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Inter- and intragenerational economic mobility

Germany in international comparison

Daniel D. Schnitzlein

Dissertationen

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To my grandparents,
Edith, Ilse, Karl, and Klaus

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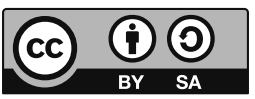

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Preface

This book is a slightly revised version of my dissertation, which was accepted by the University of Erlangen-Nuremberg in January 2012. During the preparation of this thesis, I was enrolled in the joint graduate programme of the Institute for Employment Research (IAB) and the School of Business and Economics of the University of Erlangen-Nuremberg on a doctoral scholarship from the IAB. At the same time, I worked as researcher at the IAB and the University of Erlangen-Nuremberg. The preparation of this thesis would not have been possible without the support of many people: first and foremost, my supervisor Regina T. Riphahn and my second referee and IAB mentor Gesine Stephan. I benefited immensely from their invaluable advice and great support over the last few years.

I also thank Herbert Brücker and Helmut Rudolph from the IAB. Herbert Brücker not only supported my research but also established the connection to the Aarhus School of Business, which enabled me to obtain access to the Danish data sets. Helmut Rudolph supported and encouraged me, especially during the application process for the graduate programme. I thank Tor Eriksson for his advice during my stay in Aarhus. In August 2011, I accepted a position as research associate at the German Socio-Economic Panel Study at DIW Berlin, and was fortunate to receive Jürgen Schupp's support in the process of completing my dissertation. Finally, I am grateful to all my colleagues at the IAB, the University of Erlangen-Nuremberg and DIW Berlin for their helpful suggestions, conversations and advice, and to the other participants in the graduate programme for three great years of study together.

Throughout the writing of this book, I received tremendous support and encouragement from my family. My wife Charlotte was and is always the first person I discuss new ideas with, and her feedback, suggestions and support were essential in the development of this thesis. Finally, I thank my parents and my sister for their unwavering and unconditional support, not only during the preparation of my dissertation but during the last thirty years.

Daniel D. Schnitzlein
Berlin, May 2012

1 Introduction

1.1 Motivation

Research on *intergenerational* economic mobility receives a high level of attention by scholars and policy makers and is also subject to media coverage and thus everyday conversation.[1]

As an illustration consider two societies A and B. Society A is characterized by strong associations between parent's economic status (for example earnings) and the economic status of their children. In this society the economic outcome of a child is fully predetermined by the economic success or failure of his/her parents. In contrast, in society B, the associations between parental and offspring's economic status are weak, so the economic outcome of a child is independent of the economic performance of his/her parents. In this example society B displays complete intergenerational mobility while society A is characterized by complete immobility (Björklund and Jäntti, 2009; Solon, 1999).

Apparently, as in society A own economic outcome is not dependent on own decisions, but is fully dependent on the economic outcome of one's parents, equality of opportunities are lower in society A compared to society B. Therefore, the level of intergenerational mobility can be seen as a key indicator for the degree of equality of opportunities in a society.

Most modern countries see the provision of a high level of equality of opportunities as a normative goal policy should reach. This can be motivated either from a social perspective or an efficiency reasoning. First, a low level of intergenerational mobility and thus a low level of equality of opportunities leads to a society in which the economic position of a family is determined over generations. While this might be a comfortable situation at the upper end of the distribution, it is discouraging at the lower end. A situation like this can lead to the formation of parallel societies with all negative social consequences. Second, a low level of intergenerational mobility is also negative in terms of the efficient allocation of resources in a society. If an individual does not get a job for which he/she is qualified, just because of the economic situation of his/her parents, this is an inefficient use of the societies' human capital stock. On the other hand if an unqualified individual gets a good job only because of his/her family background, this is also not an efficient use of societies' resources. So if higher intergenerational mobility is associated with a more efficient use of human

1 See for example Solon (1999) and Black and Devereux (2011) for an overview of the economic literature. Examples for media coverage can be found in Faigle (2011) and Rampell (2010).

capital, abolishing mobility barriers could even contribute to economic growth in a society.

The last decades have witnessed a rapid increase in the number of studies in the economic literature on intergenerational mobility. As discussed in more detail in chapters 2 and 3 of this dissertation, variation in the estimates for different countries is difficult to interpret if these estimates rely on information from single country studies. These studies can differ in the composition of the samples and the applied method (Solon, 2002). As it is not clear whether these variations lead to changes of the same sign and magnitude in the estimates of intergenerational mobility in different countries or not, international comparisons have to focus on studies including multiple countries. Therefore, apart from theoretical contributions and empirical analyses for single countries, a third strand of literature evolved focusing on cross-country comparisons. Based on the results of such cross-country studies, most researchers by now agree on the widely accepted stylized fact that the US is among the countries with the lowest level of intergenerational mobility while the Scandinavian countries mark the end of the scale with the highest mobility (Solon, 2002).

Chapters 2 and 3 of this dissertation contribute to this strand of the literature. As presented in detail in the two chapters, in contrast to the US and the Scandinavian countries, the existing evidence on the position of Germany in an international ranking of intergenerational mobility is at best inconclusive. Therefore, first, chapter 2 picks up the traditional method to measure intergenerational mobility and sheds new light on the question whether intergenerational mobility is higher or lower in Germany as compared to the US. Second, chapter 3 presents a three country comparison of Germany, Denmark, and the US measuring intergenerational mobility based on a broader mobility measure, which captures the influence of full family background instead of only parental income or earnings like in the standard approach. The aim of both chapters is to clarify the evidence on the position of Germany in an international ranking of intergenerational mobility. Third, while chapters 2 and 3 as cross-country comparisons are of a descriptive character, chapter 4 takes a closer look at the determinants of the intergenerational transmission process. Using unique Danish administrative data on second generation immigrants, the analysis answers the question whether cultural background matters in the determination of the level of intergenerational mobility.

Economic mobility has also another dimension. *Intragenerational* economic mobility describes how likely it is for an individual to improve (or to worsen) his/her economic position in his/her own generation. As introduced by Friedman (1962) economic mobility (e.g., measured as wage mobility) can equalize long-term

economic status. Especially in a situation of high or rising economic inequality, a high level of economic mobility involves that being in a disadvantaged economic situation might be only a transitory and not a permanent experience for an individual.

This closely relates intragenerational economic mobility to the idea of equality of opportunities described above. For example, given a constant level of medium to high economic inequality, the absence of mobility would condemn disadvantaged individuals to stay at the bottom of the distribution, irrespective of their decisions and effort. Again, like in the example of intergenerational mobility this would have negative effects on social stability and the productivity in a society. The difference compared to the case of intergenerational mobility is that the initial advantage or disadvantage does not have to be connected to the economic status of the parents. Of course, as economic mobility also increases the risk of worsening an individual's economic situation, it is arguable whether there is a tradeoff between the level of inequality and the level of mobility. However, even with this restriction, in the sense of equality of opportunities it is obvious that in a situation of rising inequality, most modern societies would prefer this rise to be accompanied with a rise in economic mobility. Thus they would prefer a situation with a high mobility in which a disadvantaged individual can improve his/her situation by own decisions or effort.

Motivated by recent evidence on rising wage inequality in Germany (Dustmann et al., 2009), chapter 5 of this dissertation contributes to the literature on intragenerational mobility by analyzing the development of wage mobility in East and West Germany.

1.2 Organization of this dissertation

This dissertation consists of four contributions, which are described in this section. Each of the chapters is intended to be a stand-alone analysis. While the first three studies are single authored, the study on wage mobility in East and West Germany is coauthored with Regina T. Riphahn.

1.2.1 A new look at intergenerational mobility in Germany compared to the US

The unclear position of Germany in an international ranking of intergenerational mobility motivates this chapter. First, I apply the standard approach in the existing literature, estimating intergenerational earnings elasticities, and present a cross-country comparison of intergenerational earnings mobility in Germany and the US.

Second, recent findings stress the importance of nonlinearities in the relationship between the father's and the son's earnings (Bratsberg et al., 2007). Thus, I test for nonlinearities in this relationship in both countries. In addition, I extend the classical test for nonlinearities with results from an unconditional quantile regression (Firpo et al., 2009). The existing literature focuses on nonlinearities along the distribution of the father's earnings, which are the origin of the intergenerational transmission process. In contrast, the unconditional quantile regression provides a method for looking at nonlinearities along the distribution of the son's earnings, which are the result of the transmission process.

1.2.2 How important is the family? Evidence from sibling correlations in permanent earnings in the US, Germany, and Denmark

Likewise motivated by the lack of clear empirical evidence on Germany, this chapter contains a three country analysis covering Germany, Denmark, and the US. In contrast to the approach in chapter 2, I use sibling correlations as a measure of intergenerational mobility. Compared to estimating intergenerational earnings elasticities, sibling correlations are a much broader measure of intergenerational mobility as they cover not only the influence of parental earnings but full parental background. I argue in the chapter, that, if intergenerational mobility is interpreted as an indicator of equality of opportunities, this broader measure should be preferred over the standard approach.

1.2.3 How important is cultural background for the level of intergenerational mobility?

In contrast to chapters 2 and 3 which describe the strength of the association between parental earnings and the earnings of the offspring, this chapter takes a closer look at the potential determinants of the transmission process. These can be divided into factors related to the institutional setting in a society (e.g. the educational system) and factors related to the cultural background (e.g. parental attitudes) of the individuals. Using unique Danish administrative data I analyze intergenerational mobility for different groups of second generation immigrants. Thus, I can use variation in cultural background and control for the institutional setting. If institutions are the main determinant of intergenerational mobility, then different ethnic groups should show similar levels of intergenerational mobility. If, instead, cultural background matters most, the groups should differ in the estimated mobility levels. The article in this chapter is published in a recent issue of Economics Letters.

1.2.4 Wage mobility in East and West Germany

This contribution is coauthored with Regina T. Riphahn. As results from recent research showed rising wage inequality in Germany (e.g. Dustmann et al., 2009) this chapter addresses the question whether this rise in inequality was accompanied by a change in wage mobility. Relying on recent long running administrative data we present descriptive evidence on wage mobility in West Germany for the period 1975–2008 and in East Germany for the period 1992–2008. Thus, we identify long-running patterns in wage mobility in both parts of the country. In the second part of the chapter, we develop hypotheses derived from the literature about potential factors explaining the observed mobility developments. Finally, we test these hypotheses using an innovative decomposition approach (Firpo et al., 2007; Fortin et al., 2011) based on recentered influence functions.

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2 A new look at intergenerational mobility in Germany compared to the US

Daniel D. Schnitzlein

2.1 Introduction

The extent to which a family's economic advantage or disadvantage persists over generations is widely seen as a key indicator of equality of opportunities. Thus, in both economics and sociology, a large field of research on intergenerational economic mobility has developed.[2] Since the seminal articles by Solon (1992) and Zimmerman (1992), numerous contributions have analyzed intergenerational mobility in most of the developed and even some developing countries. Especially in economics, most contributions focus on the estimation of intergenerational earnings elasticities (hereafter IGEs) or intergenerational earnings correlations (hereafter IGCs) as measures of intergenerational mobility.

However, these estimates are highly sensitive to differences in sampling rules and the nature of the applied data sets (Solon, 2002). Therefore, international comparisons based on the results of single-country studies are difficult to interpret and can be misleading. Given these restrictions, scholars have developed a separate research strand that focuses on cross-country comparisons based on multiple countries in one study (e.g. Couch and Dunn, 1997; Björklund and Jäntti, 1997; Jäntti et al., 2006). The aim is to establish an international ranking system based on the level of intergenerational mobility. As intergenerational mobility is seen as a key indicator of equality of opportunities, which is a normative goal in most developed countries, an international ranking system provides evidence regarding the extent to which the goal of establishing a mobile society is fulfilled.

Existing results from cross-country comparisons provided the widely accepted stylized fact that intergenerational mobility is lowest in the US and highest in the Scandinavian countries (Björklund and Jäntti, 2000; Solon, 2002). The two extremes of the international intergenerational mobility scale, the US and the Scandinavian countries have received substantial attention in the literature. In contrast, empirical evidence on Germany is rare.

Based on theoretical considerations (Becker and Tomes, 1979, 1986; Solon, 2004), which are discussed in more detail in section 2, one would expect Germany to have a higher level of intergenerational mobility than the US. However, the few

2 See Solon (1999), Björklund and Jäntti (2009) and Black and Devereux (2011) for an overview of the economics literature and Erikson and Goldthorpe (1992) and Breen (2004) for a review of the sociological literature.

existing empirical results provide no clear evidence on this point. Couch and Dunn (1997) compared the level of intergenerational mobility in Germany and the US based on data from the German Socio-Economic Panel (SOEP) and the Panel Study of Income Dynamics (PSID). Based on two comparable samples, these researchers estimated IGEs and IGCs for both countries and found no significant differences.[3] Couch and Lillard (2004) compared German estimates that were also based on SOEP data with US estimates based on data from the National Longitudinal Survey (NLS).[4] Their results support the findings of Couch and Dunn (1997).

To date, the empirical picture appears to be consistent, but recent methodological contributions have questioned these early findings. Haider and Solon (2006) showed that taking earnings observations too early (or too late) in an individual's life cycle can cause substantial bias in the estimates of intergenerational mobility. As the authors of the aforementioned studies used SOEP data only up to 1998, the children observed in the German data were still very young. This problem carries over to the US data sets because the researchers had to construct comparable samples for both countries. Thus, the results of the comparisons presented above are only valid if the bias is of the same direction and magnitude in both countries.

Recent results from national studies have led scholars to question this assumption. Although Couch and Dunn (1997) estimate that the IGE for both countries is approximately 0.12, the consensus estimate in the literature for the IGE in the US lies between 0.4 and 0.5 (Corak, 2006),[5] and recent German estimates range between 0.26 and 0.28 (Eisenhauer and Pfeiffer, 2008; Schnitzlein, 2009; Yuksel, 2009), which indicates higher intergenerational mobility in Germany compared with the US. However, because all of these recent contributions are single-country studies and therefore do not provide a US estimate based on a comparable sample, it might be misleading to draw conclusions about the rankings of the two countries. Thus, the empirical evidence remains unclear.

This chapter aims to clarify the contradictory evidence on German IGE estimates reported in the literature. I present a cross-country comparison of the intergenerational earnings mobility in Germany and the US that answers the following question: "Is intergenerational mobility higher in Germany than in the US?" In addition, I analyze whether the two countries differ in their structures of intergenerational mobility. Therefore, I extend the classical test for nonlinearities

3 The authors update their results in Dunn and Couch (1999) and again find no differences between Germany and the US.

4 Couch and Lillard (2004) present their paper as an update of Lillard's 2001 work, which also showed results for Germany and the US.

5 Based on long-running administrative data, Mazumder (2005) even estimates an IGE of 0.6 for the US.

along the distribution of the father's earnings with the results from an unconditional quantile regression. Doing so changes the perspective of the analysis to the outcome of the transmission process by providing estimates of the IGE at different percentiles of the son's earnings distribution.

According to these contributions, my main results are as follows. Based on comparable international data for father-son pairs, I find no significant differences in the level of intergenerational mobility between Germany and the US. I show that the existing low estimates for the IGE in Germany are not robust against variations in sampling criteria. Regarding the structure of intergenerational mobility, I find no evidence either in Germany or in the US for nonlinearities along the distribution of the father's earnings. When analyzing the relationship along the distribution of the son's earnings, I find that both countries show significant higher intergenerational mobility for the sons at the bottom of their earnings distribution. This means that ending up at the bottom of the earnings distribution is a severe risk for the sons of fathers from all parts of the distribution in both countries.

The remainder of the chapter is structured as follows. Section 2 presents a theoretical model, and Section 3 describes my empirical strategy. Section 4 describes the data, Section 5 presents the results and section 6 concludes.

2.2 Theoretical background

As mentioned in the introduction, the most often used measure of intergenerational mobility is the IGE (denoted as β in the following), which, in most cases, is estimated from a log earnings regression explaining the log earnings of the child with log parental earnings and additional controls. In this section, I review a simple theoretical model of intergenerational mobility developed by Solon (2004) and based on Becker and Tomes (1979, 1986). This model gives a theoretical explanation of the IGE. The results of even this simple framework can be used to determine cross-country differences and to state a hypothesis predicting the result of the comparison between Germany and the US.[6]

2.2.1 Outline of the model

Assume that family i consists of two generations. For simplicity's sake, let both generations contain one person: one parent (index $t-1$) and one child (index t). The parent's utility is given as a function of the parent's own (lifetime-) consumption (C_{t-1}) and the (lifetime-) earnings of the offspring (Y_t). Following Solon (2004),

6 There is also a discussion of the model in Black and Devereux (2011).

I assume that the utility function is of the Cobb-Douglas type. In the context of this model, the Cobb-Douglas parameter α can be interpreted as an altruism parameter that compares the relative importance of the parent's own consumption with the offspring's future earnings:

$$U_{i,t-1} = U_{i,t-1}(C_{i,t-1}, Y_{i,t}) = (1-\alpha)\log C_{i,t-1} + \alpha \log Y_{i,t} \tag{2.1}$$

In the model, the parent can influence the future earnings of the offspring through investments (I_{t-1}) in the child's human capital (H_t). The parent is not allowed to either borrow against the child's future earnings or to transfer financial assets. The parent has to divide his or her own earnings between his or her own consumption and investments in the child's human capital.[7] Thus, the parent maximizes his or her utility with respect to the following budget constraint:

$$(1-\tau)\, Y_{i,t-1} = C_{i,t-1} + I_{i,t-1} \tag{2.2}$$

where $(1-\tau)Y_{i,t-1}$ is the parent's available earnings after taxes, and τ is a proportional taxation rate.[8] The offspring's human capital formation is a function of the monetary investments of the parent and the government (G_{t-1}) as well as the inherited endowments e_t that are independent of the monetary investments.

$$H_{i,t} = e_{i,t} + \theta \log (I_{i,t-1} + G_{i,t-1}) \quad \text{with } \theta > 0 \tag{2.3}$$

The assumption $\theta > 0$ in conjunction with the semi-log functional form ensures a decreasing but positive marginal product of monetary human capital investments.

According to Solon (2004) and Becker and Tomes (1979), e_t represents different non-monetary influence factors. For example, it represents the genetic component in the transmission process. In addition it captures the family's reputation and network but also represents the inherited family values, such as attitudes towards learning. As it is obvious that these endowments do not depend only on the parent's endowments, but also on former generations, Becker and Tomes (1979) model e_t in a way that it follows a first-order autoregressive process.

$$e_{i,t} = \delta + \lambda\, e_{i,t-1} + \nu_{i,t} \quad \text{with } 0 \le \lambda \le 1 \tag{2.4}$$

7 Becker and Tomes (1986) present a model that relaxes this assumption.

8 Note that because of the assumption of proportional taxation, redistributive public policy is included only by progressive investments in children's human capital (see also Solon, 2004).

where the inheritability coefficient λ is restricted to the interval 0 to 1, and $v_{i,t}$ represents a white noise error term.

Solon (2004) characterizes governmental investments by:

$$\frac{G_{i,t-1}}{(1-\tau)Y_{i,t-1}} \cong \varphi - \gamma \log Y_{i,t-1} \quad \text{with } \gamma > 0 \tag{2.5}$$

with φ being a constant. In this definition, a positive value of γ ensures that the ratio of government investments to after-tax income is decreasing in income. Therefore, γ represents a measure of the progressivity of the government's spending on children. The more positive γ is, the more progressive the policy.[9]

Finally, I define the offspring's earnings as:

$$\log Y_{i,t} = \mu_t + \rho H_{i,t} \tag{2.6}$$

where μ is a constant and ρ is the return to human capital.

Utility-maximizing behavior from the parent then leads to the optimal level of investments, which is given by:

$$I_{i,t-1} = \left(\frac{\alpha\rho\theta}{1-\alpha(1-\rho\theta)}\right)(1-\tau)Y_{i,t-1} - \left(\frac{1-\alpha}{1-\alpha(1-\rho\theta)}\right)G_{i,t-1} \tag{2.7}$$

Using this result together with equations (2.3), (2.4), and (2.5), I can reformulate equation (2.6) as:[10]

$$\log Y_{i,t} = \mu^* + (1-\gamma)\rho\theta \log Y_{i,t-1} + \rho e_{i,t} \tag{2.8}$$

which looks similar to the standard earnings regressions applied to estimate the IGE in the literature. However, $\rho e_{i,t}$ is not a proper error term. It is correlated with the regressor $\log Y_{i,t-1}$ because both depend on the parent's inherited endowment $e_{i,t-1}$. Solon (2004) shows that in a steady state, the probability limit of the OLS estimator of the coefficient of the parent's log earnings (which is the IGE) in equation (2.8) equals:[11]

$$\beta = \frac{(1-\gamma)\rho\theta + \lambda}{1 + (1-\gamma)\rho\theta\lambda} \tag{2.9}$$

---

9 Note that this policy is relatively progressive. Although the absolute value of public investments may be higher or lower for children from high-earning families, the ratio of public investments to after-tax earnings decreases with parental earnings (see also discussion in Solon, 2004).

10 $\mu^* = \mu + \varphi\theta\rho + \theta\rho \log\left(\frac{\alpha\theta\rho(1-\tau)}{1-\alpha(1-\theta\rho)}\right)$.

11 In the framework of this simple model the degree of altruism does not influence the degree of mobility. Higher altruism in one society simply leads to higher average earnings for the offspring's generation.

2.2.2 Cross-country differences

This result helps clarify the cross-country differences in the estimated IGEs. First, intergenerational mobility is higher (= β is lower) if the heritability coefficient λ is lower. Second, intergenerational mobility is lower if the efficacy of investments in human capital rises (higher θ). Third, the intergenerational mobility is higher, the lower the returns to human capital (ρ) are. Fourth, the intergenerational mobility is higher, the more progressive governmental investments in human capital are (higher γ).

In the case of Germany and the US, one can now formulate hypotheses based on this theoretical model. First, Black and Devereux (2011) argue that the heritability coefficient is unlikely to differ significantly between two developed countries. Second, the returns to human capital (for example, when measured as education) are higher in the US than in Germany (OECD, 2011). Third, because the German educational system is free up to the university-level, governmental investments in human capital can be seen as more progressive in Germany than in the US.[12] The remaining influence factor is the efficacy of the educational system. This indicator is hard to measure because the definitions of a valid input and output measure of the educational system are not clear. Thus, I have to follow Black and Devereux (2011) and base my expectations on the remaining three influence factors. Thus, given the restriction related to the last factor, based on the theoretical model, one should expect Germany to have higher intergenerational mobility than the US.

2.3 Empirical strategy

Equation (2.10) represents the basic regression model that is used in the analysis of intergenerational mobility.

$$\log Y_{i,t} = \alpha_t + \beta \log Y_{i,t-1} + \psi Z_{i,t-1} + \varepsilon_{i,t} \tag{2.10}$$

with β being the estimated IGE. The vector Z contains control variables. In the standard case, these variables are polynomials of the father's age.[13] $\log Y_{i,t}$ and $\log Y_{i,t-1}$ are measures of the offspring's and parent's log economic status. The theoretical model in section 2 suggests using lifetime earnings or lifetime income

12 In recent years, some of the German Federal States (Bundesländer) have introduced moderate fees to attend universities, but the German sample in this study is not affected by this change.

13 Earlier contributions also included the age of the children. However, according to the findings of Haider and Solon (2006), the more recent contributions use children's observations only from a narrow age window. Thus, I do not include the children's age in the regression.

as the measure of economic status for both generations. Following most of the literature, I will use earnings.

As there are no data sets available for the US and Germany that contain the lifetime earnings for two generations together with the necessary information on family relations, I have to approximate the lifetime earnings by using annual earnings observations.

As Solon (1989, 1992) and Zimmerman (1992) point out, the use of annual earnings observations instead of the parent's lifetime earnings in equation (2.10) leads to a substantial underestimation of the true intergenerational elasticity because annual status is a noisy measure of lifetime status. Annual status introduces a measurement error in the model that leads to *attenuation bias*. Solon (1989, 1992) proposed using multiyear averages instead and showed that the estimated IGE for the US rises from 0.2 to 0.4 if one uses a five-year average of parental earnings instead of annual earnings. Mazumder (2005) adds to this discussion and suggests using ten- to fifteen-year averages instead of five-year averages.

Haider and Solon (2006) provided another important methodological contribution addressing the absence of valid observations of lifetime earnings. The authors highlight the potential *life-cycle bias* arising from a measurement error in the dependent variable, which is the log earnings of the child. According to the classical errors-in-variables model, measurement error in the child's earnings would only result in higher standard errors for the estimated IGE. The critical assumption in this case is that the noise or error component is random over the life cycle.[14] Haider and Solon (2006) showed that the classical errors-in-variables model is not appropriate and that the association between current and lifetime earnings varies over the life cycle.[15]

The authors point out that, based on their US data, annual earnings are only suited as a proxy for lifetime earnings if these earnings are observed for individuals between the ages of 35–42. Earnings observations taken at younger ages lead to a substantial underestimation of the IGE. These findings are confirmed by Böhlmark and Lindquist (2006) for Sweden and Brenner (2010) for Germany. This argument substantially challenges the early IGE estimates on Germany and the US. As mentioned in the introduction, the observed children in these samples were young. For example, the average age of the sample of oldest sons in the most recent contribution (Couch and Lillard, 2004) was 29.22 years in Germany and 28.61 years in the US. These averages are much younger than the age range suggested above.

14 A similar discussion can be found in Jenkins (1987), Björklund (1993) and Grawe (2006).

15 Again, taking the long-term averages of the child's observed annual earnings would at least partly solve this problem. However, in contrast to the father's earnings observations most data sets do not provide enough yearly observations on the children to calculate such multi-year averages.

Estimating equation (2.10) via OLS provides an estimate for the IGE at the mean of the father's and son's earnings distributions. In a further step, I want to analyze whether the structure of intergenerational mobility differs between the two countries. Therefore, I must first determine whether equation (2.10) represents the appropriate functional form in the association between the parent's and child's earnings. For example, Bratsberg et al. (2007) showed that the relationship between the father's and son's earnings is highly nonlinear in the Scandinavian countries. However, they did not find evidence for nonlinearities in the UK and the US. I will address this question by adding higher polynomials of the father's earnings to the regression equation.

Additionally I estimate equation (2.10) by applying an unconditional quantile regression (UQR) approach, which is a method that was recently developed by Firpo et al. (2009). In contrast to the standard conditional quantile regression (CQR) developed by Koenker and Bassett (1978), UQR estimates provide information on the marginal effect of parental earnings at a given percentile of the *unconditional* distribution of the child's earnings. Thus, this method allows me to determine whether the effect of parental earnings differs along the child's earnings distribution.[16]

2.4 Data

Cross-country comparisons are highly dependent on reliable and comparable data sets. For this analysis, I apply data from the SOEP (Wagner et al., 2007) and the PSID, both of which are long-running household surveys that are widely used in economic and sociological research. Both panels start with an initial set of households and track their members over time. Because the individuals are also followed when they leave their initial households and form new ones, it is possible to observe the children when they leave their parental homes and found their own families.

Additionally, both surveys are included in the Cross-National Equivalent File (CNEF) project (Frick et al., 2007). This project is conducted at Cornell University and provides a subset of the information included in the SOEP and the PSID that has already been prepared for international comparisons. I use the information on the parent-child relations from the family tables in the original surveys and take the outcome variables from the CNEF data sets. For the fathers, I use their

16 In contrast, the estimates from a CQR represent the effect at the ***conditional*** quantile of the child's earnings distribution irrespective of the position of the child in the offspring's unconditional distribution. Grawe (2004) discusses estimating CQR as a test for the existence of credit-constraints in the parent's generation. For CQR estimates see Eide and Showalter (1999) for the US and Schnitzlein (2009) for Germany.

earnings information from the years 1984–1993 that were taken when the fathers were 35–55 years old. Following the suggestions of Solon (1989, 1992), I restrict my sample of fathers in both countries to the individuals with at least five valid annual earnings observations in the period from 1984–1993. I use an average of the earnings observations available in the ten years observed. On average I can use 8.89 yearly earnings observations for the German fathers and 8.53 yearly earnings observations for the US fathers (see Table 2.1). In addition, I add the number of years included in the father's average earnings as control variable in equation (2.10).

A valid annual earnings observation is defined as an earnings observation above a certain earnings limit to exclude implausibly low values. In the next section, I will show the initial results for three different lower earnings limits.[17] First, I follow the literature and apply an annual earnings limit of 1200 EUR/1200 USD. Second, I present the results for an annual earnings limit of 4800 EUR/4800 USD and third, I present results based on a sample with a lower earnings limit of 9600 EUR/9600 USD.

Following Bratsberg et al. (2007) I restrict my analysis to father-son pairs.[18] The observations of the son's earnings are taken from the most recent survey years. For Germany, this period lasts from 2000–2010. Because the PSID has only been biannually performed since 1997 and because the most recent available year in the US CNEF data is 2007, the corresponding period is 1999–2007.[19] I restrict the sample to the individuals with at least 2 valid yearly observations. To avoid life-cycle bias, I follow Haider and Solon's (2006) suggestions and restrict the analysis to the sons aged between 35–42 years in the year that their earnings are observed. This age range is substantially older than the sample of sons in the prior cross-national studies that include Germany. Finally, to prevent the analysis on nonlinearities from being driven by outliers, I follow the literature and exclude the top and the bottom percent of the distributions of the father's and son's average earnings.

The resulting sample consists of 352 father-son pairs from 284 different families in Germany and 276 father-son pairs from 211 families in the US. The main descriptive statistics of this sample are shown in Table 2.1. As can be seen in the table, the father's age is similar in the two samples, and the samples of both countries meet the age requirements for the sons suggested by Haider and Solon (2006).

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17 Earnings are measured in 2005 real values.

18 I do so to prevent the results from being driven by differences in labor market participation.

19 Because of this limitation the US sample contains only five survey years. I did not extent the observation period for the US sons to ensure that observations in both countries are taken in the same period.

