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Intergenerational transmission of educational attainment in Germany – the last five decades

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Abstract

Over the last decades the German education system underwent numerous reforms in order to improve "equality of opportunity", i.e. to guarantee all pupils equal access to higher education. At the same time internationally comparative evidence yields that Germany features particularly low intergenerational mobility with respect to educational attainment. This study investigates the development in intergenerational education mobility in Germany for the birth cohorts 1929 through 1978 and tests whether the impact of parental background on child educational outcomes changed over time. In spite of massive public policy interventions and education reforms our results yield no significant reduction in the role of parental background for child outcomes over the last decades.

Keywords: education transmission, intergenerational mobility, schooling, human capital transmission

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1. Introduction

In most industrialized countries public and private education expenditures increased vastly over the last fifty years. Yet, it is not clear who benefited from this development: studies for the United Kingdom show that the expansion of higher education did not reduce the educational attainment gap between children of rich and poor parents (Blanden and Machin 2004, Blanden et al. 2005). Similarly, Cameron and Heckman (1998, 2001) conclude from U.S. data that government programs to reduce short term liquidity constraints will not affect schooling choices. Examining the evidence from 20 countries Chevalier et al. (2003, p.20) conclude "the expansion of access to higher education has been concomitant with an increase in the effect of paternal education." Higher public education expenditures do not seem to guarantee equitable results.

We study the development of intergenerational educational mobility over the last five decades for the case of Germany, which next to the United States and the United Kingdom is known for low intergenerational educational mobility (OECD 2004, Esping-Andersen 2004, Woessmann 2004, Schuetz et al. 2005). Applying German data on birth cohorts from the late 1920s through the 1970s we investigate the relevance of parental education, family size, region of residence, and child sex for educational attainment and test whether these correlation patterns changed over time, e.g. as a consequence of education policies.

The contributions of this paper are threefold: first, this is the first study to test economic hypotheses regarding *changes* in parent-child education transmission over time for Germany. This complements a literature which focused almost exclusively on the case of the United Kingdom. Second, our analysis provides both up-to-date evidence as well as a long term perspective and updates related sociological contributions (e.g. Blossfeld 1993). Finally, we apply more flexible empirical methods than prior studies to discover shifts in intergenerational education transmission patterns that could not be detected by more restrictive approaches.

Surprisingly, the extant empirical evidence on *changes* in intergenerational education mobility is sparse. The issue raised attention in the United Kingdom where Blanden et al. (2003), Blanden and Machin (2004), and Machin and Vignoles (2004) analysed changes in the correlation between parental relative income position and child educational outcomes. The studies use various datasets, provide comparisons of the U.S. and the U.K., and discuss whether the relevance of student cognitive ability increased with easier access to higher education. Their key findings are that the expansion of the higher education system predominantly benefited the children of rich parents and that the participation gap between children of more and less affluent parents widened over time. This would be an acceptable outcome if it were the children of rich parents who were the most able and who had previously suffered from rationed access to higher education. However, Galindo-Rueda and Vignoles (2005) show that while the relevance of parental background for educational attainment increased that of cognitive ability declined, and educational attainment increased far more for those with low ability and high income background than for those with high ability and low income background.

Beyond these contributions economic analyses of the intergenerational transmission of education typically neglect the perspective of mobility developments over time. In an early contribution Couch and Dunn (1997) compare the intergenerational education correlation in the U.S. and Germany and find higher education mobility in Germany than in the U.S.. Lauer (2003) compares German and French cohorts born between 1929 and 1968. Based on a variant of the model by Cameron and Heckman (1998) she evaluates the effect of parent characteristics on secondary schooling and post-secondary educational outcomes, however, without allowing for changes in this correlation over time. Lauer finds the two countries to be surprisingly similar. Dustmann (2004) looks at correlations between parental characteristics and child schooling and earnings for the German birth cohorts 1920 through 1966. He

confirms that parental background affects child outcomes. Again, the empirical approach is not geared to determine the variation in this relationship over time.

Also, sociological interest focused on the question of educational mobility and intergenerational status transmission. Shavit and Blossfeld (1993) survey the developments in 13 countries, with Blossfeld (1993) covering the German case. He investigates the birth cohorts 1916 through 1965 for which he finds no change in the impact of parental background over time. Müller and Haun (1994) analyze educational outcomes and transitions for the birth cohorts 1910 through 1969 and arrive at the opposite conclusion: the relevance of parental social class for child educational outcomes declined over time. Their findings are corroborated by Henz and Maas (1995).

All of these contributions investigate the effect of parental background on child outcomes without paying attention to the separate effects of nature and nurture.[1] A separate literature addresses whether it is the inheritance of genes that drives intergenerational correlation patterns ("nature") or whether a productivity effect of parental education matters ("nurture") (e.g. Oreopoulos et al. 2006, Sacerdote 2002, Plug and Vijverberg 2003, Black et al. 2005). Since inherited genes affect the intergenerational transmission of ability (Plomin et al. 2001) we would expect that even in a society which provides schooling completely without discrimination, some level of parent-child correlation remains (e.g. Bowles and Gintis 2002). If we assume that this "hard-wired" part of parent-child ability correlation remains constant, the analysis of changes in intergenerational education mobility over time is informative even without distinguishing the nature vs. nurture elements of education transmission: if parent-child education correlation declined, education provision has become more egalitarian and vice versa.[2]

[1] Ermisch and Francesconi (2001) discuss under which assumptions their measures of intergenerational correlation are causal.

[2] Interestingly, recent contributions by Cunha and Heckman (e.g. 2007) point out that the assumed separability of nature and nurture is obsolete, as the mechanisms interact in more complex ways. Piketty (2000) already discusses the limited relevance of a clear distinction between the nature and nurture concepts.

Such findings are important for various reasons. First and foremost, they inform about whether past reforms and developments in the provision of education and the related increases in education expenditures succeeded in reaching their explicitly stated goal of reducing inequities. The results from Germany are an interesting complement to the evidence from the U.K. and the U.S. which suggests that support in short-term liquidity problems does not further equal access to education. - Additionally, the findings indicate (a) the extent of intergenerational education correlation which co-determines intergenerational mobility with respect to economic well-being, and (b) whether promising opportunities for human capital investments may be foregone through low educational mobility.[3]

Our analysis draws attention to the heterogeneity in intergenerational education mobility over time. We propose several indicators of educational mobility and compare the findings across cohorts, by gender, family structure, and region instead of considering only one single education correlation coefficient for an entire society.[4] Our results indicate that the level of education and the extent of upward mobility increased over recent decades. However, the relative probabilities of reaching high educational degrees for children from low compared to high education parental backgrounds hardly changed over the last decades and the gap in the probability of reaching high educational degrees at the expense of those with many siblings, from rural region of origin and a low education parental background increased substantially.

2. Institutional Background

The German secondary education system has always been structured by parallel tracks with different performance requirements.[5] Since the 19th century standard education has been

[3] The laissez faire approach of not intervening in mobility outcomes can be efficient if the distortionary costs of government intervention exceed the efficiency gains from educating the most able (Piketty 2000).
[4] Bauer and Riphahn (2007) show that there can be substantial heterogeneity in mobility even in a given institutional framework.
[5] See Schnepf (2002) for a detailed description.

provided by Basic Schools (*Volksschule* / *Hauptschule*), which used to last 8 years and prepared pupils for apprenticeships or vocational schools. After 4 years at Basic School it is possible to advance to either Middle School (*Realschule* / *Mittelschule*) or Advanced School (*Gymnasium*),[6] where education continues for an additional 6 or 9 years, respectively (cf. Figure 1). The system hardly changed over time, and the Advanced School degree still is the key requirement for university studies.[7]

Around WWII the German educational system was centralized and underwent distortions connected to the manpower needs of the military. After the war, the occupation forces pushed for equal access of all pupils to all branches of secondary education (Lundgreen 1981, p.24). The administrative authority for the educational system was returned to the federal states. They reestablished the prior institutional framework and in 1955 agreed to harmonize their secondary schooling systems.

Over time numerous measures were introduced to strengthen public education, to allow for more general access, and to increase the share of well educated youth. These measures fall into two major groups, those with direct effects on individual household finances and those regulating institutions to strengthen equal educational opportunity.

The following reforms belong in the first group: (a) school fees were abolished state by state over time reducing the direct cost of secondary schooling (cf. Riphahn, 2006). (b) A scholarship program for university students exists since 1953 (Honnefer Modell, since 1971 "BaFöG"). (c) Over time more and more states started to provide secondary school textbooks free of charge as well as public transportation to guarantee physical access to all school types. (d) Starting in the mid 1960s more middle and advanced schools were opened which simplified access to higher education in terms of transportation costs and time.

[6] Depending on region and period more or less demanding entrance exams were required to enter Middle or Advanced School.

[7] While today the degree can be attained via alternative educational pathways, such as polytechnical schools, these were not available in the past. Therefore the educational decision taken at the end of primary school was crucial.

A second group of reforms explicitly intended to strengthen educational opportunity: (a) since 1960 formal tests for a transition from primary to middle or advanced schools are abolished. Instead, primary school teachers give recommendations, grades 5 and 6 are labeled "orientation grades", and in some states parents have a say in determining which type of school is chosen for their child. Also, the opportunities to flexibly transit between educational tracks were improved. (b) By 1969 the duration of compulsory schooling was expanded in all states to at least 9 years, such that the opportunity cost of attending Middle instead of Basic School declined. (c) Reforms of the vocational education system provided additional educational degrees in combination with vocational training. This generated opportunities for continued education at the tertiary level e.g. at polytechnical universities.

In addition to these reforms of the educational system economic and social trends supported the expansion of education demand and supply: (a) public annual education expenditures increased by about 50 percent between 1957 and 1962 (Fränz and Schulz-Hardt 1998) and further from 15 to 84 billion DM between 1965 and 1983 (Handl 1985). The cohort share of graduates entering tertiary education increased from 6 percent in 1960 to 25 percent in 1982, and reached more than 30 percent in 2003 (KMK 2005). (b) The German economy experienced a prolonged boom period from the end of WWII through the mid 1960s with annual GDP growth rates above 5 percent. This trickled down to families which had traditionally lacked the financial means to invest in their children's education. Also, it relieved families of the need to send children to earn an additional income as early as possible, freeing them for human capital investments (Schimpl-Neimanns 2000). (c) The general trend to higher education was self-reinforcing: jobs and apprenticeships which used to be available to those with little education started to be filled by better educated youths. The relevance of education became obvious and parents adjusted investment behaviors. (d) Visible structural economic adjustments, such as the decline of small farms and crafts-shops

or the increasing capital intensity of production carried the message that education came to be a precondition of economic independence, yielding adjustments in societal norms.

Figure 2 illustrates this educational expansion after the war. It shows (a) rising total expenditures on schools as a fraction of GDP, (b) increasing numbers of middle and advanced schools, (c) a parallel extension of the number of teachers, (d) similar patterns for the number of teachers per pupil, and (e) the changing distribution of pupils across the three educational tracks.

3. Theoretical Background and Hypotheses

We base our hypotheses on two theoretical arguments discussed in the literature. On the one hand Cameron and Heckman (1998) and Lauer (2003) model individual child educational attainment as a utility maximizing choice that is determined by a comparison of marginal costs and benefits and therefore as a function of any characteristic that affects the net utility of reaching a given educational level. On the other hand Fernandez and Rogerson (1998) model the aggregate equity and welfare effects of increased educational opportunity for poor children.

In their empirical analysis of educational outcomes for five birth cohorts of American males Cameron and Heckman (1998) conclude that it is not short run credit constraints which are central for schooling decisions but long-term factors such as permanent parental income and possibly genetic family background. They suggest that government subsidies have only small effects and tend to attract students from the lower tail of the *ability* distribution to higher education. Translated to the German case these findings imply that the educational reforms should have affected neither educational choices nor the correlation between child and parent educational outcomes, as they cannot modify long-term factors or family abilities. Based on these predictions we evaluate the relevance of family background for educational attainment and focus on whether this relationship changed over time.

If, to the contrary, equal opportunity policy successfully reached its objectives, the relevance of household and parent characteristics for child education choices should have declined, e.g. because reductions in the cost of education may have reduced the impact of permanent parental income.[8] In that case we expect a falling correlation between educational attainment and parental and household background. Also the differences between male and female educational attainment should decline with growing wealth if they were due to sex-specific differences in the expected returns to child education. This correlation should converge to the level induced by genetic ability correlation or, as Becker and Tomes (1986) put it, by the inheritability of endowments. Similarly, the disadvantage of children with many siblings should decline if government redistribution and increasing household incomes enable parents to invest more in the education of their children. Also, disadvantages related to growing up in rural rather than urban areas should diminish as more schools are built and transportation is provided free of charge.

Fernandez and Rogerson (1998) argue that children of poor parents underinvest in education because they cannot borrow against the future. A policy intervention that enhances educational opportunities for the poor will then yield welfare improvements and reductions in educational and income inequality (see also Fernandez and Rogerson 1996, Benabou 1996). Given that German policy reforms of the 1960s and 1970s were geared to enhance educational opportunity the Fernandez and Rogerson model suggests that inequality, e.g. with respect to parental background, declined over time. – Based on these arguments we propose six hypotheses, which are tested below:

H1: Parental education is positively correlated with child educational outcomes.

H2: This correlation declines over time for subsequent birth cohorts.

H3: Growing up with many siblings and/or in rural areas is correlated with lower educational attainment.

[8] Similarly, a change in returns to education may affect the correlation patterns. However, existing studies on the developments in returns to education in Germany only reach back to the 1980s. They show that returns to education declined slightly since that time (Boockmann and Steiner 2006).

H4: The educational disadvantage related to siblings and region declines over time.

H5: Educational attainment differs for boys and girls, and girls catch up over time.

H6: The correlation of child and parent education varies by sex of child and parent.

It seems useful to clarify the expected change in intergenerational education transmission using the transition matrix as a descriptive tool. The transition matrix – with parental education captured in rows and child educational outcomes in columns – describes the probability that a child reaches a given level of education conditional on parental education, with row percentages adding up to 100 percent.

If ability could not be inherited and the educational system would not discriminate based on parental background, child and parent outcomes should be independent. The conditional probabilities of child educational attainment should be identical across rows and reflect the politically or administratively determined cohort share at each level of schooling based on the supply of different educational degrees. The probability of reaching a high degree of schooling should be identical for children of high and low educated parents. The ratio of these conditional probabilities, which we label Ratio 1, should attain a value of 1:

$$\text{Ratio 1} = \frac{\text{Prob (child attains high degree | parent has high degree)}}{\text{Prob (child attains high degree | parent has basic degree)}}$$

If ability were inheritable we would expect a transition matrix with larger entries on the main diagonal than in other cells.[9] If for example children have a 60 percent chance of inheriting their parents' ability and type of school with an equal chance of reaching the alternative categories, one might expect a hypothetical transition matrix as depicted in Table 1. This would imply an advantage for children of highly educated parents and a Ratio 1 value of 0.6 / 0.2 = 3.

The transition matrix helps to consider the effect of erroneous school tracking decisions or measurement errors on relative education outcomes. This effect depends on the

[9] The widely cited evidence presented by Plomin et al. (2001) suggests that 40 to 80 percent of IQ variation can be explained by heritage, with lower shares measured for young and higher shares found for older individuals.

character of the measurement error, where at least two types are possible. On the one hand, errors may increase ability dispersion (row 1 could read, e.g.: 0.4, 0.3, 0.3), alternatively errors could reduce ability dispersion (e.g. row 1: 0.8, 0.1, 0.1). In a society that discriminates based on parental background the latter type of tracking error seems more likely. In this example the measurement error drives up Ratio 1 to a value of 8. If, e.g. as a consequence of the education reforms over the last decades, sorting errors were reduced, we would expect a decline in Ratio 1 and an equalization of relative education opportunities.

A separate development was induced by the expansion of the educational system with increasing shares of advanced degrees. In the transition matrix education expansion can follow if e.g. the column sum for transitions to basic education is smaller than the column sums for transitions to middle or advanced education. Clearly, the effect of education expansion on the development of educational opportunities (Ratio 1) cannot be determined a priori. It varies depending on the extent to which different population groups benefited from rising probabilities of attaining advanced education and will be evaluated below.

4. Data Description and Empirical Methods

4.1 Data and Methods

Our analysis uses the 2003 data wave of the German Socio-Economic Panel (SOEP). The SOEP is a representative annual household panel survey which gathers information on a variety of topics, some regularly every year others only in certain years (SOEP Group 2001). We chose the 2003 cross section for our analysis because it provides information on an individual's number of siblings and because it is relatively recent. In total about 23,000 individuals were surveyed in the 2003 wave of the German SOEP. In our descriptive analysis we consider individuals born between 1929 and 1978 whereas our regressions use only those born between 1940 and 1978 to minimize any biases resulting from non-random, selective mortality. To generate a sample of individuals with a comparable background in terms of

educational institutions we exclude non German citizens as well as those who were raised in the former East Germany. After these selections our sample for the regression analyses contains 4,516 men and 4,815 women who attended school within the educational system described above.

Our outcome of interest is secondary school attainment. Given the German track system our dependent variable differentiates four states, Advanced School degree (*Abitur*), Middle School degree (*Realschulabschluss*), Basic School (*Hauptschulabschluss*) or no degree, and missing information. This coding of educational outcomes differs from some of the prior literature, which focuses on sequential transition decisions instead of levels reached. However, Cameron and Heckman (1998) emphasize that a model of sequential grade transitions is an unattractive framework as it implicitly assumes that agents are myopic in their investment decision.[10]

Among our key explanatory factors we consider parental education.[11] We define parental education in the same manner as child outcomes and use the same four categories for both parents. The missing category is coded both, if a parent is not observed at all and if just the education measure is unavailable for an otherwise known parent. In our basic specification we consider only one joint indicator for both parents reflecting the highest educational degree between father and mother. Additionally, we provide analyses which treat the two parents separately.

Additional explanatory variables include a categorical indicator of individual birth cohort, the federal state of residence, a group of indicators of the number of siblings, and an indicator of whether the individual grew up in the countryside. Descriptive statistics for the regression sample are presented in Table 2.

[10] Frequently, authors in this literature compared coefficients across bivariate logit estimations to see if e.g. parental characteristics affected various transition decisions differently. Since this comparison across separate logit models is inappropriate, we interpret marginal effects in the framework of a multinomial logit estimator.

[11] This differs from parts of the literature which concentrates on parental income. Parental income measures are not available for the sample under consideration. However, since educational attainment is highly correlated with income the resulting trends in correlation patterns should be comparable to those found in similar studies e.g. for the United Kingdom.

We first describe the developments of educational attainment and intergenerational education correlation patterns over time. Then we evaluate the determinants of educational attainment and trends in their relevance over time in a multivariate framework. As our dependent variable comprises four categorical outcomes j (missing, basic, middle, advanced school degree) and we use cross-sectional data we apply the multinomial logit model as a very flexible estimator, which allows for differences in each covariate's marginal effect across categories. Our baseline model (1) describes the correlation of birth cohort, parental education, number of siblings, rural origin, federal state, and cohort size.

(1) $P(Y_i = j) = f_j(\text{parent education}_i, \text{child sex}_i, \text{birth cohort}_i, \text{number siblings}_i, \text{rural origin}_i, \text{federal state}_i)$

Based on this specification we can test hypotheses 1, 3, and 5. Initially, we estimate the model jointly for males and females. To test whether the impact of parental education changed over time (hypothesis 2) we add birth cohort interactions with parent education measures in a second step. Hypothesis 4 is considered when adding birth cohort interactions with both the number of siblings and the rural origin indicator to the baseline model. In step 4 of the analysis we examine whether the difference in educational attainment between sons and daughters changed over time (hypothesis 5). Finally, we investigate whether the impact of parental education on child educational outcomes differs depending on which of the two parents is considered and whether the effect is measured for a son or a daughter (hypothesis 6).

4.2 Descriptive Evidence

In order to summarize the development in educational attainment over time, Figure 3 describes the distribution of educational attainments by gender over the considered birth cohorts. The overall shift to higher educational degrees is clearly visible for both sexes. After

the cohort share with Advanced School degree was about half that of men for female birth cohorts in the 1930s, women completely caught up since the birth cohorts of the 1960s.

A number of indicators are available to describe the development in the overall intergenerational transmission of education. For a description of average mobility of the birth cohorts 1929 – 1978 Table 3 presents transition matrices separately for the two sexes. The numbers on the main diagonal are around 50 percent for all parental outcomes and for both sexes which indicates a low level of mobility. The entry in the third column of either table's first row indicates the probability that the child of parents with only basic education attains an advanced school degree. The probability is 9 percent for females and about 12 percent for males. Comparing these figures to those two rows below which are above 50 percent for children of highly educated parents (see rows 3 and columns 3) we see that child educational outcomes vary greatly with parental characteristics.

Table 3 presents evidence across all considered cohorts. In order to investigate the development over time Figure 4 describes the development of upward and downward mobility by sex and separately for birth cohort groups. Here the added percentage points of the matrix elements above the diagonal of the mobility matrix describe the probability of upward mobility, those on the main diagonal describe intergenerational immobility, and the three entries below the main diagonal describe downward mobility. Over time the fraction of any given cohort group which attained higher educational outcomes than their parents went up for females from around 11 to 33 percent, for males from 20 to 35 percent. The fraction of individuals with the same attainment as their parents stayed constant and the extent of downward mobility declined, for females from 37 to 15 percent, for men from 34 to 15 percent.

Finally, we investigate whether this improvement in educational attainment equally enhanced the opportunities of children from all parental backgrounds. Figure 5 entails two indicators of relative opportunities: Ratio 1 describes the probability of attaining an advanced

school degree for children of parents with an advanced school degree relative to children of parents with only basic education. For individuals born throughout the 1930s we observe a more than 8-fold difference in probabilities. Starting with the birth cohorts around 1949 for men and around 1954 for women the ratio reached the value 4 which hardly changed for subsequent cohorts and indicates a rather permanent level of inequality in opportunity. Ratio 2 describes the relative probability of attaining a middle school degree for children of parents who themselves had a middle school degree relative to children of parents with only basic education. Here we see a different picture. This ratio never reached high values and has been close to parity for females since the birth cohort of 1954 and for men born after 1944. A comparison of Ratio 1 and Ratio 2 thus suggests that the impact of parental background is particularly striking when we consider the probability of attaining an advanced school degree. Overall the figures yield a surprising level of stability in probability ratios over the last two and a half birth cohorts. Relative opportunities hardly improved, particularly for women born since the 1950s.

5. Multivariate Results and Robustness Tests

Next we investigate whether the lack of improvements in relative education opportunities can be confirmed in multivariate regression analyses and test the hypotheses set out in section 3.

In a first estimation we applied a multinomial logit estimator of specification 1 to our 9,331 observations of child educational outcomes.[12] The marginal effects are presented in Table 4 and indicate the impact of the explanatory variables on the alternative outcome probabilities. We find significant differences in the distribution of educational outcomes by child sex (hypothesis 5). Boys have significantly higher probabilities of being in the lowest and highest educational group than girls. Being male significantly increases the probability of attaining an Advanced School degree by 4.4 percentage points. The second group of

[12] We tested whether the independence of irrelevant alternatives assumption implied by the multinomial logit model holds and found no evidence to the contrary.

indicators describes the highest level of secondary schooling among the parents of a child. Jointly the effects are highly significant. The patterns are as expected (see predicted probabilities at the bottom of the table), the higher parental education, the less likely children are to reach only basic educational outcomes and the more likely they are to reach an Advanced School degree. Having highly educated parents is correlated with an average increase in the probability of attaining Advanced School by about 50 percentage points compared to children whose parents have only basic education.

The descriptive evidence on changes in educational outcomes over time is confirmed as more recent birth cohorts attain significantly higher degrees. Finally, the results on the correlation of the number of siblings and growing up in a rural area confirm hypothesis 3: compared to children without siblings educational attainment is significantly lower for the others and it decreases as the number of siblings goes up. Growing up in a rural area is correlated with an about 5 percentage point lower probability of attaining a high educational degree.

In order to test whether the impact of parental educational background on child educational outcomes changed over time we extended the baseline specification by four interaction terms of a linear time trend with the indicators of parent educational attainment. The coefficient estimates are presented in Table 5a. The trend interactions are jointly significant at the one percent level. As the calculation of marginal effects of interaction terms in nonlinear models is rather involved (Ai and Norton 2003), we interpret the change in parental education effects over time by way of simulation exercises. Table 5b describes the average predicted probabilities of attaining high, middle, or low educational degrees conditional on parental education and birth cohort. A comparison across rows yields that the probability of attaining an advanced school degree increased for children of all parental backgrounds over time (cf. last column 'Diff. 78-40'). Interestingly, the largest absolute increase occurs for the children of highly educated parents (plus 21.36 percentage points).

This increase is highly statistically significant and also implies that the percentage point difference in the probability of attaining advanced school for children from high vs. low parental education background increased from 38.90 for the 1940 birth cohort to 53.94 for the 1978 birth cohort (cf. row four 'Diff. parents high-low'). The parental background effect increased over time and absolute educational opportunities increased the most for the children of the highly educated.

The bottom half of Table 5b describes the developments regarding the probability of attaining only a basic school degree. With respect to this outcome the absolute improvement is highest for the children with low parental education background, which yielded a decline in the education gap over time. However, the top panel shows that this decline did not result in an equalization of access to tertiary education but only in improved access to middle school degrees for the children of lesser educated parents.

In order to test whether the correlation between child educational outcome and the number of siblings and the region of origin declined (hypothesis 4), we added time trend interactions of the sibling and rural origin indicators in the baseline specification. The coefficient estimates on the trend interactions are jointly and in many instances individually significantly different from zero. Again we apply simulations to interpret the effects (see Tables 6b and 6c). The simulations confirm the general shift from basic to higher degrees over time as the predicted share of individuals with only low educational outcomes declined. The gap in the probability of reaching an advanced secondary school degree by regional origin or the number of siblings increased over time and reached the largest absolute value for the birth cohort of 1978 (see rows labeled 'Difference'). Thus the educational expansion did not succeed in improving access to higher education for those with many siblings or those from rural areas. The developments are to the contrary, those who were originally disadvantaged are now more disadvantaged than ever.

So far we found differences in average educational outcomes for males and females. Table 7 presents the results obtained when testing whether these remained constant over time (hypothesis 5): the gender indicator is interacted with a linear time trend. The significant coefficients indicate that the time trends indeed differ by child sex. The simulation results in Table 7b yield that females caught up over time. Their disadvantage in terms of attaining only a low degree switched to a significant advantage and the difference in the probability of Advanced School attainment disappeared for the most recent cohorts.

In order to test the hypothesis that the correlation between child and parent education differs depending on the sex of the child we extended the baseline specification by interaction terms between the sex of the child and parent educational degrees. The results yield that the child sex interaction terms are not jointly significant. We tested whether these interaction terms changed over time but found no significant effects.[13]

Finally, we investigate whether the impact of fathers' education differs from that of mothers'. Here we reestimated the baseline models separately for male and female children and allowing for separate effects of the two parents. The results are presented in Table 8. The coefficient estimates for the parental education groups are jointly significant. In both cases the marginal effects of paternal education are generally larger than those of maternal educational background. Interestingly the paternal effects are somewhat larger for male children than for female children and the maternal education effects are somewhat larger for females than for male children. However, the patterns do not differ substantially.

In sum, we find the expected positive correlations of the probability of advanced schooling degree with being male, having highly educated parents, few siblings, and growing up in a non-rural area. Over the last decades the probability of attaining advanced schooling degrees increased strongest for children of highly educated parents, and for those from an urban region of origin and for children with few siblings.

[13] Results are not presented to save space, they are available from the authors upon request.

One shortcoming in the above analyses of developments over time consists of the restrictive assumption that any time trend takes a linear form and exclusively affects certain groups of explanatory variables. In order to test whether the results are robust to a flexible specification without parametric restrictions on the shape of time trends we reestimated the baseline model separately for three cohort groups, those born 1940-1952, 1953-1965, and 1966-1978. If the findings summarized above are due only to the linear specification of the time trend they should change or disappear when no parametric restriction is imposed. Descriptive statistics for the three cohort groups (Table 9a) indicate shifts in childhood residence, sibship sizes, and educational expansion over time for children and parents. The estimation results are presented for the first and last cohort group in Table 9b. The previously used controls for birth cohort groups are now substituted by linear time trends for the birth cohorts within the birth cohort groups.

A comparison of the marginal effects across cohort group columns confirms most of the findings described above. The largest increase in the marginal effect of parental education on the probability of reaching an advanced school degree (see the two rightmost columns) is observed for children of parents with advanced education: plus 6 percentage points comparing the early and the late cohort groups, thus increasing the gap in the probability of reaching advanced school for children of parents with advanced school instead of basic school from 44.8 to 51.4 percentage points (from 17.0 to 25.4 percentage points relative to parents with middle education). Similarly, the disadvantage in the probability of reaching advanced school education for children from large families with at least 3 siblings relative to those with no siblings almost doubled from 8.3 percentage points for the earliest cohort group to 15.5 percentage points for the last. The negative effect of growing up in a rural area on the probability of reaching advanced education went up from 3.7 to 5.9 percentage points. The difference in the probability of attaining an advanced school degree by child sex became

statistically insignificant and smaller in size over time. Thus our results are robust to this more flexible modeling approach of changes over time.

6. Conclusions

During the last decades a variety of reforms and developments supported a massive expansion of the German educational system. This paper investigates whether this expansion concurred with enhanced relative educational opportunities for children of parents with low educational background. The descriptive evidence yields a general increase in the average educational level over time. A higher cohort share attained advanced educational degrees, and we see a positive trend in upward and a negative trend in downward intergenerational mobility over time. However, the relative educational opportunity of children from disadvantaged backgrounds did not improve for over 25 years. This finding agrees, both, with recent findings for the United Kingdom, where the increase in education funding predominantly ended up supporting the rich, and with Cameron and Heckman (1998, 2001) who argue and show for the U.S. that only long term factors affect child educational outcomes and government subsidies have at best small effects. Our analyses confirm that the main beneficiary of the education expansion in Germany were children of parents with high levels of education. Thus the German variant of equal opportunity education policies was just as unsuccessful as its British equivalent.

Galindo-Rueda and Vignoles (2005) showed for the U.K. that the correlation of ability and educational attainment became weaker at the same time as parental impact increased. We have no such evidence for the case of Germany. However, nationally representative ability surveys allow a cross-sectional evaluation of pupil competencies across different school types. Such tests were performed in 1995 for seventh graders (TIMSS, Third International Mathematics and Science Study) and in 2000 for a representative sample of pupils in ninth grade (PISA, Programme of International Student Assessment). A comparison

of the distribution of pupils' competencies by type of secondary school yields large overlapping areas: Schnepf (2002) reports based on TIMSS data that more than 8 (13) percent of basic school pupils and 30 (36) percent of middle school pupils scored above the bottom quartile in the Advanced School math (science) distribution. The majority of these high scoring pupils in lower secondary tracks had parents without tertiary educational degrees. