany. However, for the high-skilled the graphs point towards a slightly downward biased wage profile for males and females of German citizens compared to native Germans. Although not strong, this difference is significant.

The graphs of Figure 5.4 compare the wage profiles of native Germans to all German citizens, i.e. the sum of native Germans, naturalized immigrants as well as resettlers. Although there are no overall differences observable between those groups (except for the high-skilled), it may be interesting to know whether those naturalized persons are more similar to native Germans or to foreigners. To study this issue, Figures 5.5 and 5.6 compare the wage profiles of the average native German and average foreigner to the average naturalized immigrant (excluding resettlers). The graphs of Figure 5.5 clarify that, except for low- and medium-skilled females, wage prospects of naturalized Germans differ from that of natives. For low- and medium-skilled males, the gap in the wage profiles starts widening in the early 40s. In contrast to that, for high-skilled males (and females) the same picture could be revealed nearly from the beginning. Figure 5.6 provides the analogous estimates for foreigners compared to naturalized Germans. It is evident from the graphs that wage prospects of foreigners are not significantly different from those of German citizens with migration background (except for high-skilled males at the age between 40 and 53 years). These similarities in wages between foreigners and German citizens with migration background indicate that when analyzing wages we could possibly pool foreigners and German citizens with migration background into one group.

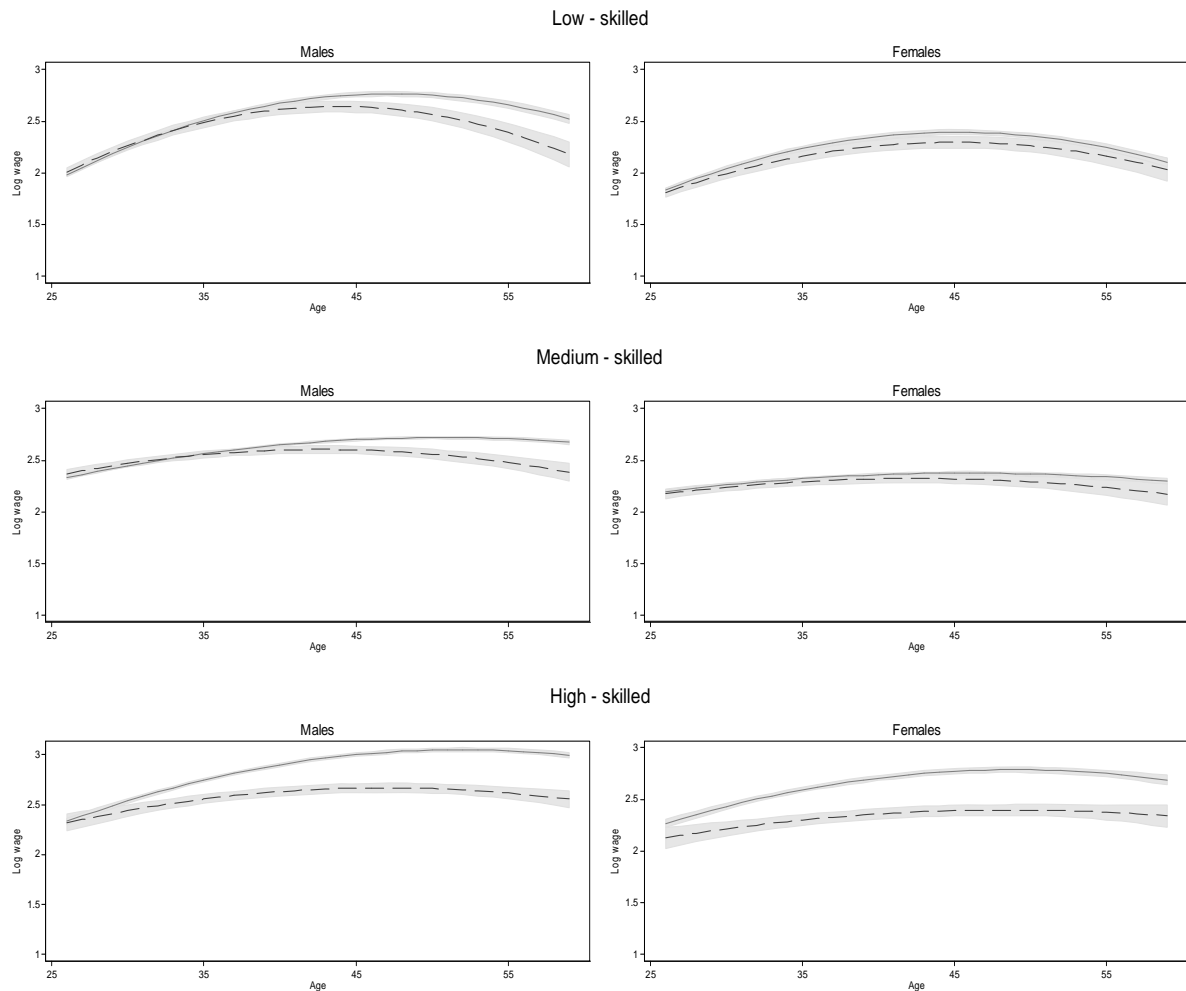
⁴⁹ The estimation results for German citizens are available on request by the authors.

Figure 5.4: Wage Profiles: Native Germans vs. German Citizens



Solid line (-) refers to native Germans, dashed line (- -) refers to German citizen. 95 percent confidence limits are shaded grey.

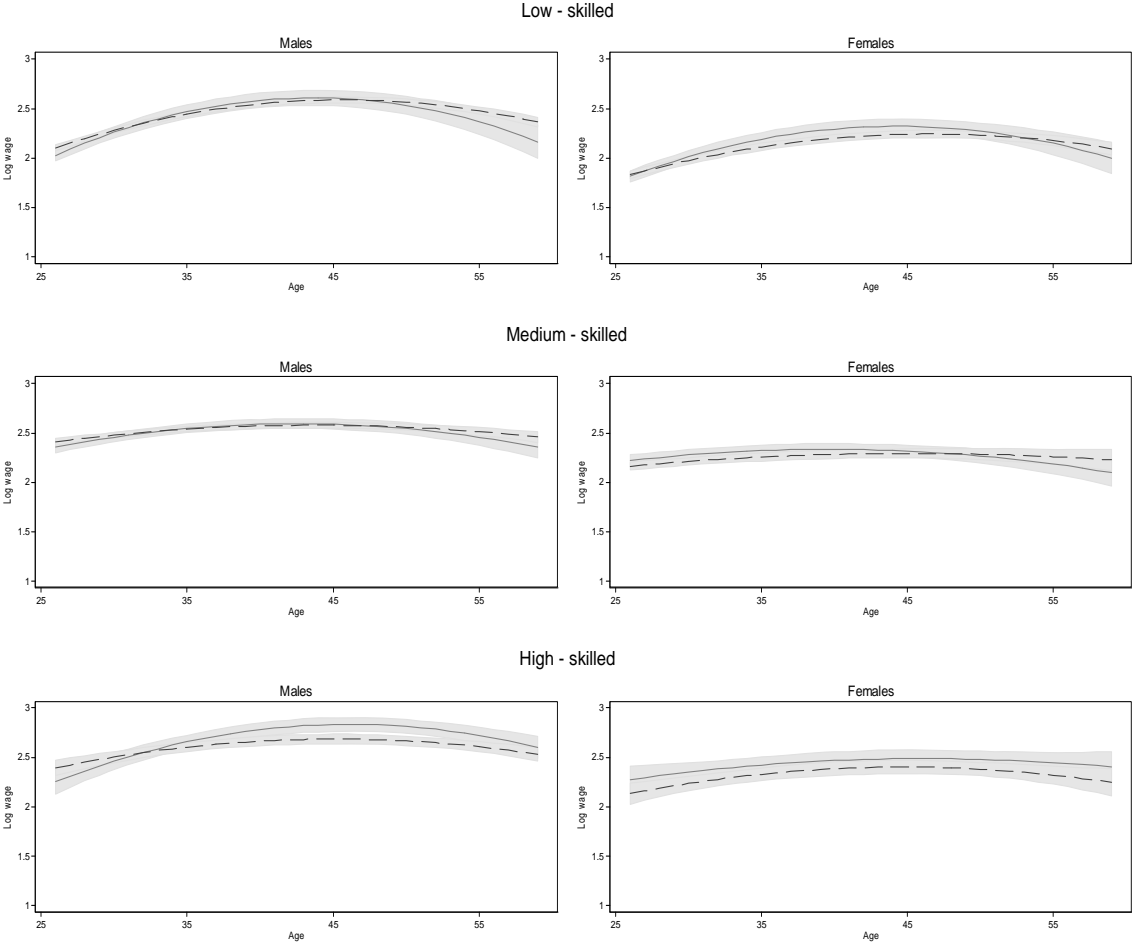
Figure 5.5: Wage Profiles: Native Germans vs. German Citizens with Migration Background



Solid line (-) refers to native Germans, dashed line (- -) refers to German citizen with migration background. 95 percent confidence limits are shaded grey.

To test the sensitivity of the estimates we carried out estimations using the panel for the years 2000 to 2005 only. Figure 5.A2 and 5.A3 in the appendix provide the wage profiles for native Germans compared to German citizens and for foreigners compared to German citizens with migration background. Again, we find no differences between natives and German citizens for low- and medium-skilled individuals. For high-skilled, there are some minor statistical significant differences for females. The comparison of the wage profiles for foreigners and German citizens with migration background results in a fairly similar picture, too. Unfortunately, no significant differences could be established between the groups. However, the lower number of observations in the reduced panel coincides with a larger variance of the estimates. Hence, although estimates are not completely robust, the alternative estimations tend to support the findings based on the 11 waves, or in other words, effects tend to be stable over time.

Figure 5.6: Wage Profiles: German Citizens with Migration Background vs. Foreigners



Solid line (-) refers to German citizen with migration background, dashed line (- -) refers to foreigners. 95 percent confidence limits are shaded grey.

Finally, Table 5.4 presents the wage differences between skill categories within the groups under study at selected ages (25, 40 and 60 years) separately by gender. The upper panel shows the difference between medium- and low-skilled workers, the lower panel provides the difference between high- and low-skilled persons. It becomes clear from the calculations that there are substantial skill-wage differences in particular for younger and older people. In summary, the findings show that for native Germans and naturalized immigrants the wage gap between high- and low-skilled increases with age, whereas the gap between medium- and low-skilled decreases up to a certain age and then increases again.⁵⁰

⁵⁰ One issue elided in the text is the gap between males and females. In line with the literature, the results throughout all estimations establish lower wages for women compared to men. However, as there are no substantial differences within gender for the migrant and non-migrants groups, we refrain from a self-contained discussion.

Table 5.4: Differences in Returns to Education for Selected Age Cohorts

Age	Difference in Euro per hour			Difference in percent		
	25	40	60	25	40	60
Males						
medium-skilled vs. low-skilled						
Native Germans	3.06	-0.32	2.29	49.14	-2.34	20.66
People with migration background	2.97	0.16	1.28	43.60	1.36	14.14
Foreigners	2.78	0.19	1.02	39.76	1.68	11.08
German citizens with migration background	2.93	-0.20	1.79	41.59	-1.51	21.88
German resettler	3.35	-0.34	2.40	61.75	-3.10	35.90
high-skilled vs. low-skilled						
Native Germans	2.91	3.56	7.42	46.72	26.41	66.92
People with migration background	2.68	1.14	2.65	39.36	9.48	29.22
Foreigners	2.66	1.57	1.95	38.13	13.67	21.09
German citizens with migration background	1.41	2.02	4.00	20.01	15.36	48.88
German resettler	4.17	-0.51	4.33	76.80	-4.59	64.79
Females						
medium-skilled vs. low-skilled						
Native Germans	2.53	0.03	1.70	49.15	0.36	24.75
People with migration background ^a	2.37	0.76	0.96	48.05	9.84	14.89
Foreigners ^a	2.18	0.70	1.07	44.23	9.43	16.45
German citizens with migration background	-	-	-	-	-	-
German resettler	-	-	-	-	-	-
high-skilled vs. low-skilled						
Native Germans	2.69	3.56	5.39	52.26	38.74	78.70
People with migration background	2.06	1.48	1.96	41.62	19.27	30.32
Foreigners	1.92	1.66	1.19	39.00	22.37	18.28
German citizens with migration background ^a	-	-	-	-	-	-
German resettler ^a	-	-	-	-	-	-

Calculations are based on parameter estimates displayed in Tables 5.A1 and 5.A2 in the appendix.

^a Differences in return to education are not computed for these groups due to infeasible numbers of observations.

5.6 Conclusion

The share of persons with migration background in Germany's population has increased during the past decades. A considerable number of these persons possess German citizenship. On the one hand, former guest-workers, their family members, and descendants were naturalized. On the other hand, a large number of ethnic Germans and family members returned from Eastern Europe and received German citizenship at the date of (re)immigration. Many studies use citizenship to analyse economic issues of immigration. However, in light of the empirical situation this approach may be problematic as more than half of the population with migration background is neglected and, moreover, the effects for the reference group (native Germans) may exhibit effects of naturalized and ethnic Germans who possibly differ from natives, too. In this paper, we utilize a wider concept of migration background to analyse wage prospects of immigrants in Germany. To give evidence on possible bias when using citizenship instead of migration background, we compare the estimates of persons with migration background to those of foreigners. Moreover, to see how strong a potential bias

affects analyses of wages, we compare the wage profiles of native Germans with those of German citizens. Our empirical analysis is based on data from the SOEP using the waves 1995 to 2005 for West Germany.

The results show that persons with migration background have on average lower wage prospects compared to native Germans independently of skill level or gender. Compared to foreigners, their expected wages are fairly similar except for the high-skilled. A further finding is that wage prospects for native Germans do not differ much from those of German citizens. Hence, the potential bias of the reference groups is not that problematic, and using citizenship to approximate natives and non-natives when analysing wage issues seems to be reasonable. However, the exception for high-skilled people has to be regarded.

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5.8 Appendix to Chapter 5

Table 5.A1: Estimation Results: Males

	Native Germans	People with migration background thereof:			
		Foreigners	with German citizenship	German resettler	
Age	0.1651 ***	0.1340 ***	0.1148 ***	0.1634 ***	0.1839 ***
Age (squared)	-0.0017 ***	-0.0015 ***	-0.0013 ***	-0.0019 ***	-0.0021 ***
Education (Base: Low-skilled)					
Medium-skilled ^a	2.2140 ***	1.7753 ***	1.5970 ***	1.9488 ***	2.7939 ***
High-skilled ^b	1.3125 ***	1.4305 ***	1.1091 ***	0.6880 *	3.5535 ***
Interaction with age					
Medium-skilled x Age	-0.1003 ***	-0.0774 ***	-0.0688 ***	-0.0889 ***	-0.1290 ***
High-skilled x Age	-0.0542 ***	-0.0614 ***	-0.0430 ***	-0.0312	-0.1682 ***
Interaction with age (squared)					
Medium-skilled x Age(squared)	0.0011 ***	0.0008 ***	0.0007 ***	0.0010 ***	0.0015 ***
High-skilled x Age(squared)	0.0007 ***	0.0007 **	0.0005 ***	0.0004 *	0.0020 ***
Economic Sectors (Base: Industry)					
Agriculture	-0.1257 ***	0.0207	0.0039	0.0964	-0.0465
Transportation	-0.0461 ***	-0.0395 ***	-0.0235	-0.0570 *	-0.0932 ***
Construction	-0.0532 ***	-0.0619 ***	-0.0820 ***	-0.0291	-0.0226
Trading services	-0.0465 ***	-0.0768 ***	-0.0992 ***	-0.0059	-0.0972 ***
Social services and health	-0.0649 ***	-0.1178 ***	-0.0924 ***	-0.1525 ***	-0.1357 ***
Self-employment	-0.0537 ***	0.0860 **	0.1022 ***	0.0674	0.1724 **
Part-time work	0.0456 ***	0.0475 **	-0.0049	0.0834 *	0.2210 ***
Time of residence in Germany		0.0051 ***	0.0057 ***	0.0043	0.0187 **
Time of residence in Germany (squared)		0.0000 *	0.0000	0.0001	-0.0002
Region^c (Base: South)					
North	-0.0700 ***	-0.0664 ***	-0.0809 ***	-0.0031	-0.0591
Centre	-0.0206 **	-0.0559 ***	-0.0343 *	-0.0917 **	-0.0564
Year Dummy (Base: 1995)					
1996	0.0224 ***	0.0257 **	0.0239 *	-0.0033	0.0679 ***
1997	-0.0112	0.0067	0.0137	-0.0195	0.0083
1998	-0.0265 ***	-0.0040	0.0030	-0.0316	-0.0013
1999	-0.0071	-0.0068	0.0002	-0.0155	-0.0167
2000	0.0002	-0.0216 *	-0.0156	-0.0202	-0.0367
2001	-0.0022	-0.0191	-0.0115	-0.0071	-0.0486
2002	0.0145 **	0.0086	0.0232	-0.0139	-0.0073
2003	0.0315 ***	0.0459 ***	0.0605 ***	0.0530	-0.0080
2004	0.015 **	0.0150	0.0358 **	0.0119	-0.0533
2005	0.0044	-0.0111	0.0095	-0.0242	-0.0660
Constant	-1.0802 ***	-0.5283 ***	-0.1447	-1.0603 ***	-1.5522 ***
σ_u	0.310	0.286	0.274	0.303	0.261
ρ	0.702	0.620	0.612	0.613	0.625
No. of persons	6,587	1,976	1,265	532	339
No. of observations	29,379	9,069	5,594	1,940	1,535

Stars denote significance on the 1 percent level (***), 5 percent level (**) and 10 percent level (*).

^a Medium-skilled are people with completed professional training.

^b High-skilled are people with advanced technical college or university degree.

^c North contains the Federal Laender of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre are the federal Laender North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South comprises Hesse, Bavaria and Baden-Wuerttemberg.

Table 5.A2: Estimation Results: Females

	Native Germans		People with migration background thereof:		
			Foreigners	with German citizenship	German resettler
Age	0.1375 ***	0.1001 ***	0.0901 ***	0.1343 ***	0.1029 ***
Age (squared)	-0.0015 ***	-0.0011 ***	-0.0010 ***	-0.0015 ***	-0.0011 ***
Education (Base: Low-skilled)					
Medium-skilled ^a	2.1254 ***	1.5228 ***	1.4413 ***	1.9661 ***	1.6138 ***
High-skilled ^b	1.1141 ***	1.0879 ***	0.7360 *	2.0245 ***	0.6693
Interaction with age					
Medium-skilled x Age	-0.0957 ***	-0.0610 ***	-0.0584 ***	-0.0847 ***	-0.0700 ***
High-skilled x Age	-0.0412 ***	-0.0409 ***	-0.0211	-0.0865 ***	-0.0277
Interaction with age (squared)					
Medium-skilled x Age(squared)	0.0011 ***	0.0006 ***	0.0006 ***	0.0009 ***	0.0008 ***
High-skilled x Age(squared)	0.0005 ***	0.0005 ***	0.0002	0.0010 ***	0.0004
Economic Sectors (Base: Industry)					
Agriculture	-0.1266 ***	0.0517	-0.0020	-0.2662	0.2785 **
Transportation	-0.0294 **	-0.0061	-0.0107	-0.0056	-0.015
Construction	0.0031	0.0179	0.0129	-0.0162	0.0100
Trading services	-0.0592 ***	-0.0551 ***	-0.0542 ***	-0.0912 **	-0.0511
Social services and health	0.0285 ***	0.0137	-0.0307	0.0437	0.0595
Self-employment	-0.0277 **	0.0317	0.0870 **	0.0636	-0.3940 ***
Part-time work	-0.0002	0.0134	0.0100	0.0241	0.0204
Time of residence in Germany		0.0141 ***	0.0111 ***	0.0156 ***	0.0464 ***
Time of residence in Germany (squared)		-0.0001 ***	-0.0001 *	-0.0001 *	-0.0007 ***
Region ^c (Base: South)					
North	-0.0286 **	-0.0797 ***	-0.0792 **	-0.0756 *	-0.0894 *
Centre	-0.0242 **	-0.0737 ***	-0.0558 **	-0.1042 **	-0.0472
Year Dummy (Base: 1995)					
1996	0.0200 **	0.0201	0.0516 ***	0.0210	-0.0962 **
1997	0.0080	0.0042	0.0030	0.0344	-0.0583
1998	0.0219 **	0.0052	0.0261	-0.0271	-0.0956 ***
1999	0.0304 ***	0.0191	0.0453 **	0.0119	-0.1350 ***
2000	0.0279 ***	0.0204	0.0293	0.0513	-0.1268 ***
2001	0.0196 **	0.0210	0.0399 *	0.0454	-0.1525 ***
2002	0.0604 ***	0.0569 ***	0.0757 ***	0.0827 *	-0.1397 ***
2003	0.0733 ***	0.0573 ***	0.0661 ***	0.1038 **	-0.1653 ***
2004	0.0781 ***	0.0570 ***	0.0672 ***	0.0710	-0.1452 **
2005	0.0739 ***	0.0288	0.0174	0.0623	-0.1608 ***
Constant	-0.7225 ***	-0.2777 ***	-0.0509	-0.9242 ***	-0.4206 *
σ_u	0.339	0.298	0.311	0.280	0.277
ρ	0.664	0.607	0.648	0.552	0.575
No. of persons	5,937	1,504	889	442	298
No. of observations	24,324	6,183	3,452	1,510	1,221

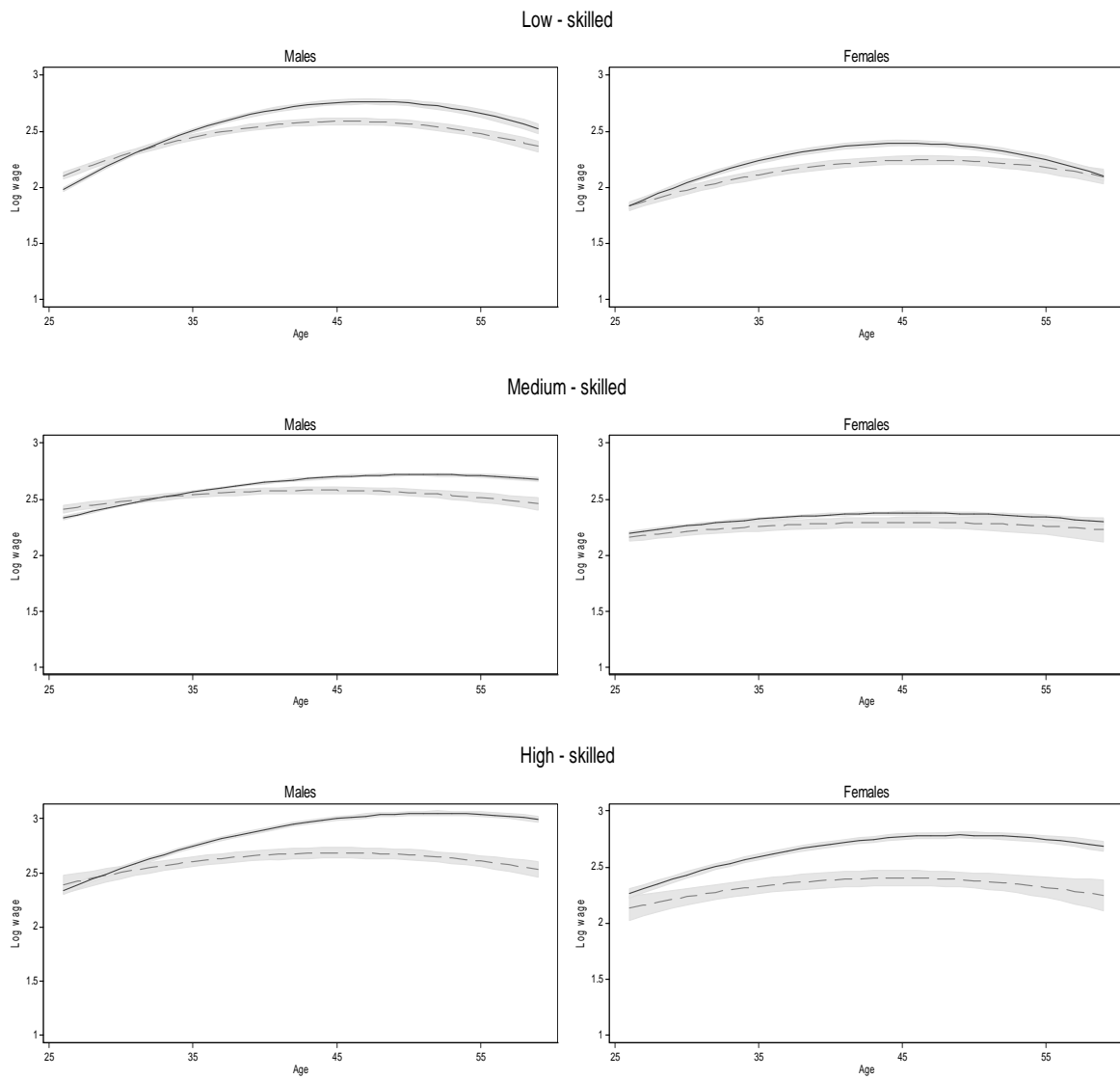
Stars denote significance on the 1 percent level (***), 5 percent level (**) and 10 percent level (*).

^a Medium-skilled are people with completed professional training.

^b High-skilled are people with advanced technical college or university degree.

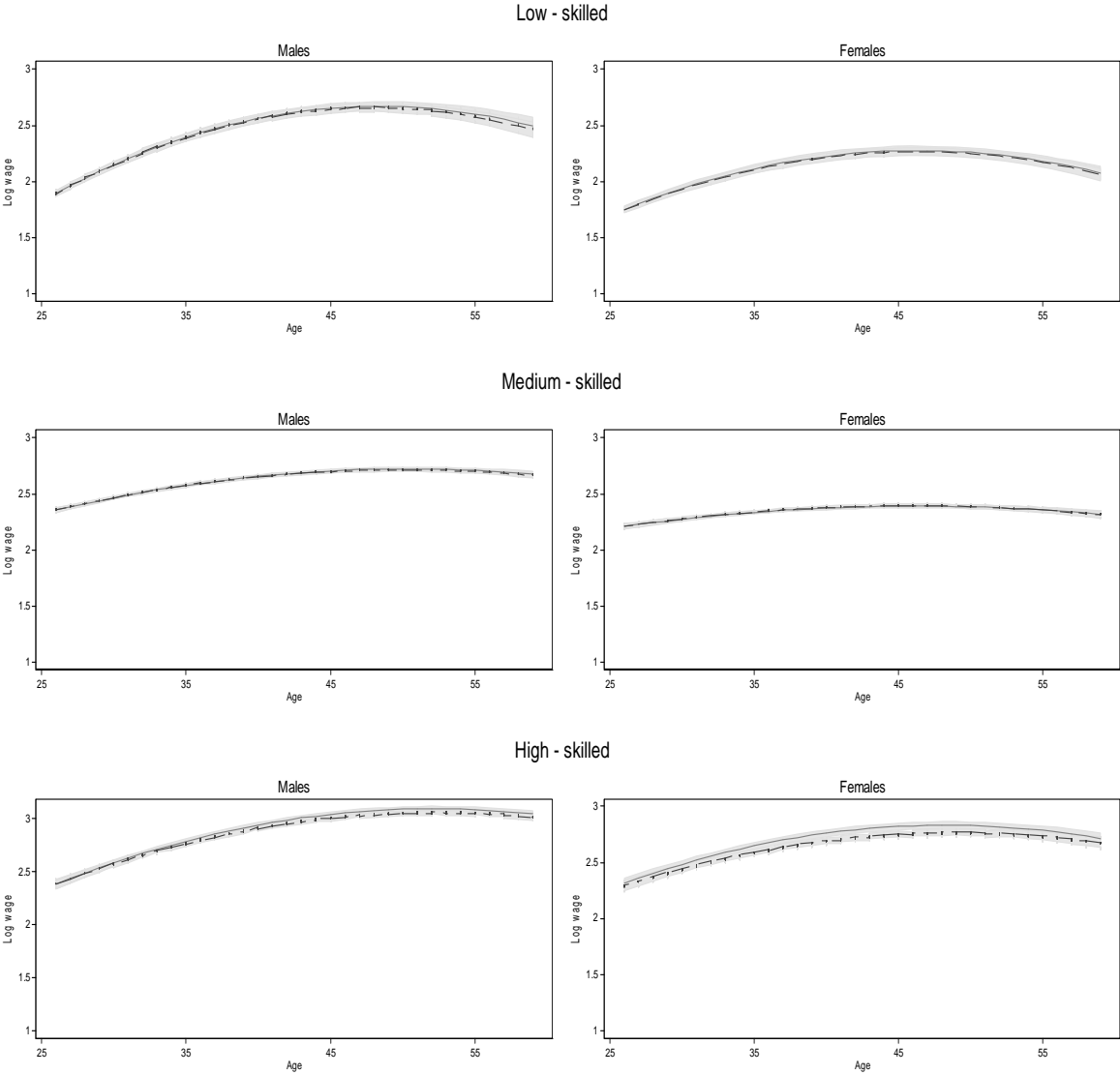
^c North contains the Federal Laender of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre are the federal Laender North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South comprises Hesse, Bavaria and Baden-Wuerttemberg.

Figure 5.A1: Wage Profiles: Native Germans vs. Foreigners



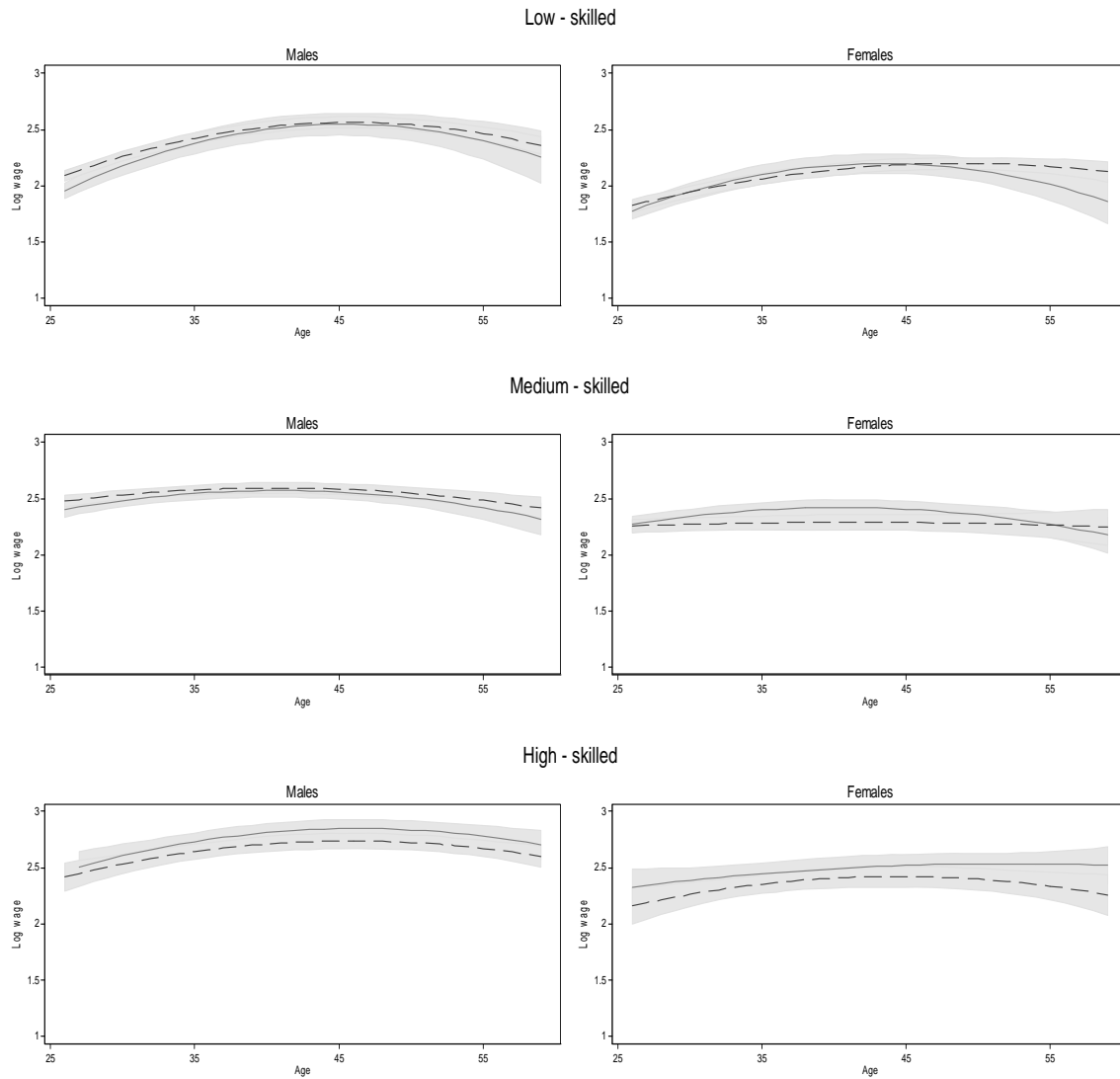
Solid line (-) refers to native Germans, dashed line (- -) refers to foreigners. 95 percent confidence limits are shaded grey.

Figure 5.A2: Wage Profiles: Native Germans vs. German Citizens (2000-2005 Panel)



Solid line (-) refers to native Germans, dashed line (- -) refers to German citizen. 95 percent confidence limits are shaded grey.

Figure 5.A3: Wage Profiles: German Citizen with Migration Background vs. Foreigners (2000-2005 Panel)



Solid line (-) refers to German citizen with migration background, dashed line (- -) refers to foreigners. 95 percent confidence limits are shaded grey.

6. The Immigrant Wage Gap in Germany

This part is joint work with Alisher Aldashev and Stephan L. Thomsen and is published in a former version as ZEW Discussion Paper 08-089.

Abstract: Immigrants consist of foreigners and naturalized immigrants. Based on data from the SOEP, we decompose the wage gap between each of these two groups and natives in Germany. To consider unequal sets of variables in the estimation, we provide an extension of the Oaxaca-Blinder decomposition technique. The results show a substantial gap in earnings for both immigrants' groups compared to natives mainly driven by “price effects”. Discarding immigrants who completed education abroad reduces much of the immigrants’ wage gap. Hence, educational attainment in Germany is an important component of economic integration of immigrants and degrees obtained abroad are valued less.

Keywords: Immigration, Wage Gap, Decomposition, Educational Attainment, Germany, SOEP.

JEL-classification: J61, J31, J15

Acknowledgements: The paper has benefited from discussion at seminars at ZEW and University of Dortmund. We would like to thank Johannes Ludsteck for his valuable comments. The paper is part of the ZEW project “Returns to Education and Wage Inequality for Persons with Migration Background in Germany”. Stephan L. Thomsen thanks for financial support from the Stifterverband für die Deutsche Wissenschaft (Claussen-Simon-Stiftung). Alisher Aldashev and Johannes Gernandt gratefully acknowledge support from the German Research Foundation under grants PF 331/ 2 & 4 (“Microeconomic Methods to Assess Heterogeneous Returns to Education”).

6.1 Introduction

Immigrant-native wage differentials exist in many countries. For example, Adsera and Chiswick (2007) show that differences in earnings of immigrants relative to natives of the same gender vary widely across countries, e.g. from about 12% (6%) for non-EU men (women) in Germany to 81% (69%) in Sweden. In a study for the Netherlands, Kee (1995) reports observed wage differences between native Dutch males and Antilleans (11.8%), Surinamese (22.9%), Turks (36.9%), and Moroccans (42.9%). Starting with Chiswick (1978)

the initial differences in earnings at time of migration and the possible convergence of immigrants' earnings have been studied for various countries; comprehensive overviews are provided by Altonji and Blank (1999) and Borjas (1994). It is important to analyse the wage gap in detail to be able to identify whether the differentials are due to differences in human capital endowment that could be mitigated by training, schooling, etc., or due to unobserved influences comprising cultural identity or ethnic discrimination.

For Germany, earnings' differentials have been analysed in a number of studies. In an early paper for the year 1989 based on register data of the Institute of Employment Research (Institut für Arbeitsmarkt und Berufsforschung), Velling (1995) analyses the immigrant-native wage gap in Germany considering immigrants with a foreign citizenship. His results show that much of the observable difference in earnings could be attributed to differences in human capital. Differences in wages have also been analysed based on data from the German Socio-Economic Panel (SOEP), for example by Constant and Massey (2005), Lang (2005), Peters (2008) or Riphahn (2003). Similar to Velling (1995), Constant and Massey (2005), Peters (2008) and Riphahn (2003), consider only foreigners as the immigrant population. The results of Constant and Massey (2005) show that much of the differential could be attributed to initial occupational segmentation, but there is also a significant ethnic discrimination in the process of occupational attainment. Moreover, by using longitudinal information they establish a convergence in immigrants' earnings after 23 years of residence in Germany. Peters (2008) decomposes the immigrant-native wage gap using quantile regression techniques. In contrast to the earlier studies, his results show an increase in the native-immigrant wage gap mainly due to coefficient effects. In the study of Lang (2005), the difference between wages and the wage potential of immigrants is analysed. He uses a wider definition of the immigrant population than the other studies covering ethnic Germans as well. However, he pools the different groups of immigrants in the analysis although differences between ethnic Germans and foreigners may exist. In addition, naturalized immigrants are contained in the group of natives. His results show that convergence in earnings is achieved after 17 years of residence.

Except Lang (2005), the studies for Germany take account of foreigners only; such approximation is reasonable if immigrants have a high probability to keep the citizenship of their home country, or, put it in other words, naturalization is not very likely. However, the immigrant population in Germany is characterized by an increasing share of naturalized immigrants (almost 10% of the population living in Germany, Statistisches Bundesamt,

2007). Therefore regarding only foreigners as immigrants could lead to biased estimates since a substantial share of immigrants are considered as Germans.

The study at hand extends the knowledge about the immigrant-wage gap in Germany in two important directions: First, we explicitly distinguish foreigners and naturalized immigrants in the analysis. Therefore, we provide the first empirical evidence on the immigrant-native wage differential for the latter group. The results are important as they provide information on the relative economic position of this group, i.e. whether the naturalized immigrants are more similar to foreigners or to native Germans. Second, a possible reason for an immigrant-native wage gap could be the imperfect international transferability of human capital and a less successful job matching of the immigrants, see Blackaby et al. (2002), Chiswick and Miller (2009) or Constant and Massey (2005) among others.⁵¹ For that reasons, even formally equivalently qualified workers may earn less than natives. If a part of the wage gap is determined by the imperfect transferability of human capital, one could expect a reduction of the differential when considering immigrants who completed education in Germany. To evaluate the extent of this cause, we estimate a separate decomposition regarding only persons who completed education in Germany.

To analyse the wage differential we apply a variant of the Oaxaca (1973) - Blinder (1973) - decomposition. As time of residence is important for convergence of immigrants' earnings it should be considered in the estimation. For the decomposition, however, this results in unequal sets of covariates for immigrants and natives since natives' time of residence is equal to age and hence it could neither be regarded in the estimation of the earnings' equation nor in the decomposition for this group. To deal with this issue, we therefore provide a methodological extension of the decomposition to account for unequal numbers of regressors and the necessary correction of the decomposition variance-covariance matrix in this paper.

By explicitly regarding two immigrant groups (foreigners and naturalized immigrants), our estimates clearly establish the existence of an immigrant-native wage gap independently of citizenship. The gap is of similar size for both groups, but a bit more pronounced for naturalized immigrants. It persists despite similarity in other characteristics like age, employment type, economic sector, place of residence or formal education. This finding has two important implications: Naturalization is not necessarily related to assimilation and economic integration of immigrants. With regard to the economic situation, naturalized

⁵¹ Blackaby et al. (2002) report rates of return ranging from 0.028 for years of schooling abroad to 0.052 for schooling in the UK for black males.

immigrants are more similar to foreigners than to native Germans. The results of the estimations of the immigrant-wage gap considering persons with an educational attainment in Germany show a strong reduction of the wage gap. This indicates that imperfect transferability of human capital plays an important role in explaining the immigrant wage gap. From a methodological perspective, the small difference in the results for both immigrant groups could be viewed to partly support the usage of citizenship to approximate immigration that is common in the empirical literature for Germany so far. However, the accuracy of this proxy is limited: On the one hand, the reference group (i.e. Germans) contains the group of naturalized immigrants as well. On the other hand, the ongoing demographic change will make a frequent re-calibration of the proxy necessary.

The paper is organized as follows: The next section describes the situation of immigration to Germany that motivates the distinction of foreigners and naturalized immigrants when analysing the immigrant-native wage gap. Section 6.3 provides details on the SOEP data used for the empirical analysis. The econometric methodology with the extension of the decomposition method is introduced in section 6.4. The results of the empirical analysis are presented in section 6.5. Finally, the last section summarizes the findings.

6.2 Immigration to Germany

Since the Second World War until recently, Germany experienced continuing immigration that could be characterized by four movements according to Dustmann and van Soest (2002). Whereas the first of these movements between 1945 and 1960 was characterized by the after-war's effects with a strong East-West migration of native Germans, the second movement was economically motivated. Starting in the mid 1950s, Germany experienced a strong boom of the economy associated with a shortage of low-skilled labour. For this reason, in contrast to traditional immigration countries, like the U.S. or Australia, Germany adopted a rather ad-hoc immigration policy that centred predominantly on recruitment of temporary workers (Bauer et al., 2007). The main inflow of immigrants arrived from Southern European countries, Turkey, and North Africa. At the turning point of the economic development in the early 1970s earmarked by the oil-price shock in 1973, Germany's government stopped actively recruiting foreign workers. Although Germany's immigration policy was initially considered as temporary, a substantial share of the immigrants decided to stay permanently (Schmidt and Zimmermann, 1992). The third movement starting after 1973 is characterized by family immigration and family reunification (as well as asylum migration). Due to quite strict laws

on naturalization until 2000, most of the immigrants did not receive German citizenship. Over the years, the number of foreigners living in Germany has been constantly increasing from 686.000 in 1961 to 2.7 million in 1970, 5.6 million in 1990, reaching 7.3 million in 2006 (Bundesamt für Migration und Flüchtlinge, 2008). In 2000, a new naturalization law was passed in Germany which relaxed barriers to naturalization. From 2000 to 2006 more than 1 million foreigners became German citizens. The fourth movement was caused by the changes in the political situation of Europe in the late 1980s that resulted in a strong increase of immigrants to Germany, namely refugees and ethnic Germans from Eastern European countries. Whereas refugees had only limited access to the labour market, ethnic Germans received German citizenship at the time or shortly after immigration to Germany. From 1990 to 2006 about 2.5 million ethnic Germans immigrated, with the peak in the early 1990s and sharply decreasing afterwards.⁵²

Associated with the movements, the fraction of immigrants' descendants who were born in Germany has also increased over the last decades and affected the share of naturalized immigrants in particular. In 2005, one fifth of the population had an immigration background, i.e. they had immigrated to Germany themselves or were descendants of former immigrants. But, less than half of these people possessed foreign citizenship (about 47%, Statistisches Bundesamt, 2007). It becomes obvious that immigration is an important issue for Germany. Schmidt and Zimmermann (1992) have shown that Germany experienced more immigration per capita than the U.S. in almost all years after the Second World War. However, in particular the rising share of naturalized immigrants should be regarded when analysing issues of immigration. Given the present situation, approximation of an immigration background by citizenship seems to be quite imprecise.

6.3 Data and Descriptives

For the empirical analysis, we use the 2005 wave of the SOEP data. Started in 1984, the SOEP is a representative longitudinal study of almost 12,000 private households with more than 21,000 persons in Germany.⁵³ The comprehensive set of socio-demographic variables included in the SOEP allows to identify whether the person herself or one of her parents immigrated to Germany (immigration background). To identify these persons, we use information on citizenship, country of origin and year of immigration to Germany of the

⁵² The rules for the admission of ethnic Germans were tightened after that peak; in 2007 only 5,792 persons arrived (Bundesamt für Migration und Flüchtlinge, 2008).

⁵³ See Haisken-DeNew and Frick (2005) and Wagner et al. (2007) for a detailed description.

person. In addition, we are able to identify the parents of an individual if they have participated in any of the SOEP waves since 1984. In these cases, we merge parental data with those of the individual.

We define three groups considered in the analysis as follows: First, foreigners are all persons who possess a non-German citizenship in 2005. Second, naturalized immigrants are naturalized former foreigners or ethnic Germans and their dependents (who are naturalized by law). Finally, the remaining persons are defined as native Germans.

For homogeneity reasons, we impose some restrictions on our sample. We exclude second-generation immigrants, i.e. descendants of immigrants who were born in Germany.⁵⁴ The study is limited to West Germany because the number of immigrants in East Germany is very small. In addition, only employed persons aged 15 to 65 who report a wage are considered. The outcome variable (gross hourly wage) is obtained for all workers including the self-employed by dividing the gross wage in the month prior to the interview by the reported working hours of the last week that are extrapolated to monthly hours.

The final sample contains 3,035 (2,810) native German males (females), 300 (231) male (female) foreigners and 260 (252) naturalized male (female) immigrants. Table 6.1 provides some descriptive statistics by gender. Starting with the gross hourly wage, natives earn on average more than both immigrant groups irrespective of gender. With respect to variables expected to affect the wage, time of residence may affect individual's wage due to assimilation effects (see e.g. Constant and Massey, 2005 or Lang, 2005). Immigrants who reside in the destination country long enough may have a better command of the language and may be more accustomed to the country which in turn can affect productivity (see e.g. Aldashev et al., 2009; Chiswick and Miller, 2007). The descriptives show that the time of residence of foreigners is longer on average than of naturalized immigrants. The main reason may be that the latter group encompasses ethnic Germans who mainly arrived in the late 1980s to early 1990s.

⁵⁴ One could argue that second-generation immigrants could be systematically different from the first generation. First, they are younger. Second, being born in Germany, they may be more familiar with the language, cultural values, etc. However, due to a small number of observations it is difficult to conduct a separate analysis for this group.

Table 6.1: Means of Selected Characteristics

	Males			Females		
	Natives	Foreigners	Naturalized	Natives	Foreigners	Naturalized
Hourly Wage	16.23	14.72	14.01	12.76	10.51	11.04
Age	41.98	43.16	41.48	41.16	43.03	41.79
Time of residence	-	27.34	21.36	-	26.06	21.80
Part-time work	0.04	0.07	0.06	0.42	0.42	0.42
Self-employment	0.09	0.06	0.05	0.06	0.03	0.02
Education						
Low-skilled	0.12	0.35	0.18	0.14	0.52	0.27
Medium-skilled	0.63	0.45	0.48	0.65	0.27	0.41
High-skilled	0.25	0.20	0.34	0.20	0.20	0.32
Out of which completed in Germany	-	0.71	0.74	-	0.55	0.76
Economic Sectors						
Agriculture	0.02	0.03	0.03	0.01	0.00	0.00
Industry	0.32	0.54	0.58	0.14	0.30	0.19
Transportation	0.08	0.08	0.07	0.05	0.03	0.06
Construction	0.09	0.08	0.05	0.01	0.01	0.01
Trading services	0.27	0.22	0.19	0.37	0.40	0.36
Social services and health	0.22	0.06	0.08	0.42	0.26	0.38
Region^a						
North	0.20	0.13	0.21	0.21	0.11	0.20
Centre	0.34	0.29	0.42	0.33	0.26	0.40
South	0.46	0.57	0.37	0.45	0.62	0.40
No. of observations	3,035	300	260	2,810	231	252

^a North contains the Federal Laender of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre are the Federal Laender North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South comprises Hessen, Bavaria and Baden-Wuerttemberg.

Education is considered in three levels. People without a formal professional training are regarded as low-skilled, persons with professional training are medium-skilled, and those with college or university degree are the high-skilled. The raw descriptives show that the share of low-educated is clearly higher in both immigrant groups. In contrast, the largest share of formally high-skilled could be observed in the group of naturalized immigrants. The majority of the immigrants in the sample completed their education in Germany (between 55, female foreigners, and 76 percent, naturalized females). Naturalized immigrants have the largest shares of persons with German education. Given the skills' composition of the two immigrants' groups, one would expect foreigners to be paid less on average than naturalized immigrants. However, taking a look at the average hourly wage for males shows that this is not the case.

6.4 Methodology

To quantify underlying causes of the wage differences between the natives and each of the two immigrants' groups, we apply a variant of the Blinder (1973) - Oaxaca (1973) - decomposition technique suggested by Daymont and Andrisani (1984). The basic idea is that

differences in wages could be explained by differences in characteristics (endowments) and by different returns to characteristics (coefficients) of groups. Daymont and Andrisani (1984) augment the decomposition equation by an interaction term capturing the perception of past discrimination (threefold-decomposition). Considering two arbitrary groups N and I (with N denoting natives and I denoting the immigrant group of interest respectively), the individual wage equation for each group is

$$(6.1) \quad Y_{ij} = X_{ij}\beta_j + \varepsilon_{ij}, \quad j = N, I,$$

where Y_{ij} is the log hourly wage of individual i of group j , X_{ij} is a vector of individual characteristics, β_j is the vector of the corresponding coefficients for group j and ε_{ij} is the residual.

The threefold decomposition is then

$$(6.2) \quad \bar{Y}^N - \bar{Y}^I = (\bar{X}^N - \bar{X}^I)\beta^I + \bar{X}^I(\beta^N - \beta^I) + (\bar{X}^N - \bar{X}^I)(\beta^N - \beta^I),$$

where the “bar” denotes the sample averages. The first term on the right hand side captures differences in wages due to characteristics (endowment effect), the second term are differences in the coefficients (price effect). The last term is the interaction effect, i.e. a positive interaction effect implies that the returns of the natives (N) tend to be greater for those characteristics for which the natives have higher means and vice versa.

For the estimation of the earnings’ regressions, we consider the effects of age, age squared, three skill levels, dummy variables for industry, dummy variables for part-time and self-employment and regional dummy variables.⁵⁵ Moreover, interactions between the skill levels and age (and age squared) are considered. Since we use cross-section data for the analysis, we have to consider possible effects of the dynamics of immigration over time. If this is not regarded, estimated effects may misguide interpretation. To mitigate the problem, cohort effects could be considered, as discussed by Borjas (1985, 1994). Therefore, we distinguish four birth cohorts in the analyses: born before 1950, 1950-59, 1960-69, and after 1970. In addition, we include time of residence (and its square) in the wage equations of foreigners and naturalized immigrants. For naturalized immigrants and foreigners time of residence in

⁵⁵ A further variable of interest could be tenure. As shown in chapter 2, tenure may have a potential influence on wages. We tried to add this variable but draw back because there are some shortcomings in the data concerning persons with migration background where we observe implausible high levels of tenure.

Germany is a potentially important factor affecting wages as it might proxy assimilation and integration of immigrants (Chiswick (1978) advocated the Immigrant Assimilation Hypothesis).⁵⁶

For native Germans time of residence is indistinguishable from age and therefore does not enter the wage regression. Due to this, the wage equation of natives contains fewer covariates. This entails a tricky part about the decomposition of the wage gap between natives and immigrants as the sets of covariates for the groups are unequal. One could in principle disregard the time of residence variable guaranteeing that the wage regression for each group contains the same set of variables. In fact, the total wage gap is thereby unaffected. However, excluding this variable leads to an omitted variable bias, which affects the coefficients in the wage regression. As a result the decomposition of the total wage gap into price and endowment components would be biased. This will give misleading conclusions as to whether the differential is caused by differences in the endowment composition or remuneration. Blackaby et al. (2002) for example analyse the wage gap between ethnic groups/races. They pool foreign and native whites together thereby guaranteeing that the arrival year is not always equal the birth year within the group. However, this approach would not work if one of the interest groups are German born natives and the other groups are foreigners or naturalized immigrants who were born outside of Germany. In this case, the problem of unequal set of covariates remains. To address the problem adequately, we modify the Oaxaca (1973) - Blinder (1973) - decomposition as follows.

Let the wage equation of the native Germans (reference group) be

$$(6.3) \quad Y^N = \beta_0^N + X^N \beta^N + \varepsilon^N,$$

where β_0 denotes the coefficient of the constant and X is the matrix of the covariates considered in the estimation. For each of the two immigrant groups, the corresponding wage equation is given by:

$$(6.4) \quad Y^I = \beta_0^I + X^I \beta^I + Z\gamma + \varepsilon^I,$$

⁵⁶ In an early study, Licht and Steiner (1994) test this hypothesis for Germany distinguishing foreigners who stay temporarily and permanently in Germany. Their results tend to reject the assimilation hypothesis. However, one could expect naturalization to be more correlated with assimilation than the decision to stay permanently. On the other hand, later studies like Blackaby et al. (2002) report that the year of arrival contributes substantially to the wage gap between the whites and ethnic minorities in the UK.

with Z denoting time of residence and its square and γ as the corresponding vector of coefficients. If we estimate equation (6.4) we obtain $E(Y^I | X^I) = \hat{\beta}_0^I + X^I \hat{\beta}^I + Z \hat{\gamma}$. Given the estimated coefficient vector $\hat{\beta}^I$, we reestimate

$$(6.5) \quad Y^I = \delta_0 + X^I \beta^I + \zeta, \text{ s.t. } \beta^I = \hat{\beta}^I.$$

Since

$$(6.6) \quad E(Y^I) = \hat{\beta}_0^I + \bar{X}^I \hat{\beta}^I + \bar{Z} \hat{\gamma} = \hat{\delta}_0 + \bar{X}^I \hat{\beta}^I,$$

the constant term δ_0 in equation (6.5) captures the effect of average time of residence (and its square) on wages. As a result, in the decomposition the endowment effect would capture the differences in the covariates excluding time of residence and time of residence (squared), and the average effects of these variables are included in the price effect.

To summarize, the decomposition procedure applied comprises the following steps. First, we regress wages of foreigners or naturalized immigrants on the set of covariates X and Z . This produces the estimates of the coefficients β , γ , and the constant term β_0^I . In the second step, a constrained regression of wages on X only is estimated, with the vector β^I restricted to the values obtained in step one (as in equation (6.5)). The new constant term in the constrained regression is then δ_0 . It should be noted that since β^I was imposed as a constraint, the variance-covariance matrix of β^I is zero by definition. Hence, to make meaningful inferences one has to modify the variance-covariance matrix of the coefficient vector.

The variance-covariance matrix of the coefficient vector of the equation $Y = \beta_0 + X\beta + Z\gamma + \varepsilon$ (suppressing the superscript I to save notation) is of the form:

$$(6.7) \quad \begin{pmatrix} \text{var}(\gamma) & & & & \\ \text{cov}(\gamma, \beta_i) & \text{var}(\beta_i) & & & \\ \vdots & \vdots & \ddots & & \\ \text{cov}(\gamma, \beta_k) & \text{cov}(\beta_i, \beta_k) & \cdots & \text{var}(\beta_k) & \\ \text{cov}(\gamma, \beta_0) & \text{cov}(\beta_i, \beta_0) & \cdots & \text{cov}(\beta_k, \beta_0) & \text{var}(\beta_0) \end{pmatrix}$$

The variance-covariance matrix of the coefficient vector of the equation $Y = \delta_0 + X\beta + \zeta$ is

very similar. In fact, all elements except for the first and last rows and columns are identical. Thus, we need to trim the first row and column, i.e. coefficients corresponding to a variable which enters only the equation for immigrants. The last row and column, i.e. elements corresponding to the constant term have to be changed. Knowing that $\hat{\delta}_0 = \bar{Z}\hat{\gamma} + \hat{\beta}_0$ we could calculate the variance and covariance terms corresponding to δ_0 . For example:

$$(6.8) \quad \text{var}(\delta_0) = \bar{Z}^2 \text{var}(\gamma) + \text{var}(\beta_0) + 2\bar{Z} \text{cov}(\gamma, \beta_0),$$

and

$$(6.9) \quad \text{cov}(\delta_0, \beta_i) = \text{cov}(\beta_0, \beta_i) + \bar{Z} \text{cov}(\gamma, \beta_i).$$

These can be calculated from the elements of the first and last rows and columns of the original variance-covariance matrix. Having constructed the variance-covariance matrix of the coefficient vector one could estimate standard errors of the decomposition terms in a straightforward way (see e.g. Jann (2008) for further details).

6.5 Empirical Findings

In this section, we will first analyse the immigrant wage gap in Germany distinguishing foreigners and naturalized immigrants as the two immigrant groups. However, as mentioned above, differences with respect to the place where education is obtained may play a role. Therefore, in a second step we will decompose the gap for persons with education in Germany only.

The results of the decomposition of the wage gap between the two immigrant groups and the natives are given in the upper panel of Table 6.2. The corresponding coefficient estimates of the underlying wage equations are in line with expectations and are not discussed here (see Table 6.A1 in appendix). It becomes obvious that the predicted wage gap between foreigners and natives is quite substantial with 9.1% (men) and 18.7% (women). About one third of the gap (32%) for men can be explained by differences in endowments, but the estimate is statistically insignificant. Differences in endowments do not explain the wage gap of foreign women either; here, the price effect accounts for about 90% of the gap. The wage differential between natives and immigrants is mainly driven by price effects. However, this price effect should not necessarily be dubbed “discriminatory”. The price effect of the wage gap could

well stem from the differences in unobserved characteristics.

Table 6.2: Decomposition of Log Real Gross Hourly Wage

	Foreigners		Naturalized Immigrants	
	Males	Females	Males	Females
Full Sample				
Predicted difference	0.091***	0.187***	0.112***	0.120***
Endowment effect	0.029 (32%)	0.017 (10%)	-0.040 (-36%)	0.017 (14%)
Price effect	0.112*** (123%)	0.154*** (87%)	0.169*** (151%)	0.143*** (119%)
Interaction effect	-0.051 (-56%)	0.007 (4%)	-0.017 (-15%)	-0.040 (-33%)
Education in Germany				
Predicted difference	0.022	0.124*	0.088*	0.096*
Endowment effect	0.030 (136%)	0.058 (47%)	-0.029 (-32%)	0.033 (34%)
Price effect	0.054 (243%)	0.110* (89%)	0.094 (107%)	0.071 (74%)
Interaction effect	-0.062* (-280%)	-0.044 (-35%)	0.022 (25%)	-0.008 (-8%)

Reference Group: Native Germans.

Stars denote significance on 1%-level (***), 5%-level (**) and 10%-level (*).

Covariates considered in the estimation are: age, age squared, three skill levels, dummy variables for industry, dummy variables for part-time and self-employment, regional dummy variables, terms for the interaction between skill levels and age (and age squared). Birth cohorts are considered: born before 1950, 1950-59, 1960-69 and after 1970. Time of residence (and its square) is considered for the immigrant groups only. See text for details.

The results for naturalized immigrants differ somewhat from the results for foreigners. Again, the wage gap with respect to native Germans is substantial with 11.2% (men) and 12.0% (women). Thus, naturalized male immigrants are even worse off than foreign men. Again, differences in endowments do not contribute significantly to the wage gap of naturalized male immigrants. For women we observe a different picture. Here the wage gap between naturalized immigrants and natives is smaller than between foreigners and natives. Similar to the wage gap between foreigners and natives, price effects are important for the naturalized immigrants independently of gender. In the latter group, the price effect of the gap is even larger.

The low endowment effect remains stable irrespective of which wave we used (we have also redone the same analysis using the waves 2002, 2003, and 2004). This is different to the results obtained by Kee (1995) for the Netherlands. He establishes a discrimination share of 35% for the wage gap between native Dutch and migrants from the Antilles and 15% for migrants from Turkey while the gap is nearly completely explained by differences in endowments for Surinamese and Moroccans. In contrast to that and similar to our findings, Blackaby et al. (2002) found for the UK that the wage gap between the whites and ethnic

minorities is mostly driven by the price effect. A similar result is established by Peters (2008) for Germany. His comprehensive decomposition analysis does not reveal any significant endowment effect either. The low endowment effect may still look somewhat surprising given clear differences in certain characteristics like for example education level which are plain to see from Table 6.1. It implies that if immigrants are disadvantaged in certain characteristics (like education) than they should have an advantage in other characteristics; for example, immigrants are more concentrated in the South of Germany, where wages are on average higher. So in the end these effects are balanced out causing a low endowment effect. Following this logic, if we had only education level as a regressor in the wage equation we should get a larger endowment effect because of the differences in education between the groups. We did this exercise and obtained larger and statistically significant endowment effects as expected.

From the results presented so far it becomes obvious that immigrants are paid less than natives for observationally equivalent characteristics irrespective of citizenship. Some important implications of these findings should be emphasized. First, evidence for the expected economic integration of naturalized immigrants could not be established from the data. On the contrary, the results tend to show a larger wage gap for naturalized immigrant males compared to that of foreign men. Consequently, analysing the native-immigrant wage gap based on citizenship alone leads to an underestimation of the true gap. In that case, the average wage of the reference group (native Germans) would be downward biased, because it is the mean of native Germans' and naturalized immigrants' wages, where the latter group makes up about 10% of the population living in Germany.

Besides discrimination, a further reason for differences in the valuation of endowments may be that observationally equivalent educational degrees attained in different countries are not necessarily comparable.⁵⁷ Even if contents of education are comparable, skills acquired may be not applicable in the destination country for different reasons, e.g. a lack of demand or differences in technology. Thus, immigrants may be less able than natives to transfer their human capital (measured by the degree obtained) into good jobs or that the value of human capital differs with regard to educational attainment in Germany or abroad. For example, Chiswick and Miller (2009) note an imperfect transferability of skills acquired on the job through formal schooling in the country of origin and that the earnings increments (in a human capital-earnings-function) associated with pre-immigration labour market experience

⁵⁷ Blackaby et al. (2002) report substantial differences between rates of return to schooling in the UK and abroad.

are only very modest for the U.S. To analyse the value of educational attainment we redo the analysis regarding only persons who completed their education in Germany. The share of immigrants who completed their education in Germany is more than 70% (except for foreign females with about 55%), see Table 6.1. The results of the decomposition are presented in the lower panel of Table 6.2.⁵⁸

It becomes clear that the wage gap shrinks significantly for foreigners⁵⁹ compared to the results of the full sample. The earnings' differential for foreign males is reduced by about 7 percentage points from 9.1% down to 2.2%. The predicted wage gap for naturalized immigrants drops, too, if one considers persons with educational attainment in Germany only. In this group, the negative (but insignificant) endowment effect for males should be noted which means that naturalized immigrants have more favourable labour market characteristics than the reference group. Hence, one would expect that they earn higher wages than the reference group. However, their worse wage position implies that the more favourable characteristics are overcrowded by price effects. It indicates that this group would have earned more than the natives had the remuneration been the same.

6.6 Conclusion

The paper analyses the wage differentials between native Germans and two immigrant groups: foreigners and naturalized immigrants. To gain more insight into the native-immigrant wage gap we perform the Oaxaca (1973) - Blinder (1973) - decomposition of the wage differential into three effects: endowment, price, and interaction effect. The underlying wage regression for the reference group (native Germans) contains fewer regressors than for the comparison groups. Namely, time of residence being an important factor affecting wages of the immigrant population is indistinguishable from age for the native German population. Therefore, we modify the decomposition technique to account for unequal regressor sets and respective variance-covariance adjustment.

Our decomposition results show that there is a considerable wage gap between immigrants and natives in Germany. Much of the gap is due to the fact that immigrants are paid less than natives for observationally equivalent characteristics. Relative wages of foreigners and naturalized immigrants (with respect to native Germans) do not differ much. Thus, citizenship

⁵⁸ Corresponding coefficient estimates of the underlying wage equations are given in Table 6.A2 in appendix.

⁵⁹ The wage gap is always considered with respect to the reference group, the native German population.

alone does not necessarily guarantee economic integration. However, discarding persons who completed education abroad reduces the wage gap for immigrants. Educational attainment in Germany is thus an important component of economic integration and degrees obtained abroad are valued less in the German labour market.

6.7 References for Chapter 6

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6.8 Appendix to Chapter 6

Table 6.A1: Wage Equation: Estimation Results for Full Sample

	Males			Females		
	Natives	Foreigners	Naturalized	Natives	Foreigners	Naturalized
Time of residence	-	0.0275 ***	-0.0030	-	0.0036	0.0147 *
Time of residence (squared)	-	-0.0003 **	0.0002	-	0.0001	-0.0002
Age	0.1256 ***	0.1024 ***	0.1361 ***	0.1136 ***	0.0285	0.1070 ***
Age (squared)	-0.0012 ***	-0.0011 ***	-0.0016 ***	-0.0011 ***	-0.0001	-0.0011 **
Birth Cohort (Ref. Before 1950)						
1950-1959	0.0309	-0.1422	-0.0284	0.0267	0.1381	0.0133
1960-1969	0.1115 *	-0.1309	0.0565	0.1073	0.3552	0.1553
1970 or later	0.1387 *	-0.0001	0.1025	0.1894 **	0.3962	0.4508
Education (Ref. Low)						
Medium	1.5808 ***	0.7940	1.7407 **	1.3798 ***	-0.1249	0.2006
High	0.8131 **	3.4027 **	1.1158	0.9495 **	1.1338	1.5778
Medium*Age	-0.0649 ***	-0.0300	-0.0866 **	-0.0528 ***	0.0237	-0.0087
High*Age	-0.0210	-0.1410 **	-0.0638	-0.0241	-0.0392	-0.0654
Medium*Age(squared)	0.0007 ***	0.0003	0.0011 **	0.0006 ***	-0.0004	0.0002
High*Age(squared)	0.0003	0.0015 **	0.0009	0.0003	0.0004	0.0007
Economic Sector (Ref. Industry)						
Transportation	-0.1123 ***	-0.2333 ***	-0.2395 ***	-0.0786 *	0.0437	0.0496
Construction	-0.1072 ***	-0.1006	-0.1443	-0.0822	-0.4004	-0.0890
Trading Services	-0.0964 ***	-0.2763 ***	-0.1258 **	-0.1803 ***	-0.1466 **	-0.0788
Social Services and Health	-0.0711 ***	0.1018	-0.1770 *	-0.0126	0.0396	0.0689
Region^a (Ref. South)						
North	-0.0509 ***	0.0239	-0.1132 *	-0.0582 ***	-0.2452 ***	-0.0969
Centre	-0.0097	0.0069	-0.0869 *	-0.0254	-0.0508	-0.0249
Part-time work	-0.1210 ***	-0.2679 ***	-0.1703	-0.0878 **	-0.1591 ***	-0.1022 *
Self-employed	-0.1477 ***	0.2982 ***	0.0944	-0.2070 ***	-0.1416	-0.3050 *
Constant	-0.5311 ***	-0.0642	-0.2811	-0.3648	0.7768	-0.6763
No. of observations	2,717	259	230	2,534	197	236

Stars denote significance on 1%-level (***), 5%-level (**) and 10%-level (*).

^a North contains the Federal Laender of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre are the Federal Laender North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South comprises Hessen, Bavaria and Baden-Wuerttemberg.

Table 6.A2: Wage Equation: Sample with Education in Germany

	Males		Females	
	Foreigners	Naturalized	Foreigners	Naturalized
Time of residence	0.0446 ***	-0.0044	0.0270 *	0.0277 **
Time of residence (squared)	-0.0006 ***	0.0002	-0.0004	-0.0004 **
Age	0.0337	0.1753 ***	0.0261	0.1075 **
Age (squared)	-0.0004	-0.0021 ***	0.0000	-0.0011 *
Birth Cohort (Ref. Before 1950)				
1950-1959	-0.3255 **	-0.1149	-0.1158	-0.0446
1960-1969	-0.3893 *	-0.0523	-0.0550	0.0012
1970 or later	-0.4025	-0.0727	0.0204	0.2728
Education (Ref. Low)				
Medium	-0.6944	2.7346 ***	-0.9191	0.1834
High	1.6411	0.3790	0.5019	2.1110
Medium*Age	0.0441	-0.1372 **	0.0693	-0.0065
High*Age	-0.0542	-0.0284	-0.0118	-0.0799
Medium*Age(squared)	-0.0006	0.0017 **	-0.0010	0.0002
High*Age(squared)	0.0006	0.0006	0.0001	0.0009
Economic Sector (Ref. Industry)				
Transportation	-0.2635 **	-0.2696 ***	0.0545	0.0674
Construction	-0.1069	-0.0904	-0.1117	-0.1034
Trading Services	-0.2356 ***	-0.0934	-0.0331	-0.0360
Social Services and Health	0.0246	-0.2873 **	0.2726 **	0.0705
Region^a (Ref. South)				
North	0.0077	-0.0781	-0.2158 *	-0.0972
Centre	-0.0397	-0.0689	-0.0509	0.0625
Part-time work	0.3644 ***	0.0719	0.1236	-0.3865 **
Self-employed	-0.2289	-0.0580	-0.1556 *	-0.0630
Constant	1.5612	-0.8490	0.8615	-0.7056
No. of observations	160	156	97	171

Stars denote significance on 1%-level (***), 5%-level (**) and 10%-level (*).

^a North contains the Federal Laender of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre are the Federal Laender North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South comprises Hessen, Bavaria and Baden-Wuerttemberg.

7. Language Usage, Participation, Employment and Earnings – Evidence for Foreigners in West Germany with Multiple Sources of Selection

This part is joint work with Alisher Aldashev and Stephan L. Thomsen and is published in *Labour Economics* 16, 330-341.

Abstract: Language proficiency may not only affect the earnings of the individual, but the probability to participate in the labour market or becoming employed as well. It may also affect selection of people into economic sector and occupation. In this paper, the effects of language proficiency on earnings are analysed for foreigners in Germany with joint consideration of up to four types of selection. The results show that language proficiency significantly increases participation and employment probability and affects occupational choice. When selection into economic sector and occupation is regarded, we do not find an impact of language ability on earnings thereby implying an indirect effect.

Keywords: Foreigners, Participation, Employment, Language Ability, Multiple Selection.

JEL-classification: J61, J24, J15, C35

Acknowledgements: The authors thank Juan Dolado, Julia Horstschraer, Erez Siniver, and Thomas Walter for valuable comments and Philipp Eisenhauer, Falco Möller, and Carmen Nagy for their research assistance. The paper has benefited from discussions at the Spring Meeting of Young Economists, Lille, the Conference of Economics and Education, Zurich, the Society of Labor Economists (SOLE) meeting, New York, and the Research Seminar at University Hannover. The paper is part of the ZEW project “Returns to Education and Wage Inequality for Persons with Migration Background in Germany”. Alisher Aldashev and Johannes Gerndt gratefully acknowledge support from the German Research Foundation under grants PF 331/2 & 4 (“Microeconometrics Methods to Assess Heterogeneous Returns to Education”). Stephan L. Thomsen thanks the Stifterverband für die Deutsche Wissenschaft (Claussen-Simon-Stiftung) for financial support. The usual disclaimer applies.

7.1 Introduction

A core topic of the migration literature are earnings’ differentials between immigrants and natives that have been explored in numerous studies since the seminal paper of Chiswick (1978). A well-established finding of many studies is that migrants' earnings lack behind

those of the equally-qualified and experienced native population. In addition, catching up at a later stage depending on the duration of residence is documented in the literature leading to the so-called assimilation hypothesis. One explanation for the gap in earnings between foreigners and natives is language deficiency of the immigrants that may hamper productivity. From a policy perspective, language effect is interesting as language learning could be stimulated through language courses or similar activities. Consequently, the impact of immigrants' language ability on earnings has been studied by many authors. Whereas some early studies, see, e.g. Carliner (1981) or Reimers (1983, 1985), could not establish significant positive effects of language proficiency on earnings, the majority of later studies revised that finding presenting clear positive effects, see, e.g. Chiswick and Miller (1995), Dustmann (1994), McManus et al. (1983) or Tainer (1988).⁶⁰ Given these studies are not directly comparable due to differences with respect to the analysed questions, the formulation of the estimation equations and sample selection criteria, makes this common positive effect of language on earnings even more remarkable.

Despite the large number of studies on language effects on earnings, the context of employment or job type have been scarcely considered. McManus et al. (1983) argue that if economy consisted of one-person producing units and impersonal products, communication would have no effect on earnings. If, alternatively, products were personal, so that the value of the service may depend on a producer's ability to communicate and convey the product to a consumer, communication ability would affect earnings. More practically, Kossoudji (1988) argues that jobs are extremely heterogeneous in their use of language. Although communication is necessary in most jobs, its contribution to productivity clearly varies by occupation. In a similar vein, Tainer (1988) argues that language proficiency is an important communication factor, and communication is a vital aspect of any job. For that reason, language deficiency could, on the one hand, prevent someone from getting a job. On the other hand, even if the person finds a job, it could be below the skill level depending on the degree of the deficiency and the communication skills of the co-workers. Nevertheless, characteristics of occupation are not regarded in the majority of studies and earnings are used to reflect the communication inability.

⁶⁰ Further studies establishing positive effects, amongst others, are Berman et al. (2003), Chiswick (1991), Chiswick and Miller (1999), Dustmann (1999), Dustmann and Fabri (2003), Dustmann and van Soest (2001, 2002), Grenier (1984), Kossoudji (1988), Rivera-Batiz (1990) and Shields and Price (2002). Chiswick and Miller (1995) provide a comparison for adult male immigrants (aged 25-64 years) in Australia, the U.S., Canada, and Israel. For all countries they find significant positive effects of host-country-language fluency, with the largest effect for the U.S.

An early attempt to include occupation is given by Kossoudji (1988) who explicitly analyses the effect of language on occupation-specific earnings and occupational mobility in the U.S. Language ability is measured in terms of English language deficiency. Estimating a mixed simultaneous model the results indicate that English language deficiency has no effect on earnings in either of the two highest productivity occupations (managers and professionals). The explanation provided by the author is that immigrant professionals may possess unique skills highly demanded in the labour market that employers are willing to ignore language deficiencies. With regards to other occupations English language deficiency alters access to jobs. Very recently, Chiswick and Miller (2009) pick up the topic for the U.S. again. They argue that occupation provides information about the channels through which earnings gains are achieved. Similar to education, language can be viewed as having both direct and indirect effects on earnings, where indirect effects operate via occupational attainment. In their empirical analysis, they include occupations as further regressors in the earnings equation, implicitly assuming that occupation is independent of language usage. Their results show that inclusion of occupation reduces the earnings gap, and the effect is strongest for the low-skilled. In that sense, the authors conclude that some of the earnings disadvantage of the immigrants could be attributed to their occupational choice.

Further reasons may complicate the evaluation of the impact of language proficiency on earnings. On the one hand, the endogeneity of language proficiency of immigrants may induce further issues of self-selection beyond occupational choice. Time of residence and age at migration may affect language proficiency (e.g. Bleakley and Chin, 2004) in a way that persons who stayed longer in the host country accumulate better language skills and, therefore, earn higher wages.⁶¹ Moreover, language proficiency may depend on country of origin (e.g. Espenshade and Fu, 1997) or linguistic distance (e.g. Beenstock et al., 2001; Chiswick and Miller, 2007;). This indicates that we would expect language proficiency not only to have an impact on earnings, but also on the selection processes in the labour market. Ignoring these impacts may lead to biased estimates. On the other hand, interpretation of the effects of language proficiency on earnings could be hampered due to measurement or misclassification errors in the language proficiency variable. Dustmann and van Soest (2001, 2002) analyse the bias due to time-varying and time-persistent misclassification errors in self-reported language indicators in German data.⁶² The results show that potential measurement errors lead to downward biased estimates of coefficients of language proficiency on earnings

⁶¹ It should be noted that Beenstock et al. (2005) reject this so-called Immigration Assimilation Hypothesis.

⁶² A similar analysis is provided by Dustmann and Fabri (2003) using data for the UK.

in that sense that individuals over-report their language abilities. Controlling for this leads to larger effects of language proficiency on earnings and also to a higher standard deviation. Charette and Meng (1994) examine the nature and potential measurement error resulting from self-assessed measure of literacy using Canadian data including subjective and objective measures of literacy. Their results show that the measurement error in the self-assessed literacy variable does not have a serious effect on the estimates of the wage determination equation.

The study at hand contributes to the existing literature in a number of aspects. Based on a theoretical model that provides a link between language proficiency and the various selection processes in the labour market, individuals with better language skills are more likely to participate and to be employed even in the absence of a language premium in wages. In the empirical analysis, we explicitly regard these different selection processes. Namely, we take account of self-selection into participation as well as of self-selection into employment. In addition, more proficient individuals could be expected to end up working in higher-paying firms or in higher-paid occupations. Therefore, we extend the model to estimate the effect of language proficiency on earnings regarding additional patterns of self-selection into economic sector and occupation, which is a major difference to the previous literature. In contrast to Chiswick and Miller (2009) who regard occupation as a further regressor, we take account of the potential endogeneity due to language proficiency by including a further selection equation. Moreover, we extend the set-up of the analyses of Kossoudji (1988) and Chiswick and Miller (2009) by considering selection processes prior to occupation as well. In addition, besides occupation we also take account of economic sector choice that has not been done before. To consider skill heterogeneity and capture the potential relationship between language proficiency and skill level, we estimate skill-specific effects. Finally, by addressing these issues we add to the scarce literature on effects of occupation (so far available only for the U.S.) with first results for Germany.⁶³

The empirical analysis is based on data from the SOEP. To mitigate problems of measurement error in the language proficiency variable, we use information on language usage in the

⁶³ There are number of studies exploring the effects of language usage on earnings in Germany. Dustmann (1994), e.g. analyses the determinants of German language ability and the effects on earnings testing the assimilation hypothesis. However, he addresses potential self-selection bias for women only and neglects potential occurrence for men. In addition, Dustmann (1999) studies the incentives to invest in language capital conditional on the expected duration of stay, i.e. comparing temporary and permanent immigration. Finally, Dustmann and van Soest (2001, 2002) focus on the potential bias of estimates due to measurement or misclassification errors. All studies establish positive effects of language on earnings but self-selection with regards to the stages discussed here is not regarded.

household as a proxy for individual language command, which supposedly suffers less from measurement error than the self-reported language proficiency information. To test the sensitivity of the results we also present the estimates using the self-assessed language proficiency variable. In that sensitivity analysis, we use language usage in the household and time of residence as instruments to capture measurement error. The estimates are robust irrespective to which variable is used to approximate language proficiency. The results show that language proficiency significantly increases participation and employment probability of foreigners in Germany. Moreover, earnings are clearly higher for persons speaking mainly or at least partly German in the household compared to people using mainly their native language. When additional selection into economic sector and type of occupation is considered, foreigners with better language proficiency appear more likely to be white-collar workers. With regards to earnings, once selection into occupation and economic sector is taken into account, no significant effect of language usage on earnings for blue-collar workers can be observed. For white-collar workers no conclusive evidence is found.

The paper is organized as follows: Section 7.2 presents the estimation strategy starting with the outline of a theoretical model with flat wages within each firm and the econometric methodology afterwards. Details on the data and some selected descriptives are given in section 7.3. The empirical estimates of the effects of language usage on the selection processes and earnings are discussed in section 7.4. In addition, details of the sensitivity analysis using different measures of language proficiency are provided. The final section 7.5 concludes.

7.2 Estimation Strategy

7.2.1 Theoretical Background

Assuming language proficiency to be related to productivity and through this affecting earnings, participation and employment, a useful theoretical framework for analysing the central question of the paper is given by a variant of the Burdett and Mortensen (1998) model (see also Manning, 2003 and Mortensen, 2003). This model provides argumentation for controlling for self-selection even if an employer pays the same wage for workers with different language abilities.

Consider an economy consisting of three types of individuals with productivities p_0 , p_1 , and p_2 , such that $p_0 < p_1 < p_2$. Suppose that there is a guaranteed minimal income b (for example

welfare assistance or minimum wage). The lowest possible wage a firm can set is thus b . Suppose that $p_0 < b$. This implies that no firm employs individuals with productivity p_0 and they do not participate. Assume the inflow of job offers to unemployed workers happens in continuous time according to a stationary Poisson process so that each worker receives only one offer at maximum during an infinitesimal short time interval. Employed workers may search on the job for higher paid vacancies. The arrival rates of job offers to employed and unemployed workers are assumed to be equal. Since the arrival rates are the same for out-of-job and on-the-job search, it is optimal for a worker to accept the first offer he receives and to continue searching on the job for a better offer (if returns to search are higher than the search costs). As a result in equilibrium there will still be a fraction of highly productive workers employed at low-wage firms.

For simplicity, suppose further that there is a flat wage policy in any firm, so that a firm that hires both p_1 and p_2 workers pays equal wages to them. A firm offering a wage lower than p_1 can hire both p_1 and p_2 individuals, but a firm with a wage above p_1 can hire only p_2 workers. Consider an arbitrary firm 1, which offers a wage equal to b and has a profit of $\Pi_1 = (p_1 - b)L_1(p_1) + (p_2 - b)L_1(p_2)$, where $L_1(p_1)$ is the labour supply of p_1 workers to firm 1 and $L_1(p_2)$ is the labour supply of p_2 workers to firm 1. A firm 2, offering a wage w greater than p_1 , has a profit of $\Pi_2 = (p_2 - w)L_2(p_2)$, where $L_2(p_2)$ is the labour supply of p_2 workers to firm 2. Then, as in a Burdett and Mortensen (1998) model, there exists an equilibrium such that both firms are equally profitable. Firm 2 pays a higher wage, but at the same time has a larger workforce of p_2 workers as it would “steal away” some of the workers from firm 1 attracted by a higher wage. Ultimately, more p_2 workers would be concentrated in high-wage firms.

The model implies that even in the presence of a flat wage policy within a firm, the observed wages in the sample between p_1 and p_2 workers would be different due to differences in employment probabilities. When estimating the effect of p on wages one has to keep in mind that p_1 workers are more likely to be unemployed than p_2 workers. Moreover, participation rates differ with p as p_0 individuals do not participate. This implies that the estimated effect of p on wages based on the sample of employed individuals is biased as the sample of employed wage-earners is self-selected and a distribution of p in a sample of employed individuals is not a correct estimate of the distribution of p in the population.

7.2.2 Econometric Model and Selection Issues

Suppose that worker's productivity cannot be observed by a firm, but a firm knows that language proficiency is related to productivity as

$$(7.1) \quad p = \psi(H) + \nu$$

where H is language proficiency, ψ is some arbitrary function and ν includes other factors affecting productivity including a random component. Language proficiency then signals the potential productivity.

The theoretical model is constructed in such a way to allow a flat-wage policy, i.e. a firm pays the same wage to workers with different productivities. In reality, this would mean that firms pay the same wage independent of language proficiency. The rationale is although persons with better language proficiency are more productive, on average paying different wages based on language spoken may be deemed overtly discriminatory. Nevertheless, sorting with respect to employment might be present.

Thereby, we would expect a higher participation probability and higher employment chances of foreigners with a better command of German language in case of an equal pay policy within firms. On the other hand, according to theory, there is a critical level of productivity for participation, b . Persons with productivity below this value do not participate. Therefore, the participating individuals with a good language command could have lower values of ν as higher values of H compensate for this to reach the critical level of productivity. Alternatively higher values of ν may compensate lower values of H . Moreover, one needs to keep in mind that the most productive workers are more likely to be employed in high-paid firms raising out another source of self-selection.

In the theoretical model above it was shown that participating and employed individuals may be non-random samples of the population. Thus, to estimate the earnings equation we have to control for self-selection modelling participation and employment decision simultaneously. The approach could be interpreted as a variant of the classical Heckman-Lee method, following Heckman (1976) and Lee (1976) that is applied when one source of self-selection is present. In our case, we have to regard two sources (participation and employment) in a first step, requiring certain adjustments that are discussed below. Here, the participation equation is given as:

$$(7.2) \quad I_1^* = Z_1\gamma_1 + \varepsilon_1,$$

where Z_1 is a matrix of exogenous variables, γ_1 is a parameter vector, and ε_1 is a random component. I_1^* is latent, instead we observe $I_1=1$ (in case of participation) if $w^R \geq b$ and $I_1=0$ (in case of nonparticipation) otherwise where w^R denotes the reservation wage. The employment equation is specified analogously as:

$$(7.3) \quad I_2^* = Z_2\gamma_2 + \varepsilon_2,$$

where Z_2 is a matrix of exogenous variables, γ_2 is a parameter vector, and ε_2 is a random component. I_2^* is latent, instead we observe $I_2=1$ (in case of employment) if $w \geq w^R$ and $I_2=0$ (for unemployed individuals) otherwise. Both I_1^* and I_2^* depend on the reservation wage. If Z_1 and Z_2 contain all variables which determine w^R , ε_1 and ε_2 are independent. If some of these variables are not observed (or not contained) in the data they will be included in the error term, which could result in the correlation between ε_1 and ε_2 . Hence, it might be advisable to allow for this correlation and estimate equations (7.2) and (7.3) jointly.

Finally, the wage offer equation is of a standard Becker-Mincer type, $w=X\beta+u$, where w is the log wage, X is a matrix of exogenous variables, β is a parameter vector, and u is an error component, which is normally distributed with mean zero. Wages are observed if both $I_1=1$ and $I_2=1$. Hence, expected observed wage is given by:

$$(7.4) \quad E(w | I_1 = 1, I_2 = 1) = X\hat{B} + E(u | I_1 = 1, I_2 = 1).$$

Define the covariance between the error terms of the participation and the earnings equation as $\sigma_{u1}=\text{cov}(u, \varepsilon_1)$, and analogously between employment and earnings $\sigma_{u2}=\text{cov}(u, \varepsilon_2)$. Moreover, let $\text{var}(u)=\sigma_u^2$. In order to estimate the selection model, variances of the error terms have to be standardized as $\text{var}(\varepsilon_1)=\text{var}(\varepsilon_2)=1$ and $\text{cov}(\varepsilon_1, \varepsilon_2)=\rho_1$. Following Mohanty (2001) (see also Maddala, 1983), $E(u|I_1=1, I_2=1)=\sigma_{u1}\lambda_1+\sigma_{u2}\lambda_2$, where $\lambda_1=\phi(Z_1\gamma_1)\Phi(A)/F(Z_1\gamma_1, Z_2\gamma_2; \rho_1)$ and $\lambda_2=\phi(Z_2\gamma_2)\Phi(B)/F(Z_1\gamma_1, Z_2\gamma_2; \rho_1)$, $A=(Z_2\gamma_2-\rho_1\cdot Z_1\gamma_1)/(\sqrt{1-p_1^2})$, $B=(Z_1\gamma_1-\rho_1\cdot Z_2\gamma_2)/(\sqrt{1-p_1^2})$. ϕ is the univariate standard normal density function, Φ is the univariate standard normal distribution function, and F is the bivariate standard normal distribution function.

It is worth noting that the λ 's are the inverse Mill's ratios adjusted for the bivariate case. In

fact, if participation and employment decisions are unrelated, i.e. if ρ_1 is not statistically significant, then $F(Z_1\gamma_1, Z_2\gamma_2; \rho_1) = \Phi(A) \cdot \Phi(B)$ (conditional probability of independent events) and hence $\lambda_1 = \Phi(Z_1\gamma_1) / \Phi(Z_1\gamma_1)$ and $\lambda_2 = \Phi(Z_2\gamma_2) / \Phi(Z_2\gamma_2)$ which are the inverse Mill's ratios in a standard two-stage Heckit model (see Heckman, 1979).

The conditional wage in equation (7.4) can be rewritten as:

$$(7.5) \quad E(w | X) = X\hat{\beta} + \lambda_1\sigma_{u1} + \lambda_2\sigma_{u2}.$$

To estimate equation (7.5), in a first step equations (7.2) and (7.3) have to be estimated jointly. Estimates obtained at the first stage ($\gamma_1, \gamma_2, \rho_1$) are used to construct λ_1 and λ_2 as defined above. At the second stage, wage is regressed on X, λ_1 and λ_2 by OLS which produces the parameter estimates of β , σ_{u1} , and σ_{u2} .

The theoretical model attributes a higher probability of better jobs to workers with a higher productivity. Consequently, even having controlled for self-selection into participation and employment, earnings may be affected by worker's occupation and economic sector choice (in the subsample of employed individuals). In the empirical analysis, we take account of self-selection into economic sector modelled as the probability of working in basic or high tech industry and manufacturing and of self-selection into occupation modelled as the probability of being a qualified/highly-qualified white-collar worker. Analogously to the basic model, both choices have to be considered as joint decisions in a first step. Assuming joint normality of the errors, estimation is carried out using a bivariate probit model. However, since the participation-employment decision is a double-hurdle, i.e. the employment decision is observed only for participating individuals and is a precondition for occupational and economic sector choice, this has to be regarded in the estimation procedure. A detailed explanation is given in the appendix.

7.3 Data and Selected Descriptives

7.3.1 Data

The empirical analysis is based on data from eight waves of the German Socio-Economic Panel (SOEP) for the years 1996 to 2005 excluding 2002 and 2004 due to missing information on the variable of interest (language usage at home). The SOEP is a wide-ranging representative longitudinal study of private households carried out since 1984 in Germany. It

provides information about all household members covering Germans, foreigners and recent immigrants to Germany. In 2005, there were almost 12,000 households and more than 21,000 persons sampled in SOEP. An advantage of the SOEP is that it contains an over-sample of migrants to provide a sufficient data base for statistical analyses of the immigrant minorities.

For homogeneity reasons, we impose some restrictions on the sample. First, we use only data on male foreigners in West Germany who have a personal migration experience (first generation immigrants). Foreigners who arrived before 1948 are not considered. Second, we only regard persons from so-called guest-worker countries. We define persons as guest-workers if their country of origin is one of the traditional German recruiting countries from the mid 1950s to 1970s.⁶⁴ The countries comprised by our sample are: Turkey (48 percent), Former Yugoslavia (11 percent), Greece (11 percent), Italy (23 percent), Spain (7 percent) and Portugal (1 percent). These persons are a large group of all foreigners in Germany (about 80 percent). Moreover, guest-workers seem to be more homogeneous as a group by definition. On the one hand, we exclude persons who came as refugees, e.g. from Africa or the Middle East, and, on the other hand, we exclude persons who came from highly advanced countries like the U.S., Western and Northern Europe, or Austria. Third, the analysis takes account of people aged 25 to 55 years to avoid bias due to education or early retirement decisions (those in education are explicitly discarded from our data). In addition, we exclude individuals who do not report the language usage in the household from the sample (less than 2 percent). Finally, information on wages is symmetrically two percent trimmed to exclude extreme values.

Variables for language proficiency may be prone to measurement error due to self-assessment of the respondents in many surveys. For example, Dustmann and van Soest (2001, 2002) show that reliability of the self-assessed language proficiency variable in the SOEP may be limited in terms of inter-personal and intra-personal comparability.⁶⁵ In addition, in about half of the observations self-assessed language proficiency is missing in our sample. Language usage at home of the respondents contains of three categories: 1) speaking mainly German, 2) speaking partly German and partly the mother tongue, or 3) speaking mainly the language of the home country. As it could be expected that reporting the type of the language used in the household is easier than assessing language proficiency in terms of written or oral skills, we suppose the variable to be less prone to measurement errors.

⁶⁴ The goal of the guest-worker program was to solve labour supply shortages in West Germany in the industrial sector that emerged during the strong economic development of that time.

⁶⁵ The language spoken in the household is also not free from inter-personal variation.

Raw descriptive statistics reveal a strong relationship between self-assessed language proficiency and language usage in the household, suggesting that language spoken in the household could be a good proxy for language proficiency. For example, 51 percent of people who speak mainly German at home report to have very good speaking ability (in German) and more than 90 percent report at least good speaking ability. More than 60 percent of those who speak partly German at home report to have at least good speaking ability and over 30 percent report satisfactory speaking ability. Persons speaking mainly mother tongue at home mostly report satisfactory (about 45%) and poor (about 30%) speaking ability. Although these descriptive statistics tend to support the use of language usage as a proxy for self-assessed language proficiency, differences in interpretation may remain. For that reason, we check the robustness of the results by estimating the effects of self-assessed language proficiency in section 7.4.4.

Even with the information on labour market states of non-participation, employment and unemployment of SOEP at hand, modelling the two-stage self-selection process requires some further treatment of the variables. Respondents are asked two separate questions, whether they are registered unemployed and whether they are non-participants. However, non-participation is not necessarily understood by respondents as being out of the labour market in an economic sense (some people mix up non-participation and registered unemployment). For that reason, we define people as non-participants if they responded *not in the labour market* and *not registered as unemployed* simultaneously. It has to be noted that this group may still include some active participants who are not registered at the labour office.⁶⁶ A further complication could arise from the fact that respondents do not necessarily understand employment and unemployment as exclusive labour market states. For example, a person having a low-paid job⁶⁷ is eligible for receiving additional subsistence allowance. Officially registered unemployed are allowed to hold a minor job or work part-time and earn up to a certain threshold. In the empirical application, unemployed people who are registered at the labour office but earn more than 1,000 Euro per month are counted as employed. The outcome variable (real gross hourly wage) is obtained for all employees by dividing the gross earnings in the month prior to the interview by the reported working hours of the last week that are extrapolated to monthly hours. Wages are deflated using the consumption price index based on the year 2000 to get real consumption wages of comparable purchasing power (source:

⁶⁶ Potential reasons could be, for example, expiration of unemployment benefits eligibility or benefit sanctions.

⁶⁷ With earnings below the subsistence level.

Statistisches Bundesamt, 2008).⁶⁸

In the SOEP, foreigners could leave the sample for two reasons. First, there is some common panel mortality, i.e. persons decide not to participate in subsequent interviews or they change their place of residence and interviewers lose track of them. Second, foreigners could be naturalized. As there is considerable return migration from Germany this may cause non-random panel attrition. Dustmann and van Soest (2002) have analysed the extent with respect to language ability and earnings. Their results do not show any significant estimates on language ability or on earnings. Therefore, we could assume panel mortality to be random. In contrast, naturalization could be expected to be non-random. Performing distribution tests of equality of language usage for nationality changers and non-changers showed no significant differences. Overall, about 5 percent from our sample of foreigners changed nationality (76 persons out of 1,282). Hence, we refrain from controlling for selection into German citizenship explicitly in the analysis. Persons who were naturalized are not considered in the estimations after the date of naturalization.

7.3.2 Selected Descriptives

Before presenting the empirical application and the estimation results, it is useful to take a closer look at the data available. Table 7.1 provides means of selected variables used in the empirical model with a distinction between non-participants (first column), persons who participate but are not employed (second column) and employed persons (third column). Instead of discussing the single figures in the table, we will concentrate on findings that are of primary interest for our analysis. Although we use language usage in the household in the empirical analysis, we additionally include self-assessed language proficiency for comparison. First, compared to the other groups employed individuals are more likely to speak mainly German at home. Whereas about 32 percent of the employed persons speak German in the household, the shares in the group of non-participants are 22 percent and in the group of the unemployed 14 percent only. Vice versa, non-participants (38 percent) and unemployed persons (44 percent) speak mainly their mother tongue at home compared to the employed (22 percent). With respect to self-assessed language proficiency the picture is similar. As about 63 percent of the employed persons report a good or very good proficiency this group tends to have a clearly better command of German language as unemployed persons (42 percent) or non-participants (54 percent). All in all, employed persons report better language ability than

⁶⁸ It should be noted that the reported gross earnings in the month prior to the interview have not been adjusted for end-of-year bonuses, overtime-payments, holiday allowances etc.

the other groups.

Table 7.1: Means of Selected Variables

	Part.=0	Part.=1	
		Emp.=0	Emp.=1
Language usage in the household			
Mainly German	0.22	0.14	0.32
Mainly mother tongue	0.38	0.44	0.22
Partly German	0.40	0.42	0.46
Self-assessed language proficiency			
Very good	0.22	0.09	0.21
Good	0.32	0.33	0.42
Satisfactory	0.32	0.38	0.28
Poor	0.12	0.19	0.10
Not at all	0.02	0.01	0.00
Level of education			
Low skilled	0.60	0.66	0.51
Medium skilled	0.35	0.28	0.41
High skilled	0.05	0.06	0.08
Socio-demographic variables			
Age	38.79	41.41	39.18
Time of residence	22.89	22.78	23.55
Married	0.75	0.83	0.86
Child	0.80	0.75	0.78
Economic sector			
Manufacturing	-	-	0.65
Transportation	-	-	0.05
Construction	-	-	0.13
Trading services	-	-	0.14
Social services and health	-	-	0.03
Firm size			
Fewer than 20 employees	-	-	0.18
20-199 employees	-	-	0.28
200-1999 employees	-	-	0.32
2000 and more employees	-	-	0.20
Observations	255	290	2,285

Source: Samples from SOEP 2005; own calculation, see text.

A major determinant of productivity is the skill level. We consider it in the analysis in three different categories. Low-skilled are people who lack professional training. This group could be expected to be most strongly disadvantaged in the labour market, in particular in a high-developed country with a regulated labour market as Germany. Medium-skilled comprise people who completed a professional training (not necessarily in the German apprenticeship system, but comparable to it). Finally, high-skilled persons are those who graduated from advanced technical college (Fachhochschule) or university. The shares of the low-skilled are particularly large in the group of non-participants (60 percent) and the group of unemployed persons (66 percent). In contrast, the share is lower in the group of employed persons (51 percent) but still considerable. With regard to the socio-demographic characteristics further heterogeneity could be obtained. The non-participants are, on average, about half a year younger than the employed; unemployed persons, in contrast, are more than two years older

than the employed. The time of residence is comparable between groups but employed persons have lived in Germany longer than the other groups. Finally, taking a look at the economic sectors and firm sizes of the employed persons shows that the majority works in manufacturing, trading services and construction and more than half are employed at firms with at least 200 employees.

Table 7.2: Distribution of Language Ability across Skill Groups

	Low skilled	Medium skilled	High skilled
Language usage in the household			
Mainly German	0.24	0.34	0.43
Partly German	0.32	0.20	0.18
Mainly mother tongue	0.45	0.46	0.39
Self-assessed language proficiency			
Very good	0.14	0.25	0.31
Good	0.38	0.44	0.31
Satisfactory	0.34	0.22	0.30
Poor	0.13	0.08	0.07
Not at all	0.00	0.01	0.01

Source: Samples from SOEP 2005; own calculation, see text.

The last point we want to present descriptively is the correlation between language ability and level of education (Table 7.2). In general, language ability increases with the skill level. Low-skilled persons show the lowest language proficiency irrespective if it is measured by language usage or self-reported ability. High-skilled workers have a higher variance in self-reported language ability compared to medium-skilled. While more high-skilled workers report very good language ability this is also true for satisfactory language ability, which could imply that high-skilled are too heterogeneous as a group.

7.4 Empirical Results

7.4.1 Participation and Employment

To answer the question what impact language ability has on foreigners' earnings, we will start our discussion with the effects of language proficiency on the decisions on participation and employment. As shown in the set-up of the empirical model, individual's decisions on participation and employment may be correlated. Hence, in a first step we estimate both decisions jointly using full-information maximum likelihood. For identification purposes not to solely rely on distributional assumptions, we choose marital status (married) and children (children) as the exclusion restrictions that enter the participation equation, but not the employment equation. Marital status has a statistically significant effect, thereby, justifying the choice of exclusion variables. The correlation between the errors was statistically

insignificant and, therefore, we estimate both equations separately.

The variables of language usage are included in both equations. Effects are estimated with dummies for speaking mainly German language and for speaking partly German language at home relative to speaking mother tongue (the reference group). Moreover, to improve explanatory power, a number of socio-economic variables are added into the models. In particular, person's age and time of residence (i.e. the years the individual lives in Germany) as well as the squares are considered in both equations. We do not include immigration cohort effects in the model as they are a perfect linear combination of age, time of residence and year dummies. Therefore, we refrain from interpreting effects of age or time of residence as we cannot identify them separately from cohort effects. It should be noted that the effect of language proficiency is unaffected by the exclusion of cohort effects. Those are absorbed in the parameter estimates for the constant term. As productivity is closely related to qualification, we estimate the effect of medium- or high-qualification in reference to low-qualification.

Another issue, which one has to deal with, are differences in requirements of language proficiency across jobs. It may be possible that low-skilled workers mainly supplying manual labour are less likely to need a good language command in order to perform their tasks, unlike their high-skilled counterparts who need the language of the host country on a daily basis for communication and decision-making. For that reason we interact language usage with skill dummies. As a result the effect of language usage on earnings for each skill group is a sum of the coefficients of language usage and the respective skill dummy. The effects of language usage on participation and employment across skill groups are given in Table 7.3.⁶⁹ The estimates of the language variables clearly point towards a positive effect of usage of the host country's language on both the decision to participate in the labour market and the employment chances. Although the coefficients in the table cannot be interpreted as marginal effects, it becomes obvious from the relative scale that speaking mainly German has an even stronger effect than using it only partly. Surprisingly, no significant effect is found for high-skilled workers. However, given that the share of non-participants and unemployed among the high-skilled is only about 5%, the overall number of high-skilled workers is relatively low in the sample, and given possible heterogeneity of this group one should be cautious in interpreting insignificance as non-existence of the effect. The scale of the point estimates

⁶⁹ The complete estimates are given in Table 7.B1 in the appendix 7B.

supports this argument.⁷⁰

With regard to other variables (see Table 7.B1 in the appendix), most findings are in line with the expectations. Considering the level of education, medium-skilled people experience a higher propensity to participate than the low-skilled. Maybe due to the small number of foreigners who are high-skilled and possible heterogeneity of this group, estimations do not provide evidence that those differ in their behaviour from the low-skilled in terms of participation.

Table 7.3: Language Usage Effects on Participation and Employment across Skill Groups

	Low skilled	Medium skilled	High skilled
Participation ^a			
Mainly German	0.3511 *	0.6010 #	0.7771 *
Partly German	0.3248 #	0.3277 **	0.5769
Employment ^b			
Mainly German	0.5653 #	0.9404 #	0.1461
Partly German	0.3193 **	0.4711 #	-0.0576

#- significant at 0.1% level, *** - at 1% level, ** - at 5% level, * - at 10% level.

^a The complete estimations are given in Table 7.B1 (first column) in the appendix.

^b The complete estimations are given in Table 7.B1 (second column) in the appendix.

7.4.2 Impact of Language Usage on Earnings

Having established selection patterns into participation and employment conditional on language usage, we want to analyse the effects on earnings in the next step. As a starting point we estimate the effects of language usage on earnings without controlling for self-selection. These results are summarized in the upper panel of Table 7.4.⁷¹ Without controlling for selection, foreigners speaking mainly German earn about 5 percent more than foreigners speaking their mother tongue at home. For high skilled workers the gap is as large as 39 percent. Speaking partly German has a significant effect for high skilled and is smaller in magnitude (about 17 percent compared to speaking mother tongue).

⁷⁰ At this point, one should bear in mind that with respect to language ability high-skilled workers are a more heterogeneous group (see Table 7.2) than the other skill groups.

⁷¹ Complete results are given in model 1 of Table 7.B2 in the appendix 7B.

Table 7.4: Language Usage Effects on Earnings across Skill Groups

	Low skilled	Medium skilled	High skilled
Earnings (no selection control) ^a			
Mainly German	0.0531 *	0.0709 **	0.3857 #
Partly German	-0.0226	0.0525 *	0.1706 **
Earnings (employment, participation selection) ^b			
Mainly German	0.0750	0.0855	0.3618 #
Partly German	-0.0171	0.0617 *	0.1431 *

#- significant at 0.1% level, *** - at 1% level, ** - at 5% level, * - at 10% level.

^a The complete estimations are given in Table 7.B2 (model 1) in the appendix.

^b The complete estimations are given in Table 7.B2 (model 2) in the appendix.

To consider self-selection of participation and employment, we calculate both inverse Mill's ratios based on the results from Table 7.B1 in the appendix. As shown in the set-up of the econometric model (section 7.2.2) both terms are plugged into the earnings equation as additional regressors. The corresponding estimates of the effects of language usage are summarized in the lower panel of Table 7.4.⁷² Controlling for selection into participation and employment increases the earnings gap between foreigners speaking mainly German and foreigners speaking mainly their mother tongue by about 2 percentage points for the low skilled and by about 1.5 percentage points for the medium-skilled. In contrast, the effect for the high-skilled is reduced by about 2.5 percentage points.

These results so far point out at a wage premium for language proficiency even after controlling for selection into participation and employment. This result is not new and has already been discussed in the literature. For example, Dustmann (1994) notes a 7.3 percent wage increase for males who report to have good or very good writing abilities in German. Chiswick and Miller (1999) report higher wages by about 8 percent for migrant males who are proficient in both speaking and reading English using the 1989 Legalized Population Survey (LPS) for the U.S. For Great Britain Shields and Price (2002) establish that language fluency increases the mean occupational wage by about 16.5 percent. Chiswick et al. (2005) find out that immigrants who are proficient in English have 19 percent higher earnings than those with limited English language skills using the Longitudinal Survey of Immigrants to Australia 1993-1995. For Israel Berman et al. (2003) predict a 23 percent earnings' increase for immigrants from the former Soviet Union who fluently speak Hebrew in 1994. Nevertheless, the results presented here clarify that neglecting self-selection of employed immigrants leads to biased estimates of the earnings effects.

⁷² Model 2 of Table 7.B2 in the appendix B contains the complete estimation results.

7.4.3 Considering Self-Selection into Economic Sector and Occupation

However, selection into occupation and industrial sector was not regarded explicitly in earlier studies. Put it in other words, are immigrants with better language proficiency paid better in a firm than immigrants with poorer language command or do they earn different wages because they work in different firms and do different jobs? Theory predicts that workers with higher productivity enter higher paid jobs. Therefore, even having controlled for self-selection into participation and employment, earnings may be affected by worker's occupation and economic sector choice. Further, we distinguish between blue- and white-collar workers and basic/high-tech industry and other economic sectors. Table 7.5 presents descriptive statistics of the language ability variables and skills for these groups. As it becomes obvious, there is a substantial difference in language ability (independently whether measured in terms of language usage or self-assessed language proficiency) between blue-collar and white-collar workers. White-collar workers are more likely to speak mainly German in the household, be more fluent in German language and be high-skilled. In contrast, comparing basic and high-tech industry with other industry establishes minor differences only.

Table 7.5: Descriptives Statistics by Occupation and Economic Sector

	Occupation		Economic sector	
	White collar	Blue collar	Basic and high-tech industry	Other industry
Language usage in the household				
Mainly German	0.67	0.29	0.29	0.36
Partly German	0.03	0.24	0.24	0.21
Mainly mother tongue	0.29	0.47	0.48	0.44
Self-reported German language proficiency				
Very good	0.58	0.17	0.17	0.25
Good	0.41	0.42	0.44	0.40
Satisfactory	0.01	0.30	0.31	0.24
Poor	0.00	0.11	0.08	0.11
Not at all	0.00	0.00	0.01	0.00
Level of education				
Low skilled	0.21	0.54	0.54	0.49
Medium skilled	0.37	0.41	0.41	0.41
High skilled	0.42	0.05	0.06	0.10

Source: Samples from SOEP 2005; own calculation, see text.

Due to these differences, it is reasonable to estimate the separate earnings equations for each of the four groups: 1. white-collar in basic and high-tech industry, 2. blue-collar in basic and high-tech industry, 3. white-collar in other industry, and 4. blue-collar in other industry. Each of these groups is non-random and appropriate correction for self-selection is required (see section 7A in the appendix for a description). Estimation is carried out using bivariate probit models on choice of occupation type and economic sector. Complete estimates are given in

Table 7.B4 in the appendix. The estimate of the correlation coefficient (ρ) is highly significant, hence, both choices have to be estimated jointly to avoid selection bias. The estimates of language usage across skill groups in both equations are summarized in Table 7.6. The results show that foreigners speaking mainly German at home have a clearly higher probability to be white-collar workers; speaking partly German is relevant for the probability of being a white-collar worker for medium-skilled persons.

Table 7.6: Language Usage Effects on Occupation and Economic Sector Choice across Skill Groups

	Low skilled	Medium skilled	High skilled
Occupation choice			
Mainly German	0.7715 **	0.7266 **	1.9069 #
Partly German	0.2800	0.5411 *	0.8115
Economic sector choice			
Mainly German	-0.2693	-0.0543 **	-0.8583 *
Partly German	-0.1739	0.1383	-0.4057

#- significant at 0.1% level, *** - at 1% level, ** - at 5% level, * - at 10% level.
 The complete estimations are given in Table 7.B4 in the appendix.

Having constructed appropriate inverse Mill's ratios we estimated earnings equations for each group restricting the β -coefficients to be equal across groups (Table 7.B2, model 3 in the appendix) and for two groups excluding white-collar workers who are a relatively small group (Table 7.B2, models 4 and 5 in the appendix). The effects of language usage and skills are summarized in Table 7.7. Consideration of all groups points out at a slightly significant effect of language usage on earnings especially for high-skilled workers. Excluding white-collar workers (156 observations out of 2,021) reduces the magnitude of the effect and its significance. In fact, none of the coefficients for the language effect on earnings are significant. This implies that language usage affects earnings of white- and blue-collar workers differently and occupational heterogeneity of workers should not be neglected. For blue-collar workers language proficiency does not seem to affect wages directly. It influences wages indirectly by affecting participation and employment probability as well as occupational choice (white- or blue-collar occupation). For white-collar workers the results tend to indicate that a wage premium for language proficiency exists, but given the small number of observations for white-collar workers we can neither prove it nor disprove.

Table 7.7: Language Usage Effects on Earnings across Skill Groups (Additionally Controlled for Occupation and Economic Sector)

	Low skilled	Medium skilled	High skilled
All groups			
Mainly German	0.0985 *	0.1116 *	0.2690 **
Partly German	-0.0111	0.0854 *	0.1412 *
Excluding white-collar workers			
Mainly German	0.0855	0.0905	0.0961
Partly German	-0.0116	0.0716	0.0932

#- significant at 0.1% level, *** - at 1% level, ** - at 5% level, * - at 10% level.

Although these results are not directly comparable due to differences in the selection criteria of the sample and the methods used to estimate the effects of occupation on earnings, it may be useful to discuss the findings in light of the results of Chiswick and Miller (2009) and Kossoudji (1988). In contrast to our results, Kossoudji (1988) finds significant negative effect of language deficiency on earnings of craft and service personnel (blue-collar occupations). However, the results are not directly comparable as she analyses Hispanics and East Asians in the U.S. labour market in the 1970s which is different to Germany. On the other hand, selection into participation and employment is not considered in Kossoudji (1988). Chiswick and Miller (2009) control for occupational choice by including dummy variables for different occupations. Their findings suggest that about one half of the typical earnings differential reported in the literature with respect to language ability can be attributed to occupational attainment, i.e. workers with better language command enter higher paid occupations. This is consistent with our finding that controlling for occupation reduces the observed wage premium for language proficiency. However, unlike Chiswick and Miller (2009) we find that for blue-collar workers in Germany the effect of language proficiency on earnings is to full extent attributed to higher participation and employment rates and better occupational attainment of persons with better command of the German language.

7.4.4 Language Usage vs. Language Proficiency

So far we have used the information on the language usage in the household as a proxy for actual language proficiency. However, there may be concerns about the validity of language usage in the household to approximate the effects of language proficiency. The problem of approximation of language proficiency by self-assessed variables is common in many studies. For that reason, different language variables are used (as single variables or combinations). For Germany, e.g. Dustmann (1994) uses speaking and writing fluency, Dustmann and van Soest (2001, 2002) use information on speaking fluency compressed by a dummy instead of a five-scale variable. Other examples are McManus et al. (1983) who construct a combined

indicator derived from answers to questions on language usage in the household and neighbourhood. In a similar fashion, Chiswick and Miller (1995) and Chiswick and Miller (2009) use combined information on language usage in the household and self-assessed speaking fluency. In contrast, Rivera-Batiz (1990) has access to data on objective test scores of literacy (see above). We have redone our analysis using information on self-assessed language proficiency to provide a sensitivity analysis of the results discussed so far. Unfortunately, as noted above self-assessed language proficiency is missing in about half of the observations in our sample.

Denote the latent language proficiency by H . The self-assessed language proficiency is reported in 5 categories: not at all, poor, satisfactory, good, and very good. The probability that an outcome i is observed is given by:

$$(7.6) \quad \Pr(O = i) = \Pr(\kappa_{i-1} < H \leq \kappa_i)$$

where κ are the cut-off points and O is the observed self-assessed language proficiency. Equation (7.6) could be estimated by ordered probit method.⁷³ As a set of explanatory variables we choose age, time of residence (and the respective squares), skill and year dummies, and language usage in the household. The estimation results are presented in Table 7.8. Not surprisingly, persons who speak mainly German in the household also have better command of German language. Speaking partly German also increases language proficiency. However, the effect is smaller in magnitude.

Using the fitted values \hat{H} as a regressor instead of language usage in the household we re-estimate equations (7.2), (7.3), (7.A1) and extended earnings equation (7.5). Given the parametric form $H = Q\eta + \zeta$ we also impute the missing values. Namely, O is observed in only about half of observations, and hence, $\hat{\eta}$ is obtained from the regression in equation (7.6) using non-missing observations in O (half of the sample). However, once $\hat{\eta}$ is estimated and given that Q is observed for the whole sample, $\hat{H} = Q\hat{\eta}$ can be calculated for missing observations as well.

⁷³ Bleakley and Chin (2004) use IV method to correct for measurement error in the self-assessed language proficiency variable. However, they fail to take into account the ordinal nature of the self-assessed proficiency variable.

Table 7.8: Ordered Probit Estimates on Proficiency in Spoken German Language

Age	-0.0195
Age (squared)	-0.0004
Time of residence	0.1223 #
Time of residence (squared)	-0.0015 #
Level of education	
Medium skilled	0.1880 **
High skilled	0.3897 **
Language usage	
Mainly German	1.8088 #
Partly German	0.8159 #
Year dummies	Yes
κ_1	-2.1356
κ_2	-0.2985
κ_3	1.1160
κ_4	2.7256
Pseudo R ²	0.2338
Observations	1,314

#- significant at 0.1% level, *** - at 1% level, ** - at 5% level, * - at 10% level.

The results for earnings are given in the appendix 7.B in Table 7.B3, the corresponding estimates for the selection models in Tables 7.B1 and 7.B4 in the appendix. Qualitatively the results are similar to the estimates using language usage in the household. Self-assessed language proficiency significantly increases participation probability and employment chances especially for the medium- and the high-skilled. Besides, foreigners with better language proficiency are more likely to be white-collar workers. Without controlling for selection language proficiency has a significant positive effect on earnings especially for medium- and high-skilled persons. Taking selection into participation and employment into account slightly increases the magnitudes of the effect. However, once additional selection into economic sector and occupation is considered, the effect of language proficiency on earnings becomes statistically insignificant for blue-collar workers. In that sense, it could be concluded that independently of the language variables used, language ability affects the selection processes in the labour market but a direct effect of language on earnings (as a kind of wage premium) could not be established.

7.5 Conclusion

There is quite comprehensive international evidence showing that foreigners speaking the language of the host country well are better off in terms of earnings than those with poor command. One of the explanations is a relationship between productivity and language proficiency, and more productive workers are paid a wage premium. However, this explanation is not easy to reconcile with the empirical findings due to self-selection of

workers.

Put it in other words, are immigrants with better language proficiency paid better in a firm than immigrants with poorer language command or do they earn different wages because they work in different firms and do different jobs? To shed more light on this issue we analyse earnings of foreigners in Germany considering selection of workers into participation, employment, economic sector, and occupation.

We begin our analysis by building a theoretical model which assumes no wage premium to productivity (and hence to language proficiency). We show that in the absence of wage premium, language proficiency heterogeneity would generate differences in participation and employment levels. Moreover, more proficient individuals end up working in higher-paid firms. In the empirical model, we show that without controlling for self-selection or controlling only for selection into participation and employment the estimates support the existence of wage premium for language proficiency. However, once selection into economic sector and occupation is controlled for, no significant effects of language proficiency on earnings of blue-collar workers are observed. For white-collar workers no conclusive evidence is found due to small number of observations.

Language proficiency, however, plays an important role at different selection stages. For example, it significantly increases participation probability and employment chances, especially for the low- and medium-skilled. Moreover, foreigners with better language command are more likely to be white-collar workers. This implies that language proficiency only indirectly affects foreigners' earnings in Germany through higher participation rate and employment chances and higher likelihood of working in white-collar occupations. A wage premium per se or a direct effect could not be established. Using two different measures of language proficiency (language usage in the household and self-assessed language proficiency) does not change the results qualitatively.

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7.7 Appendix to Chapter 7

Appendix 7A: Modelling Selection into Economic Sector and Occupation

Theory predicts that workers with higher productivity enter higher paid jobs. Therefore, even having controlled for self-selection into participation and employment, earnings may be affected by worker's occupation and economic sector choice. Therefore, we extend our model to explicitly control for selection through these channels. In the sub-sample of employed

persons, we take account of self-selection into the economic sector modelled as the probability of working in basic or high tech industry and of self-selection into occupation modelled as the probability of being a white-collar worker. Analogously to our empirical model discussed in section 7.2.2, we consider both choices as joint decisions in a first step. Assuming joint normality of the errors, estimation is carried out using a bivariate probit model.

However, one needs to keep in mind that participation-employment decision is a double-hurdle, i.e. employment decision is observed only for participating individuals. In case of occupation-industry decision all combinations are observed: 1. white-collar in basic and high tech industry, 2. blue-collar in basic and high tech industry, 3. white-collar in other industry, and 4. blue-collar in other industry. Let the two choices be modelled as:

$$\begin{aligned} I_3 &= Z_3\gamma_3 + \varepsilon_3 \\ I_4 &= Z_4\gamma_4 + \varepsilon_4 \end{aligned}$$

with $\text{cov}(\varepsilon_3, \varepsilon_4) = \rho$ and I_3 being an indicator variable taking the value one if a person is a white-collar worker and I_4 being an indicator variable taking the value one if a person is employed in basic or high-tech industry. There is an earnings equation defined for each group (see Fische et al., 1981):

$$(7.A1) \quad \begin{aligned} w_1 &= X_1\beta_1 + u_1 \text{ if } I_3 = 1, I_4 = 1 \\ w_2 &= X_2\beta_2 + u_2 \text{ if } I_3 = 0, I_4 = 1 \\ w_3 &= X_3\beta_3 + u_3 \text{ if } I_3 = 1, I_4 = 0 \\ w_4 &= X_4\beta_4 + u_4 \text{ if } I_3 = 0, I_4 = 0 \end{aligned}$$

It is assumed that $\mu_{k \in K}$ with $K = \{1, 2, \dots, 4\}$ is jointly distributed with ε_3 and ε_4 with $E(u_{k \in K} \varepsilon_{l \in L}) = \sigma_{kl}$ where $L = \{1, 2\}$. Since w_1 is observed only if $I_3 = 1, I_4 = 1$ then $E(w_1 | I_3 = 1, I_4 = 1) = X_1\hat{\beta}_1 + E(u_1 | I_3 = 1, I_4 = 1)$. It is shown in Fische et al. (1981):

$$(7.A2) \quad \begin{aligned} E(u_1 | I_3 = 1, I_4 = 1) &= \sigma_{13}M_{12} + \sigma_{14}M_{21} \\ E(u_2 | I_3 = 0, I_4 = 1) &= \sigma_{23}M_{34} + \sigma_{24}M_{43} \\ E(u_3 | I_3 = 1, I_4 = 0) &= \sigma_{33}M_{56} + \sigma_{34}M_{65} \\ E(u_4 | I_3 = 0, I_4 = 0) &= \sigma_{43}M_{78} + \sigma_{44}M_{87} \end{aligned}$$

The Ms are Mills ratios adjusted for bivariate case. The general formula for calculating Ms is

$M_{ij} = (1 - \rho_2^2)^{-1}(P_i - \rho_2 P_j)$ with Ps defined by the following equation:

$$(7.A3) \quad \begin{aligned} P_1 &= \frac{\int_{-\infty}^{Z_4\gamma_4} \int_{-\infty}^{Z_3\gamma_3} \varepsilon_3 f(\varepsilon_3 \varepsilon_4) d\varepsilon_3 d\varepsilon_4}{F(Z_3\gamma_3, Z_4\gamma_4)}, & P_2 &= \frac{\int_{-\infty}^{Z_3\gamma_3} \int_{-\infty}^{Z_4\gamma_4} \varepsilon_4 f(\varepsilon_3 \varepsilon_4) d\varepsilon_4 d\varepsilon_3}{F(Z_3\gamma_3, Z_4\gamma_4)} \\ P_3 &= \frac{\int_{-\infty}^{Z_4\gamma_4} \int_{Z_3\gamma_3}^{\infty} \varepsilon_3 f(\varepsilon_3 \varepsilon_4) d\varepsilon_3 d\varepsilon_4}{F(-Z_3\gamma_3, Z_4\gamma_4)}, & P_4 &= \frac{\int_{Z_3\gamma_3}^{\infty} \int_{-\infty}^{Z_4\gamma_4} \varepsilon_4 f(\varepsilon_3 \varepsilon_4) d\varepsilon_4 d\varepsilon_3}{F(-Z_3\gamma_3, Z_4\gamma_4)} \\ P_5 &= \frac{\int_{Z_4\gamma_4}^{\infty} \int_{-\infty}^{Z_3\gamma_3} \varepsilon_3 f(\varepsilon_3 \varepsilon_4) d\varepsilon_3 d\varepsilon_4}{F(Z_3\gamma_3, -Z_4\gamma_4)}, & P_6 &= \frac{\int_{-\infty}^{Z_3\gamma_3} \int_{Z_4\gamma_4}^{\infty} \varepsilon_4 f(\varepsilon_3 \varepsilon_4) d\varepsilon_4 d\varepsilon_3}{F(Z_3\gamma_3, -Z_4\gamma_4)} \\ P_7 &= \frac{\int_{Z_4\gamma_4}^{\infty} \int_{Z_3\gamma_3}^{\infty} \varepsilon_3 f(\varepsilon_3 \varepsilon_4) d\varepsilon_3 d\varepsilon_4}{F(-Z_3\gamma_3, -Z_4\gamma_4)}, & P_8 &= \frac{\int_{Z_3\gamma_3}^{\infty} \int_{Z_4\gamma_4}^{\infty} \varepsilon_4 f(\varepsilon_3 \varepsilon_4) d\varepsilon_4 d\varepsilon_3}{F(-Z_3\gamma_3, -Z_4\gamma_4)} \end{aligned}$$

The Ps can be interpreted as conditional expectations of errors in equation (7.A1) as

$$E(\varepsilon_3 | I_3 = 1, I_4 = 1) = \frac{\int_{-\infty}^{Z_4\gamma_4} \int_{-\infty}^{Z_3\gamma_3} \varepsilon_3 f(\varepsilon_3 \varepsilon_4) d\varepsilon_3 d\varepsilon_4}{F(Z_3\gamma_3, Z_4\gamma_4)} = \rho_1 \text{ and so on. Equation (7.A3) can still be}$$

evaluated numerically. In fact, the term M_{12} and M_{21} are calculated by the same token as λ_1 and λ_2 for which the numerical evaluation is straightforward. Other terms are calculated in the same fashion.

Appendix 7B: Tables

Table 7.B1: Selection Model: Results for Separate Estimation of Participation and Employment Decision

	Language usage		Language proficiency	
	Part.	Emp.	Part.	Emp.
Constant	0.5768	-0.0377	0.5887	-0.0094
Age	0.0055	0.0401	0.0150	-0.0495
Age (squared)	0.0001	-0.0006	0.0001	-0.0050
Time of residence	0.0068	0.2750 **	-0.0251	0.0000
Time of residence (squared)	-0.0002	-0.0004 *	0.0001	-0.0003
Level of education (ref. low skilled) ^a				
Medium skilled	-3.7063 *	-3.8598	-2.7681 *	-3.9856 *
High skilled	-0.3958	3.8949	0.5533	-1.3900
Language usage (ref. mainly mother tongue) ^b				
Mainly German	0.3511 *	0.5653 #	-	-
Partly German	0.3248 #	0.3139 **	-	-
Language Proficiency	-	-	0.2124 **	0.3193 #
Exclusion restriction (participation)				
Married	0.4741 **	-	0.4835 ***	-
Children	-0.2159	-	-0.2172	-
Interactions				
Medium skilled*age	0.1702 *	0.2222 *	0.1653 *	0.2160 *
Medium skilled*age (squared)	-0.0024 *	-0.0029 *	-0.0024 *	-0.0028 *
High skilled*age	-0.0001	0.1138	-0.0704	0.1097
High skilled*age (squared)	0.0003	-0.0016	0.0012	-0.0016
Mainly German*medium skilled	0.2500	0.3752 *	-	-
Mainly German*high skilled	0.4260	-0.4192	-	-
Partly German*medium skilled	0.0029	0.1518	-	-
Partly German*high skilled	0.2521	-0.3770	-	-
Language proficiency*medium skilled	-	-	0.0952	0.1969
Language proficiency*high skilled	-	-	0.3106 *	-0.1225
Year dummies	Yes	Yes	Yes	Yes
Observations	2,830	2,575	2,830	2,575
Pseudo R ²	0.0534	0.0770	0.0533	0.0784
Linear combinations medium-skilled				
Mainly German	0.6010 ***	0.9404 #	-	-
Partly German	0.3277 **	0.4711 #	-	-
Language proficiency	-	-	0.3076 ***	0.5162 #
Linear combinations high-skilled				
Mainly German	0.7771 *	0.1461	-	-
Partly German	0.5769	-0.0576	-	-
Language proficiency	-	-	0.5230 ***	0.1968

All estimates are displayed in terms of coefficients. Significance is indicated as follows: # denoting the 0.1%, *** the 1%, ** the 5% and * the 10% level.

^a Medium-skilled are people with professional training, high-skilled are people with advanced technical college or university degree.

^b Language proficiency is estimated by the ordered probit regression. See section 7.4.4 for details.

Table 7.B2: Earnings Equation and Language Usage in the Household

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Constant	1.6260 #	1.5633 #	1.4986 #	1.5469 #	1.5264 #
Age	0.0280 ***	0.0306 **	0.0310 **	0.0307 **	0.0301 **
Age (squared)	-0.0003 **	-0.0004 **	-0.0004	-0.0004	-0.00004
Time of residence	0.0135	0.0150 #	0.0188 #	0.0156 #	0.0182 #
Time of residence (squared)	-0.0002 **	-0.0002 **	-0.0003 #	-0.0003 #	-0.0003 #
Level of education ^a (ref. low skilled)					
Medium skilled	-0.0085	0.0003	0.0003	0.0070	0.0018
High skilled	-0.0920	-0.0609	-2.0326	-0.0716	-0.0609
Language usage (ref. mainly mother tongue)					
Mainly German	0.0531 *	0.0750	0.0985 *	0.0921 *	0.0855
Partly German	-0.0226	-0.0609	-2.0326	-0.0716	-0.0609
Sector (ref. industry and manufacturing)					
Transportation	-0.1264 #	-0.1254 #	-0.0596	-0.1423 #	-0.0587
Construction	-0.0092	-0.0082 **	0.0664 **	-0.0092	0.0725 **
Trading services	-0.1218 #	-0.1206 #	-0.0763	-0.1536 #	-0.0724 *
Social services and health	-0.0874 **	-0.0899 **	-0.0517	-0.1172 **	-0.0343 *
Firm size (ref. <20 employees)					
20-199 employees	0.0996 #	0.0994 #	0.0983	0.1019 #	0.0991 #
200-1999 employees	0.1917 #	0.1923 #	0.1822 #	0.1817 #	0.1730 #
2000 and more employees	0.2466 #	0.2454 #	0.2311 #	0.2441 #	0.2311 #
Location ^b (ref. south)					
North	-0.0102	-0.0116	-0.0185	-0.0110	-0.0186
Centre	-0.0335 *	0.2868 *	-0.0315	0.3560 *	-0.0306
Interactions					
Mainly German*medium skilled	0.0177	0.0106	0.0131	0.0016	0.0050
Mainly German*high skilled	0.3326 #	0.2868 **	0.1706	0.0331	0.0106
Partly German*medium skilled	0.0750 **	0.0789 **	0.0965 **	0.0737 **	0.0832 **
Partly German*high skilled	0.1931 **	0.1603 **	0.1524 *	0.1216	0.1047
Selection terms ^c					
λ_1 (participation)	-	0.2105	0.2732	0.2823	0.3023
λ_2 (employment)	-	-0.2263	-0.2704	-0.2498 *	-0.2822 *
M1	-	-	0.0374	-	-
M2	-	-	-0.6780	-	-
M3	-	-	-0.2227	-	-0.0162
M4	-	-	0.0763	-	0.0497
M5	-	-	-0.0845	-	-
M6	-	-	0.3124	-	-
M7	-	-	-0.1343	-	0.0130
M8	-	-	-0.0509	-	-0.0742 *
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	2,021	2,021	2,021	1,865	1,865
R ²	0.2894	0.2915	0.3264	0.2789	0.2908
Linear combinations medium-skilled					
Mainly German	0.0709 **	0.0855	0.1116 *	0.0937	0.0905
Partly German	0.0525 *	0.0617 *	0.0854 *	0.0653	0.0716
Linear combinations high-skilled					
Mainly German	0.3857 #	0.3618 #	0.2690 **	0.1253	0.0961
Partly German	0.1706 **	0.1431 *	0.1412 *	0.1131	0.0932

Significance is indicated as follows: # denoting the 0.1%, *** the 1%, ** the 5% and * the 10% level.

Model 1 – no selection control; Model 2 – controlling for selection into participation and employment; Model 3 – additional controls for selection into economic sector and occupation; Model 4 – excluding white-collar workers, controlling for selection into participation and employment; Model 5 – excluding white-collar workers, additional controls for selection into economic sector and occupation

^a Medium-skilled are people with professional training, high-skilled are people with advanced technical college or university degree.

^b North contains the Federal States of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre are the Federal States North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South comprises Hessen, Bavaria and Baden-Wuerttemberg.

^c λ_1 and λ_2 are calculated using estimates for the participation and employment given in Table 7.B1 in the appendix.

Table 7.B3: Earnings Equation and Self-Assessed Language Proficiency

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Constant	1.6306 #	1.6594 #	1.5863 #	1.6172 #	1.6215 #
Age	0.0283 ***	0.0274 **	0.0288 **	0.0286 **	0.0276 **
Age (squared)	-0.0003 **	-0.0003 **	-0.0003 **	-0.0003 **	-0.0003 **
Time of residence	0.0073	0.0081	0.0109	0.0091 **	0.0124 ***
Time of residence (squared)	-0.0001	-0.0001	-0.0002 **	-0.0002 **	-0.0002 ***
Level of education^a (ref. low skilled)					
Medium skilled	0.0057	0.0137	0.0110	0.0134	0.0126
High skilled	-0.1412 **	-0.1255	-0.0846	-0.0473	-0.0413
Language usage (ref. mainly mother tongue)					
Language proficiency	0.0297 **	0.0315	0.0441 *	0.0346 *	0.0313
Sector (ref. industry and manufacturing)					
Transportation	-0.1286 #	-0.1278 #	-0.0601 *	-0.1415 #	-0.0567 *
Construction	-0.0110	-0.0097	0.0683 **	-0.0092	0.0743 **
Trading services	-0.1230 #	-0.1219 #	-0.0744 *	-0.1511 #	-0.0691 *
Social services and health	-0.0746 *	-0.0756 *	-0.0411	-0.1514	-0.0299
Firm size (ref. <20 employees)					
20-199 employees	0.1038 #	0.1041 #	0.1024 #	0.1057 #	0.1028 #
200-1999 employees	0.1939 #	0.1946 #	0.1847 #	0.1862 #	0.1767 #
2000 and more employees	0.2460 #	0.2453 #	0.2330 #	0.2473 #	0.2346 #
Location^b (ref. south)					
North	-0.0081	-0.0099	-0.0168	-0.0103	-0.0177
Centre	-0.0348 *	-0.0367 *	-0.0323 *	-0.0362 *	-0.0325 *
Interactions					
Language proficiency*medium skilled	0.0131	0.0088	0.0166	0.0088	0.0093
Language proficiency*medium skilled	0.1401 #	0.1276 #	0.1167 *	0.0205	0.0150
Selection terms^c					
λ_1 (participation)	-	0.9590	0.1569	0.1578	0.1644
λ_2 (employment)	-	-0.1896	-0.2141	-0.2005	-0.2304
M1	-	-	-0.1066	-	-
M2	-	-	-0.0649	-	-
M3	-	-	-0.2861	-	0.0041
M4	-	-	0.0602	-	0.0022
M5	-	-	0.1429	-	-
M6	-	-	-0.0992	-	-
M7	-	-	-0.1931 *	-	-0.0010
M8	-	-	-0.0619	-	-0.0899 *
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	2,021	2,021	2,021	1,865	1,865
R ²	0.2906	0.2921	0.3231	0.2728	0.2855
Linear combinations medium-skilled					
Language proficiency	0.0428 **	0.0403	0.0978 ***	0.0455	0.0406
Linear combinations high-skilled					
Language proficiency	0.1699 #	0.1591 #	0.0608 *	0.0572	0.0463

Significance is indicated as follows: # denoting the 0.1%, *** the 1%, ** the 5% and * the 10% level.

Model 1 – no selection control; Model 2 – controlling for selection into participation and employment; Model 3 – additional controls for selection into economic sector and occupation; Model 4 –excluding white-collar workers, controlling for selection into participation and employment; Model 5 – excluding white-collar workers, additional controls for selection into economic sector and occupation

^a Medium-skilled are people with professional training, high-skilled are people with advanced technical college or university degree.

^b North contains the Federal States of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre are the Federal States North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South comprises Hessen, Bavaria and Baden-Wuerttemberg.

^c λ_1 and λ_2 are calculated using estimates for the participation and employment given in Table 7.B1 in the appendix.

Table 7.B4: Selection Model: Results for Joint Estimation of Occupation Type and Economic Sector

	Language usage	Language proficiency	Language usage	Language proficiency
	Type of occupation		Economic sector	
Constant	-2.8096	-2.2869	-1.6932 **	-1.6898 **
Age	-0.0045	-0.0378	0.0663	0.0632
Age (squared)	0.0002	0.0004	-0.0008	-0.0008
Time of residence	0.1095 **	0.0387	0.0380 *	0.0553 **
Time of residence (squared)	-0.0012	-0.0003 *	-0.0008 **	-0.0010 **
Level of education (ref. low skilled) ^a				
Medium skilled	0.1578	0.1192	-0.2533	-0.1560 *
High skilled	0.9728	-0.1912 **	-0.0035	0.0113 *
Language usage (ref. mainly mother tongue) ^b				
Mainly German	0.7715 **	-	-0.2693	-
Partly German	0.2800	-	-0.1739	-
Language proficiency	-	0.3083 *	-	0.1427 *
Interactions				
Mainly German*medium skilled	-0.0448	-	0.2150	-
Mainly German*high skilled	1.1354 *	-	-0.5889	-
Partly German*medium skilled	0.2610	-	0.3122	-
Partly German*high skilled	0.5314	-	-0.2317	-
Language proficiency*medium skilled	-	0.0400	-	0.0871
Language proficiency*high skilled	-	0.8473 ***	-	-0.1633
Exclusion restriction (ref. north) ^c				
Centre	0.5218 **	0.5174 **	-	-
South	0.2023	0.2008	-	-
ρ	-0.4470 #	-0.5521 #	-	-
Observations	2,021	2,021	2,021	2,021
Linear combinations medium-skilled				
Mainly German	0.7266 *	-	-0.0543 **	-
Partly German	0.5411 **	-	0.1383	-
Language proficiency	-	0.3483 **	-	-0.0727
Linear combinations high-skilled				
Mainly German	1.9069 #	-	-0.8583 *	-
Partly German	0.8115	-	-0.4057	-
Language proficiency	-	1.1557 #	-	0.1598 *

All estimates are displayed in terms of coefficients. Significance is indicated as follows: # denoting the 0.1%, *** the 1%, ** the 5% and * the 10% level.

^a Medium-skilled are people with professional training, high-skilled are people with advanced technical college or university degree.

^b Language proficiency is estimated by the ordered probit regression. See Section 4.4 for details.

^c North contains the Federal States of Schleswig-Holstein, Hamburg, Lower-Saxony, Bremen and Berlin. Centre are the Federal States North Rhine-Westphalia, Rhineland-Palatinate and Saarland. South comprises Hessen, Bavaria and Baden-Wuerttemberg.

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Thesis: “Entry Wages” (in German; Supervisor: PD Dr. Friedhelm Pfeiffer) – Karin-Islinger Award for outstanding thesis
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- 11/2003 - 12/2004 **Student Research Assistant**, Centre for European Economic Research, Mannheim (ZEW), Research Department “Labour Markets, Human Resources and Social Policy”

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Publications

Articles in Refereed Journals

- 2009 Language Usage, Participation, Employment and Earnings - Evidence for Foreigners in West Germany with Multiple Sources of Selection, *Labour Economics* 16, 330-341 (with Alisher Aldashev and Stephan L. Thomsen)
- 2007 Rising Wage Inequality in Germany, *Jahrbücher für Nationalökonomie und Statistik* 227 (4), 358-380 (with Friedhelm Pfeiffer)
- 2006 Einstiegslohne bei unvollkommenen Arbeitsmärkten, *Perspektiven der Wirtschaftspolitik* 7 (2), 147-172. (with Friedhelm Pfeiffer)

Articles in Edited Volumes

- 2009 Wage Convergence and Inequality after Unification: (East) Germany in Transition, in: Ravi Kanbur and Jan Svejnar, *Labor Markets and Economic Development*, 1. Aufl., Routledge Studies in Development Economics Bd. 73, London, 387-404 (with Friedhelm Pfeiffer)
- 2008 Soziale Ungleichheit von Geisteswissenschaftlern im Beruf, in: Heike Solga, Denis Huschka, Patricia Eilsberger, Gert G. Wagner, *Findigkeit in unsicheren Zeiten, Ergebnisse des Expertisenwettbewerbs "Arts and Figures – GeisteswissenschaftlerInnen im Beruf"*, Opladen & Farmington Hills, 157-174 (with Michael Gebel)

Discussion Papers und Working Papers

- 2009 Decreasing Wage Mobility in Germany, ZEW Discussion Paper No. 09-044
- 2009 Noncognitive Skills, School Achievements and Educational Dropout, ZEW Discussion Paper No. 09-019 (with Katja Coneus and Marianne Saam)
- 2008 The Immigrant Wage Gap in Germany, ZEW Discussion Paper No. 08-089 (with Alisher Aldashev and Stephan L. Thomsen)
- 2007 Earnings Prospects for People with Migration Background in Germany, ZEW Discussion Paper No. 07-031 (with Alisher Aldashev and Stephan L. Thomsen)
- 2006 Distributional Effects of the High School Degree in Germany, ZEW Discussion Paper No. 06-088 (with Michael Maier, Friedhelm Pfeiffer and Julie Rat-Wirtzler)

Presentations at Conferences (Selection)

2009, Sep 24-25	24 th National Conference of Italian Labour Economists (AIEL), Sassari, Italy
2009, Sep. 11-12	Annual Conference of the European Association of Labour Economists (EALE), Tallinn, Estonia
2008, Sep. 15-18	German Statistical Week 2008, Cologne, Germany
2008, Sep. 11-12	23 rd National Conference of Italian Labour Economists (AIEL), Brescia, Italy
2008, Jul. 9-11	8 th International SOEP User Conference, Berlin, Germany
2008, Jun. 25-27	International Conference on Economics of Education, Firm Behaviour and Training Policies, Zurich, Switzerland
2008, May 9-10	13 th Annual Meeting of the Society of Labor Economists (SOLE), New York, USA
2007, Sep. 24-27	German Statistical Week 2007, Kiel, Germany
2007, Sep. 13-14	22 nd National Conference of Italian Labour Economists (AIEL), Naples, Italy
2007, Jun. 14-16	21 st Conference of the European Society for Population Economics (ESPE), Chicago, USA
2006, Sep. 26-29	Annual Congress of the "Verein für Socialpolitik", Bayreuth, Germany
2006, Sep. 14-15	21 st National Conference of Italian Labour Economists (AIEL), Udine, Italy
2006, Aug. 24-28	21 st Congress of European Economic Association (EEA), Vienna, Austria

Mannheim, December 2009

Eidesstattliche Erklärung

Ich versichere, dass ich die vorliegende Dissertation ohne Hilfe Dritter und ohne Benutzung anderer als der angegebenen Quellen und Hilfsmittel angefertigt habe. Diese Arbeit hat in gleicher oder ähnlicher Form noch keiner anderen Prüfungsbehörden vorgelegen.

Unterschrift