2.5 Results

2.5.1 The standard model

Table 2.2 contains estimates for the IGE that are comparable to the standard estimates in the existing literature. These findings are the result of estimating equation (2.10) without including higher-order polynomials of the father's earnings. I present the results for three cases. In the upper panel, all annual earnings observations that are higher than 1200 Euro/1200 USD are included in the calculations of the father's and son's average earnings. Based on this sample, I estimate the IGE to be 0.262 in Germany and 0.459 in the US. This finding is in line with the recent results from national studies on both countries.[20] Based on the point estimate, these results indicate that the intergenerational mobility in Germany is higher than that in the US. Thus these results are in line with the expectations generated by the theoretical model in section 2. According to these estimates, a German son whose father's earnings are 100 percent above the mean in the parent's generation can expect, on average, his own earnings to be 26 percent above the average in his generation.[21] In the US, the same son could expect an earnings advantage of 46 percent. Thus, the regression to the mean is stronger in Germany than in the US. However, the difference between the countries fails to be statistically significant.

Additionally, one may ask how robust this finding is. The second panel in Table 2.2 contains the estimates for the IGE based on a sample for which the lower earnings limit is varied. Increasing the lower earnings limit to 4800 EUR/4800 USD leaves the IGE estimate for the US unaffected but increases the IGE for Germany up to 0.332. Thus, the gap between the two estimates is reduced. In the third panel, the estimates are based on a sample that only included the earnings observations above 9600 EUR/9600 USD. Again, the US estimate remains stable, but the German estimate further increases to 0.417.

So, I can reproduce the standard result from the prior literature, which states that the German IGE estimates are lower than the US ones. However, even a reasonable degree of variation in the sampling rules leads to similar estimates in both countries. The differences in the reaction of the estimated IGE to a variation in the lower earnings limit highlight the need for a cross-country comparison. Based on these results there is no evidence for a significant difference between the two countries.

One may now ask which earnings limit to choose. A lower earnings limit of 1200 EUR/1200 USD is very low in an analysis including Germany. In Germany

20 See Schnitzlein (2009) for an overview on the results for Germany and Corak (2006) for an overview on the US results.

21 Note that this finding is a correlation, not a causal effect.

individuals whose earnings are around 100 EUR per month will receive social benefits or unemployment benefits in most cases. As an analysis of the intergenerational transmission of welfare benefits is not within the scope of this chapter (for results on this topic see for example, Baron et al., 2008; Pepper, 2000) I chose a higher earnings threshold. However, an earnings limit of 9600 EUR/9600 USD is very restrictive as monthly earnings of 800 EUR or 800 USD are not unreasonably low. Therefore, I decided to apply the medium lower threshold to the further analysis.

2.5.2 Structure of the intergenerational mobility

To analyze the structure of the intergenerational relationship I present a graphical representation of the data. Figure 2.1 depicts the data of the two countries. The figure provides the average of the son's log earnings by the father's earnings percentile together with a linear regression through these data points. The upper part of the figure represents the German data, and the lower part represents the US data.

In both countries there is no evidence for nonlinearities along the distribution of the father's earnings. This finding is in line with the result of Bratsberg et al. (2007) who, based on NLSY data, also present a graphical representation of the intergenerational transmission process in the US and who also found no evidence for a nonlinear relationship.

Thus, the first examination of the data did not provide evidence on nonlinearities in either country. This finding is supported by the results of a RESET test that I performed on the model in equation (2.10). In both countries, the test fails to reject the null hypothesis. Nevertheless I reestimated equation (2.10) for both countries including the second- and third-order polynomials of the the father's log earnings. The results of these estimations are presented in Table 2.3. All of the cases including the higher-order polynomials lead to insignificant coefficient estimates for the father's log earnings variables. A joint F-test for the significance of the higher-order polynomials also fails to reject the null hypothesis in both countries. In sum there is no evidence that the IGE differs along the distributions of the father's earnings in both countries.

Adding the polynomials of the father's earnings to the standard earnings equation answers the question of whether intergenerational mobility is higher or lower for the children of parents with higher incomes. Another important but less analyzed question is whether there are differences with respect to the distribution of the son's earnings. The focus on the distribution of the children's earnings changes the perspective of the analysis. Whereas parental earnings are the origin of the transmission process, the offspring's earnings are the outcome.

To assess this question, I apply a UQR approach to equation (2.10). The results are shown in Table 2.4, which presents the OLS estimate as well as the UQR estimates at the 20th, the 40th, the 60th and the 80th percentile of the son's earnings.

The table shows that in both countries mobility is significantly higher at the bottom quintile than at the top quintile. In Germany for low-earning sons, the estimated IGE is 0.102 and is not statistically different from 0. Hence, there is virtually no association between the father's earnings and the son's own earnings in this part of the son's earnings distribution. The estimate at the 20th percentile is also the lowest in the US. In contrast to the German estimate, the US estimate is significantly different from 0. In both countries the estimate at the 20th percentile is significantly lower than the estimate at the 80th percentile. Thus, Table 2.4 indicates that the intergenerational mobility in both countries is higher for the low-earning sons than the high-earning sons.

However, in an analysis along the distribution of the father's earnings this finding would be positive. Higher intergenerational mobility for sons whose father's are at the bottom of the earnings distribution would indicate that the sons can improve their position. In contrast, the finding in this analysis indicates higher mobility for sons at the bottom of *their* distribution of earnings. As the son's earnings are the outcome of the intergenerational transmission process, that result means that ending up at the bottom of the distribution of son's earnings is a severe risk for sons with fathers from all parts of the distribution.

The results in Table 2.4 further show, that the remaining structure is different. The 20th percentile estimate is a clear outlier among the German results. The remaining estimates all range from 0.5 to 0.6, which suggests that the intergenerational mobility is low. These results suggest that the low OLS estimate for Germany might be driven by high mobility at the lower end of the son's earnings distribution. In contrast to Germany, the IGE estimates increase with the son's earnings in the US up to an estimate of 0.767 at the 80th percentile. This finding also shows a low level of intergenerational mobility in the US. However, even if the structure of the intergenerational mobility differs between the US and Germany both countries show a low level of mobility.

2.6 Conclusion

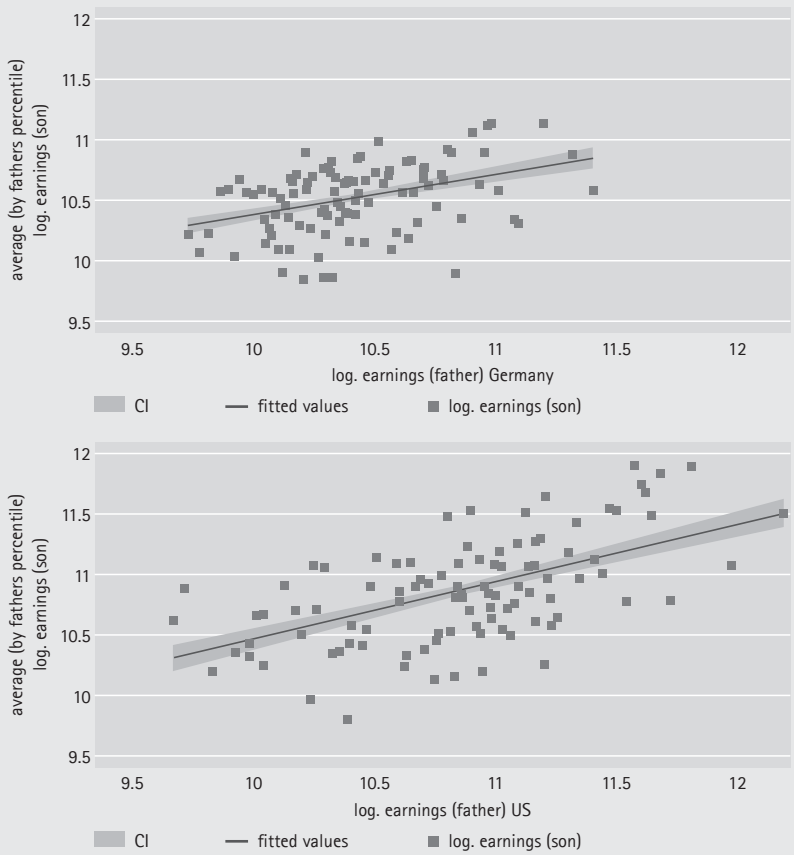
In this chapter I present estimates of intergenerational mobility in Germany and the United States based on recent comparable data sets. Although the point estimate for the IGE derived from the standard estimation indicates that intergenerational mobility is higher in Germany, this difference fails to be significant and appears not to be robust against variation in sampling criteria. I find no evidence for

nonlinearities along the father's earnings distribution. In contrast, I find that intergenerational mobility is higher for the sons at the lowest quintile of the son's earnings distribution in both countries. Thus ending up at the bottom of the earnings distribution is an actual risk for the sons of fathers from all parts of their earnings distribution.

Based on these results I conclude that although the two countries may differ in their structures of intergenerational mobility, there is no clear evidence of one being more mobile than the other. In particular, the UQR estimates show high intergenerational persistence in both countries.

2.7 Figures and tables

Figure 2.1: The relationship between the father's and son's earnings in Germany and the US



Note: the figure contains the regression line and mean log earnings of sons and fathers for each percentile of father's earnings distribution. The upper part presents German data and the lower part presents data from the US.

Source: SOEP (1984–2010), PSID (1984–2007).

Table 2.1: Descriptive statistics

	Germany Median/Mean	US Median/Mean
son's earnings	53,803.65	50,467.08
father's earnings	45,165.29	53,617.57
number of years in average	8.89	8.53
father's age	47.66	48.05
son's age	37.77	38.20
sample size	352	276
number of families	284	211

Note: the table contains descriptive statistics of the sample used in the analysis. The table presents the median of the earnings and the mean for all of the other variables. The applied lower earnings limit is 4800 EUR/4800 USD. For better comparability earnings are given in USD using the following exchange rate: 1 EUR = 1.3992 USD.

Source: SOEP (1984–2010), PSID (1984–2007).

Table 2.2: Estimated intergenerational elasticities

	Germany	US
lower earnings limit 1200 EUR/1200 USD		
IGE	0.262 ***	0.459 ***
se	*0.096*	*0.070*
N	357	278
lower earnings limit 4800 EUR/4800 USD		
IGE	0.332 ***	0.454 ***
se	*0.088*	*0.068*
N	352	276
lower earnings limit 9600 EUR/9600 USD		
IGE	0.417 ***	0.482 ***
se	*0.074*	*0.070*
N	295	262

Note: the table contains estimates of intergenerational elasticities. The figures in italics are standard errors clustered at family level. ***: significance at 1 percent level, **: significance at 5 percent level, *: significance at 10 percent level.

Source: SOEP (1984–2010), PSID (1984–2007).

Table 2.3: Estimated intergenerational elasticities – different functional forms

	Germany			US		
	(1)	(2)	(3)	(1)	(2)	(3)
ln (father's earnings)	0.332 ***	1.853	35.026	0.454 ***	–2.364	–51.634
se	*0.088*	*3.601*	*119.553*	*0.068*	*2.122*	*44.595*
ln (father's earnings)^2		–0.072	–3.226		0.130	4.671
se		*0.172*	*11.394*		*0.099*	*4.106*
ln (father's earnings)^3			0.100			–0.139
se			*0.362*			*0.126*
N	352	352	352	276	276	276
adj.-R^2	0.062	0.06	0.057	0.157	0.159	0.159
p-value RESET test	0.217	–	–	0.528	–	–
p-value joint F-test	–	0.674	0.857	–	0.190	0.219

Note: the table contains estimates of intergenerational elasticities. The figures in italics are standard errors clustered at family level. ***: significance at 1 percent level, **: significance at 5 percent level, *: significance at 10 percent level.

Source: SOEP (1984–2010), PSID (1984–2007).

Table 2.4: Estimated intergenerational elasticities – results from unconditional quantile regressions

	Germany	US
OLS	0.332 ***	0.454 ***
se	*0.088*	*0.068*
N	352	276
results from UQR:		
20th percentile	0.102	0.239 **
se	*0.112*	*0.093*
40th percentile	0.518 ***	0.383 ***
se	*0.093*	*0.072*
60th percentile	0.562 ***	0.494 ***
se	*0.080*	*0.078*
80th percentile	0.506 ***	0.767 ***
se	*0.115*	*0.104*

Note: the table contains estimates of intergenerational elasticities based on unconditional quantile regressions. ***: significance at 1 percent level, **: significance at 5 percent level, *: significance at 10 percent level.

Source: SOEP (1984–2010), PSID (1984–2007).

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3 How important is the family? Evidence from sibling correlations in permanent earnings in the US, Germany, and Denmark

Daniel D. Schnitzlein

3.1 Introduction

The last three decades witnessed a substantial growth of the economic literature on intergenerational mobility with results covering a large number of countries.[22] The studies addressed numerous questions, starting with simple linear estimates of the intergenerational association of earnings and ending up in international comparisons of non-linearities in the intergenerational transmission of labor market success. Most of these studies focus on the calculation of intergenerational earnings elasticities (hereafter IGEs) which measure the association between parental income and the economic success of the offspring. Intergenerational mobility in this sense answers the question: *"How strong is the relationship between parental income and the income of the offspring in adulthood?"*

The main reason why research on intergenerational mobility gets attention in the literature is that the degree of intergenerational mobility in a society is often seen as a key indicator of equality of opportunities. Having this interpretation in mind, it might not be enough to analyze the association between the earnings or the income of parents and children. The relevant question to ask would rather be: *"How dependent or independent is the economic outcome of children of the situation of the family they were born into?"*

Of course this includes much more than only parental income but all family factors[23] and community factors[24] that children face. While parental income might be an important factor it is not obvious that it should be the only, or the major influence factor. Recent research on intergenerational mobility based on sibling correlations has shown that parental income and factors correlated with it explain less than half of the total impact of family and community factors on children's economic outcome in adulthood (Björklund et al., 2010; Mazumder, 2008). Thus, it is necessary to calculate a broader measure of the influence of family background

22 See Solon (1999), Black and Devereux (2011), and Björklund and Jäntti (2009) for an extensive overview of the literature on intergenerational mobility.

23 Beside parental income these can be for example parental education, parent's social network but also parental attitudes and parenting style.

24 Two examples would be the neighborhood and the quality of the available schools.

than an IGE to draw firm conclusions with respect to the degree of intergenerational mobility as an indicator of equality of opportunities in a specific country.

Sibling correlations provide such a broader measure: if family and community factors have a significant impact on the outcome of children, two siblings should resemble each other more than two randomly drawn individuals (Solon, 1999). While calculating sibling correlations is a well known method in sociological research it is so far a rarely used approach in the economic literature on intergenerational mobility.[25]

One way to evaluate the level of intergenerational mobility as an indicator of equality of opportunities, is to compare the situation in different countries. The three countries considered in this chapter represent different types of modern welfare states with different institutional settings. We know from the existing literature on sibling correlations as well as intergenerational correlations, that intergenerational mobility is higher in the Scandinavian countries than it is in the US (Björklund et al., 2002; Corak, 2006). The evidence about the ranking of Germany remained unclear in the literature. Here this chapter contributes in three ways.

First, it provides estimates of sibling correlations for Denmark, the US, and Germany based on comparable samples. As there are no results on sibling correlations in permanent earnings for Germany so far, this chapter fills a gap in the literature. Second, it updates the US-Denmark comparison carried out by Björklund et al. (2002) based on recent data and an alternative estimation strategy. Third, it provides evidence on where to rank Germany in terms of intergenerational mobility in international comparison. Additionally, I present extensive robustness checks for the results using different sample selection rules. All estimations are carried out for both, brothers and sisters.

To summarize the main findings: the importance of family and community background in Germany is higher than in Denmark and comparable to that in the US. This holds true for brothers and sisters. In Denmark 20 percent of the inequality in permanent earnings can be attributed to family and community factors shared by brothers while the corresponding estimates are 43 percent in Germany and 45 percent in the US. For sisters the estimates are 19 percent for Denmark, 39 percent for Germany and 29 percent for the US. The developed ranking appears to be robust to most of the variations in sample selection rules.

25 In contrast to the economic literature the sociological literature on sibling correlations or sibling resemblance mainly focused on educational outcomes or prestige score measures. See for example Hauser and Wong (1989) for the US and Sieben et al. (2001) for Germany.

3.2 Literature review

3.2.1 Literature on sibling correlations

Table 3.1 summarizes the existing results on sibling correlations in permanent earnings by country.[26] It shows that, with one exception for China, until now, the literature focused on the US and the Scandinavian countries.[27]

One of the earliest studies is Solon et al. (1991) who use Panel Study of Income Dynamics (PSID) data for the US.[28] The authors pointed out that it is important to separate transitory fluctuations from the earnings measure. Their results showed that intergenerational mobility measured by sibling correlations in permanent economic outcomes is much lower in the US than what was known from previous studies based on short run measures.[29] They found the brother correlation in earnings to be 0.34–0.45, depending on which assumptions they impose on their model.

These results are updated by Mazumder (2008): using the PSID and the National Longitudinal Survey of Youth (NLSY) he found the brother correlations in earnings to be 0.49 (NLSY) and 0.39 (PSID). He also presents estimates of the contribution of specific factors explaining sibling correlation, for example, he shows that only 36 percent of the brother correlation in earnings can be explained by parental income measures. Human capital factors and occupation each are able to explain about half the sibling correlation.

A much more detailed study on the question which factors determine sibling correlations is Björklund et al. (2010) based on Swedish data. Besides parental income, human capital, and occupation they found that measures of parental behavior (indicators like parental involvement in schoolwork, parenting practices and maternal attitudes) have substantial explanatory power.

In another study using Swedish data, Björklund et al. (2009) show that intergenerational mobility rose remarkably in Sweden during the rise of the welfare state. They found brother correlations of about 0.49 for cohorts born in the 1930s and

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26 Most authors focus on brother pairs and sister pairs. Given the differences in the attachment to the labor market between brothers and sisters, allowing for mixed sibling pairs would lead to estimates that highly depend on how many brother-sister pairs are observed in each family.

27 Comi (2010) calculates sibling correlations in early career earnings for seven European countries including Germany. The results are not listed in Table 3.1 as they have an explicit focus on early career outcomes. So these estimates cannot be seen as a proxy for intergenerational mobility. Schnitzlein (2011) presents brother correlations in permanent earnings for different ethnic groups in Denmark. As the results in Table 3.1 do not distinguish between ethnic groups, these results are also not included.

28 There were some studies published before the Solon et al. (1991) article, but as they suffer from various sources of bias as described in Solon et al. (1991) I did not include them in Table 3.1. See Solon (1999) for a survey.

29 This is very similar to the findings in Solon (1989) and Solon (1992) for intergenerational correlations.

brother correlations of about 0.32 for cohorts born in the 1950s, slightly increasing back to 0.37 for cohorts born in the 1960s. The authors show that factors related to schooling can account for a large part of this rise in intergenerational mobility; however, they cannot identify which factors were the important determinants after eliminating changes in returns to schooling and changes in the brother correlations in schooling. In their conclusion the authors suggest that this rise in mobility is most likely driven by school reforms.

In the most recent contribution Eriksson and Zhang (2010) used Chinese data and conclude, that intergenerational mobility is very low in China even compared to the US. They also analyzed if there were differences between coastal and interior provinces, but they found a very similar level of intergenerational mobility in both types of regions.

3.2.2 Cross-country comparisons

There, so far are only two studies providing results on cross-country comparisons of sibling correlations in permanent earnings. Björklund et al. (2002) compared the US to Denmark, Finland, Sweden, and Norway. They focused on brother correlations and concluded that the influence of family background is much less important in the Scandinavian countries than in the US. Björklund et al. (2004) extended the results for Finland, Sweden, and Norway to sisters and found the same cross-national pattern but lower overall correlations for sisters.

These findings for sibling correlations are in line with those on intergenerational mobility based on IGEs, which result in the following widely accepted stylized fact:[30] the US mark the lower end of the mobility scale in international comparisons of industrialized countries, and the Scandinavian countries face the lowest influence of parental economic status on the labor market success of their offspring.

The evidence for Germany is less clear. As there are no previous results on sibling correlations, all prior comparisons are based on IGEs. Couch and Dunn (1997) carried out the first comparison of intergenerational mobility between Germany and the US. They used data from the PSID and the German Socio-economic Panel (SOEP) to estimate IGEs for both countries. Their German sample of sons and daughters was very young due to the short duration of the SOEP at the time. When constructing a US sample that was comparable in age to their German data, they found no significant differences between the two countries. Haider and Solon (2006) however point out that observing offspring at very young ages could lead to serious bias in the estimation of the IGE, so that the results of

30 See for example Corak (2006).

Couch and Dunn (1997) could be biased. This skepticism is supported by recent estimates of IGEs for Germany that are much lower than the consensus estimate for the US, indicating higher intergenerational mobility in Germany than in the US (Eisenhauer and Pfeiffer, 2008; Schnitzlein, 2009; Yuksel, 2009). But as these studies only provided national analyses it remains unclear how comparable the results are to the US estimates.

3.3 Statistical model and empirical strategy

The following statistical model is based on Solon et al. (1991) and Solon (1999). Let y_{ij} be a measure of permanent or long-run earnings for child j of family i. Next assume that the interaction of family background (including community effects) and individual effects can be characterized such that permanent earnings can be decomposed into the sum of two orthogonal components, a family component α_i and an individual component μ_{ij}.

$$y_{ij} = \alpha_i + \mu_{ij} \tag{3.1}$$

The family component in this framework represents the combined effect of all factors that are shared by siblings from family i. The individual component covers all factors that are purely idiosyncratic to sibling j. Assuming orthogonality of α_i and μ_{ij}, the variance of permanent earnings σ_y^2 can be expressed as the sum of the variances of the family component α_i and the individual component μ_{ij}:

$$\sigma_y^2 = \sigma_\alpha^2 + \sigma_\mu^2 \tag{3.2}$$

As in the present case, the measure of interest is the correlation coefficient between the permanent earnings of two siblings one needs an expression for the covariance between the permanent earnings of two siblings j and j' of the same family i. This covariance can be shown to be

$$\text{Cov}\,(y_{ij}, y_{ij'}) = \sigma_\alpha^2 \quad \text{with } j \neq j' \tag{3.3}$$

which equals the variance of the family component. With this information the correlation coefficient ρ of the permanent earnings of two siblings j and j' equals the ratio of the variance of the family component σ_α^2 and the variance of the complete permanent earnings $\sigma_\alpha^2 + \sigma_\mu^2$:

$$\rho = \text{corr}\,(y_{ij}, y_{ij'}) = \frac{\sigma_\alpha^2}{\sigma_\alpha^2 + \sigma_\mu^2} \quad \text{with } j \neq j' \tag{3.4}$$

The intuitive interpretation of this ratio is, that the correlation in permanent earnings between two siblings (therefore sibling correlation) equals the proportion of the variance of permanent earnings that can be attributed to factors shared by siblings. If variance is interpreted as a measure of inequality, the sibling correlation denotes the share of inequality in a permanent outcome that can be attributed to factors shared by siblings.

As σ_α^2 and σ_μ^2 cannot be negative, ρ takes on values between 0 and 1. Linking this measure to the question of intergenerational mobility, a correlation of 0 indicates that there is no influence from family and community factors and 1 indicates that there is no influence from the individual. The first case would describe a fully mobile society and the latter a fully deterministic one.

An important issue in the analysis of intergenerational mobility is the choice of an outcome measure. One obvious choice could be annual earnings. However, annual earnings contain not only information on the economic outcome of an individual but also contain a transitory part that reflects temporary fluctuations. In the sense of the research question stated above "How dependent or independent is the economic outcome of the children of the situation of the family they were born into?" transitory fluctuations are of minor interest. The important outcome is the permanent or long-run component of earnings. Thus, the empirical strategy has to separate the transitory from the permanent component of annual earnings.

In the context of sibling correlations this was first addressed by Solon et al. (1991).[31] They showed that not controlling for transitory fluctuations when using annual earnings leads to serious underestimation of sibling correlations. The authors found an attenuation factor above 0.55 for their US data. This suggests that not taking into account the difference between permanent and annual earnings might lead to estimates for the sibling correlation of only half of the correct size.

The sibling correlation described above can be estimated as the within-cluster correlation in the following linear multilevel model,

$$y_{ijt} = X_{ijt}\beta + \alpha_i + \mu_{ij} + \nu_{ijt} \tag{3.5}$$

with y_{ijt} being an annual earnings observation, X_{ijt} being a matrix of fixed year and age effects (including year dummies and polynomials of age) and the remaining three parts being the family, individual and transitory components. In this model $(\alpha_i + \mu_{ij})$ can be interpreted as permanent income. Following Mazumder (2008)

31 See Solon (1992) for a discussion of the same issue in the case of IGEs.

I apply Restricted Maximum Likelihood (REML) to estimate this model and to calculate the variances of α_i and μ_{ij}. In the results section I will report the variance components along with the sibling correlation. The standard error for the sibling correlation is calculated using the delta method.[32]

3.4 Data and sampling rules

3.4.1 Data

For the US and Germany I use data from the SOEP (Wagner et al., 2007) and the PSID. Both are nationally representative household surveys widely used in economic and sociological research. Both datasets started with a set of households that were asked on an annual basis (in the case of the PSID the households are interviewed biannually after 1997). As the children of these original households grew up and founded own families, their households were interviewed as new survey households. This feature enables me to link siblings when they are grown up. A strength of the SOEP and the PSID, in addition to the vast amount of information available in the data, is, that both surveys are included in the Cross-National-Equivalent-File (CNEF) project carried out at Cornell University. It contains internationally comparable variables for a subset of the information in the original surveys.[33]

I extract family relations information from the original surveys and use the information on annual labor earnings as provided in the CNEF data. I use the most recent waves available, covering the years 2002–2008 for Germany and the years 1999, 2001, 2003, 2005 and 2007 for the US.

For Denmark I had access to data from the Danish Integrated Database for Labor Market Research (Integreret Database for Arbejdsmarkedsforskning (IDA)) which is a database that combines information from various administrative registers collected by the Danish government and administered by Statistics Denmark.[34] Being administrative data the IDA database has some desirable properties. First, it covers

32 There is a discussion in the literature on whether the model should be estimated allowing for serial correlation of the transitory individual component. As, especially in the survey data, gaps of different lengths in the series of yearly earnings observations are common, I did not incorporate a serial correlations model. If serial correlation would be a problem the presented correlations in this chapter would be downward biased. Björklund et al. (2002) showed that accounting for autocorrelated errors in the Danish data only slightly changed the brother correlation from 0.25 to 0.29. Mazumder (2008) argued that estimating the model allowing for serial correlation has no effect on his estimates for the US. Nevertheless if there would be a problem with serial correlation, the corrected German estimate would be even higher than the one presented in this chapter. This would leave the main findings unaffected.

33 See http://www.human.cornell.edu/pam/research/centers-programs/german-panel/cnef.cfm for an overview on the available data and Frick et al. (2007) for additional information.

34 Unfortunately there is no English documentation available. Nevertheless an English description of the database can be found in Timmermans (2010) and http://www.asb.dk/article.aspx? pid=675. A complete list of variables, in Danish, can be found in Danmarks Statistik (1998).

the entire Danish population so there is no sample selection or panel attrition. Second, the earnings information should be more precise when coming from administrative data sources then from interviews. Third, another major advantage of this data is the high number of individuals (all Danish residents) covered.

As it would be computationally very burdensome to use the entire Danish population for the analysis I had to draw a sample comparable to the ones from Germany and the US. A natural choice would be to draw a random sample of the Danish population. But this would be different from what is given in the surveys for Germany and the US.

In the two surveys the initial unit is the parental household and not the offspring that is observed in this study. To take this into account, I choose to first define a family indicator for every individual covered in the years 2002–2006. As it is important how to define which siblings belong to one family, I will provide results for four different alternatives and will verify that the results are robust to these definitions. In the main scenario I define two individuals to belong to one family, and thus to be considered siblings, if the data contains the same mother and the same father identification number.[35] Then I draw a 10 percent random sample of these families. In the second step I include all children from the sampled families in the analysis and use the annual labor earnings variable available in the IDA dataset.

3.4.2 Sampling rules

As for example Björklund et al. (2002) pointed out, the results of a sibling correlation analysis are sensitive to the applied sample selection rules. In the following I will describe the sample selection rules for what I call the main scenario. The results based on these specifications are the results that are most comparable to the existing literature. I will present robustness checks that show how sensitive the main findings are to these sampling decisions.

In the main scenario the earnings observations of siblings between age 31 and 49 are considered. So in every country even the high educated have entered the labor market and should still be in the labor force. Below I will also show results for a shorter age window (36–49).

I impose a lower annual earnings limit of 1200 Euro (9000 DKK, 1200 USD) in real 2007 values. I also consider three alternative cases, a lower earnings limit of 600 Euro (4500 DKK, 600 USD) and a case with no lower earnings limit.

Table 3.2 contains descriptive statistics for both brothers and sisters for the main sample scenario. The first column in each part of the table contains the

35 Note that this does not have to be identical with being biological siblings.

number of individuals observed in each year.[36] These are clearly higher in the Danish administrative data compared to the household surveys from Germany and the US. This explains that the results in the next section are estimated more precisely for the Danish sample. The table further contains median earnings and mean age for brothers and sisters in the three countries.

3.5 Results

3.5.1 Results for the main scenario

Starting with the main scenario, the estimation results for brothers and sisters are shown in Table 3.3. In the first three rows the estimated variance components σ^2_α, σ^2_μ, and σ^2_υ are shown along with their standard errors. As all figures in the table are at least statistically significant at the five percent level the significance is not explicitly marked. The estimated sibling correlations ρ are presented in the bold typed line of Table 3.3.

For brothers the estimated correlation in permanent earnings is 0.20 in Denmark, 0.43 in Germany and 0.45 in the US. According to these results family and community background is of about the same importance in Germany and the US and is much less important in Denmark. Thus, in Denmark, around 20 percent of the inequality in permanent earnings can be attributed to factors shared by siblings. The corresponding figures are 43 percent for Germany and 45 percent for the US.

Comparing the 95 percent confidence intervals it becomes clear that there is a significant difference between Germany and Denmark and between the US and Denmark. The intervals of the German and the US estimates however overlap. Given the argumentation above that sibling correlations are a measure of intergenerational mobility, this leads to the first results:

- *For brothers there is significantly less intergenerational mobility in Germany and the US than in Denmark.*
- *For brothers there is no significant difference in intergenerational mobility between Germany and the US.*

The situation is not as clear-cut for sisters as for brothers. The estimated correlations are 0.19 for Denmark, 0.39 for Germany and 0.29 for the US, meaning that 19 (39/29) percent of the inequality in permanent earnings can be attributed to factors shared by sisters in Denmark (Germany/US).

36 These numbers include siblings as well as singletons. In the estimation I follow the existing literature and estimate the model including singletons. For a discussion see Solon et al. (1991) and Mazumder (2008).

The estimates are in line with prior results, i.e. that sister correlations are lower than the corresponding brother correlations. Due to the lower number of observations available, especially in the German data, the estimates are less precise compared to the estimates for brother pairs. As a result, the 95 percent confidence intervals for the three countries are overlapping, even with the Danish point estimate being only half of the size of the German one. However the differences between Germany and the US on one side and Denmark on the other side are statistically significant at the 10 percent level, indicating that there is a difference between the importance of family background for sisters in Denmark compared to the two other countries. Thus, the summary for sisters resembles that for brothers:

- *For sisters there is significantly less intergenerational mobility in Germany and the US than in Denmark.*
- *For sisters there is no significant difference in intergenerational mobility between Germany and the US.*

3.5.2 Discussion of the results

The results show that there is a higher level of intergenerational mobility in Denmark compared to Germany and the US. As it is beyond the scope of this chapter to identify causal mechanisms in the determination of the level of intergenerational mobility I want to offer a short discussion of the potential reasons for the observed differences. The first question that has to be addressed is: are the observed differences due to differences in the cultural background of the individuals in the three countries or due to differences in the institutional settings. As I cannot test this within a cross-country comparison, because cultural background and institutional setting jointly vary between the three countries, recent results from the literature show that cultural background might not be a major determinant for the level of intergenerational mobility. First, Björklund et al. (2009) show that the rise of the Swedish welfare state, which can be interpreted as a variation of the institutional framework controlling for cultural background, was accompanied by a clear rise in intergenerational mobility over time. Second, in Schnitzlein (2011) I find no differences in brother correlations among different groups of second generation immigrants in Denmark. These results indicate that instead of cultural background the institutional setting plays a major role in the determination of the level of intergenerational mobility.

Given these results from the literature, together with the results from the cross-country comparisons in Björklund et al. (2002) and this recent chapter, that show that there are significant differences between the countries under study, future research should try to identify the role of specific institutions in the determination of the level of intergenerational mobility.

3.6 Robustness of the results

Björklund et al. (2002) show that the estimates for sibling correlations are to some extent sensitive to variations in the applied sample selection rules. The aim of this section is to analyze how robust the main findings stated above are to changes in the main sample dimensions.

First, I vary the definition of a sibling. Second, I modify the lower earnings limit holding fixed the age at which I observe the siblings. Third, I vary the age and hold the earnings limit fixed. The results of these robustness checks can be found in Tables 3.4–3.9. Tables 3.4, 3.5, and 3.6 present estimated sibling correlations for 20 different sample specifications in each country.[37] Finally, Tables 3.7, 3.8 and 3.9 give an overview over which cross-country comparisons result in a significant difference and at which level.

The structure of the tables is oriented at the three factors mentioned above. Each column contains another definition of who is counted as a sibling: alternative 1 is the definition of the main scenario, where two individuals are counted as siblings if they report the same mother and father. Alternative 2 relaxes this to the case that two individuals are counted as siblings if they report the same father and in the case the information on the father is missing they are matched if they report the same mother. Alternative 3 counts two individuals as siblings only based on the information on the mother and Alternative 4 incorporates only the information on the father.

In the first panel of the tables the age window is hold constant (31–49 years of age) and I vary the lower earnings limit. I calculate the sibling correlations for three scenarios. The first row contains the earnings definition of the main scenario in which low earnings are cut at 9000 DKK, 1200 EUR and 1200 USD. In the second row, I relax the lower limit to half of the main scenario and in the last row of this block all results are calculated using no lower earnings limit.[38]

The second panel holds the earnings limit fixed at the definition of the main scenario and varies the age restriction. The first row presents results for siblings observed at younger ages (26–44 years) and the second row for siblings observed between 36 and 49 years of age.

3.6.1 Results of the robustness checks

I start the discussion with the different definitions of siblings. While every column of Tables 3.4, 3.5, and 3.6 contains another sibling definition, the sibling correlations

37 Tables 3.10, 3.11, and 3.12 contain the associated number of observations, individuals, and families.

38 Only missing observations and those with zero earnings (because of the calculation of log earnings) are excluded.

in all three countries do not vary much along this dimension. Thus, the estimates seem to be robust for both, brothers and sisters.

The modification of the lower earnings limit seems to be more influential. One important source of bias in the early studies on intergenerational mobility based on sibling correlations was that they relied on too homogeneous samples (see the discussion in Solon et al., 1991). One could expect a similar effect here. The higher the annual earnings limit, the more homogeneous the sample gets with respect to permanent earnings. This reduces the overall variance. The total effect on the sibling correlation is unclear, because it is not obvious which part of the overall variance, the family specific part or the individual part or both will be depressed. The results in the first two rows of the upper panels of Tables 3.4, 3.5, and 3.6 show that reducing the annual earnings limit to half of the size in the main scenario has little effect on the estimated correlations. For German sisters, this is also true for dropping the annual earnings limit. While the estimates for US brothers show a slight increase, for all other groups waiving the earnings restriction comes along with a clear decrease in the estimated sibling correlation. In these groups dropping the annual earnings limit increases the within family variance (variance of the individual specific component) by a higher amount than the between family variance (variance of the family specific component).

These different reactions to a change in the sampling rules highlight the need for a cross-country comparison. They show that it might be misleading to draw conclusions solely based on national studies when it is not possible to vary the sample restrictions of all countries involved. As the impact of these variations may differ between the countries, one needs to know the magnitude of the change to examine whether the main results are affected.

The lower panels in Tables 3.4, 3.5, and 3.6 hold the earnings limit fixed at the definition of the main scenario and vary the age at which the individuals were observed. The first row in the lower panels contains an estimate based on a younger cohort (26–44 years of age) and the second an estimate based on an older cohort (36–49 years of age).

One would expect the more narrow age window (between 36–49 years) to yield a more homogeneous sample. Again the overall effect is not clear. On the one hand reducing the age difference should reduce the variance within a family as the brothers and sisters are observed at more similar ages. But the same is true for the variance between families. The results show that narrowing the age window has little effect on the estimates. There is only one clear exception, the estimated correlations for German brothers clearly increase when the age window is restricted to the age between 36–49 years. This means that the change in the age window did reduce the within family variation to a larger extent than the variance between

families. This can either be due to the fact that now observations are taken at more similar ages or that siblings with too large age differences do not enter the sample in this specification. As it is the aim of this chapter to present results of a cross-country comparison I interpret this differing reaction as another evidence that international rankings should be based on cross-country comparisons instead of national studies.

Another example is the response of the estimates for German brothers and sisters compared to US brothers to a change in the age restriction towards a younger age group (26–44 years of age). While the estimates for brothers in the US rise in magnitude, the German estimates decrease. One possible explanation for this behavior would be that in Germany especially highly educated individuals enter the labor market at older ages. In the first years there is not yet a big difference between high and low earners. If there are families with mainly low earning members and families with mainly high earning members this would lead to a decrease in the estimated correlation.

The majority of the mentioned differences resulting from variations in the sampling dimensions are not statistically significant as parts of their confidence bands overlap. But especially when the response of the correlations due to a change in sample selection rules is different in two countries it is important to see whether the results stated in section 5 are still correct.

3.6.2 Robustness of the main scenario results

The results stated in section 5 refer to the cross-national comparison of the sibling correlations. In the following I discuss how robust these findings are to the described variations in sample selection criteria. Tables 3.7, 3.8 and 3.9 show which pairwise confidence intervals are not overlapping for the different specifications. Two stars denote non-overlapping 95 percent confidence intervals and one star denotes non-overlapping 90 percent confidence intervals.

In Table 3.7 one can find the Denmark-US comparison. As all calculated specifications for brothers show differences at the 5 percent level, the difference between Denmark and the US is a robust result. This updates and confirms the results by Björklund et al. (2002) and is in line with the results based on IGE/IGCs.

Table 3.8 shows the position of Germany compared to Denmark. For brothers, the differences between Denmark and Germany are statistically significant for all specifications except for the younger cohort. Even though the point estimates are all higher in Germany, the differences for this cohort are not statistically significant. This is because the correlations respond differently to a change in the age restriction in Germany and Denmark. Given this exception the result of higher intergenerational mobility in Denmark is a robust finding.

For sisters the picture is less clear. In the Denmark-US comparison (Table 3.7) most of the specifications except the one without lower earnings limit are significantly different at least at the ten percent level. In the Germany-Denmark comparison (Table 3.8) this is only true for less than half of the specifications. However, given the low number of observations especially in the German sample and as most of the specifications in the main age window show significant differences, I still interpret this as support for the results in section 5.

The comparison between Germany and the US can be found in Table 3.9. For sisters, no specification yields a significant difference between the two countries. The German estimates are higher than the US ones but none of the differences is statistically significant.

For brothers there is a clear result for the age window 31–49 in as much as there is no significant difference between Germany and the US. But the result changes when the age restriction changes. For the younger cohort, brother correlations in the US are higher than in Germany, indicating higher intergenerational mobility in Germany compared to the US. The picture is the opposite for the more narrow age group. In two cases the German estimate is even significantly higher than the corresponding US one. Nevertheless, the result of similar levels of intergenerational mobility is supported for the main age window. But the different reactions to the variations in age and the conclusions resulting from this for the structure of intergenerational mobility in the two countries should be subject to further research on this topic.

3.7 Conclusion

This chapter is the first to analyze sibling correlations in permanent earnings in Germany and it is the first to analyze Germany in a cross-country comparison with Denmark and the US. As existing studies show that these two countries mark the two ends of the scale of intergenerational mobility, this chapter studies where to position Germany in this ranking.

The importance of family and community background in Germany is higher than in Denmark and comparable to the US. This holds true for brothers and sisters. This means that in Denmark 20 percent of the inequality in permanent earnings can be attributed to family and community factors shared by brothers while the corresponding estimates are 43 percent in Germany and 45 percent in the US. For sisters the estimates are 19 percent for Denmark, 39 percent for Germany and 29 percent for the US.

I present extensive robustness checks on these results and the developed ranking appears to be robust to most of the variations in sample selection rules.

Given the results in the literature that cultural background is not a major determinant of the level of intergenerational mobility, the differences between the three countries are most likely due to differences in the institutional settings and thus can be influenced by policy decisions. To derive a detailed policy advise, future research should focus on the role of specific institutions.

3.8 Tables

Table 3.1: Existing literature on sibling correlations in permanent earnings

Country	Sibling correlation	Cohort	Method	Author(s)
		Brothers		
China	0.57	not reported	REML	Eriksson and Zhang (2010)
USA	0.49	1957–1965	REML	Mazumder (2008)
USA	0.45	1957–1965	REML	Levine and Mazumder (2007)
USA	0.45	1951–1958	ANOVA	Solon et al. (1991)
USA	0.43	1951–1967	ANOVA	Björklund et al. (2002)
Sweden	0.37	1962–1968	GMM	Björklund et al. (2009)
Sweden	0.25	1949–1957	REML	Björklund et al. (2010)
Sweden	0.25	1948–1965	ANOVA	Björklund et al. (2002)
Sweden	0.22	1962–1968	REML	Björklund et al. (2007)
Sweden	0.19	1951–1968	ANOVA	Björklund et al. (2004)
Finland	0.26	1953–1965	ANOVA	Björklund et al. (2002)
Finland	0.26	1950–1960	ANOVA	Österbacka (2001)
Finland	0.24	1955–1965	ANOVA	Björklund et al. (2004)
Denmark	0.23	1951–1968	ANOVA	Björklund et al. (2002)
Norway	0.14	1953–1969	ANOVA	Björklund et al. (2004)
Norway	0.14	1950–1970	ANOVA	Björklund et al. (2002)
		Sisters		
USA	0.34	1957–1965	REML	Mazumder (2008)
Sweden	0.23	1949–1957	REML	Björklund et al. (2010)
Sweden	0.15	1951–1968	ANOVA	Björklund et al. (2004)
Finland	0.11	1955–1965	ANOVA	Björklund et al. (2004)
Finland	0.11	1950–1960	ANOVA	Österbacka (2001)
Norway	0.12	1953–1969	ANOVA	Björklund et al. (2004)

Table 3.2: Descriptive statistics (main scenario)

Year	Brothers			Sisters		
	N	Median Earnings	Age	N	Median Earnings	Age
	Denmark					
2002	53,027	51,636	39.3	47,794	40,205	38.8
2003	54,058	53,737	39.4	49,611	42,331	39.1
2004	54,963	56,015	39.6	51,540	43,972	39.4
2005	56,013	58,184	39.7	53,014	45,685	39.6
2006	56,817	61,564	39.7	54,599	48,307	39.7
2007	56,931	65,657	39.9	55,341	51,423	39.9
	Germany					
2002	666	42,112	36.3	336	23,967	35.4
2003	692	43,482	36.8	374	25,043	35.6
2004	700	44,149	37.2	418	25,289	36.0
2005	708	46,024	37.6	433	24,104	36.5
2006	712	46,073	37.9	439	24,476	37.1
2007	693	46,453	38.5	462	26,410	37.3
2008	703	47,953	38.6	483	27,027	37.3
	US					
1999	933	30,400	39.9	968	18,400	39.8
2001	936	35,700	40.1	1,012	21,250	39.9
2003	914	35,600	40.0	998	23,140	40.2
2005	938	42,300	39.9	970	25,380	40.4
2007	923	48,500	39.8	958	30,000	40.3

Note: the table shows descriptive statistics for the three different national samples. In all three countries the figures are based on the definitions of the main scenario, i.e. age in [31 ; 49], annual earnings > 9000 DKK, 1200 EUR, 1200 USD, siblings report the same mother and the same father. N is the number of observed individuals including singletons. For better comparability earnings are given in USD using the following exchange rates: 1 DKK = 0.1876 USD and 1 EUR = 1.3992 USD.

Source: SOEP (2002–2008), PSID (1999–2007), IDA (2002–2007).

Table 3.3: Sibling correlations in Denmark, Germany and the US (main scenario)

	Brothers			Sisters		
	Denmark	Germany	US	Denmark	Germany	US
Family component (σ^2_α)	0.072	0.165	0.239	0.053	0.230	0.154
	(0.003)	(0.033)	(0.028)	(0.003)	(0.066)	(0.026)
Individual component (σ^2_μ)	0.284	0.218	0.293	0.231	0.358	0.386
	(0.003)	(0.030)	(0.024)	(0.003)	(0.064)	(0.027)
Transitory component (σ^2_υ)	0.109	0.096	0.191	0.129	0.220	0.233
	(0.000)	(0.002)	(0.005)	(0.000)	(0.007)	(0.006)
Correlation (ρ)	**0.202**	**0.432**	**0.450**	**0.187**	**0.391**	**0.285**
	(0.008)	(0.078)	(0.043)	(0.009)	(0.107)	(0.045)
	[0.187 ; 0.217]	[0.279 ; 0.585]	[0.365 ; 0.535]	[0.170 ; 0.205]	[0.182 ; 0.600]	[0.196 ; 0.374]
Observations	331,806	4,874	4,644	311,897	2,945	4,906
Individuals	73,554	1,014	1,435	68,062	704	1,538
Families	55,190	858	996	52,222	642	1,067

Note: the table contains estimates of sibling correlations (separate estimations for brothers and sisters). The variance components used to calculate the sibling correlations are estimated via Restricted Maximum Likelihood. The standard errors of the correlations (in parentheses) are calculated using the delta method. The 95 percent confidence intervals are given in brackets. All calculations are based on the main scenario (individuals are 31–49 years of age and annual earnings are truncated at a lower earnings limit of 9000 DKK, 1200 EUR or 1200 USD) and the main definition of siblings (same father and mother). The matrix of fixed effects X_{ijt} in the multilevel model contains dummy variables for each year and three polynomials of age.

Source: SOEP (2002–2008), PSID (1999–2007), IDA (2002–2007).

Table 3.4: Sensitivity of the results – Denmark

	Brothers (ρ_{ms} = 0.202)				Sisters (ρ_{ms} = 0.187)			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Age in [31 ; 49]				*Age in [31 ; 49]*			
annual earnings > 9000 DKK	0.202	0.184	0.194	0.190	0.187	0.188	0.192	0.197
	[0.187 ; 0.217]	[0.169 ; 0.198]	[0.180 ; 0.208]	[0.175 ; 0.204]	[0.170 ; 0.205]	[0.172 ; 0.203]	[0.176 ; 0.208]	[0.181 ; 0.214]
	[0.178 ; 0.205]	[0.171 ; 0.196]	[0.182 ; 0.205]	[0.178 ; 0.202]	[0.172 ; 0.201]	[0.174 ; 0.201]	[0.178 ; 0.205]	[0.183 ; 0.211]
annual earnings > 4500 DKK	0.188	0.169	0.181	0.176	0.176	0.177	0.186	0.185
	[0.173 ; 0.203]	[0.155 ; 0.183]	[0.167 ; 0.195]	[0.162 ; 0.191]	[0.159 ; 0.193]	[0.161 ; 0.193]	[0.170 ; 0.203]	[0.169 ; 0.202]
	[0.172 ; 0.199]	[0.157 ; 0.180]	[0.169 ; 0.192]	[0.164 ; 0.189]	[0.161 ; 0.190]	[0.163 ; 0.190]	[0.172 ; 0.199]	[0.172 ; 0.199]
no lower limit	0.158	0.150	0.142	0.139	0.154	0.148	0.146	0.152
	[0.143 ; 0.173]	[0.136 ; 0.164]	[0.128 ; 0.156]	[0.124 ; 0.153]	[0.137 ; 0.172]	[0.132 ; 0.163]	[0.130 ; 0.162]	[0.135 ; 0.168]
	[0.132 ; 0.159]	[0.138 ; 0.161]	[0.130 ; 0.153]	[0.127 ; 0.151]	[0.139 ; 0.168]	[0.134 ; 0.161]	[0.132 ; 0.159]	[0.138 ; 0.165]
	Annual earnings > 9000 DKK				*Annual earnings > 9000 DKK*			
age in [26 ; 44]	0.226	0.188	0.203	0.206	0.183	0.196	0.193	0.189
	[0.210 ; 0.242]	[0.173 ; 0.203]	[0.188 ; 0.218]	[0.191 ; 0.221]	[0.165 ; 0.200]	[0.180 ; 0.212]	[0.176 ; 0.209]	[0.172 ; 0.205]
	[0.178 ; 0.207]	[0.175 ; 0.200]	[0.190 ; 0.215]	[0.193 ; 0.218]	[0.167 ; 0.198]	[0.182 ; 0.209]	[0.178 ; 0.207]	[0.175 ; 0.203]
age in [36 ; 49]	0.194	0.183	0.190	0.183	0.170	0.166	0.167	0.194
	[0.177 ; 0.211]	[0.166 ; 0.200]	[0.173 ; 0.208]	[0.166 ; 0.200]	[0.150 ; 0.191]	[0.148 ; 0.185]	[0.147 ; 0.186]	[0.175 ; 0.213]
	[0.150 ; 0.183]	[0.168 ; 0.197]	[0.175 ; 0.204]	[0.169 ; 0.197]	[0.153 ; 0.186]	[0.150 ; 0.181]	[0.150 ; 0.183]	[0.178 ; 0.210]

Note: the table contains estimates of sibling correlations (separate estimations for brothers and sisters). The variance components used to calculate the sibling correlations are estimated via Restricted Maximum Likelihood. The 95 percent and the 90 percent confidence intervals are given in brackets. The table contains the information on four alternative definitions of siblings (1: same father and same mother; 2: same father, if no information on the father is available, then same mother; 3: same mother; 4: same father) and variations in age and the applied earnings limit. See the discussion in the text for a detailed description. The matrix of fixed effects X_{ijt} in the multilevel model contains dummy variables for each year and three polynomials of age.

Source: IDA (2002–2007).

Table 3.5: Sensitivity of the results – Germany

	Brothers (ρ_{ms} = 0.432)				Sisters (ρ_{ms} = 0.391)			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Age in [31 ; 49]				*Age in [31 ; 49]*			
annual earnings > 1200 EUR	0.432	0.465	0.430	0.461	0.391	0.360	0.369	0.373
	[0.279 ; 0.585]	[0.320 ; 0.611]	[0.277 ; 0.583]	[0.315 ; 0.607]	[0.182 ; 0.600]	[0.159 ; 0.561]	[0.159 ; 0.580]	[0.173 ; 0.574]
	[0.303 ; 0.560]	[0.343 ; 0.587]	[0.301 ; 0.558]	[0.338 ; 0.583]	[0.216 ; 0.566]	[0.191 ; 0.529]	[0.193 ; 0.546]	[0.205 ; 0.542]
annual earnings > 600 EUR	0.429	0.458	0.425	0.455	0.400	0.374	0.382	0.385
	[0.274 ; 0.583]	[0.312 ; 0.604]	[0.271 ; 0.580]	[0.308 ; 0.602]	[0.208 ; 0.591]	[0.189 ; 0.559]	[0.191 ; 0.577]	[0.200 ; 0.569]
	[0.299 ; 0.558]	[0.335 ; 0.581]	[0.296 ; 0.555]	[0.332 ; 0.578]	[0.239 ; 0.560]	[0.219 ; 0.530]	[0.222 ; 0.546]	[0.230 ; 0.539]
no lower limit	0.344	0.367	0.341	0.366	0.387	0.366	0.372	0.376
	[0.184 ; 0.505]	[0.212 ; 0.522]	[0.181 ; 0.501]	[0.210 ; 0.522]	[0.186 ; 0.587]	[0.171 ; 0.561]	[0.170 ; 0.575]	[0.182 ; 0.570]
	[0.209 ; 0.479]	[0.237 ; 0.497]	[0.207 ; 0.475]	[0.235 ; 0.497]	[0.219 ; 0.555]	[0.203 ; 0.530]	[0.203 ; 0.542]	[0.213 ; 0.539]
	Annual earnings > 1200 EUR				*Annual earnings > 1200 EUR*			
age in [26 ; 44]	0.302	0.301	0.289	0.306	0.310	0.327	0.301	0.340
	[0.164 ; 0.439]	[0.166 ; 0.436]	[0.153 ; 0.424]	[0.169 ; 0.444]	[0.143 ; 0.477]	[0.167 ; 0.486]	[0.135 ; 0.467]	[0.180 ; 0.500]
	[0.187 ; 0.417]	[0.188 ; 0.414]	[0.175 ; 0.403]	[0.191 ; 0.422]	[0.170 ; 0.450]	[0.193 ; 0.461]	[0.162 ; 0.440]	[0.206 ; 0.474]
age in [36 ; 49]	0.631	0.655	0.626	0.650	0.369	0.316	0.324	0.356
	[0.501 ; 0.762]	[0.535 ; 0.775]	[0.495 ; 0.758]	[0.529 ; 0.771]	[0.084 ; 0.654]	[0.054 ; 0.579]	[0.037 ; 0.610]	[0.094 ; 0.617]
	[0.522 ; 0.741]	[0.554 ; 0.756]	[0.515 ; 0.737]	[0.548 ; 0.752]	[0.130 ; 0.608]	[0.096 ; 0.537]	[0.083 ; 0.564]	[0.136 ; 0.575]

Note: the table contains estimates of sibling correlations (separate estimations for brothers and sisters). The variance components used to calculate the sibling correlations are estimated via Restricted Maximum Likelihood. The 95 percent and the 90 percent confidence intervals are given in brackets. The table contains the information on four alternative definitions of siblings (1: same father and same mother; 2: same father, if no information on the father is available, then same mother; 3: same mother; 4: same father) and variations in age and the applied earnings limit. See the discussion in the text for a detailed description. The matrix of fixed effects X_{ijt} in the multilevel model contains dummy variables for each year and three polynomials of age.

Source: SOEP (2002–2008).

Table 3.6: Sensitivity of the results – US

	Brothers (ρ_{ms} = 0.450)				Sisters (ρ_{ms} = 0.285)			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Age in [31 ; 49]				*Age in [31 ; 49]*			
annual earnings > 1200 USD	0.450	0.484	0.453	0.442	0.285	0.285	0.285	0.290
	[0.365 ; 0.535]	[0.409 ; 0.560]	[0.369 ; 0.537]	[0.366 ; 0.517]	[0.196 ; 0.374]	[0.203 ; 0.366]	[0.196 ; 0.373]	[0.210 ; 0.370]
	[0.378 ; 0.521]	[0.421 ; 0.548]	[0.382 ; 0.524]	[0.379 ; 0.505]	[0.211 ; 0.359]	[0.216 ; 0.353]	[0.211 ; 0.359]	[0.223 ; 0.357]
annual earnings > 600 USD	0.461	0.501	0.464	0.454	0.263	0.264	0.263	0.270
	[0.374 ; 0.547]	[0.424 ; 0.577]	[0.378 ; 0.550]	[0.377 ; 0.532]	[0.174 ; 0.352]	[0.181 ; 0.347]	[0.175 ; 0.352]	[0.189 ; 0.352]
	[0.388 ; 0.533]	[0.436 ; 0.565]	[0.392 ; 0.536]	[0.389 ; 0.519]	[0.188 ; 0.338]	[0.194 ; 0.333]	[0.189 ; 0.338]	[0.203 ; 0.338]
no lower limit	0.495	0.498	0.494	0.443	0.216	0.216	0.217	0.217
	[0.407 ; 0.582]	[0.418 ; 0.579]	[0.407 ; 0.581]	[0.363 ; 0.523]	[0.126 ; 0.306]	[0.134 ; 0.298]	[0.127 ; 0.306]	[0.137 ; 0.297]
	[0.421 ; 0.568]	[0.431 ; 0.566]	[0.421 ; 0.567]	[0.376 ; 0.510]	[0.141 ; 0.291]	[0.147 ; 0.285]	[0.142 ; 0.292]	[0.150 ; 0.284]
	Annual earnings > 1200 USD				*Annual earnings > 1200 USD*			
age in [26 ; 44]	0.515	0.520	0.511	0.501	0.285	0.278	0.286	0.277
	[0.431 ; 0.598]	[0.446 ; 0.594]	[0.427 ; 0.594]	[0.428 ; 0.574]	[0.192 ; 0.379]	[0.192 ; 0.364]	[0.194 ; 0.378]	[0.193 ; 0.362]
	[0.445 ; 0.585]	[0.458 ; 0.582]	[0.440 ; 0.581]	[0.439 ; 0.562]	[0.207 ; 0.364]	[0.206 ; 0.350]	[0.209 ; 0.363]	[0.206 ; 0.348]
age in [36 ; 49]	0.444	0.474	0.450	0.420	0.301	0.302	0.304	0.301
	[0.347 ; 0.542]	[0.387 ; 0.562]	[0.353 ; 0.546]	[0.332 ; 0.508]	[0.204 ; 0.398]	[0.214 ; 0.391]	[0.209 ; 0.400]	[0.214 ; 0.389]
	[0.363 ; 0.526]	[0.401 ; 0.548]	[0.369 ; 0.531]	[0.346 ; 0.494]	[0.219 ; 0.382]	[0.228 ; 0.377]	[0.224 ; 0.385]	[0.214 ; 0.389]

Note: the table contains estimates of sibling correlations (separate estimations for brothers and sisters). The variance components used to calculate the sibling correlations are estimated via Restricted Maximum Likelihood. The 95 percent and the 90 percent confidence intervals are given in brackets. The table contains the information on four alternative definitions of siblings (1: same father and same mother; 2: same father, if no information on the father is available, then same mother; 3: same mother; 4: same father) and variations in age and the applied earnings limit. See the discussion in the text for a detailed description. The matrix of fixed effects X_{ijt} in the multilevel model contains dummy variables for each year and three polynomials of age.

Source: PSID (1999–2007).

Table 3.7: Reliability of the results of the cross-country comparison: Denmark – US

	Brothers				Sisters			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Denmark – US Age in [31 ; 49]				*Denmark – US Age in [31 ; 49]*			
annual earnings > 9000 DKK	**	**	**	**	*	*	*	*
annual earnings > 4500 DKK	**	**	**	**		*		*
no lower limit	**	**	**	**				
	Annual earnings > 9000 DKK, 1200 USD				*Annual earnings > 9000 DKK, 1200 USD*			
age in [26 ; 44]	**	**	**	**	*		*	*
age in [36 ; 49]	**	**	**	**	**	**	**	**

Note: the table indicates which pair wise cross-country comparisons (according to different age and earnings restrictions and different definitions of siblings) lead to non-overlapping confidence intervals. " ** ": non-overlapping 95 percent confidence intervals; " * ": non-overlapping 90 percent confidence intervals; " ": overlapping confidence intervals.

Source: PSID (1999–2007), IDA (2002–2007).

Table 3.8: Reliability of the results of the cross-country comparison: Denmark – Germany

	Brothers				Sisters			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Denmark – Germany Age in [31 ; 49]				*Denmark – Germany Age in [31 ; 49]*			
annual earnings > 9000 DKK	**	**	**	**	*			
annual earnings > 4500 DKK	**	**	**	**	**	*	*	*
no lower limit	**	**	**	**	**	**	**	**
	Annual earnings > 9000 DKK, 1200 EUR				*Annual earnings > 9000 DKK, 1200 EUR*			
age in [26 ; 44]								
age in [36 ; 49]	**	**	**	**				

Note: the table indicates which pair wise cross-country comparisons (according to different age and earnings restrictions and different definitions of siblings) lead to non-overlapping confidence intervals. " ** ": non-overlapping 95 percent confidence intervals; " * ": non-overlapping 90 percent confidence intervals; " ": overlapping confidence intervals.

Source: SOEP (2002–2008), IDA (2002–2007).

Table 3.9: Reliability of the results of the cross-country comparison: Germany – US

	Brothers				Sisters			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Germany – US *Age in [31 ; 49]*				*Germany – US* *Age in [31 ; 49]*			
annual earnings > 9000 DKK								
annual earnings > 4500 DKK								
no lower limit								
	Annual earnings > 1200 EUR, 1200 USD				*Annual earnings > 1200 EUR, 1200 USD*			
age in [26 ; 44]	*	*	**	*				
age in [36 ; 49]		*		*				

Note: the table indicates which pair wise cross-country comparisons (according to different age and earnings restrictions and different definitions of siblings) lead to non-overlapping confidence intervals. " ** ": non-overlapping 95 percent confidence intervals; " * ": non-overlapping 90 percent confidence intervals; " ": overlapping confidence intervals.

Source: SOEP (2002–2008), PSID (1999–2007).

Table 3.10: Number of observations, individuals and families – Denmark (corresponding to Table 3.4)

	Brothers				Sisters			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Age in [31 ; 49]				*Age in [31 ; 49]*			
Observations	331,806	342,314	335,895	344,525	311,897	325,489	317,925	323,945
Individuals	73,554	76,716	74,416	76,122	68,062	71,479	69,266	70,176
Families	55,190	56,836	54,715	56,204	52,222	53,871	51,920	52,977
Observations	333,809	344,647	337,981	346,751	313,975	327,733	320,025	326,143
Individuals	73,943	77,183	74,831	76,558	68,406	71,833	69,581	70,522
Families	55,414	57,091	54,935	56,467	52,431	54,082	52,109	53,172
Observations	336,974	348,153	341,107	350,191	317,100	331,105	323,129	329,594
Individuals	74,604	77,875	75,476	77,252	68,896	72,343	70,072	71,069
Families	55,809	57,477	55,280	56,841	52,735	54,368	52,377	53,486
	Annual earnings > 9000 DKK				*Annual earnings > 9000 DKK*			
Observations	340,815	348,541	342,843	349,462	325,104	335,558	330,783	334,260
Individuals	76,580	78,779	76,882	78,135	73,602	76,469	74,703	75,556
Families	58,160	58,593	56,898	58,153	56,825	57,597	55,901	57,042
Observations	240,145	249,438	243,202	251,835	225,541	238,129	230,250	236,179
Individuals	56,695	59,467	57,491	59,149	51,969	55,021	52,974	53,957
Families	43,150	44,970	43,242	44,431	40,494	42,360	40,596	41,533

Source: IDA (2002–2007).

Table 3.11: Number of observations, individuals and families – Germany (corresponding to Table 3.5)

	Brothers				Sisters			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Age in [31 ; 49]				*Age in [31 ; 49]*			
Observations	4,874	5,565	4,986	5,453	2,945	3,450	3,033	3,362
Individuals	1,014	1,167	1,039	1,142	704	830	726	808
Families	858	1,001	882	976	642	760	662	739
Observations	4,892	5,585	5,004	5,473	3,001	3,520	3,091	3,430
Individuals	1,017	1,170	1,042	1,145	712	839	734	817
Families	861	1,004	885	979	646	765	666	744
Observations	4,908	5,602	5,020	5,490	3,040	3,564	3,130	3,474
Individuals	1,018	1,171	1,043	1,146	713	841	735	819
Families	862	1,005	886	980	647	767	667	746
	Annual earnings > 1200 EUR				*Annual earnings > 1200 EUR*			
Observations	6,608	7,349	6,763	7,194	4,656	5,215	4,728	5,143
Individuals	1,518	1,695	1,554	1,659	1,163	1,324	1,187	1,300
Families	1,274	1,438	1,307	1,404	1,022	1,171	1,044	1,147
Observations	3,029	3,529	3,103	3,455	1,556	1,960	1,633	1,883
Individuals	691	811	710	792	414	516	433	497
Families	588	702	607	682	385	480	402	463

Source: SOEP (2002–2008).

Table 3.12: Number of observations, individuals and families – US (corresponding to Table 3.6)

	Brothers				Sisters			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Age in [31 ; 49]				*Age in [31 ; 49]*			
Observations	4,644	5,880	4,742	5,782	4,906	6,663	5,058	6,511
Individuals	1,435	1,870	1,473	1,832	1,538	2,159	1,593	2,104
Families	996	1,357	1,027	1,290	1,067	1,560	1,110	1,474
Observations	4,658	5,900	4,756	5,802	4,962	6,741	5,114	6,589
Individuals	1,436	1,873	1,474	1,835	1,550	2,175	1,605	2,120
Families	997	1,360	1,028	1,293	1,075	1,572	1,118	1,486
Observations	4,678	5,931	4,777	5,832	5,022	6,823	5,175	6,670
Individuals	1,443	1,884	1,481	1,846	1,564	2,201	1,620	2,145
Families	1,001	1,367	1,032	1,299	1,083	1,587	1,127	1,500
	Annual earnings > 1200 USD				*Annual earnings > 1200 USD*			
Observations	5,071	6,379	5,195	6,255	5,239	7,157	5,393	7,003
Individuals	1,680	2,165	1,721	2,124	1,797	2,494	1,855	2,436
Families	1,235	1,642	1,271	1,576	1,290	1,857	1,334	1,768
Observations	3,381	4,297	3,437	4,241	3,716	4,984	3,830	4,870
Individuals	1,102	1,440	1,129	1,413	1,250	1,703	1,287	1,666
Families	758	1,033	778	984	856	1,210	885	1,143

Source: PSID (1999–2007).

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4 How important is cultural background for the level of intergenerational mobility?

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All of us do not have equal talent, but all of us should have an equal opportunity to develop our talents.

(John F. Kennedy, San Diego, June 6th, 1963)

4.1 Introduction and background

Equality of opportunities in the sense of "leveling the playing field" (Roemer, 1998) is widely seen as a normative goal policy should reach in modern societies. Intergenerational economic mobility (hereafter IM) is often interpreted as an indicator of equality of opportunities. While there is a substantial literature on IM, both in economics and sociology (Solon, 1999; Black and Devereux, 2011), we still know little about the determinants of the transmission process. This note analyzes the importance of cultural background for the level of IM.

Theoretical models (Becker and Tomes, 1979) as well as empirical studies on the determinants of IM suggest that the transmission process can be influenced by numerous factors. In principle, these can be divided into two groups: institutional factors such as the educational system, tax system, and family policy and family related factors such as parental attitudes, parental behavior, and, as a result, parental resources. I assume in the following that these family related factors are heavily influenced by the cultural background of the family.[39]

Recent contributions followed different empirical strategies to analyze the determinants of IM. First, international comparisons (Björklund et al., 2002) show that the level of IM differs substantially in different countries. But in a cross-country study both, institutional factors and cultural background vary between the countries. So it is not clear which group causes the differences in the level of IM.

Another approach is followed for example in Björklund et al. (2009) who studied the change in IM over time in Sweden using long-running administrative data. Holding cultural background constant, the change in institutions during the expansion of the welfare state was accompanied by a rise in IM. Another example

39 For example Javo et al. (2004) show that child-rearing styles in Norway vary significantly between individuals with Norwegian and Sami cultural background.

can be found in Bauer and Riphahn (2009) who used regional variation in institutions (age at school entry) in Switzerland to analyze effects on intergenerational educational mobility.

In contrast to the studies mentioned above that controlled for cultural background and used institutional variation as an identification strategy, this note adds to the literature by identifying the importance of cultural background by controlling for the institutional setting. Based on a unique Danish data set I analyze IM among different ethnic groups of second generation immigrants. As the data are collected in the same country and for the same period in time for all groups, it is ensured that all individuals face the same institutional framework. If institutions are the main determinant of IM, then different ethnic groups should show similar levels of IM. If, instead, cultural background matters most, the groups should differ in the estimated mobility levels.

4.2 Estimation strategy and data

There are several ways to measure IM. In the literature, most authors focused on intergenerational earnings correlations or elasticities. However, recent contributions analyzed sibling correlations instead (Mazumder, 2008; Björklund et al., 2009). Sibling correlations offer a broader measure of IM compared to intergenerational earnings correlations. They cover not only the influence of parental earnings on the economic outcome of the offspring but the influence of all family background and community factors that are shared by siblings (Solon, 1999). Thus they are more adequate to assess IM, especially if IM is seen as an indicator of equality of opportunities.

Following this approach, I use sibling correlations in permanent earnings as a measure of IM. The correlations are estimated as the within-cluster correlation ρ in the following multilevel model:

$$\log y_{ijt} = X_{ijt}\beta + \alpha_i + \mu_{ij} + \varepsilon_{ijt} \tag{4.1}$$

with y_{ijt} reflecting annual earnings of sibling j of family i in year t. The matrix X contains year indicators and polynomials of age. β are coefficients to be estimated. α_i and μ_{ij} denote the family specific and the individual specific component of the error term and ε_{ijt} captures transitory fluctuations. The sibling correlation $\rho = \sigma_\alpha^2/(\sigma_\alpha^2 + \sigma_\mu^2)$ is calculated as the ratio of the variance of the family-specific component and the sum of the variances of the family-specific and the individual-specific component of the error term. The sibling correlation is interpreted as the share of the variance (inequality) in permanent earnings that can be attributed

to factors shared by siblings. The multilevel model is estimated via restricted maximum likelihood.

I use data from the Danish Integrated Database for Labor Market Research (IDA) which combines information from various registers of administrative data collected by the Danish government and administered by Statistics Denmark. Being administrative data the IDA database covers the entire Danish population. So there is no problem of sample selection or panel attrition (except for natural attrition). Additionally I had access to information on the immigrant status of the individuals in IDA which also comes from administrative registers. The large number of individuals in the data allows me to analyze IM not only for all second generation immigrants in Denmark but also separately for immigrants with German, Pakistani, Turkish and Moroccan background.[40] The analysis is restricted to men because there might be a selection bias connected to the labor market participation of women in these subgroups. I use annual earnings for the years 2002–2006 for individuals aged 26–41. Following the literature, I exclude observations with annual earnings lower than 9000 DKK (around 1200 Euro in 2005 prices). The main descriptive statistics of the remaining sample are shown in Table 4.1.

4.3 Results

Table 4.2 shows the estimation results. The estimated brother correlation for Danish natives shows the well known result that the level of IM is very high in Denmark (Björklund et al., 2002). Only about 17 percent of inequality in permanent earnings can be attributed to family and community factors (first element in bold type row of Table 4.2). The next five columns of Table 4.2 contain the estimated brother correlations for the second generation immigrant subsamples. With the institutional setting being the same for all these groups, I interpret the differences in the level of IM between the immigrant groups as an indicator of the importance of cultural background.

The estimated brother correlations range from 0.238 for German immigrants to 0.285 for Moroccan immigrants. This is remarkable for two reasons: first, even though the cultural background varies significantly between these groups this seems to have no influence on the level of IM. Second IM estimates based on brother correlations, for example, for Germans in Germany lie around 0.43 (Schnitzlein, 2011b). I interpret these results as support for the hypothesis

40 In an earlier version of this note, I also present results for immigrants with Yugoslavian background. But as this group contains a high number of refugees and thus is not comparable to the other groups that mainly consist of labor migrants I did not include them here. The results for this group and a discussion can be found in Schnitzlein (2011a).

that cultural background is not a major influence factor and that instead the institutional framework is an important determinant of IM. This is in line with the result, mentioned above, that the change in the institutional framework in Sweden was accompanied by a clear rise in IM (Björklund et al., 2009).

There remains one deviation to explain: the estimates for all immigrant groups are higher compared to that for native Danes, even though the result for natives falls within a 95 percent confidence interval of the correlations for the immigrant groups. At first glance, this seems to be in contrast with the just stated hypothesis on the role of cultural background. But as mentioned in section 2, a sibling correlation has to be interpreted as a broad measure of IM. It covers not only the influence of family related factors, but also neighborhood and community effects. So in the absence of perfect integration such neighborhood and community effects should lead to higher brother correlations for immigrants than for natives. Additionally their importance should increase with the (cultural) distance of the immigrant's country of origin to Denmark. This explanation is supported by two aspects of the results in Table 4.2. First, the only estimate that is clearly lower than all others is the one for native Danes. Second, among the immigrant groups, the estimated brother correlation is lowest for Germans which are, at least compared to the other groups, closest to native Danes.

4.4 Conclusions

Using results on brother correlations for different groups of second generation immigrants based on administrative data from Denmark, this note analyzes the role of cultural background in the determination of the level of IM. The results indicate that cultural background is not a major determinant of IM and that instead the institutional framework is more relevant for the level of IM. This implies, e.g., that low IM is not a culturally determined, fixed feature of a society but could be influenced by means of social policy. To derive detailed policy advice, future research should more explicitly try to identify the most important institutions.

4.5 Tables

Table 4.1: Descriptive statistics

	Natives		German		Pakistani		Turkish		Moroccan	
	Earnings	Age	Earnings	Age	Earnings	Age	Earnings	Age	Earnings	Age
2002	260,252	33.57	266,501	34.80	200,348	27.38	192,019	27.63	212,132	28.29
2003	270,561	33.69	273,997	34.81	210,920	27.84	201,167	27.81	209,578	28.66
2004	280,379	33.79	279,368	35.01	225,833	28.45	201,180	27.93	230,989	28.98
2005	291,579	33.87	298,395	35.29	238,450	28.88	217,261	28.16	232,983	29.17
2006	308,586	33.92	311,344	35.18	264,614	29.32	231,791	28.42	262,680	29.41

Note: descriptive statistics for natives and four different groups of second generation immigrants; given are median earnings and mean age for every group; only male individuals aged 26–41 with annual earnings higher than 9,000 DKK are included. All figures in 2005 real values. Basis is the full population of second generation immigrants and a 10 percent random sample of natives. The number of observations, individuals and families for the different groups are shown in the last three lines of Table 4.2.

Source: IDA (2002–2006).

Table 4.2: Brother correlations

	Natives	all 2nd gen	German	Pakistani	Turkish	Moroccan
Family component (σ_α^2)	0.059	0.126	0.105	0.109	0.105	0.144
	(0.004)	(0.021)	(0.054)	(0.035)	(0.046)	(0.090)
Individual component (σ_μ^2)	0.298	0.353	0.337	0.315	0.308	0.362
	(0.004)	(0.022)	(0.057)	(0.038)	(0.048)	(0.093)
Transitory component (σ_υ^2)	0.142	0.275	0.156	0.299	0.360	0.303
	(0.000)	(0.004)	(0.007)	(0.011)	(0.013)	(0.022)
Correlation (ρ)	**0.165*****	**0.263*****	**0.238****	**0.256*****	**0.255****	**0.285***
	(0.010)	(0.042)	(0.119)	(0.079)	(0.108)	(0.169)
Observations	240,737	13,512	1,384	2,502	2,518	601
Families	49,584	3,661	328	611	843	152
Individuals	63,829	4,423	392	832	982	209

Note: REML-estimates based on a sample of male 2nd generation immigrants (excluding immigrants from Yugoslavia) and native Danes, lower earnings limit of 9,000 DKK, age between 26 and 41; standard errors of brother correlations are calculated via bivariate delta method; standard errors in parentheses; *** indicate significance on 1 percent level; ** indicate significance on 5 percent level; * indicates significance on 10 percent level.

Source: IDA (2002–2006).

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5 Wage mobility in East and West Germany

Regina T. Riphahn and Daniel D. Schnitzlein

5.1 Introduction

Even though high levels of income mobility can, both, increase or reduce individual welfare, the economic literature tends to stress its beneficial aspects. This goes back to Friedman (1962), who introduced the notion that income mobility can function as an equalizer of long-term personal incomes. Shorrocks' index (Shorrocks, 1978) measures to what extent income mobility reduces income inequality. High income mobility promises the disadvantaged of today a better position in the future and balances the distribution of lifetime incomes. A broad and often methodological literature studies wage and earnings mobility, its developments over time and in international comparison.[41]

Motivated by the recent rise of wage inequality in Germany (e.g. Dustmann et al., 2009), by the availability of new, long running administrative data, and by the event of German unification this chapter studies wage mobility in Germany. We describe wage inequality and mobility over the last 35 years in West Germany and the trends since unification in the former communist East Germany. In addition, we test hypotheses regarding the determinants of aggregate mobility shifts using linked employee-employer data. Our novel approach to the study of wage mobility generates insights on structural shifts in the East German transition economy and the West German labor market over time.

So far, the international evidence on the development of wage mobility over time does not yield unambiguous conclusions or general trends. Kopczuk et al. (2010), who investigate U.S. earnings inequality and mobility between 1937 and 2004, find that short-run mobility, measured over two- or five-year periods was rather stable since the 1950s. In contrast, longer-run mobility has been increasing for females and slightly declining for males.[42] Dickens (2000) evaluates British evidence on wage mobility from 1975 to 1994 and concludes that mobility has been declining since the 1970s. In contrast, Jenkins (2011) considers the period

41 For recent contributions on the U.S. see Kopczuk et al. (2010), Shin and Solon (2011), Buchinsky and Hunt (1999), for studies on the U.K. see Dickens (2000), or Jarvis and Jenkins (1998), a recent contribution on France is Buchinsky et al. (2003), two studies on Austria are Hofer and Weber (2002) and Raferzeder and Winter-Ebmer (2007). For comparative studies see Aaberge et al. (2002), Chen (2009), van Kerm (2004), van Kerm (2006), Jenkins and van Kerm (2006), Maasoumi and Trede (2001), Gottschalk and Spolaore (2002), Ayala and Sastre (2008), OECD (1997) and for methodological contributions Fields and Ok (1996), Fields and Ok (1999a), Fields and Ok (1999b) or Gregg and Vittori (2008) among others.

42 Buchinsky and Hunt (1999) study wage mobility for the aging cohorts of National Longitudinal Survey of Youth and find falling mobility over the time period 1979–1991.

1991 to 2006 based on the British Household Panel Survey and finds hardly any mobility change over time. Buchinsky et al. (2003) find falling mobility in French earnings between 1967 and 1999.

Most prior contributions on German wage mobility used data of the German Socioeconomic Panel (SOEP) covering West Germany since 1984. This literature is dominated by comparisons of West German and U.S. wage mobility.[43] The results of these comparisons vary, as different survey years, income measures, and mobility indicators are applied. Some authors find that wage mobility is higher in the U.S. (Burkhauser et al., 1997; Chen, 2009) and others find the opposite even for the same period of observation.[44] Only few studies evaluate mobility developments over time. In their comparison of East and West German income mobility early after unification Hauser and Fabig (1999) find that mobility was initially much higher in East Germany but declined already by 1995. Gernandt (2009) applies SOEP data (1984–2007) for West Germany and studies the standard deviation of changes in individual rank positions in the wage distribution. He finds a substantial mobility decline over time.

Most studies in the international literature on wage and income mobility focus on the measurement and description of mobility without attention to its determinants. Among the contributions that address the mechanisms behind mobility developments, three approaches dominate. The first approach was initiated by Lillard and Willis (1978), Lillard and Weiss (1979), MaCurdy (1982), and Abowd and Card (1989). These studies only indirectly analyze aggregate mobility developments as they follow individual wage and earnings developments over time and focus on the covariance structure of earnings. They determine the time series representation of individual wages which best fits the data.[45] This literature differs from our approach in that it focuses on the stochastic nature of the individual earnings process over time rather than on mobility as an aggregate labor market characteristic.

The second approach in the study of mobility determinants consists of decompositions of mobility indicators. The literature holds numerous procedures: (a) some authors consider different mobility patterns for different types of household incomes (e.g. Chen, 2009), (b) some split the sample in different subsamples (e.g. Maasoumi and Trede, 2001; van Kerm, 2004; Ayala and Sastre, 2008; Chen, 2009), or (c) differentiate between and within group mobility (Buchinsky and Hunt, 1999);

43 See, e.g., Burkhauser et al. (1997), Burkhauser and Poupore (1997), Maasoumi and Trede (2001), Gottschalk and Spolaore (2002), van Kerm (2004), Jenkins and van Kerm (2006), and Chen (2009).

44 See, e.g., Burkhauser and Poupore (1997), Maasoumi and Trede (2001), Gottschalk and Spolaore (2002). Jenkins and van Kerm (2006) consider this difference to be a function of the type of mobility measure.

45 For more recent contributions see e.g. Baker (1997) and Meghir and Pistaferri (2004, 2010).

(d) some studies consider different contributions to overall mobility for different quantiles of the initial distribution (Gregg and Vittori, 2008; van Kerm, 2003, 2006), and, finally, (e) based on Fields and Ok (1999b) some authors decompose mobility (measured as per capita income movement, i.e. absolute difference in log-incomes) into mobility due to overall economic growth and mobility due to the transfer of income within a given distribution (e.g. Chen, 2009; van Kerm, 2004; Ayala and Sastre, 2008).

Finally, a third approach studies individual-level determinants of wage dynamics: Hunt (2001) investigates the determinants of year-to-year changes in East German wages immediately after unification. Raferzeder and Winter-Ebmer (2007) and Gernandt (2009) investigate correlation patterns of changes in individual income positions between 1994 and 2001. Generally, these analyses suggest that wage mobility is concentrated among individuals at the beginning of their labor market careers.

This study contributes to the literature in several ways. First, we study German wage mobility based on a new administrative data set. Our data provide large samples, go back further in time than prior contributions (to 1975) and also cover very recent developments, i.e. through 2008. Compared to survey data, our administrative data promise higher precision, less measurement error, and less attrition (cf. Gottschalk and Huynh, 2010). Second, the data allow us to compare the developments in East and West Germany in the two decades since unification, which is missing in the literature so far. Finally, we go beyond the mere description of wage mobility over time and between groups and test specific hypotheses regarding the determinants of changes in wage mobility. We apply aggregate and detailed decompositions based on recentered influence function (RIF) regressions as introduced by Firpo et al. (2009) and presented by Fortin et al. (2011) to quantify the contribution of potential determinants of aggregate mobility.

Our main results are as follows: first, we observe substantial declines in East German wage mobility in the 1990s and moderate reductions since the late 1990s in both East and West Germany. Since about 1997, wage mobility in East Germany had fallen below West German levels. Second, we confirm the extant evidence on rising wage inequality in Germany. Therefore, mobility is less and less effective as an "equalizer" of inequality in the sense of Friedman (1962). Third, the results yield that a substantial part of the mobility decline in East Germany is associated with changes in observable characteristics, particularly those describing job stability and employment characteristics. However, also structural and unexplained factors contributed to the wage mobility decline in both parts of Germany.

The chapter is structured as follows: in section two we describe our data, key variables, and measurement issues. Section three describes the developments

of inequality and mobility in West and East Germany. Section four derives our hypotheses regarding determinants of mobility from the literature and outlines the empirical approach chosen to test them. The empirical results are presented and discussed in section five before we conclude in section six.

5.2 Data and measurement issues

Our analysis uses the newly available SIAB (Sample of Integrated Labour Market Biographies) data, a two percent random sample of administrative records drawn from the Integrated Employment Biographies (IEB 1975–2008).[46] The data contain the employment history of 1.6 million individuals and inform about benefit receipt, job-search, and individual characteristics that can be matched with establishment characteristics. The IEB data describes all individuals covered by the statutory retirement insurance, i.e. about 80 percent of the German labor force, as well as all individuals registered with the federal employment agency.[47]

The SIAB data have two weaknesses. First, they provide only a limited number of available covariates, e.g. we only know about workers' full-time vs. part-time employment status rather than the actual number of hours worked.[48] Second, the information on daily wages is censored: since retirement insurance contributions are paid as a fixed earnings share only up to an upper threshold, earnings values beyond the threshold are not registered in the data. This threshold value is fixed nominally every year, separately for East and West Germany. We apply "consistent top-coding" to avoid time inconsistencies in the share of censored observations (see Burkhauser et al., 2009) and consistently censor the top 15 and 10 percent of each annual wage distribution for West and East Germany, respectively.

Our sample covers all full-time employed individuals in East and West Germany, between 25 and 60 years of age. We consider every individual who is employed full-time at some point in the calendar year. East and West German subsamples are distinguished based on the individuals' place of work.[49] In the analysis of wage mobility between periods t and $t + k$ we use observations who were full-time employed in the base (t) and the final ($t+k$) reporting year, who worked in the same region of the country at both points in time, and who met the age restrictions in both periods. Table 5.6 in the appendix A provides the

46 The SIAB is the successor of the widely used IABS data set of the Institute for Employment Research.

47 Excluded are civil servants, self employed workers, and those in military service. Individuals are registered with the federal employment agency, e.g., if they are unemployed or participate in training measures.

48 Full time employment is coded if the person's contract runs over that number of weekly hours which is considered full time in the employee's establishment. Depending on bilateral bargaining agreements this number may vary between 35 and 45 hours per week. For details on the data see Dorner et al. (2010).

49 Observations from Berlin are considered East Germans since unification and are omitted before 1992.

overall number of observations used in the mobility analysis for the two regional samples by year.

Our key variable of interest describes real daily wages in 2008 Euro, deflated using a national consumer price index. We disregard employment relationships with daily wages below 12 Euro.[50] Next, we describe the long run evidence on wage inequality and wage mobility for full-time workers in East and West Germany.

5.3 Inequality and mobility patterns in East and West Germany

5.3.1 Inequality patterns

In this section we briefly replicate the evidence on wage inequality in Germany as presented e.g. by Dustmann et al. (2009). Based on the SIAB data, we extend their observation window to include the more recent years and the East German subsample.

Figure 5.1 presents the development of real wages at the 20th, 50th, and 80th percentile of the full wage distribution, i.e. including censored observations, as well as the real censoring threshold over time. The 80th percentile of the distribution always remains below the censoring threshold. The evidence on West German inequality confirms prior findings (e.g. Dustmann et al., 2009; Gernandt, 2009): inequality rises in the upper part of distribution since the early 1980s and in the lower part of the distribution since the early 1990s, recently with falling real wages at the 20th percentile. In East Germany, inequality in the top half of the distribution increased over time, while the 20th and 50th percentiles moved almost in tandem. Again, we find falling real wages at the median and below.

Figure 5.9 in the appendix A presents the relative development of real wages since 1975 in West and since 1992 in East and West Germany. The graphs yield higher wage growth for the upper than for the lower percentiles of the respective wage distributions, with overall higher growth rates in East than in West Germany. Inequality rose both in the upper and the lower half of the real wage distributions.

To sum up, we depict the aggregate inequality developments using three distributional measures: Gini coefficients and the mean log deviation of annual real wages in Figure 5.2 and the spread between the 80th and 20th percentile of the annual wage distribution in Figure 5.10, all calculated separately for the two regional subsamples.[51] In West Germany, wage inequality has been rising steadily and in particular since the late 1990s. In East Germany, wage inequality has been rising continuously.

50 Dustmann et al. (2009) use a similar cutoff value.

51 We also studied the Gini coefficients for the full earnings distribution including censored values. The developments are very similar to those depicted for the uncensored part of the distribution.

5.3.2 Mobility patterns

Increasing cross-sectional wage inequality does not have to enhance permanent and lifetime inequality if it is balanced by increasing intertemporal wage mobility. Next, we study the development of wage mobility over time.

The literature uses a number of different indicators of wage mobility. To ensure that our findings are reliable and independent of any particular chosen measure, we apply different indicators. We first study indicators that are based on individual rank positions in the wage distribution. In particular we look at (a) the probability of shifting to a different quintile of the wage distribution, (b) the probability of jumping by more than 10 rank positions, (c) the distribution of changes in rank positions, and (d) rank correlations over alternative interval lengths in East and West Germany. Our second set of indicators uses the Shorrocks index (Shorrocks, 1978), which describes the extent to which short term wage mobility can reduce long term inequality. Finally, we compare the development of mean absolute and relative wage changes over time.

Figure 5.3 summarizes transition matrices, where the probability of staying in any given quintile between periods t and $t + 4$ is compared to the probability of moving by one, two, three, or four quintiles. For the West German subsample we show the developments since 1975, for the East German sample those since 1992. Since the last year of our data is 2008, the last transition is depicted for the starting year 2004, which represents the mobility between 2004 and 2008. Mobility patterns vary between regions: among West Germans (see top panel) mobility appears to be rather stable over time. Only recently, we observe an increase in immobility, i.e. in the probability of remaining in a given quintile (labeled "stayer"). Correspondingly, the probability of position shifts by one or two quintiles slightly dropped. The probabilities for larger position shifts remained at below ten percent.

The shifts in East German mobility are more pronounced. Here the probability of staying in a given quintile, increased since 1992 from around 50 to 70 percent (bottom panel) and thus assimilated to West German levels. Thus, we observe a general trend to lower mobility, particularly in East Germany. This matches the evidence provided by Gernandt (2009) using SOEP data and the picture recently drawn for the U.S. by Kopczuk et al. (2010).

As a second and somewhat more detailed indicator based on rank positions, we study the development of the probability of changing the individual rank position by more than 10 percentage points within a window of four years. Figure 5.4

presents the development for the two regional subsamples.[52] A high probability of a ten percentage point shift reflects high mobility. The mobility level in West Germany slightly declined between 1975 and 1985, it increased through 1989, and subsequently declined substantially from about 40 to 30 percent. For East Germany the development is more striking. Here, mobility declined from initially about 55 to about 25 percent, i.e. to levels clearly below the West German values.

One shortcoming of quintile or 10 percentage point transitions is that they do not describe developments within the considered ranges.[53] Figure 5.5 addresses this problem and presents the distribution of changes in relative rank positions separately for three periods in West and for two periods in East Germany.[54] The dispersion in rank adjustments over time is roughly constant in West Germany (see top row). In East Germany (see bottom row) the variance of the rank change distribution visibly declines between the first and the second observation period (1992–1996 vs. 2004–2008).

Figure 5.6 presents the development of individual rank correlation coefficients over time, for East and West Germany, and for time intervals of different lengths. Correlations are higher if mobility is measured over shorter observation windows, e.g. between t and $t + 1$ versus t and $t + 4$. Rank correlation coefficients increase over time in almost all depicted series. In East Germany immobility increases strongly over time reaching West German levels.

The correlation patterns over alternative time horizons already indicate that mobility developments can vary in the short and the long run. The Shorrocks index (M) describes the extent to which wage mobility balances short-run inequality (Shorrocks, 1978). If period-specific inequality is measured by an indicator $G(z)$, we can compare the average of T period-specific inequality measures with inequality averaged over T periods. If the latter is smaller than the former, intertemporal mobility serves to reduce short-run inequality:

$$G(\bar{z}) \leq \sum_{t=1}^{T} G(z_t)/T \tag{5.1}$$

The Shorrocks index is defined as M with

$$M = 1 - \frac{G(\bar{z})}{\sum_{t=1}^{T} G(z_t)/T} \tag{5.2}$$

52 Since censored observations do not change their measurable rank position over time we calculated the rates using only the uncensored observations.

53 In addition, these mobility indicators cannot differentiate between more or less dispersed distributions.

54 Here, censored wage observations are omitted. Since all censored individuals occupy the same rank, their consideration would vastly increase the share of zero rank changes.

If mobility reduces income inequality, the inequality of averaged incomes is below the average of period-specific inequality measures. The larger the difference between these two indicators, the larger mobility and the closer *M* is to one. If there is no mobility, the inequality of the average and the average of the inequality measures are identical and *M* is close to zero.[55] Figure 5.7 presents the development of the Shorrocks index when we apply two alternative inequality indicators *G*, mean log deviation and the Gini coefficient to East and West German samples. The developments over time are similar to prior measures. Overall, mobility in West Germany is lower in the early 2000s than in the 1970s, even though the process was not one of a linear decline. In East Germany, mobility has been declining without interruption since unification. It soon fell below West German wage mobility.

In our final group of mobility measures we calculate the development of absolute and relative changes in real wages over time. Rising absolute wage changes over time would be suggestive of increasing mobility. Appendix Figure 5.11 shows the development of the mean absolute individual real wage change across intervals of different lengths for the regional subsamples. While the values fluctuate, the overall patterns, particularly when considering wage developments over longer periods, are clear: mean absolute wage changes trend downwards both in East Germany since the first measurements and in West Germany since the mid 1980s. Appendix Figure 5.12 describes relative instead of absolute wage changes over time. Again, we find general declines in mean relative wage changes over time. This confirms the decline in wage mobility that we found using other indicators.

Overall, the evidence supports two stylized facts: (i) wage mobility declined over time and (ii) it declined faster in East than West Germany. In the next sections, we study the mechanisms behind these developments.

5.4 Explaining the mobility decline: hypotheses and empirical approach

5.4.1 Hypotheses

The literature offers a range of hypotheses that may explain changes in aggregate wage mobility. These hypotheses fall in four groups: connected to labor supply, a first group of factors considers individual characteristics (*Z*); closer to labor demand, a second group of potential mobility determinants focuses on job stability

55 The literature applies a variety of inequality measures to calculate Shorrocks index (e.g. the Gini coefficient, mean log deviation, Theil I1, or Theil I2), which vary in their sensitivity to changes in different parts of the income distribution (e.g. Hofer and Weber, 2002). We present results using the Gini coefficient, which is particularly sensitive to changes in the middle of the distribution and using the mean log deviation which is particularly sensitive to changes in the lower part of the distribution.

(*J*) and a third on employment characteristics (*E*). A last group considers regional and aggregate developments (*R*) as determinants of wage mobility. Next, we discuss each of the four groups of hypotheses which we later test empirically.

Wage mobility is affected by individual characteristics including changes over the life-cycle (Drewianka, 2010; Raferzeder and Winter-Ebmer, 2007; Gernandt, 2009; Aaberge et al., 2002; Kohn and Antonczyk, 2011).[56] Clearly, the composition of the East German labor force, for which mobility changed the most, with respect to age, sex, and education has changed since unification: East Germany experienced demographic aging and fertility declines (Lechner, 2001), selective out-migration (Hunt, 2006; Fuchs-Schündeln and Schündeln, 2009), modifications of the education system (Riphahn and Trübswetter, 2011), and shifts in female labor force participation (Hanel and Riphahn, 2011). In order to gauge the joint effects of changes in work force characteristics we consider the following individual characteristics (*Z*): age, sex, education, citizenship, an indicator for whether an individual will leave East Germany for the West in the future, and the rank position in the income distribution in the base period starting from which mobility is measured.

Wage mobility is typically associated with job changes. Therefore, overall changes in job stability and tenure are likely to be connected to shifts in wage mobility (Stevens, 2001; Farber, 2007, 2008; Shin and Solon, 2011; Gottschalk and Moffitt, 1994, 2009). In the U.S., job stability declined recently suggesting an increase in wage mobility. In East Germany, it is plausible that job stability increased since unification, which should reduce wage mobility. To test these mechanisms, we consider three indicators of job stability (*J*): individual employer changes, individual unemployment experience between t and $t+4$, and tenure with the current employer.

A third group of factors relevant to wage mobility relates to employer and employment characteristics. In this group we distinguish four different mechanisms. First, the recent decline in unionization and wage compression may contribute to the rise in wage inequality (e.g. Dustmann et al., 2009; Antonczyk et al., 2010b; Kohn and Antonczyk, 2011) and may affect wage mobility (Gottschalk and Moffitt, 1994). Particularly in East Germany, employers left collective bargaining arrangements as a result of overly generous wage negotiations (Stephen and Schroeder, 2007). Second, Gottschalk and Moffitt (1994) argue that employment shifts between industries affect aggregate wage mobility if workers move from more stable (e.g. manufacturing) to more instable (e.g. services) sectors. This is

56 Antonczyk et al. (2010a) point out that wage inequality over the life-cycle changed in different ways for different workers, which suggests shifts in age-mobility profiles over time.

particularly relevant for the East German industrial structure which adjusted after unification with shifting industry and employer size composition. As a third mechanism, Comin et al. (2009) and Gottschalk and Moffitt (2009) show the connection between wage instability and the volatility of firm performance and discuss firm stability as a determinant of wage mobility. Fourth and finally, given the relevance of occupation-specific human capital (Schmillen and Möller, 2010; Firpo et al., 2011), of skill biased technical change, and increasing specialization it may have become more difficult to transfer human capital between employments over time (Gottschalk and Moffitt, 2009). This again may affect wage mobility. To control for the impact of these mechanisms on wage mobility we consider a variety of indicators (E). We use employer size, and its change between t and $t + 4$ as indicators of employer stability. We control for industry and occupation as of period t as well as for the change of industry and of occupational category by an employee over time.

Our fourth and final set of factors considers regional developments that might affect wage mobility such as the business cycle, unemployment rates, GDP growth, as well as specifics of the regional employment structures such as the share of the self-employed (cf. Gottschalk and Moffitt, 1994, 2009; Anger, forthcoming). As summary measures for these macroeconomic indicators we consider state-level fixed effects.

In order to answer the question, which of the four factor groups contributes most strongly to the decline in German wage mobility, we pursue a decomposition approach (cf. Fortin et al., 2011). The decomposition framework suggests that the observed mobility decline must be connected either to composition effects, i.e. to shifts in the observable determinants of wage changes, or to structure effects, i.e. to shifts in unobservables or in correlation patterns as reflected in regression coefficients. We first evaluate the magnitude of the overall composition and structure effects and then study the detailed impact of the four factor groups on wage mobility. The next section explains our approach.

5.4.2 Empirical approach

To quantify the contribution of the four factor groups to the change in wage mobility over time we apply the recentered influence function (RIF) method as introduced by Firpo et al. (2009) and discussed in Firpo et al. (2007) and Fortin et al. (2011). Similar to the Oaxaca Blinder decomposition which focuses on differences in the means of distributions, the RIF method permits decompositions of differences in other functionals of distributions such as the variance. The aggregate decomposition separates the effect of changes in characteristics and

coefficients, while the detailed decomposition assigns (groups of) covariates their specific contribution to the difference in the distributional measure.

As our indicator of wage mobility we use the variance of the distribution of individual changes in rank positions in annual wage distributions between periods t and $t+4$ (cf. Figure 5.5). We separately consider the East and West German labor markets. The measure reflects our interpretation of wage mobility as a characteristic of regional labor markets. Let y_i represent the change in the relative rank position of individual i between period t and $t+4$. y_i takes on values in the interval [–99, 99]. In a balanced panel of individual wage observations the mean of y is zero and independent of wage mobility. Wage mobility, instead, is reflected in the variance of y: labor markets with high wage mobility are characterized by a high dispersion of rank changes while labor markets with low wage mobility feature mostly small changes in rank positions and thus a small variance of y. Since we are interested in decomposing the observed mobility difference over time we compare the variance of an early and a late period.

The approach (Firpo et al., 2007, 2009) provides a method to measure the impact of changes in the distribution of covariates at the individual and aggregate level on the change in the variance of y. The influence function of the variance, $IF(y_i;\sigma^2)$, describes the influence of an individual observation y_i on the aggregate variance, σ^2:

$$IF(y_i;\sigma^2) = \left(y_i - \int z \cdot dF_Y(z)\right)^2 - \sigma^2 \tag{5.3}$$

The recentered influence function (RIF) adds this influence function back to the observed variance (see equation 5.4), which after substituting the expected value of the influence function yields the original variance (see equation 5.5):

$$RIF(y_i;\sigma^2) = IF(y_i;\sigma^2) + \sigma^2 \tag{5.4}$$

$$RIF(y_i;\sigma^2) = \left(y_i - \int z \cdot dF_Y(z)\right)^2 = (y_i - \mu)^2 \tag{5.5}$$

Firpo et al. (2007) show that the conditional expectation of RIF $(y_i;\sigma^2)$ can be modeled as a linear function of explanatory variables X:

$$E\left[RIF(y_i;\sigma^2)|X\right] = X_i \cdot \gamma \tag{5.6}$$

The RIF regression coefficients (γ) provide partial effects of changes in the distribution of the covariates X on the variance of the conditional distribution of y. In this framework we can separate the contribution of covariate (X) and structure

effects to the explanation of overall changes in wage mobility over time.[57] The overall change in wage mobility between a late ($t=0$) and an early ($t=1$) period is defined as

$$\Delta_O^{\sigma^2} = \sigma_0^2 - \sigma_1^2 \tag{5.7}$$

and can be decomposed into two parts

$$\Delta_O^{\sigma^2} = \Delta_S^{\sigma^2} + \Delta_X^{\sigma^2} \tag{5.8}$$

where $\Delta_X^{\sigma^2}$ represents the composition effect and $\Delta_S^{\sigma^2}$ indicates the structure effect. Firpo et al. (2007) show that this decomposition can be obtained as a Oaxaca Blinder decomposition of equation (5.6).

However, the authors recommend a two step procedure: the first step consists of reweighting the data following the well known DiNardo et al. (1996) procedure. The objective of this reweighting procedure is to account for potential non-linearities in the true conditional expectation of equation (5.6). Without reweighting, the decomposition yields consistent results only if the true conditional expectation of equation (5.6) is in fact linear, which imposes a strong assumption on the data. The reweighting procedure generates counterfactual observations ($t=2$) that result if individuals of the late period ($t=0$) had the same distribution of observable characteristics as individuals observed in the early period ($t=1$). The reweighting procedure is based on estimating a probit model on the probability of being observed in the early period.[58]

In the second step the decomposition analysis is then performed on the reweighted data. The composition and structure effects are calculated as follows:

$$\Delta_X^{\sigma^2} = \left(\overline{X}_2 - \overline{X}_0\right)\hat{\gamma}_0 + \overline{X}_2\left(\hat{\gamma}_2 - \hat{\gamma}_0\right) = \left(\overline{X}_2 - \overline{X}_0\right)\hat{\gamma}_0 + \hat{R}_X^{\sigma^2} \tag{5.9}$$

and

$$\Delta_S^{\sigma^2} = \overline{X}_1\left(\hat{\gamma}_1 - \hat{\gamma}_2\right) + \left(\overline{X}_1 - \overline{X}_2\right)\hat{\gamma}_2 = \overline{X}_1\left(\hat{\gamma}_1 - \hat{\gamma}_2\right) + \hat{R}_S^{\sigma^2} \tag{5.10}$$

$\hat{R}_X^{\sigma^2}$ represents the approximation error. It reflects the imprecision of the approximation of $\Delta_X^{\sigma^2}$ through RIF regressions, which is enhanced if the linearity

57 The literature frequently uses the terminology of explained vs. unexplained effects. We follow Fortin et al. (2011) and label explained effects composition effects and unexplained effects structure effects.

58 Our probit specification considers the explanatory variables of the decomposition analysis and their interactions. The results of the reweighting step are presented in Tables 5.9 and 5.10 in the appendix B. In both tables, the last three columns present the difference of the mean characteristics in the reweighted and original period. These differences are very small or equal to zero in almost all cases.

of the RIF regression is inappropriate. The approximation error disappears if the conditional expectation of the variance is indeed linear in X (see Firpo et al., 2007). $\hat{R}_S^{\sigma^2}$ represents the reweighting error that disappears if the reweighting matrix is consistently estimated and $plim\ \overline{X}_2 = plim\ \overline{X}_1$.

The results identify $\Delta_X^{\sigma^2}$ and $\Delta_S^{\sigma^2}$ under two assumptions. (i) Ignorability requires that conditional on X the unobservable determinants of the dependent variable in equation (5.6) are independent of the assignment to treatment group t, i.e. to the early vs. late period in our mobility comparison. (ii) Overlapping support requires that there is no set of covariates X which is exclusively observed among members of treatment group 0 or 1.

To test our hypotheses and to determine the contribution of different groups of covariates to the decline in wage mobility over time we use linear regressions of the individual contribution to aggregate wage mobility considering the four factor groups (Z, J, E, and R) defined above and ε as a random error term:

$$RIF(y_i;\sigma^2) = \gamma_0 + Z\gamma_1 + J\gamma_2 + E\gamma_3 + R\gamma_4 + \varepsilon \tag{5.11}$$

Based on this model we can calculate composition (5.12) and structure (5.13) effects for each covariate group k:

$$\sum_{k=1}^{K} \left(E\left[X^k|t=1\right] - E\left[X^k|t=0\right]\right)' \cdot \hat{\gamma}_{0,k}^{\sigma^2} \tag{5.12}$$

$$\sum_{k=1}^{K} E\left[X^k|t=1\right]' \cdot \left(\hat{\gamma}_{1,k}^{\sigma^2} - \hat{\gamma}_{2,k}^{\sigma^2}\right) \tag{5.13}$$

Under the stated assumptions this procedure can be applied to evaluate the contribution of the four factor groups to the observed changes in wage mobility. We follow Firpo et al. (2007) and estimate the standard errors of all indicators by bootstrap procedures. There are several advantages connected to the application of the RIF procedure: first, it allows us to decompose the patterns behind changes in variances, second, in contrast to other decomposition procedures it permits both aggregate and detailed decompositions, and third, the results of the detailed decomposition for each group of covariates are not path dependent. However, the RIF procedure also suffers the disadvantages of the standard Oaxaca Blinder decomposition: the measured contribution of covariates to the structure effect depends on the chosen reference group and results generally depend on which of the two comparison groups $t = 0,1$ is the reference. In response to the first disadvantage we do not present detailed structure effects. In response to the second point we perform a robustness check of our results.

5.4.3 Descriptive evidence

The dependent variable of the RIF regression (see equations 5.6 or 5.11) describes the individual contribution to the variance of the wage change distribution. The means of the dependent variable are depicted by region and calendar year in Figure 5.8: for any year t it shows the variance of the distribution of individual rank changes between periods t and $t + 4$. The patterns in Figure 5.8 strongly resemble those in Figures 5.4 and 5.7. The values for West Germany followed a U-shape between 1975 and 1990. In the early 1990s wage mobility was substantially higher in East than in West Germany. It continuously declined since then in East Germany dropping from values of 470 in 1992 to 191 in 2004. In West Germany mobility has been declining since 1997. Since 1996 East German wage mobility is below West German levels, which confirms the results of section 3 above.

In our empirical analysis we focus on a comparison of the East and West German developments since unification. We consider numerous variables to measure the impact of the four factor groups discussed in section 4.1. These variables are described in greater detail in the data appendix, which includes descriptive statistics.

5.5 Results and discussion

5.5.1 Empirical results

The empirical analysis evaluates the contribution of the four factor groups to the decline in wage mobility. In an initial step we regress the individual contribution to the aggregate variance on the four factor groups (cf. equation 5.11). The estimates of these results are available in the appendix B. We present the results of our decomposition analysis in Table 5.1, where we compare wage mobility observed in the early years after unification (base year $t = 1993$)[59] to that observed most recently (base year $t = 2004$).[60] Panel A of Table 5.1 describes that the observed variance of the rank change distribution dropped significantly, by half in East and by 15 percent in West Germany over the observed period. Panel B of Table 5.1 presents the results of the aggregate decomposition (cf. equation 5.8), where we

59 The administrative process on which our data depend was extended to East Germany in 1991. We want to ensure that our decomposition results are not biased due to incorrect information stemming from problems in the introductory period of the mandatory retirement system. So, in contrast to the presented descriptive results, we decided to use 1993 as base year for our further analysis. However as presented in the descriptive results section the mobility trends are robust to an exclusion of 1992.

60 As a robustness check we present the results of the aggregate decomposition with swapped period assignments (1 vs. 0) in the appendix B. The results are robust to the direction of the decomposition.

distinguish the contribution of composition ($\Delta_X^{\sigma^2}$) and structure effects ($\Delta_S^{\sigma^2}$) to the overall change in wage mobility over time. In East and West Germany most of the change in wage mobility is associated with structural shifts, i.e. with changes in correlation patterns and the relevance of unobservables. However, in East Germany a statistically significant share of about 40 percent of the total decline in wage mobility is associated with composition effects, i.e. with changes in observable characteristics. Panel C of Table 5.1 presents the contribution of changes in observable characteristics separately for the four groups of explanatory factors. In both regions changes in job stability and employment characteristics contributed substantially to the composition effect. While in East Germany changes in all factor groups contribute to a decline in wage mobility, the shifts in job stability (*J*) and employment (*E*) characteristics in West Germany would have increased wage mobility. Surprisingly, the contribution of individual level characteristics (*Z*) in East Germany is relatively small: if the mobility decline were driven by migration and ensuing changes in population characteristics this should have shown up in a more substantial contribution of factor group *Z* to the total composition effect. Instead, job stability (*J*) and employment characteristics (*E*) appear to be associated most strongly with the overall composition effect.

The bottom rows of Table 5.1 describe the magnitude of the approximation and the reweighting errors. For East Germany the approximation error to the true functional form of the composition effect is negligible, for West Germany it takes on a value of -5, which is not large compared to the total change in variance between the periods. The reweighting error is statistically significant for East Germany. It indicates that there remains a difference between the characteristics of the compared groups even after the reweighting procedure.[61]

Overall, the substantial decline in East German wage mobility is connected to both composition and structure effects whereas the small change in West Germany can be accounted for by structure effects. In principle, it is possible to decompose structure effects and to evaluate the contribution of each factor group. However, because the results vary substantially depending on reference group chosen, we prefer not to present a – necessarily arbitrary – decomposition of the structure effect.

Instead, we refine our decomposition analysis and break the observation window in two periods. Figure 5.8 shows that mobility declines non-linearly in the two regions. Table 5.2 presents the results of an analysis were the mobility decline is compared first for the base years 1993 and 1998 and then, separately, for the base years 1998 and 2004 in East and West Germany. Panel A confirms that

61 The results of the reweighting procedure are described in the appendix B.

the East German mobility decline slowed down substantially after the first period, whereas the West German mobility decline only started after 1998. Indeed, the change in the second period was of equal size in East and West while East German mobility had already dropped below West German levels in 1998.

Panel B again separates the contributions of structure and composition effects. Both contribute significantly to all observed changes. In East Germany, the patterns differ for the first and the second period. Whereas in the early period about one quarter of the overall mobility change is associated with shifts in characteristics that share increases to about more than 60 percent in the second period. In West Germany the variance changed little in the first period and in the second period the decline is connected to both, composition and structure changes. Across both regions and periods the detailed decomposition of the characteristics effect in Panel C again yields a dominance of observables that are connected to job stability and employment characteristics. In the East, job stability indicators dominate, in the West the employment indicators. The approximation and reweighting errors are generally small and mostly insignificant in this analysis. Overall, the mobility shifts in East and West are associated with both, changes in composition and in structure.

Overall, the results confirm that the change in characteristics of the East German labor market drives a substantial share of the decline in wage mobility particularly in the second half of the observation window. Job stability and employment characteristics may be key determinants of wage mobility in East and West Germany. The change in labor force characteristics (Z) matters less. Before we provide a more detailed discussion of this evidence, we test its robustness.

5.5.2 Two robustness tests

We address two issues in our robustness tests, the impact of Berlin and East-West migration. More than one fifth of the East German population resides in Berlin. Since the labor market in this metropolis may differ substantially from the labor markets in the other, at times sparsely populated regions of East Germany we investigate whether our findings for East Germany are robust to omitting the observations employed in Berlin from the East German sample. Table 5.3 presents the results of this exercise. The first two columns show the two sub-periods and the final column shows the evidence for the entire observation window.

The descriptive evidence on the drop in wage mobility in Panel A confirms the patterns that we observed for all of East Germany in Tables 5.1 and 5.2. The aggregate decomposition in Panel B confirms that a substantial share of the mobility decline is associated with the composition of the sample, particularly in the second sub-period. The detailed decomposition in Panel C again shows that job

stability and employment characteristics are the factors that contribute most to the composition effect. Overall, our results are robust to omitting Berlin.

The second test addresses a sample selection criterion that we imposed on the analysis. To ensure that we truly describe the East and West German labor markets we required so far that individuals are observed in the same region of the country (i.e. east or west) when we measure their wages in periods t and $t + 4$. This causes a selectivity problem if there is migration, e.g. between the two regions, a phenomenon we certainly observed since the early 1990s (see e.g. Brücker and Trübswetter, 2007; Hunt, 2006). It is possible that East German wage mobility declined because those workers who are mobile with respect to their wage position left the region. In that case the East German labor market may not have changed at all and our previous results were biased.

To test this scenario, we generated an alternative sample. First, we pooled the East and West German observations. Next, we account for the difference in nominal wage censoring thresholds between East (low) and West Germany (high): we apply the 90th percentile of the East German wage distribution for consistent top coding in the full sample. We then ranked the uncensored wage observations in our full national sample. For the robustness test, we consider all individuals who work in East Germany in base year (t) of the mobility measurement and describe their mobility in the wage distribution by period $t + 4$ independent of whether they are observed in East or West Germany at that point. This describes the wage mobility of East German employees rather than the wage mobility in the East German labor market.[62] The total number of observations increases from 158,909 considered in Table 5.2 to 169,329 in the decomposition analyses for the new sample. The development of the variance of the rank change distribution based on the now nationally calculated ranks is presented in Appendix Figure 5.13: the patterns for the regional groups that stay in East and West Germany for the full observation window are similar to those presented in Figure 5.8. When those individuals are added to the East German sample who migrate to West Germany by period $t + 4$ the drop in wage mobility is attenuated but remains substantial.

The results of the decomposition exercise based on national ranks and the extended East German sample are presented in Table 5.4. The observed variances of the rank change distributions in Panel A of Table 5.4 do not differ vastly from those in Tables 5.1 and 5.2. The overall decline in mobility is reduced from 199.1 (see Panel A Table 5.1) to 145.11 (see column 3, Panel A, Table 5.4). Panel B shows the aggregate decomposition which is fairly similar to that presented in Tables

62 Eventually, at least 94.1 percent of the initial East German employees are observed to be employed in the East German labor market after 4 years. The share of East-West migrants by period $t + 4$ ranged from 3.08 percent in period 1993–1997, to 5.9 percent in period 1998–2002 and 4.25 percent in 2004–2008.

5.1 and 5.2, where structure effects dominate particularly in the first period. Again composition effects matter particularly in the second period. The share of the overall decline that is explained is also fairly similar in both tables. In Table 5.1 about 40 percent of the overall decline in mobility is explained by observable characteristics compared to 47 percent in the extended sample (last column in Table 5.4). So both, the observed decline in mobility and the substantial contribution of observables are robust to changes in sample composition.

The patterns of the detailed decomposition presented in Panel C of Table 5.4 differ compared to those in Table 5.1. When considering the wage mobility of East German employees rather than the East German labor market individual characteristics explain a substantial amount of the observed decrease in mobility. This is not surprising given that we extended the sample with East-West migrants and we know from the literature that these are a highly selective group. However, also in the extended sample job stability and employment characteristics are important influence factors. Overall, the results in Table 5.4 confirm the robustness of prior findings to changes in the sample composition.

5.5.3 Discussion

We have learnt that East German wage mobility was high initially after German unification and rapidly fell below West German wage mobility, which also declined over time. About 40 percent of the overall East German mobility decline is associated with shifts in observables (composition effect) and about 60 percent is connected to correlation patterns and unobservables (structure effect). The structure effect drives the initial fast drop in wage mobility in the first half of the observed period (1993–1998), when the labor market, its matching and remuneration mechanisms were to be established. In the second half of the observation period (1998–2004) the composition effect dominates in East Germany.

We find that it is not migration or a shift in workforce characteristics, such as the age structure, that drive the mobility decline or even the composition effect. Instead, changes in job stability and employment characteristics are behind most of the composition effect in both periods and both regions of the country. The development of job stability indicators (J) is summarized in Table 5.5, separately by region. These characteristics document the stabilization of the East German labor market: the share of individuals changing employers declines to reach West Germans levels in 2004. Past unemployment experience still differs between the regions, but declined in East Germany. As one might expect, the accumulation of job tenure in East Germany took some time but by 2004 the share of employees with at least two years of tenure has about reached the West German level.

Similarly, the incidence of changes in occupation and industry converged between both regions over time.

So, indeed, observable characteristics reflect adjustments in the East German labor market, in particular its rising job stability. This, however, does not explain why East German wage mobility has fallen below that in West Germany most recently. Future research may address this phenomenon.

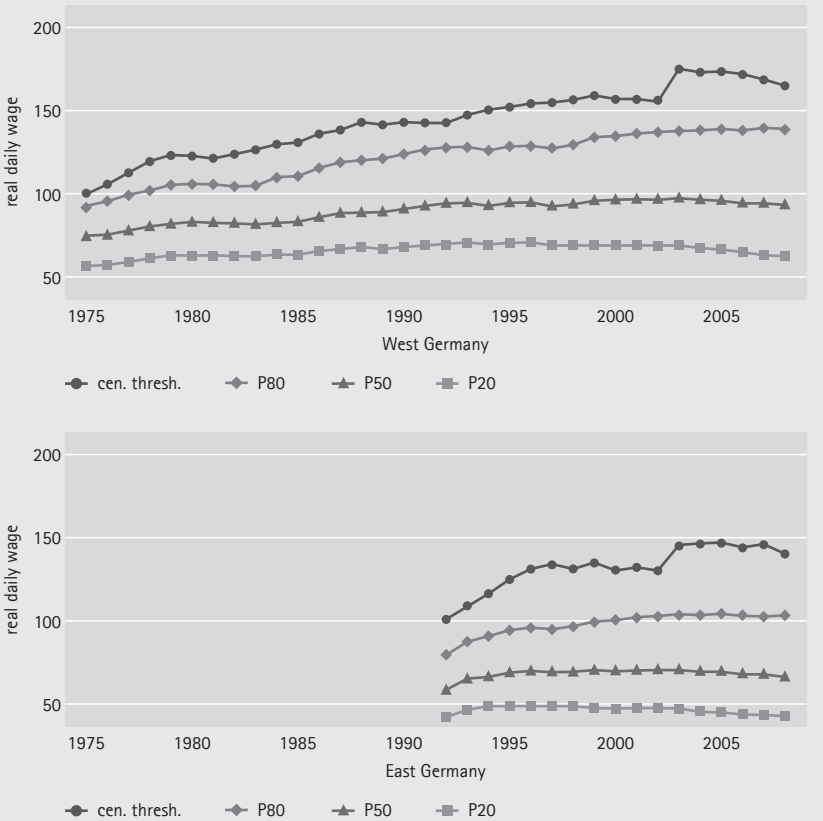
5.6 Conclusions

This is one of the first studies to apply a large and long-running administrative dataset to study the development of wage mobility. We describe the case of Germany since the mid 1970s and show that wage mobility in East Germany declined continuously since unification. West German wage mobility was initially more stable and declined since the late 1990s. We discuss different explanations of the observed phenomenon and empirically quantify their contribution to the mobility decline using a decomposition procedure that is based on recentered influence functions (RIF). The results yield that a substantial part of the mobility decline in East Germany is associated with changes in observable characteristics, particularly those describing job stability and employment characteristics. However, also structural and unexplained factors contributed to the wage mobility decline in both parts of Germany.

The ongoing changes in the wage structure in the West German labor market suggest that the transition process in the former socialist East German labor market cannot be interpreted as a convergence to a static, possibly institution-driven West German wage structure. Instead, wage mobility appears to be a dynamic characteristic of modern labor markets that develops over time. An important conclusion of our analysis is that potential welfare effects of the observed rise in wage inequality are not balanced by higher life-time wage mobility, as suggested by Friedman (1962), who interpreted mobility as an equalizer of long-term incomes. Instead, inequality continues to rise at the same time as its potential balancing mechanism – wage mobility – loses effectiveness.

5.7 Figures and tables

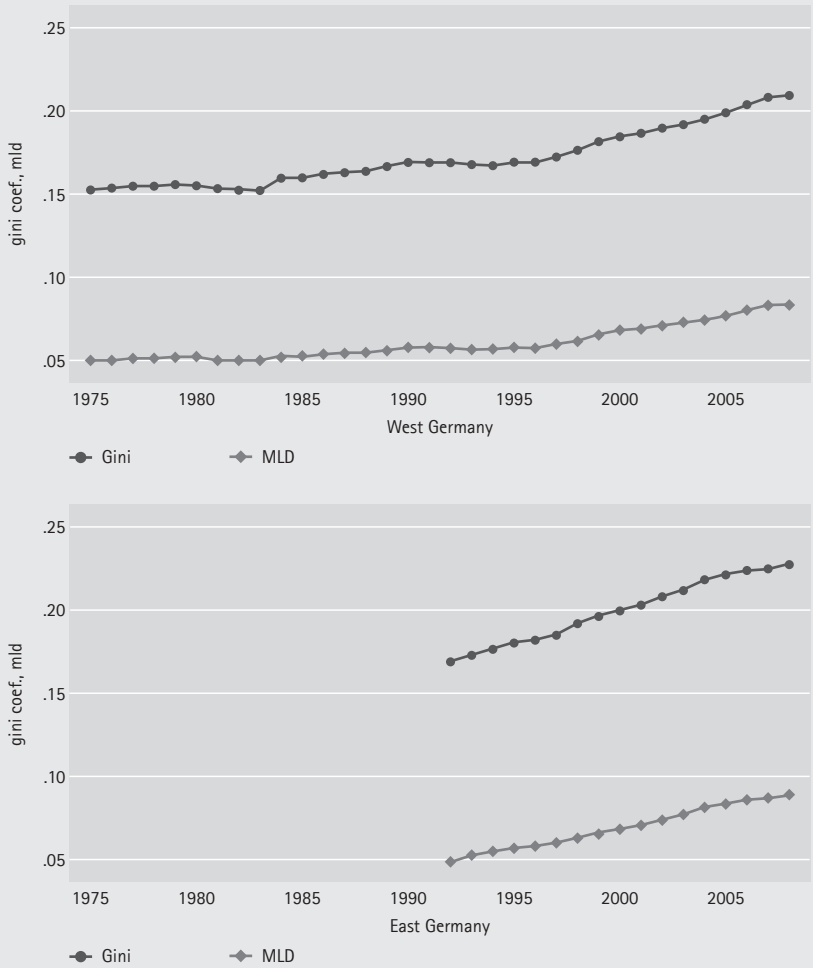
Figure 5.1: Development of percentiles of the real wage distribution by region



Note: all figures present the 20th (P20), 50th (P50), and 80th (P80) percentile of the distribution of daily real wages separately in West and East Germany. In addition, the censoring threshold for insurance contributions (cen. thresh.) is depicted.

Source: SIAB (1975-2008).

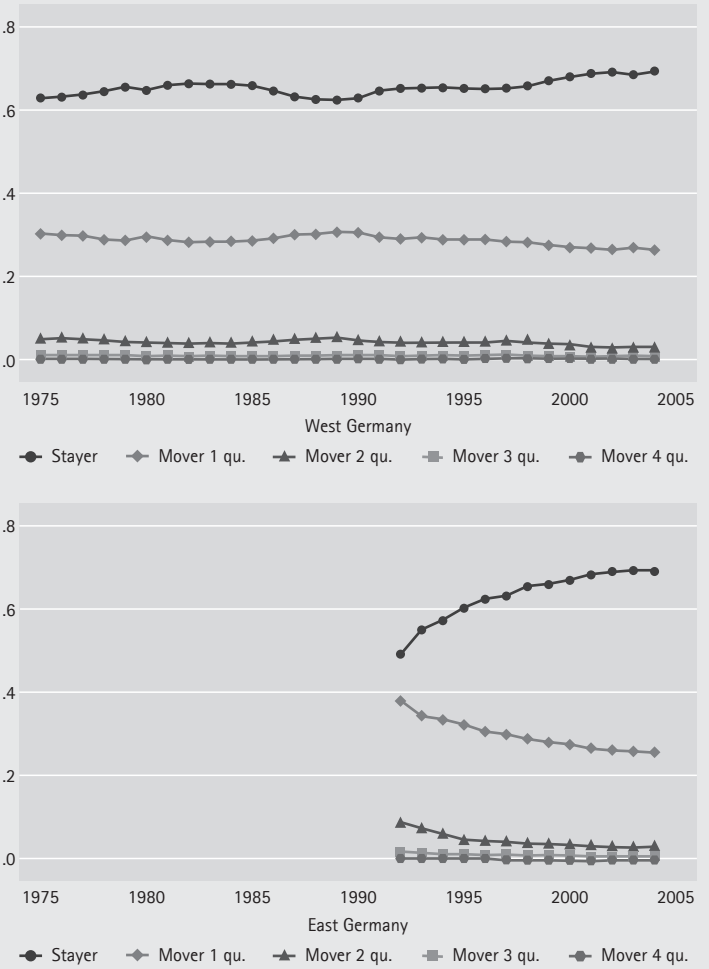
Figure 5.2: Development of real daily wage inequality in East and West Germany: Gini coefficients and mean log deviation (MLD)



Note: the measures are calculated for the uncensored part of the distribution of real daily wages only.

Source: SIAB (1975-2008).

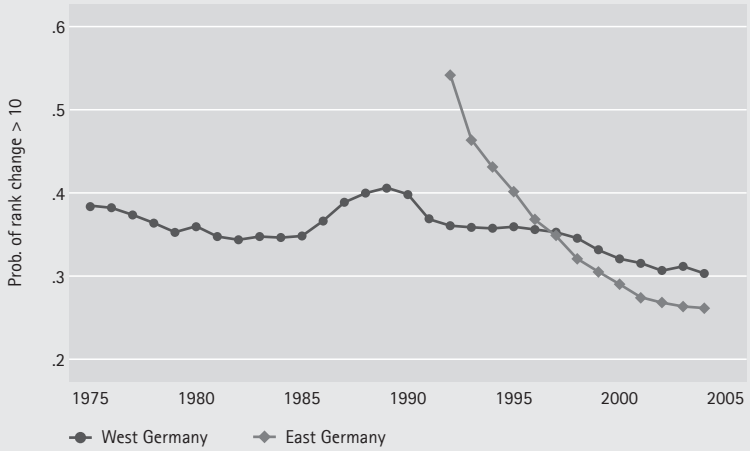
Figure 5.3: Development of quintile transition probabilities by region



Note: all figures present the probability of a transition from a given quintile in the quintile transition matrix of year *t* (x-axis) to year *t* + 4. Rank positions and transition matrices are calculated based on separate East and West German wage distributions in each year (*t* and *t* + 4). The graphs indicate the probability of staying in a given quintile, of jumping by one, two, three, or four quintiles. Upward and downward mobility are not distinguished. All observations – including censored observations – are considered.

Source: SIAB (1975-2008).

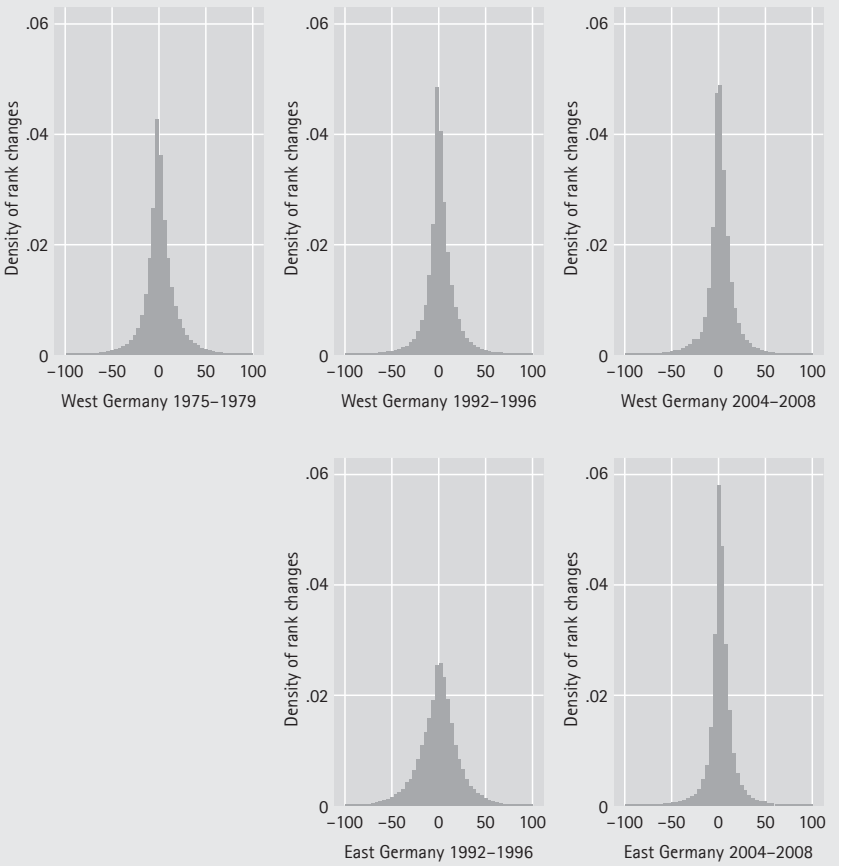
Figure 5.4: Development of the probability of a change in rank position by more than 10 points between *t* and *t* + 4



Note: calculated using rank distributions based only on uncensored observations.

Source: SIAB (1975–2008).

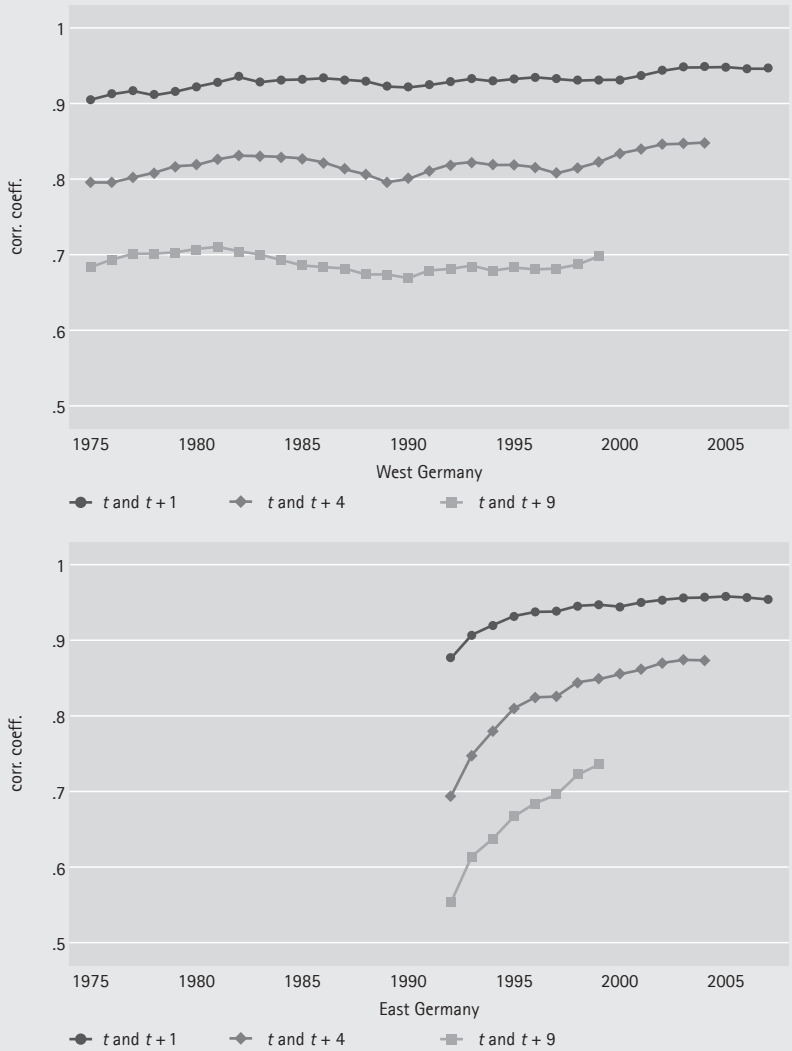
Figure 5.5: Distribution of changes in relative rank positions – by period and region



Note: individual rank positions are determined based on the regional wage distribution in both, the beginning and the end years of the considered intervals. Since not all wage earners of the base year are observed four years later, and because those with stable employment situations may represent a positive selection, we obtain slightly more upward than downward mobility in rank positions. Censored wage observations are omitted. Because all censored individuals occupy the same rank, their consideration would vastly increase the share of zero changes in rank position. Alternative depictions including censored wage observations are available upon request.

Source: SIAB (1975–2008).

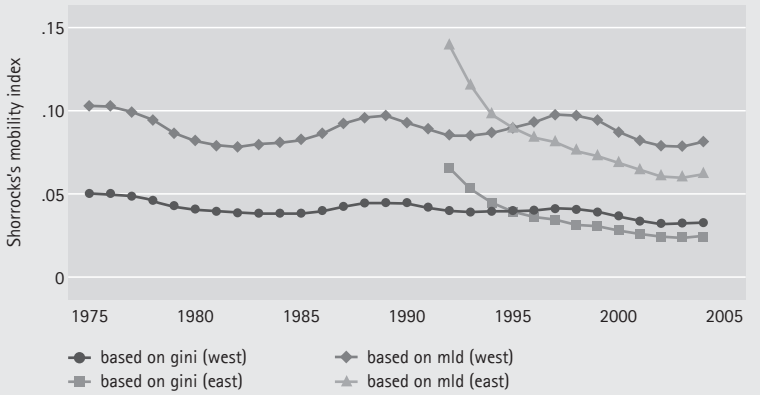
Figure 5.6: Development of correlation coefficients for individual percentile ranks



Note: these figures describe correlation coefficients at the individual level measured based on subsequent base years (x-axis). The correlation coefficients were calculated including the wages of censored observations. Since the last year of observed data is 2008 we cannot calculate more recent correlations so far.

Source: SIAB (1975–2008).

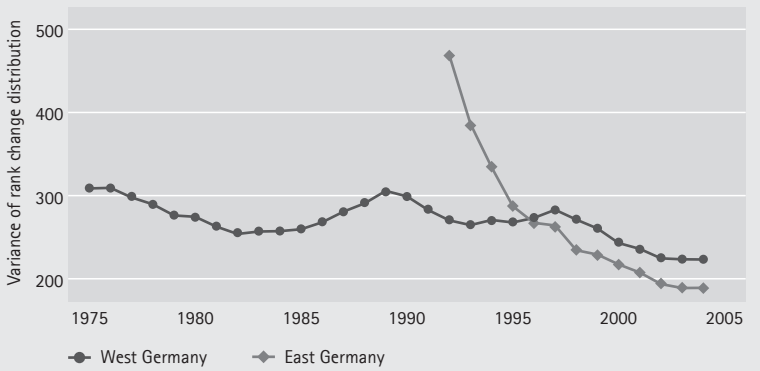
Figure 5.7: Development of Shorrocks indices based on mean log deviation (MLD) and Gini coefficients for regional subsamples



Note: all values are calculated for an accounting period of five years (i.e. years $t - t + 4$). The calculations use only the uncensored part of the wage distribution. Indicators labeled "mld" present the Shorrocks Index when using a mean log deviation inequality measure. Indicators labeled "gini" are based on the Gini coefficient as an inequality measure.

Source: SIAB (1975–2008).

Figure 5.8: Development of annual mean values of dependent variable by region



Note: the dependent variable of the empirical decomposition analyses describes the individual contribution to the variance of the distribution of individual rank changes in the annual wage distributions between periods t (on the x-axis) and $t + 4$.

Source: SIAB (1975–2008).

Table 5.1: Decomposition results – full period

period 1 period 0	1993–1997 2004–2008 East	1993–1997 2004–2008 West
A. Description		
period 1	390.19 ***	265.70 ***
	2.90	*1.40*
period 0	191.09 ***	224.39 ***
	2.78	*1.46*
change	–199.10 ***	–41.31 ***
	4.09	*2.12*
B. Aggregate Decomposition		
composition	–80.25 ***	2.00
	5.16	*1.97*
structure	–138.97 ***	–37.62 ***
	6.27	*2.12*
C. Detailed Decomposition		
Z – individual	–13.37 ***	–6.03 ***
	3.80	*0.82*
J – job stability	–32.55 ***	2.31 ***
	2.61	*0.78*
E – employment	–33.08 ***	5.83 ***
	3.09	*1.10*
R – regional	–1.25 ***	–0.12
	0.40	*0.10*
approximation error	0.94	–5.31 **
	9.20	*2.16*
reweighting error	19.18 ***	–0.38
	4.45	*0.78*

Note: *Z*, *J*, *E*, and *R* represent the groups of individual, job stability, employment and regional variables, which contain different numbers of indicators as described in the text and data appendix. The figures present absolute values of mobility and its changes. The figures in italics are bootstrapped standard errors (100 replications). ***, ** and * indicate statistical significance at the 1, 5, and 10 percent level, respectively. The analysis is based on the consistently censored part of the daily wage distribution. Number of observations: East Germany 1993–1997: 60,676; East Germany 2004–2008: 46,341; West Germany 1993–1997: 189,533; West Germany 2004–2008: 184,846.

Source: SIAB (1975–2008).

Table 5.2: Decomposition results – partial periods

period 1 period 0	1993–1997 1998–2002	1998–2002 2004–2008	1993–1997 1998–2002	1998–2002 2004–2008
	East		West	
A. Description				
period 1	390.19 ***	238.61 ***	265.70 ***	272.78 ***
	3.12	*2.78*	*1.54*	*1.51*
period 0	238.61 ***	191.09 ***	272.78 ***	224.39 ***
	2.90	*2.58*	*1.71*	*1.23*
change	–151.58 ***	–47.52 ***	7.08 ***	–48.39 ***
	4.41	*4.11*	*2.44*	*1.79*
B. Aggregate Decomposition				
composition	–36.57 ***	–33.09 ***	17.86 ***	–19.26 ***
	2.94	*3.66*	*1.44*	*1.81*
structure	–113.54 ***	–21.45 ***	–8.57 ***	–26.21 ***
	4.48	*4.53*	*2.29*	*2.20*
C. Detailed Decomposition				
composition	–36.57 ***	–33.09 ***	17.86 ***	–19.26 ***
	2.94	*3.66*	*1.44*	*1.81*
Z – individual	–7.44 ***	–8.71 ***	–4.85 ***	–4.83 ***
	1.18	*2.22*	*0.52*	*0.50*
J – job stability	–17.63 ***	–12.28 ***	10.63 ***	–7.00 ***
	1.69	*1.61*	*0.72*	*0.90*
E – employment	–10.82 ***	–11.91 ***	12.17 ***	–7.37 ***
	1.80	*2.21*	*1.07*	*1.07*
R – regional	–0.67 *	–0.19	–0.09	–0.05
	0.38	*0.24*	*0.09*	*0.09*
approximation error	–1.85	–0.02	–4.03 *	–1.77
	5.17	*5.23*	*2.28*	*1.96*
reweighting error	0.37	7.05 ***	1.82 **	–1.16
	1.62	*1.92*	*0.76*	*0.94*

Notes: see Table 5.1. Number of observations: East Germany 1993–1997: 60,676; East Germany 1998–2002: 51,892; East Germany 2004–2008: 46,341; West Germany 1993–1997: 189,533; West Germany 1998–2002: 187,681; West Germany 2004–2008: 184,846.

Source: SIAB (1975–2008).

Table 5.3: Decomposition results – robustness test 1: drop Berlin

period 1 period 0	1993–1997 1998–2002	1998–2002 2004–2008	1993–1997 2004–2008
		East Germany	
A. Description			
period 1	380.32 ***	225.13 ***	380.32 ***
	3.31	*2.47*	*3.38*
period 0	225.13 ***	180.95 ***	180.95 ***
	2.59	*2.63*	*2.93*
change	–155.19 ***	–44.18 ***	–199.37 ***
	4.18	*3.63*	*4.40*
B. Aggregate Decomposition			
composition	–38.80 ***	–30.17 ***	–79.39 ***
	2.98	*3.56*	*7.28*
structure	–113.08 ***	–20.77 ***	–137.63 ***
	4.78	*4.45*	*6.89*
C. Detailed Decomposition			
composition	–38.80 ***	–30.17 ***	–79.39 ***
	2.98	*3.56*	*7.28*
Z – individual	–6.88 ***	–6.76 ***	–9.55 **
	1.13	*1.88*	*4.46*
J – job stability	–19.23 ***	–11.99 ***	–34.37 ***
	1.66	*1.88*	*3.03*
E – employment	–12.71 ***	–11.43 ***	–35.57 ***
	1.75	*2.02*	*4.32*
R – regional	0.02	0.01	0.08
	0.18	*0.11*	*0.16*
approximation error	–2.34	–0.21	–4.54
	6.16	*5.45*	*11.38*
reweighting error	–0.96	6.96 ***	22.19 ***
	1.73	*1.85*	*7.12*

Notes: see Table 5.1. Observations employed in Berlin in period *t* are omitted from the sample.
Number of observations: 1993–1997: 51,332; 1998–2002: 43,803; 2004–2008: 39,100.

Source: SIAB (1975–2008).

Table 5.4: Decomposition results – robustness test 2: national ranks and extended sample

period 1 period 0	1993–1997 1998–2002	1998–2002 2004–2008	1993–1997 2004–2008
		East Germany	
A. Description			
period 1	340.12 ***	243.52 ***	340.12 ***
	2.85	*2.98*	*2.32*
period 0	243.52 ***	195.01 ***	195.01 ***
	2.98	*2.79*	*2.74*
change	-96.60 ***	-48.51 ***	-145.11 ***
	4.28	*4.23*	*3.70*
B. Aggregate Decomposition			
composition	-25.26 ***	-38.38 ***	-68.92 ***
	2.76	*2.98*	*4.87*
structure	-71.28 ***	-13.48 ***	-82.94 ***
	4.35	*4.31*	*5.61*
C. Detailed Decomposition			
composition	-25.26 ***	-38.38 ***	-68.92 ***
	2.76	*2.98*	*4.87*
Z – individual	-7.07 ***	-21.35 ***	-30.43 ***
	1.51	*2.04*	*2.35*
J – job stability	-13.18 ***	-11.37 ***	-22.37 ***
	1.34	*1.51*	*2.34*
E – employment	-4.28 ***	-5.66 ***	-14.64 ***
	1.47	*1.90*	*3.09*
R – regional	-0.73 **	0.00	-1.48 ***
	0.30	*0.27*	*0.43*
approximation error	-1.38	-0.19	-3.30
	5.29	*5.23*	*7.02*
reweighting error	1.32	3.53 *	10.04 ***
	1.53	*2.04*	*3.42*

Notes: see Table 5.1. The ranks were calculated for the pooled East and West German wage distribution. The decomposition is performed for those observations, who are employed in East Germany in the base period t independent of where they are employed in period $t + 4$. Number of observations 1993–1997: 65,292; 1998–2002: 54,999; 2004–2008: 49,038.

Source: SIAB (1975–2008).

Table 5.5: Job and employment characteristics by region and year

			(J)				(E)	
	Firm		Unemployment Exp.			Tenure	Occupation	Industry
	Change	none	< 0.5 yr	< 1 yr	> 1 yr	> 2 yrs	Change	Change
East								
1993	0.48	0.66	0.15	0.08	0.12	0.53	0.23	0.24
1998	0.38	0.69	0.12	0.07	0.12	0.63	0.17	0.18
2004	0.32	0.70	0.10	0.08	0.13	0.70	0.13	0.13
West								
1993	0.29	0.81	0.09	0.05	0.05	0.74	0.13	0.13
1998	0.34	0.82	0.09	0.04	0.05	0.69	0.14	0.14
2004	0.30	0.80	0.08	0.05	0.06	0.74	0.12	0.13

Notes: average values for full sample observed in base years 1993, 1998 and 2004.

Source: SIAB (1975–2008).

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5.9 Appendix A

Table 5.6: Number of annual observations in full sample and in mobility analyses

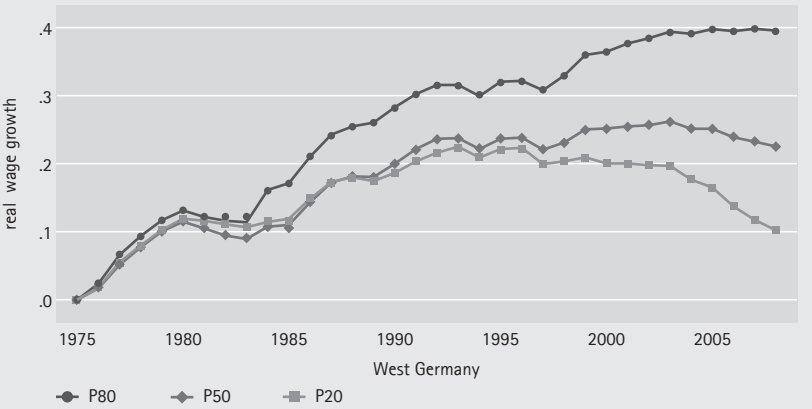
Year	West Germany			East Germany		
	t	*t* & *t* + 4 abs.	*t* & *t* + 4 in %	*t*	*t* & *t* + 4 abs.	*t* & *t* + 4 in %
1975	229,173	171,123	0.75			
1976	229,826	172,463	0.75			
1977	233,020	174,423	0.75			
1978	233,252	171,417	0.73			
1979	240,586	172,122	0.72			
1980	242,998	171,930	0.71			
1981	243,737	170,963	0.70			
1982	240,919	172,945	0.72			
1983	236,286	171,147	0.72			
1984	237,829	173,507	0.73			
1985	236,028	172,254	0.73			
1986	242,790	177,151	0.73			
1987	245,336	178,227	0.73			
1988	249,548	180,022	0.72			
1989	256,878	182,117	0.71			
1990	269,878	184,992	0.69			
1991	280,101	189,907	0.68			
1992	283,999	191,013	0.67	98,967	64,419	0.65
1993	281,241	189,906	0.68	94,949	62,431	0.66
1994	276,411	189,413	0.69	93,100	60,941	0.65
1995	275,693	191,082	0.69	92,450	60,548	0.65
1996	271,929	191,855	0.71	89,918	58,687	0.65
1997	268,761	189,956	0.71	85,320	55,406	0.65
1998	268,893	188,040	0.70	82,641	53,105	0.64
1999	270,074	187,241	0.69	81,224	52,033	0.64
2000	273,463	188,047	0.69	78,512	50,028	0.64
2001	272,230	187,394	0.69	75,368	47,961	0.64
2002	265,904	186,372	0.70	71,997	46,884	0.65
2003	259,578	186,538	0.72	69,426	46,934	0.68
2004	253,159	184,855	0.73	66,771	46,343	0.69

Note: the columns entitled "*t*" provide the number of sample observations observed in the base period (calendar year provided in "Year" column). The columns entitled "*t* & *t* + 4" provide the number of observations ("abs") with wage observations in periods *t* and *t* + 4 as well as their share ("in %") in the number of observations in the base period.

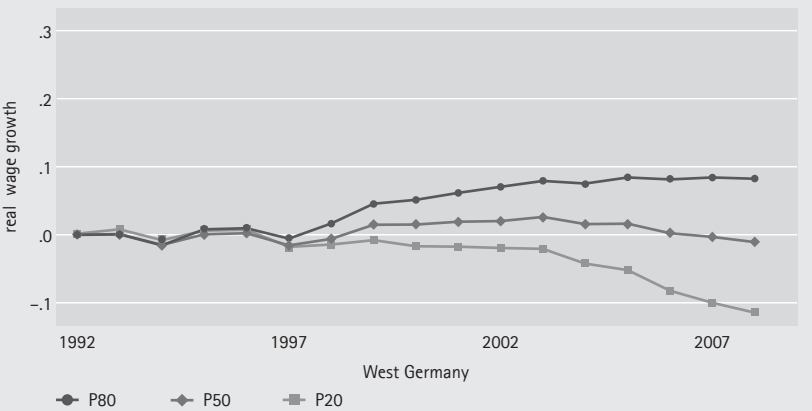
Source: SIAB (1975–2008).

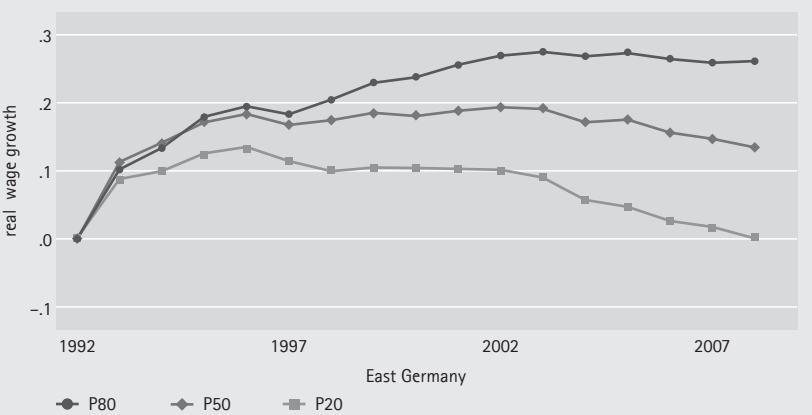
Figure 5.9: Changes in real wages

(i) West Germany – base year 1975



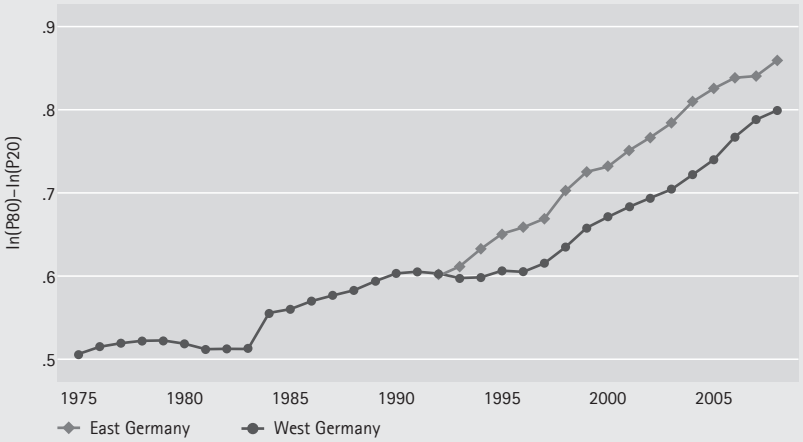
(ii) West and East Germany – base year 1992





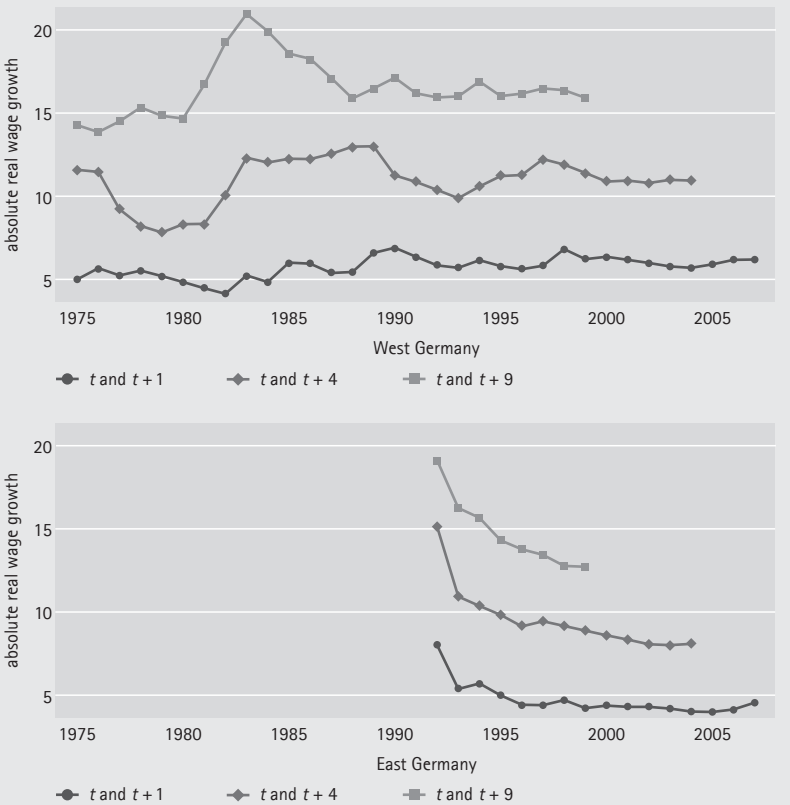
Source: SIAB (1975-2008).

Figure 5.10: Development of the spread between 80th and 20th percentile of the real wage distribution



Source: SIAB (1975-2008).

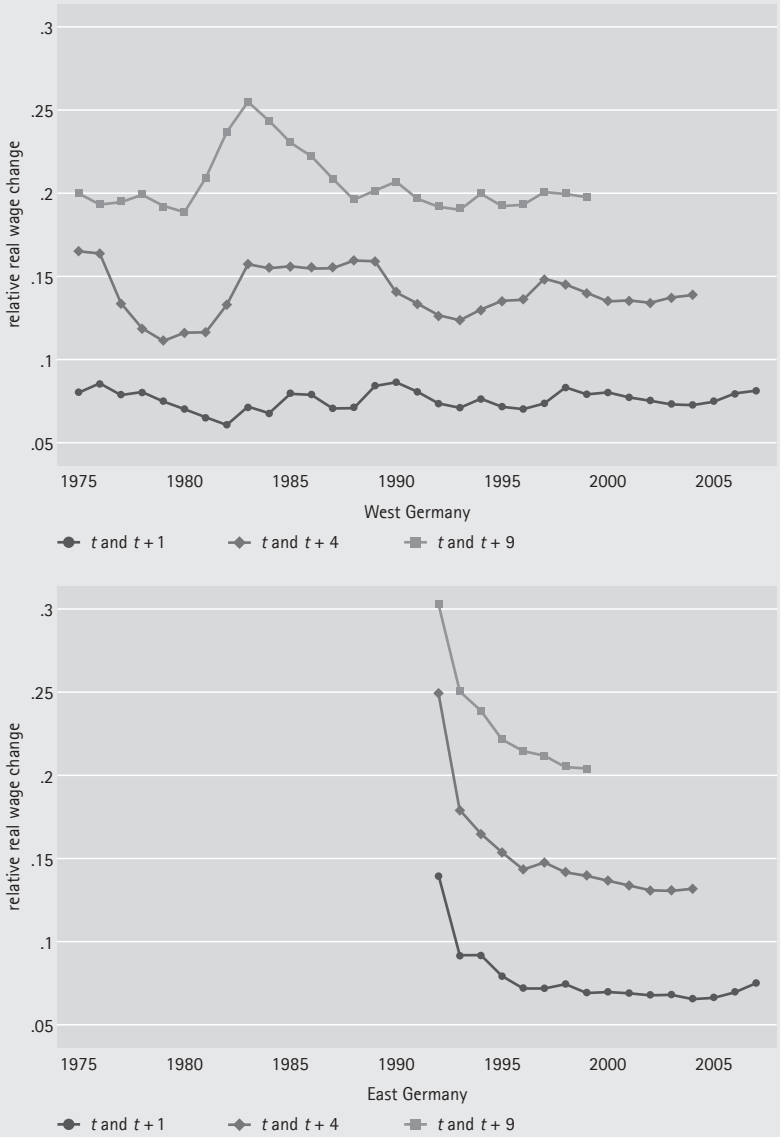
Figure 5.11: Development of mean absolute change in real wages



Note: only developments for the uncensored part of the daily wage distribution are described.

Source: SIAB (1975–2008).

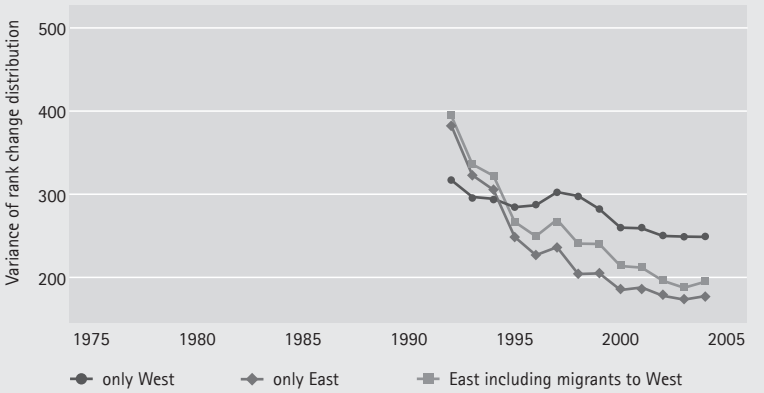
Figure 5.12: Development of mean relative change in real wages



Note: only developments for the uncensored part of the daily wage distribution are described.

Source: SIAB (1975–2008).

Figure 5.13: Variances of rank change distribution based on national ranks



Note: the "only West" and "only East" patterns describes the aggregate mobility patterns for those individuals who are observed in the same region of the country in periods t and $t + 4$ only now using nationwide rank assignments. The "East including migrants to West" extends the East German sample by the group of migrants that was not considered in the main analyses.

Source: SIAB (1975–2008).

5.10 Data appendix

This data appendix provides a detailed description of the variables used in the decomposition analyses. Tables 5.7 and 5.8 present descriptive statistics as of the three base years (*t*) considered in the mobility analyses, 1993, 1998, and 2004. All information is collected for the base year *t*.

Wage measure

Our data provide employment spells. We are interested in wages of full-time employment relationships, only. If several simultaneous full-time employment relationships are reported for a given person over the course of a calendar year we consider the wage of the main job. The main job is the one with the longest spell duration or –if several employment relationships have the same duration– the highest daily wages.[63] Since we are interested in wage mobility in the main job we do not consider information on secondary jobs. We use a daily wage observation for every individual that was full-time employed at least one day in a given year. The daily wage is measured in 2008 prices.

Wage observations are censored at the contribution limit of the mandatory retirement system. This upper threshold varies by year and by region (i.e. east and west). To ensure that we observe a constant share of the wage distribution in both regions we apply a consistent top-coding approach (Burkhauser et al., 2009). In detail, we censor the regional wage distribution at the highest percentile that can be observed uncensored in all years. For West Germany this is the 85th percentile and for East Germany this is the 90th percentile.

The data contain two structural breaks. A first one occurs in 1984: since 1984 one-time payments such as bonuses are added to the earnings data. While various authors who study wages or inequality with our data correct for this break using a method developed by Fitzenberger (1999) we omit this adjustment for two reasons: first, it is unlikely that the addition of bonuses to the upper parts of the wage distribution affects rank positions and mobility, and second the correction does not provide imputations for individuals observed only prior to 1984. However, as our main analysis focuses on the period after 1992 it is not affected by this structural break. The data contain a second structural break, as after 1999 minor employment was registered with the retirement insurance.

63 On average about 15 percent of the employees in our sample experienced more than one full-time employment spell over the course of the year. By considering the wage of a "main job" we differ from the procedure applied by Dustmann et al. (2009), who use the average wage of all full-time employment relationships in a given calendar year.

However, since we condition on full-time employment this should not affect our results.

Wage ranks

The main variable in our mobility analysis is the change in the individual's rank in the wage distribution between two years t and $t + k$. To obtain this change, we first define the rank in the wage distribution. For a given year t, we divide the uncensored part of the wage distribution (up to the 85th percentile in West Germany and up to the 90th percentile in East Germany) into 100 percentiles. We now assign each individual with an uncensored wage observation one of these 100 ranks for this year. We repeat the same procedure for year $t + k$ to calculate the individual wage rank in year $t + k$. The resulting difference between these two ranks is our measure of the individual's wage mobility. The variance of the distribution of these individual rank changes is our main aggregate measure of wage mobility which we interpret as a characteristic of the regional labor market.

Individual characteristics Z

Education: the data contain information on the education of the individual which we divide into three categories. We classify individuals to be *low educated* if they have no degree at all or if they finished school (without university entrance certificate) but did not complete vocational training. An individual is *medium educated* if the person finished school and vocational training or if the person holds a university entrance degree but does not hold a university degree. Finally, individuals holding a university degree are classified as *high educated* (for a similar classification see Dustmann et al., 2009). As the data show many missing values for the education variable, we imputed education according to the procedure suggested by Fitzenberger et al. (2006).[64]

Age: we use six age categories: (1) 25–30, (2) 31–35, (3) 36–40, (4) 41–45, (5) 46–50, and (6) >50 years. As we analyze a five year period and age is measured in the start year t, the highest age in the last category is 56. Otherwise, the individual would be above age 60 in period $t + 4$ which would violate our age restriction.

Starting position: we control for the individual's rank position in the wage distribution in the start year. The variable considers ten categories according to the 10 deciles of the uncensored part of the wage distribution.

64 Fitzenberger et al. (2006) suggest a number of different imputation rules. We apply the procedure describes as IP1 in their paper.

Citizenship: indicator variable (= 1) if person is not of German citizenship.
Sex: indicator variable (= 1) if person is female.
Migrates west (mw): indicator variable (= 1) if person migrates to West Germany in the future. This information is only calculated for the East German sample.

Job stability J

Firm change: indicator variable (=1) if individual changes employers between t and $t + 4$.
Unemployment: we control for individuals' unemployment experience in the five year period between t and $t + 4$. We consider an individual as unemployed if the person is observed to receive unemployment benefits (this includes short term as well as long term unemployment).[65] We consider four categories: (1) No unemployment experience, (2) up to half a year of unemployment experience, (3) more than half a year but less than 1 year of unemployment experience, (4) more than 1 year of unemployment experience.
Tenure: tenure is measured in four categories: (1) less than half a year, (2) between half a year and one year, (3) between one and two years, (4) more than two years.

Employer and employment characteristics E

Firm size: we include six categories of firm size: (1) up to 10 employees, (2) between 10 and 25 employees, (3) 25 to 50 employees, (4) 51 to 100 employees, (5) 101 to 1000 employees, (6) more than 1000 employees.
Sector: we control for 9 sectors: (1) agriculture, (2) energy, water supply and mining, (3) manufacturing, (4) construction, (5) retail, (6) transport and telecommunication, (7) banking and insurance, (8) services, (9) administration, non-profit organizations and private households.
Decreasing workforce (dw): indicator variable (= 1) if an individual's employer reduces the number of employees between t and $t + 4$.
Occupational category: we control for 11 occupational categories (according to Blossfeld, 1985): (1) simple manual occupation, (2) qualified manual occupations, (3) technicians and engineers, (4) simple services, (5) qualified services, (6) semi professions, (7) professions, (8) simple sales and administration occupations, (9) qualified sales and administration occupations, (10) manager, (11) miscellaneous.

65 Note that this definition excludes individuals that are unemployed but for any reason do not receive unemployment benefits.

Sector change: indicator variable (= 1) if individual changes sector between t and $t + 4$.
Occupation change: indicator variable (= 1) if individual changes occupational category between t and $t + 4$.

Regional information R

State indicators: indicator variables controlling for the federal state (Bundesland) of the individual's workplace.

Table 5.7: Descriptive statistics of the East German sample

	base year 1993 A	base year 1998 B	base year 2004 C	difference C – A	difference B – A	difference C – B
Z						
age						
25–30	0.21	0.16	0.12	–0.09	–0.05	–0.04
31–35	0.20	0.19	0.14	–0.06	–0.01	–0.05
36–40	0.19	0.20	0.19	0.00	0.02	–0.02
41–45	0.16	0.18	0.21	0.06	0.03	0.03
46–50	0.12	0.15	0.18	0.07	0.04	0.03
> 50	0.13	0.11	0.16	0.03	–0.02	0.05
start position						
1–10	0.08	0.08	0.07	–0.01	0.00	–0.01
11–20	0.09	0.08	0.09	0.00	–0.01	0.01
21–30	0.10	0.10	0.10	0.00	0.00	0.01
31–40	0.10	0.10	0.11	0.00	0.00	0.00
41–50	0.11	0.11	0.11	0.00	0.00	0.00
51–60	0.11	0.11	0.11	0.00	0.00	0.00
61–70	0.11	0.11	0.11	0.00	0.00	0.00
71–80	0.11	0.11	0.11	0.00	0.01	0.00
81–90	0.11	0.11	0.11	0.00	0.01	0.00
91–100	0.08	0.09	0.09	0.00	0.01	0.00
education						
low	0.06	0.03	0.03	–0.03	–0.02	–0.01
medium	0.86	0.87	0.87	0.01	0.01	0.00
high	0.08	0.09	0.10	0.02	0.01	0.01
citizenship						
non-German	0.01	0.01	0.01	0.00	0.00	0.00
sex						
female	0.42	0.42	0.41	0.00	0.00	–0.01
migrates west						
mw = 1	0.08	0.05	0.01	–0.07	–0.03	–0.04
J						
firm change						
fc = 1	0.48	0.38	0.32	–0.16	–0.10	–0.06
unemployment						
not unemployed	0.66	0.69	0.70	0.04	0.03	0.01
0–0.5 year	0.15	0.12	0.10	–0.05	–0.03	–0.02
0.5–1 year	0.08	0.07	0.08	0.00	0.00	0.00
> 1 year	0.12	0.12	0.13	0.01	0.00	0.01
tenure						
< 0.5 year	0.07	0.07	0.07	0.00	0.00	0.00
0.5–1 year	0.18	0.16	0.10	–0.08	–0.02	–0.06
1–2 years	0.22	0.14	0.14	–0.08	–0.07	–0.01
> 2 years	0.53	0.63	0.70	0.17	0.10	0.07

	base year 1993 A	base year 1998 B	base year 2004 C	difference C – A	difference B – A	difference C – B
E						
firm size (no. of employees)						
1–10	0.17	0.21	0.20	0.03	0.04	–0.01
11–25	0.13	0.15	0.15	0.02	0.02	0.00
26–50	0.11	0.13	0.13	0.02	0.01	0.01
51–100	0.12	0.13	0.14	0.02	0.01	0.01
101–1000	0.33	0.29	0.30	–0.03	–0.05	0.02
> 1000	0.14	0.09	0.07	–0.07	–0.05	–0.02
sector						
agriculture	0.01	0.01	0.03	0.02	0.00	0.02
energy, w. s. & m.	0.03	0.02	0.01	–0.01	–0.01	0.00
manufacturing	0.23	0.24	0.22	–0.01	0.00	–0.02
construction	0.15	0.14	0.12	–0.03	–0.01	–0.03
retail	0.10	0.10	0.12	0.02	0.01	0.01
transport & telecom.	0.09	0.09	0.08	0.00	0.00	0.00
banking and insurance	0.02	0.02	0.01	0.00	0.00	0.00
services	0.21	0.25	0.33	0.11	0.04	0.07
adm., non-profit and p.h.	0.17	0.13	0.07	–0.09	–0.04	–0.05
decreasing workforce						
dw = 1	0.71	0.61	0.55	–0.16	–0.10	–0.05
occupational category						
simple manual	0.18	0.18	0.19	0.01	0.00	0.02
qualified manual	0.22	0.21	0.19	–0.03	0.00	–0.02
tech. and engineers	0.05	0.06	0.06	0.00	0.00	0.00
simple services	0.14	0.14	0.14	0.00	–0.01	0.00
qualified services	0.05	0.05	0.06	0.01	0.00	0.00
semi professions	0.07	0.07	0.07	0.00	0.00	0.00
professions	0.01	0.01	0.01	0.00	0.00	0.00
simp. sales a. adm.	0.06	0.07	0.06	0.00	0.00	–0.01
qual. sales a. adm.	0.18	0.18	0.18	0.00	0.00	0.00
manager	0.02	0.02	0.02	0.00	0.00	0.00
miscellaneous	0.01	0.00	0.01	0.00	0.00	0.00
occ. change						
oc = 1	0.23	0.17	0.13	–0.09	–0.06	–0.03
sector change						
sc = 1	0.24	0.18	0.13	–0.11	–0.06	–0.05
R						
Berlin	0.15	0.16	0.16	0.00	0.00	0.00
Brandenburg	0.15	0.15	0.15	0.00	0.00	0.00
Meck.–West Pom.	0.10	0.10	0.10	0.00	0.00	0.00
Saxony	0.28	0.27	0.28	0.00	0.00	0.00
Saxony–Anhalt	0.17	0.17	0.16	–0.01	0.00	–0.01
Thuringia	0.15	0.15	0.16	0.01	0.00	0.01

Note: the table contains the descriptive statistics of the explanatory variables used in the decomposition analyses.

Source: SIAB (1975–2008).

Table 5.8: Descriptive statistics of the West German sample

	base year 1993 A	base year 1998 B	base year 2004 C	difference C – A	difference B – A	difference C – B
Z						
age						
25–30	0.27	0.22	0.16	–0.11	–0.06	–0.05
31–35	0.19	0.21	0.16	–0.03	0.02	–0.05
36–40	0.16	0.19	0.20	0.04	0.03	0.01
41–45	0.14	0.16	0.19	0.05	0.01	0.04
46–50	0.11	0.14	0.16	0.04	0.02	0.02
> 50	0.13	0.10	0.13	0.00	–0.03	0.03
start position						
1–10	0.08	0.08	0.07	0.00	0.00	0.00
11–20	0.09	0.09	0.09	0.00	0.00	0.00
21–30	0.10	0.10	0.10	0.00	0.00	0.00
31–40	0.11	0.11	0.11	0.00	0.00	0.00
41–50	0.11	0.11	0.11	0.00	0.00	0.00
51–60	0.11	0.11	0.11	0.00	0.00	0.00
61–70	0.11	0.11	0.11	0.00	0.00	0.00
71–80	0.11	0.11	0.11	0.00	0.00	0.00
81–90	0.11	0.10	0.11	0.00	0.00	0.00
91–100	0.08	0.08	0.08	0.00	0.00	0.00
education						
low	0.16	0.13	0.11	–0.05	–0.03	–0.02
medium	0.81	0.82	0.83	0.02	0.01	0.01
high	0.03	0.05	0.06	0.03	0.01	0.02
citizenship						
non-German	0.10	0.09	0.08	–0.02	–0.01	–0.01
sex						
female	0.33	0.33	0.33	–0.01	–0.01	0.00
J						
firm change						
fc = 1	0.29	0.34	0.30	0.00	0.04	–0.04
unemployment						
not unemployed	0.81	0.82	0.80	–0.01	0.00	–0.01
0–0.5 year	0.09	0.09	0.08	–0.01	0.00	–0.01
0.5–1 year	0.05	0.04	0.05	0.01	0.00	0.01
> 1 year	0.05	0.05	0.06	0.01	0.00	0.02

	base year 1993 A	base year 1998 B	base year 2004 C	difference C – A	difference B – A	difference C – B
tenure						
< 0.5 year	0.05	0.06	0.06	0.01	0.01	–0.01
0.5–1 year	0.10	0.12	0.08	–0.02	0.02	–0.04
1–2 years	0.11	0.12	0.12	0.01	0.01	0.00
> 2 years	0.74	0.69	0.74	0.01	–0.04	0.05
E						
firm size (no. of employees)						
1–10	0.17	0.19	0.15	–0.03	0.02	–0.05
11–25	0.12	0.13	0.13	–0.01	0.00	–0.01
26–50	0.10	0.11	0.12	0.01	0.01	0.01
51–100	0.11	0.11	0.13	0.02	0.01	0.01
101–1000	0.33	0.33	0.35	0.02	–0.01	0.02
> 1000	0.16	0.14	0.13	–0.04	–0.03	–0.01
sector						
agriculture	0.01	0.01	0.01	0.00	0.00	0.00
energy, w. s. & m.	0.02	0.02	0.01	–0.01	0.00	0.00
manufacturing	0.40	0.38	0.33	–0.07	–0.02	–0.05
construction	0.08	0.08	0.08	–0.01	–0.01	0.00
retail	0.13	0.13	0.15	0.02	0.01	0.01
transport & telecom.	0.06	0.06	0.07	0.01	0.00	0.01
banking and insurance	0.03	0.03	0.03	0.00	0.00	0.00
services	0.19	0.22	0.27	0.08	0.03	0.05
adm., non–profit and p.h.	0.08	0.08	0.06	–0.03	–0.01	–0.02
decreasing workforce						
dw = 1	0.65	0.44	0.53	–0.12	–0.21	0.08
occupational category						
simple manual	0.23	0.22	0.21	–0.02	–0.01	–0.01
qualified manual	0.23	0.22	0.20	–0.03	–0.01	–0.02
tech. and engineers	0.05	0.06	0.06	0.01	0.00	0.00
simple services	0.14	0.14	0.14	0.00	0.00	0.00
qualified services	0.04	0.04	0.04	0.01	0.00	0.00
semi professions	0.04	0.05	0.06	0.01	0.01	0.01
professions	0.01	0.01	0.01	0.00	0.00	0.00
simp. sales a. adm.	0.07	0.07	0.06	–0.01	0.00	–0.01
qual. sales a. adm.	0.17	0.18	0.20	0.02	0.01	0.01
manager	0.01	0.01	0.02	0.00	0.00	0.00
miscellaneous	0.00	0.00	0.00	0.00	0.00	0.00
occ. change						
oc = 1	0.13	0.14	0.12	–0.01	0.01	–0.02

	base year 1993 A	base year 1998 B	base year 2004 C	difference C – A	difference B – A	difference C – B
sector change						
sc = 1	0.13	0.14	0.13	0.00	0.01	–0.02
R						
Schleswig-Holstein	0.04	0.04	0.04	0.00	0.00	0.00
Hamburg	0.03	0.03	0.03	0.00	0.00	0.00
Lower Saxony	0.11	0.11	0.12	0.00	0.00	0.00
Bremen	0.01	0.01	0.01	0.00	0.00	0.00
North Rhine-Westphalia	0.28	0.28	0.27	0.00	0.00	0.00
Hesse	0.10	0.09	0.09	0.00	0.00	0.00
Rhineland-Palatinate	0.06	0.06	0.06	0.00	0.00	0.00
Baden-Württemberg	0.17	0.17	0.17	0.00	0.00	0.00
Bavaria	0.19	0.19	0.19	0.00	0.00	0.00
Saarland	0.02	0.02	0.02	0.00	0.00	0.00

Note: the table contains the descriptive statistics of the explanatory variables used in the decomposition

Source: SIAB (1975–2008).

5.11 Appendix B

Table 5.9: Results of the reweighting step (East Germany): mean values of observed characteristics

	base year 1993 A	base year 2004 rw. to 1993 B	base year 1998 rw. to 1993 C	base year 1998 D	base year 2004 rw. to 1998 E	base year 2004 F	difference A – B	difference A – C	difference D – E
Z									
age									
25–30	0.21	0.22	0.21	0.16	0.16	0.12	–0.01	0.00	0.00
31–35	0.20	0.19	0.20	0.19	0.19	0.14	0.01	0.00	0.00
36–40	0.19	0.18	0.18	0.20	0.20	0.19	0.00	0.00	0.00
41–45	0.16	0.16	0.16	0.18	0.18	0.21	0.00	0.00	0.00
46–50	0.12	0.12	0.12	0.15	0.16	0.18	0.00	0.00	0.00
> 50	0.13	0.13	0.13	0.11	0.11	0.16	0.00	0.00	0.00
start position									
1–10	0.08	0.09	0.08	0.08	0.08	0.07	–0.01	0.00	0.00
11–20	0.09	0.09	0.09	0.08	0.08	0.09	0.00	0.00	0.00
21–30	0.10	0.09	0.09	0.10	0.09	0.10	0.00	0.00	0.00
31–40	0.10	0.10	0.10	0.10	0.10	0.11	0.01	0.00	0.00
41–50	0.11	0.10	0.11	0.11	0.11	0.11	0.01	0.00	0.00
51–60	0.11	0.11	0.11	0.11	0.11	0.11	0.00	0.00	0.00
61–70	0.11	0.11	0.11	0.11	0.12	0.11	0.00	0.00	0.00
71–80	0.11	0.11	0.11	0.11	0.11	0.11	0.00	0.00	0.00
81–90	0.11	0.11	0.11	0.11	0.11	0.11	0.00	0.00	0.00
91–100	0.08	0.09	0.09	0.09	0.09	0.09	0.00	0.00	0.00

education									
low	0.06	0.07	0.06	0.03	0.04	0.03	−0.01	0.00	0.00
medium	0.86	0.85	0.86	0.87	0.87	0.87	0.01	0.00	0.00
high	0.08	0.09	0.08	0.09	0.09	0.10	0.00	0.00	0.00
citizenship									
non-German	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
sex									
female	0.42	0.43	0.42	0.42	0.42	0.41	−0.01	0.00	0.00
migrates west									
mw = 1	0.08	0.10	0.08	0.05	0.05	0.01	−0.01	0.00	0.00
J									
firm change									
fc = 1	0.48	0.51	0.48	0.38	0.40	0.32	−0.03	0.01	−0.02
unemployment									
not unemployed	0.66	0.65	0.66	0.69	0.69	0.70	0.00	0.00	0.00
0–0.5 year	0.15	0.15	0.15	0.12	0.12	0.10	0.00	0.00	0.00
0.5–1 year	0.08	0.08	0.08	0.07	0.08	0.08	0.00	0.00	0.00
> 1 year	0.12	0.12	0.12	0.12	0.12	0.13	0.00	0.00	0.00
tenure									
< 0.5 year	0.07	0.07	0.07	0.07	0.08	0.07	0.00	0.00	0.00
0.5–1 year	0.18	0.20	0.19	0.16	0.16	0.10	−0.01	−0.01	0.00
1–2 years	0.22	0.21	0.22	0.14	0.14	0.14	0.01	0.00	0.00
> 2 years	0.53	0.52	0.53	0.63	0.63	0.70	0.01	0.00	0.00

	base year 1993 A	base year 2004 rw. to 1993 B	base year 1998 rw. to 1993 C	base year 1998 D	base year 2004 rw. to 1998 E	base year 2004 F	difference A–B	difference A–C	difference D–E
E									
firm size (no. of employees)									
1–10	0.17	0.18	0.18	0.21	0.22	0.20	–0.01	–0.01	0.00
11–25	0.13	0.13	0.13	0.15	0.15	0.15	0.00	0.00	0.00
26–50	0.11	0.11	0.11	0.13	0.13	0.13	0.00	0.00	0.00
51–100	0.12	0.12	0.12	0.13	0.13	0.14	0.00	0.00	0.00
101–1000	0.33	0.33	0.33	0.29	0.29	0.30	0.00	0.01	0.00
> 1000	0.14	0.14	0.14	0.09	0.09	0.07	0.01	0.00	0.00
sector									
agriculture	0.01	0.01	0.01	0.01	0.01	0.03	0.00	0.00	0.00
energy, w. s. & m.	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.00	0.00
manufacturing	0.23	0.22	0.23	0.24	0.23	0.22	0.01	0.00	0.00
construction	0.15	0.16	0.16	0.14	0.15	0.12	–0.01	–0.01	0.00
retail	0.10	0.10	0.10	0.10	0.10	0.12	0.00	0.00	0.00
transport & telecom.	0.09	0.08	0.08	0.09	0.08	0.08	0.01	0.00	0.01
banking and insurance	0.02	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.00
services	0.21	0.23	0.22	0.25	0.26	0.33	–0.02	0.00	–0.01
adm., non-profit and p.h.	0.17	0.16	0.16	0.13	0.13	0.07	0.00	0.00	0.00
decreasing workforce									
dw = 1	0.71	0.71	0.70	0.61	0.61	0.55	0.00	0.01	0.00

occupational category									
simple manual	0.18	0.16	0.18	0.18	0.17	0.19	0.02	0.00	0.00
qualified manual	0.22	0.22	0.22	0.21	0.21	0.19	0.00	0.00	0.00
tech. and engineers	0.05	0.06	0.05	0.06	0.06	0.06	−0.01	0.00	0.00
simple services	0.14	0.14	0.14	0.14	0.14	0.14	0.00	0.00	0.00
qualified services	0.05	0.05	0.05	0.05	0.05	0.06	0.00	0.00	0.00
semi professions	0.07	0.07	0.07	0.07	0.07	0.07	0.00	0.00	0.00
professions	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
simp. sales a. adm.	0.06	0.07	0.06	0.07	0.07	0.06	0.00	0.00	0.00
qual. sales a. adm.	0.18	0.19	0.18	0.18	0.18	0.18	−0.01	0.00	0.00
manager	0.02	0.03	0.02	0.02	0.02	0.02	0.00	0.00	0.00
miscellaneous	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
occ. change									
oc = 1	0.23	0.24	0.22	0.17	0.18	0.13	−0.02	0.00	−0.01
sector change									
sc = 1	0.24	0.28	0.24	0.18	0.19	0.13	−0.04	0.00	−0.01
R									
Berlin	0.15	0.18	0.16	0.16	0.16	0.16	−0.03	−0.01	0.00
Brandenburg	0.15	0.14	0.15	0.15	0.15	0.15	0.01	0.00	0.00
Mecklenburg-West Pomerania	0.10	0.10	0.10	0.10	0.10	0.10	0.01	0.00	0.00
Saxony	0.28	0.27	0.27	0.27	0.27	0.28	0.00	0.00	0.00
Saxony-Anhalt	0.17	0.16	0.17	0.17	0.16	0.16	0.01	0.00	0.01
Thuringia	0.15	0.14	0.15	0.15	0.15	0.16	0.00	0.00	0.00

Source: SIAB (1975–2008).

Table 5.10: Results of the reweighting step (West Germany): mean values of observed characteristics

	base year 1993 A	base year 2004 rw. to 1993 B	base year 1998 rw. to 1993 C	base year 1998 D	base year 2004 rw. to 1998 E	base year 2004 F	difference A–B	difference A–C	difference D–E
Z									
age									
25–30	0.27	0.27	0.27	0.22	0.21	0.16	0.00	0.00	0.00
31–35	0.19	0.19	0.19	0.21	0.21	0.16	0.00	0.00	0.00
36–40	0.16	0.16	0.16	0.19	0.19	0.20	0.00	0.00	0.00
41–45	0.14	0.15	0.14	0.16	0.16	0.19	0.00	0.00	0.00
46–50	0.11	0.11	0.11	0.14	0.14	0.16	0.00	0.00	0.00
> 50	0.13	0.13	0.13	0.10	0.10	0.13	0.00	0.00	0.00
start position									
1–10	0.08	0.08	0.08	0.08	0.08	0.07	0.00	0.00	0.00
11–20	0.09	0.09	0.09	0.09	0.09	0.09	0.00	0.00	0.00
21–30	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
31–40	0.11	0.11	0.11	0.11	0.11	0.11	0.00	0.00	0.00
41–50	0.11	0.11	0.11	0.11	0.11	0.11	0.00	0.00	0.00
51–60	0.11	0.11	0.11	0.11	0.11	0.11	0.00	0.00	0.00
61–70	0.11	0.11	0.11	0.11	0.11	0.11	0.00	0.00	0.00
71–80	0.11	0.11	0.11	0.11	0.11	0.11	0.00	0.00	0.00
81–90	0.11	0.11	0.10	0.10	0.10	0.11	0.00	0.00	0.00
91–100	0.08	0.08	0.08	0.08	0.08	0.08	0.00	0.00	0.00

education									
low	0.16	0.16	0.16	0.13	0.13	0.11	0.00	0.00	0.00
medium	0.81	0.81	0.81	0.82	0.82	0.83	0.00	0.00	0.00
high	0.03	0.03	0.03	0.05	0.05	0.06	0.00	0.00	0.00
citizenship									
non-German	0.10	0.11	0.10	0.09	0.09	0.08	0.00	0.00	0.00
sex									
female	0.33	0.34	0.33	0.33	0.33	0.33	-0.01	0.00	0.00
J									
firm change									
fc = 1	0.29	0.29	0.30	0.34	0.33	0.30	0.00	0.00	0.00
unemployment									
not unemployed	0.81	0.81	0.81	0.82	0.81	0.80	0.00	0.00	0.00
0–0.5 year	0.09	0.09	0.09	0.09	0.09	0.08	0.00	0.00	0.00
0.5–1 year	0.05	0.05	0.05	0.04	0.05	0.05	0.00	0.00	0.00
> 1 year	0.05	0.05	0.05	0.05	0.05	0.06	0.00	0.00	0.00
tenure									
< 0.5 year	0.05	0.05	0.05	0.06	0.06	0.06	0.00	0.00	0.00
0.5–1 year	0.10	0.10	0.10	0.12	0.12	0.08	0.00	0.00	0.00
1–2 years	0.11	0.11	0.11	0.12	0.12	0.12	0.00	0.00	0.00
> 2 years	0.74	0.74	0.74	0.69	0.69	0.74	0.00	0.00	0.00

	base year 1993 A	base year 2004 rw. to 1993 B	base year 1998 rw. to 1993 C	base year 1998 D	base year 2004 rw. to 1998 E	base year 2004 F	difference A–B	difference A–C	difference D–E
E									
firm size (no. of employees)									
1–10	0.17	0.17	0.17	0.19	0.18	0.15	0.00	0.00	0.00
11–25	0.12	0.12	0.13	0.13	0.13	0.13	0.00	0.00	0.00
26–50	0.10	0.10	0.10	0.11	0.11	0.12	0.00	0.00	0.00
51–100	0.11	0.11	0.11	0.11	0.11	0.13	0.00	0.00	0.00
101–1000	0.33	0.33	0.33	0.33	0.33	0.35	0.00	0.00	0.00
> 1000	0.16	0.16	0.16	0.14	0.14	0.13	0.00	0.01	0.00
sector									
agriculture	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
energy, w. s. & m.	0.02	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.00
manufacturing	0.40	0.39	0.40	0.38	0.38	0.33	0.00	0.00	0.00
construction	0.08	0.08	0.09	0.08	0.08	0.08	0.00	–0.01	0.00
retail	0.13	0.13	0.13	0.13	0.13	0.15	0.00	0.00	0.00
transport & telecom.	0.06	0.06	0.06	0.06	0.06	0.07	0.00	0.00	0.00
banking and insurance	0.03	0.03	0.03	0.03	0.03	0.03	0.00	0.00	0.00
services	0.19	0.19	0.18	0.22	0.21	0.27	0.00	0.01	0.00
adm., non-profit and p.h.	0.08	0.09	0.08	0.08	0.08	0.06	0.00	0.00	0.00
decreasing workforce									
dw = 1	0.65	0.65	0.65	0.44	0.44	0.53	0.00	0.00	0.00

occupational category									
simple manual	0.23	0.22	0.23	0.22	0.22	0.21	0.01	0.00	0.00
qualified manual	0.23	0.22	0.23	0.22	0.22	0.20	0.00	0.00	0.00
tech. and engineers	0.05	0.05	0.05	0.06	0.06	0.06	0.00	0.00	0.00
simple services	0.14	0.14	0.14	0.14	0.14	0.14	0.00	0.00	0.00
qualified services	0.04	0.04	0.04	0.04	0.04	0.04	0.00	0.00	0.00
semi professions	0.04	0.05	0.04	0.05	0.05	0.06	0.00	0.00	0.00
professions	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
simp. sales a. adm.	0.07	0.07	0.07	0.07	0.07	0.06	0.00	0.00	0.00
qual. sales a. adm.	0.17	0.18	0.17	0.18	0.18	0.20	0.00	0.00	0.00
manager	0.01	0.01	0.01	0.01	0.01	0.02	0.00	0.00	0.00
miscellaneous	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
occ. change									
oc = 1	0.13	0.13	0.13	0.14	0.14	0.12	0.00	0.00	0.00
sector change									
sc = 1	0.13	0.13	0.13	0.14	0.14	0.13	0.00	0.00	0.00
R									
Schleswig-Holstein	0.04	0.04	0.04	0.04	0.04	0.04	0.00	0.00	0.00
Hamburg	0.03	0.03	0.03	0.03	0.03	0.03	0.00	0.00	0.00
Lower Saxony	0.11	0.11	0.11	0.11	0.11	0.12	0.00	0.00	0.00
Bremen	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
North Rhine-Westphalia	0.28	0.27	0.28	0.28	0.28	0.27	0.00	0.00	0.00
Hesse	0.10	0.10	0.09	0.09	0.09	0.09	0.00	0.00	0.00
Rhineland-Palatinate	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.00	0.00
Baden-Württemberg	0.17	0.17	0.17	0.17	0.17	0.17	0.00	0.00	0.00
Bavaria	0.19	0.19	0.19	0.19	0.19	0.19	0.00	0.00	0.00
Saarland	0.02	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00

Source: SIAB (1975–2008).

Table 5.11: RIF regressions for East and West Germany

	East Germany			West Germany		
	1993	1998	2004	1993	1998	2004
age cat. 2	−28.45 **	−69.23 ***	−48.83 ***	−60.73 ***	−92.68 ***	−71.08 ***
	−2.91	*−7.74*	*−4.84*	*−13.46*	*−19.04*	*−14.07*
age cat. 3	−41.51 ***	−98.63 ***	−88.65 ***	−81.57 ***	−123.30 ***	−101.00 ***
	−4.14	*−11.12*	*−9.34*	*−16.90*	*−24.32*	*−20.77*
age cat. 4	−64.79 ***	−106.80 ***	−98.68 ***	−89.33 ***	−129.80 ***	−115.10 ***
	−6.17	*−11.69*	*−10.57*	*−17.96*	*−24.22*	*−23.27*
age cat. 5	−70.22 ***	−115.20 ***	−101.40 ***	−92.18 ***	−131.70 ***	−108.90 ***
	−6.08	*−12.07*	*−10.53*	*−16.98*	*−23.57*	*−20.88*
age cat. 6	−98.47 ***	−101.20 ***	−109.20 ***	−91.07 ***	−114.80 ***	−103.30 ***
	−8.77	*−9.58*	*−10.98*	*−17.20*	*−18.39*	*−18.80*
pos. 2	26.16	−61.50 ***	−17.43	12.87	−17.31 *	−21.70 **
	1.69	*−4.58*	*−1.33*	*1.72*	*−2.22*	*−3.04*
pos. 3	47.57 **	−71.53 ***	−18.31	84.59 ***	−9.13	−5.21
	3.05	*−5.43*	*−1.41*	*11.25*	*−1.17*	*−0.73*
pos. 4	67.78 ***	−87.90 ***	−15.38	101.70 ***	2.09	20.03 **
	4.35	*−6.60*	*−1.17*	*13.40*	*0.26*	*2.78*
pos. 5	96.11 ***	−56.26 ***	3.59	129.90 ***	17.81 *	45.86 ***
	6.09	*−4.22*	*0.27*	*16.91*	*2.23*	*6.26*
pos. 6	109.70 ***	−14.41	43.75 **	133.00 ***	19.67 *	55.61 ***
	6.88	*−1.07*	*3.28*	*17.11*	*2.43*	*7.51*
pos. 7	120.50 ***	−3.40	54.38 ***	152.90 ***	26.17 **	72.22 ***
	7.44	*−0.25*	*4.00*	*19.40*	*3.20*	*9.61*
pos. 8	162.00 ***	10.15	51.97 ***	159.10 ***	27.36 **	61.01 ***
	9.75	*0.73*	*3.74*	*19.95*	*3.29*	*8.00*
pos. 9	147.70 ***	−8.27	30.12 *	173.90 ***	29.16 ***	32.95 ***
	8.68	*−0.58*	*2.12*	*21.30*	*3.41*	*4.20*
pos. 10	146.00 ***	−42.52 **	38.32 *	203.70 ***	36.48 ***	33.52 ***
	7.99	*−2.79*	*2.54*	*23.26*	*4.03*	*3.98*
educ mid	16.37	11.39	31.55	29.70 ***	35.88 ***	33.72 ***
	1.16	*0.76*	*1.92*	*6.42*	*6.97*	*6.80*
educ high	18.22	52.03 **	84.23 ***	94.25 ***	162.70 ***	130.20 ***
	0.97	*2.89*	*4.48*	*9.42*	*17.03*	*16.12*
non-German	104.00 ***	23.88	−41.85	35.30 ***	19.74 ***	−5.05
	3.86	*0.96*	*−1.64*	*6.71*	*3.36*	*−0.91*
sex	−46.23 ***	−29.30 ***	−1.95	4.42	−21.07 ***	11.27 **
	−5.40	*−4.13*	*−0.29*	*1.06*	*−4.92*	*2.97*
migrates west	43.56 ***	68.50 ***	30.05	–	–	–
	3.73	*5.68*	*1.10*			
firm change	125.70 ***	156.50 ***	133.30 ***	167.90 ***	177.80 ***	169.70 ***
	15.27	*21.12*	*18.32*	*38.76*	*39.25*	*39.86*
unempl. cat. 2	126.20 ***	86.04 ***	106.70 ***	113.00 ***	68.17 ***	93.95 ***
	12.77	*9.28*	*11.35*	*19.72*	*11.47*	*16.12*

	East Germany			West Germany		
	1993	1998	2004	1993	1998	2004
unempl. cat. 3	217.50 ***	142.80 ***	153.10 ***	164.30 ***	72.26 ***	137.80 ***
	16.92	*12.51*	*14.00*	*21.35*	*8.85*	*19.37*
unempl. cat. 4	265.30 ***	149.80 ***	139.60 ***	240.20 ***	57.93 ***	90.33 ***
	21.93	*13.82*	*14.29*	*31.17*	*6.97*	*12.95*
tenure cat. 2	−29.91 *	−62.01 ***	−59.21 ***	−93.60 ***	−156.70 ***	−87.10 ***
	−2.05	*−5.11*	*−4.61*	*−11.33*	*−19.88*	*−10.98*
tenure cat. 3	6.03	−25.03 *	−55.41 ***	−90.93 ***	−174.60 ***	−87.62 ***
	0.42	*−1.98*	*−4.44*	*−11.05*	*−21.70*	*−11.52*
tenure cat. 4	−24.63	−31.91 **	−74.56 ***	−133.30 ***	−209.30 ***	−117.80 ***
	−1.75	*−2.77*	*−6.53*	*−17.96*	*−28.80*	*−16.97*
firm size class 2	−22.90	16.08	−12.14	−4.05	8.00	2.20
	−1.95	*1.78*	*−1.38*	*−0.71*	*1.38*	*0.41*
firm size class 3	−35.67 **	22.36 *	12.95	−0.11	9.73	19.83 ***
	−2.87	*2.31*	*1.40*	*−0.02*	*1.58*	*3.47*
firm size class 4	−22.59	34.40 ***	7.45	0.58	20.83 ***	13.84 *
	−1.82	*3.53*	*0.80*	*0.10*	*3.40*	*2.44*
firm size class 5	−17.15	17.06 *	26.69 **	−13.90 **	12.84 *	20.67 ***
	−1.63	*2.01*	*3.23*	*−2.75*	*2.51*	*4.20*
firm size class 6	23.48	−41.29 ***	−8.85	−37.77 ***	3.86	32.44 ***
	1.77	*−3.44*	*−0.69*	*−6.17*	*0.60*	*5.19*
sec1	−97.80 ***	−105.40 ***	−52.76 **	−109.30 ***	−138.20 ***	−107.40 ***
	−3.33	*−4.34*	*−3.27*	*−6.07*	*−7.39*	*−7.16*
sec2	173.10 ***	−6.54	−43.44	−38.90 **	−45.72 ***	−0.96
	8.06	*−0.30*	*−1.93*	*−3.23*	*−3.45*	*−0.08*
sec3	156.80 ***	−0.99	−1.89	17.13 **	−15.91 **	13.61 **
	14.57	*−0.11*	*−0.22*	*3.27*	*−3.00*	*2.91*
sec4	61.30 ***	−5.43	−54.18 ***	2.35	−18.34 *	−30.79 ***
	4.87	*−0.50*	*−5.17*	*0.33*	*−2.41*	*−4.59*
sec5	47.58 ***	−9.32	−8.41	−20.44 ***	−39.51 ***	−27.56 ***
	3.60	*−0.87*	*−0.87*	*−3.40*	*−6.52*	*−5.35*
sec6	−61.59 ***	−29.13 **	−29.42 **	−38.46 ***	−32.78 ***	−34.78 ***
	−4.54	*−2.61*	*−2.76*	*−5.07*	*−4.25*	*−5.24*
sec7	85.56 **	15.33	16.78	−24.24 *	−44.47 ***	0.30
	3.13	*0.70*	*0.73*	*−2.39*	*−4.21*	*0.03*
sec9	−83.84 ***	−66.74 ***	−76.69 ***	−66.32 ***	−97.64 ***	−71.68 ***
	−7.69	*−6.84*	*−6.84*	*−10.15*	*−14.29*	*−10.36*
negative dev.	−23.70 **	−39.87 ***	−31.97 ***	−19.12 ***	−23.87 ***	−32.43 ***
	−3.01	*−6.61*	*−5.78*	*−5.73*	*−6.92*	*−10.79*
occupation 2	−20.91 *	11.92	8.19	−17.15 ***	−4.02	−9.83 *
	−2.04	*1.37*	*0.95*	*−3.64*	*−0.80*	*−2.08*
occupation 3	0.24	49.31 ***	15.53	−6.59	25.27 **	18.23 *
	0.01	*3.57*	*1.19*	*−0.84*	*3.15*	*2.54*
occupation 4	54.22 ***	33.53 **	0.95	18.12 **	4.53	−14.51 **
	4.42	*3.12*	*0.09*	*3.19*	*0.75*	*−2.61*
occupation 5	81.22 ***	46.05 **	22.43	4.67	−9.00	−7.63
	4.61	*3.14*	*1.62*	*0.49*	*−0.93*	*−0.89*

	East Germany			West Germany		
	1993	1998	2004	1993	1998	2004
occupation 6	100.00 ***	58.66 ***	41.57 **	24.56 **	26.44 **	28.95 ***
	5.89	*4.14*	*3.04*	*2.63*	*2.81*	*3.52*
occupation 7	48.55	104.30 ***	31.62	176.90 ***	234.50 ***	265.90 ***
	1.44	*3.71*	*1.25*	*9.45*	*13.12*	*18.06*
occupation 8	65.36 ***	51.45 ***	35.05 **	36.59 ***	45.47 ***	21.26 **
	4.00	*3.78*	*2.63*	*4.96*	*5.77*	*2.91*
occupation 9	107.20 ***	99.03 ***	72.26 ***	99.14 ***	132.10 ***	76.44 ***
	8.26	*8.95*	*6.90*	*16.42*	*20.93*	*13.57*
occupation 10	137.70 ***	125.10 ***	67.96 ***	157.80 ***	208.90 ***	137.90 ***
	6.04	*6.35*	*3.51*	*10.45*	*13.84*	*10.95*
occupation 11	–35.28	44.44	–13.15	20.02	117.70 **	26.05
	–0.96	*1.11*	*–0.38*	*0.25*	*2.79*	*1.08*
occ. change	151.50 ***	153.90 ***	169.60 ***	169.30 ***	182.30 ***	170.40 ***
	17.79	*18.69*	*19.57*	*33.00*	*34.96*	*33.39*
sector change	180.00 ***	175.70 ***	177.10 ***	155.60 ***	168.40 ***	211.00 ***
	20.18	*20.61*	*19.14*	*28.75*	*30.11*	*40.05*
state1	69.57 ***	77.89 ***	44.67 ***	–	–	–
	5.72	*7.74*	*4.69*			
state2	20.05	–1.35	–7.65	–	–	–
	1.75	*–0.14*	*–0.83*			
state3	–5.25	–32.83 **	–17.39	–	–	–
	–0.42	*–3.08*	*–1.69*			
state4	11.17	8.09	–2.35	–	–	–
	1.11	*0.96*	*–0.29*			
state5	–19.53	–8.19	–8.20	–	–	–
	–1.75	*–0.87*	*–0.90*			
state6	–	–	–	11.79	34.11 **	39.41 ***
				1.02	*2.78*	*3.51*
state7	–	–	–	–8.02	–3.71	–17.91 *
				–0.89	*–0.39*	*–2.09*
state8	–	–	–	2.47	9.73	–35.86 *
				0.16	*0.60*	*–2.42*
state9	–	–	–	11.89	21.83 *	3.92
				1.43	*2.51*	*0.49*
state10	–	–	–	8.12	13.98	10.71
				0.88	*1.44*	*1.21*
state11	–	–	–	4.55	2.51	–6.90
				0.45	*0.24*	*–0.72*
state12	–	–	–	10.97	21.61 *	4.95
				1.27	*2.38*	*0.60*
state13	–	–	–	–4.97	5.57	–6.51
				–0.58	*0.62*	*–0.80*
state14	–	–	–	19.06	1.85	–10.75
				1.42	*0.13*	*–0.84*
constant	88.09 ***	200.10 ***	155.70 ***	172.30 ***	362.10 ***	216.10 ***
	3.32	*8.24*	*6.26*	*12.44*	*25.55*	*16.24*
N	**60,676**	**51,892**	**46,341**	**189,533**	**187,681**	**184,846**
R-sq	**0.09**	**0.11**	**0.11**	**0.10**	**0.10**	**0.11**

Note: *t*-statistics in italics; *, **, and *** indicates statistical significance at the 5, 1 and .1 percent level.

Source: SIAB (1975–2008).

Table 5.12: Decomposition results – robustness test: swapping $t = 0$ and $t = 1$

period 1 **period 0**	**1993–1997** **2004–2008** **East**	**1993–1997** **2004–2008** **West**
A. Description		
period 1	390.19 ***	265.70 ***
	3.30	*1.58*
period 0	191.09 ***	224.39 ***
	2.44	*1.38*
change	–199.10 ***	–41.31 ***
	4.10	*1.98*
B. Aggregate Decomposition		
composition	–66.75 ***	–0.17
	3.73	*2.14*
structure	–135.33 ***	–39.20 ***
	3.66	*2.26*
C. Detailed Decomposition		
composition	*–66.75* ***	*–0.17*
	3.73	*2.14*
Z – individual	–10.52 ***	–9.10 ***
	1.49	*1.01*
J – job stability	–28.40 ***	3.81 ***
	2.13	*1.07*
E – employment	–29.30 ***	5.31 ***
	2.82	*0.94*
R – regional	1.47 ***	–0.19 **
	0.40	*0.08*
approximation error	4.06	–2.19
	4.87	*2.11*
reweighting error	–1.09	0.24
	1.65	*0.85*

Notes: see Table 5.1.

Source: SIAB (1975–2008).

6 Conclusive remarks

This dissertation investigates two aspects of economic mobility, intergenerational economic mobility and intragenerational economic mobility. It consists of four independent articles. The first three contributions focus on *intergenerational* economic mobility.

First, I show that the level of intergenerational mobility is similar in Germany and the US. Based on recent highly comparable data, I estimate intergenerational earnings elasticities for both countries. Although I can reproduce the low estimates shown in the prior literature on Germany, these are not robust against variations in sampling criteria. In all cases the difference between the US and Germany is not significant. Further, in both countries, I find no evidence for nonlinearities along the distribution of father's earnings. In addition, I apply an unconditional quantile regression to assess if the effect of the father's earnings varies at different percentiles of the distribution of son's earnings. As discussed in chapter 2, the son's earnings are the outcome of the intergenerational transmission process. Although the structure differs in the two countries, in both cases, my results show high mobility at the bottom of the distribution of son's earnings. This means, that, in both countries, ending up in the lower part of the earnings distribution is a severe risk for all sons irrespective of the earnings position of their fathers.

Second, I add to the literature the first estimates of sibling correlations in permanent earnings in Germany. In chapter 3, I discuss sibling correlations as an alternative measure of intergenerational mobility. I argue that especially in the context of intergenerational mobility as indicator of equality of opportunities, sibling correlations should be preferred over the standard intergenerational elasticities. Again the results are presented within a cross–country comparison. The estimates confirm the finding in chapter 2 that intergenerational mobility is similar in Germany and the US. In addition, I compare both countries to Denmark and find significant differences.

Third, motivated by these variations in mobility levels among different countries, I investigate whether cultural background is an important determinant of the level of intergenerational mobility. Relying on unique Danish administrative data on second generation immigrants, I can conclude that cultural background is not a major determinant of the level of mobility. Instead the institutional framework seems to be more important.

The last contribution focuses on *intragenerational* economic mobility. The article investigates the development of wage mobility in East and West Germany. In a situation of rising wage inequality we find declining wage mobility in both parts of Germany. Initially, after German unification, East Germany shows a high level

of wage mobility, which rapidly declined to West German levels and even beyond. We find that a substantial part of this decline in East Germany is associated with changes in observable characteristics, particularly job stability and employment characteristics.

Although establishing policy implications was not the primary aim of this dissertation, the four articles contain implications for both, future research and politics. Again I start with the results on intergenerational mobility. The information where Germany is located on the scale of intergenerational mobility is important for social policy makers. The findings in this dissertation show that intergenerational mobility in Germany is of a similar level compared to the US and significant lower compared to Denmark. However, this information is limited as from the cross–country comparisons it is unclear, which factors determine the level of mobility. A first step to a more detailed policy advice is taken in chapter 4. The results indicate that it is the institutional setting and not cultural differences that are important determinants in the intergenerational transmission process. Thus, high or low intergenerational mobility is not a predetermined characteristic of a society, but can be influenced by means of policy. To derive more specific policy advice, future research should more explicitly try to identify the most important institutions.

The second part of the dissertation also provides relevant information for policy. We highlight that the increase in wage inequality in both parts of Germany is accompanied by a decline in wage mobility. Thus potential welfare effects of the rising inequality are not balanced by higher wage mobility. Again further research is needed to derive more detailed advice. Our results show that a substantial part of the decline is associated with changes in the unobservable wage structure. Future research should try to identify the determinants of these changes.

In the introduction, I motivated the research on economic mobility with the idea of equality of opportunities. At the very end of this dissertation I want to pick up this motivation and conclude. What we have learnt from the presented findings is: the prior result in the literature on intergenerational mobility, that Germany shows a high or medium level of equality of opportunities has to be denied. According to my results, Germany is among the countries with the lowest level of equality of opportunities. In addition, this situation is accompanied by falling intragenerational economic mobility. Therefore, as argued above, future research should focus on providing more detailed policy advice on how to improve equality of opportunities in Germany.

Abstract

This book investigates two aspects of economic mobility: *intergenerational* economic mobility and *intragenerational* economic mobility. It consists of four independent essays whereby the first three focus on *intergenerational* economic mobility.

In the first, it is shown that the level of intergenerational mobility is similarly low in Germany and the US. Although the prior estimates indicating high intergenerational mobility in Germany can be reproduced, these are not robust against variations in sampling criteria. In all cases the difference between the US and Germany is not significant. Further, in both countries, there is no evidence for the existence of nonlinearities along the distribution of fathers' earnings. Instead, it appears that the effect of the fathers' earnings varies at different percentiles of the distribution of sons' earnings. Although the structure differs in the two countries, in both cases, the results show high mobility at the bottom of the distribution of sons' earnings. This means, that, in both countries, ending up in the lower part of the earnings distribution is a severe risk for all sons irrespective of the earnings position of their fathers.

Second, sibling correlations as an alternative measure of intergenerational mobility are discussed. It is argued that, especially in the context of intergenerational mobility as an indicator of equality of opportunities, sibling correlations should be preferred over the standard intergenerational elasticities. Again the results are presented within a cross-country comparison. The estimates confirm the finding that intergenerational mobility is similar in Germany and the US. In addition, both countries are compared to Denmark where significantly higher mobility is found.

Third, motivated by these variations in mobility levels among different countries, it is investigated whether cultural background is an important determinant of the level of intergenerational mobility. Relying on unique Danish administrative data on second generation immigrants, it can be concluded that cultural background is not a major determinant of the level of mobility. Instead the institutional framework seems to be more important.

Fourthly, the last essay focuses on *intragenerational* economic mobility. It examines the development of wage mobility in the eastern and western parts of Germany. In a situation of rising wage inequality, the results show declining wage mobility in both parts of Germany. Initially, after German unification, the eastern part showed a high level of wage mobility, which rapidly declined to western German levels and even beyond. A substantial part of this decline in the eastern part of Germany is associated with changes in observable characteristics, particularly job stability and employment characteristics.

Kurzfassung

Dieses Buch untersucht zwei Aspekte ökonomischer Mobilität, *intergenerationale* ökonomische Mobilität und *intragenerationale* ökonomische Mobilität. Es besteht aus vier unabhängigen Aufsätzen. Die ersten drei beschäftigen sich schwerpunktmäßig mit *intergenerationaler* Mobilität.

Im ersten Beitrag wird gezeigt, dass die USA und Deutschland ein ähnlich niedriges Niveau an intergenerationaler Einkommensmobilität aufweisen. Die in der Literatur bestehenden Ergebnisse hoher Durchlässigkeit in Deutschland können zwar repliziert werden, es zeigt sich aber, dass diese nicht robust gegenüber Variationen in der Stichprobenabgrenzung sind. In allen Modellspezifikationen ist der Unterschied zwischen den USA und Deutschland nicht signifikant. Weiterhin gibt es in beiden Ländern keine Evidenz für die Existenz von Nichtlinearitäten entlang der Einkommensverteilung der Väter. Stattdessen zeigt sich, dass der Effekt des väterlichen Einkommens entlang der Einkommensverteilung der Söhne variiert. Obwohl sich die Struktur in den beiden Ländern unterscheidet, zeigen die Ergebnisse in beiden Fällen hohe Mobilität am unteren Ende der Einkommensverteilung der Söhne. Das bedeutet, dass es für Söhne unabhängig von der Einkommensposition ihrer Väter eine ernste Gefahr ist, am unteren Ende der Einkommensverteilung positioniert zu sein.

Im zweiten Beitrag werden Geschwisterkorrelationen als alternative Maßzahl zur Ermittlung intergenerationaler Mobilität diskutiert. Diese sind, speziell im Kontext einer Interpretation intergenerationaler Mobilität als Indikator für Chancengleichheit, dem Standardansatz, der Berechnung intergenerationaler Elastizitäten, vorzuziehen. Analog zum ersten Beitrag werden die Ergebnisse in einem Mehrländervergleich präsentiert. Es bestätigt sich, dass die intergenerationale Mobilität in den USA und Deutschland auf einem ähnlich niedrigen Niveau liegt. Ebenso zeigt sich, dass in Dänemark eine signifikant höhere Durchlässigkeit besteht.

Der dritte Beitrag untersucht potenztielle Determinanten der Höhe der intergenerationalen Mobilität. Auf Grundlage administrativer Daten von Migranten zweiter Generation in Dänemark kann gezeigt werden, dass der kulturelle Hintergrund keinen wesentlichen Einfluss auf die Höhe der intergenerationalen Mobilität hat. Stattdessen scheinen die institutionellen Rahmenbedingungen wichtiger zu sein.

Der vierte Beitrag fokussiert auf *intragenerationale* ökonomische Mobilität. Er untersucht die Entwicklung von Lohnmobilität in Ost- und Westdeutschland. In einer Zeit steigender Lohnungleichheit zeigen die Ergebnisse sinkende Lohnmobilität in beiden Teilen Deutschlands. Unmittelbar nach der Wiedervereinigung zeigt sich in Ostdeutschland ein sehr hohes Niveau an Lohnmobilität, das rapide absinkt und sogar unter das Westniveau fällt. Ein substantieller Teil dieses Rückgangs ist mit Veränderungen in beobachtbaren Charakteristika, insbesondere der Jobstabilität und Beschäftigungscharakteristika, verbunden.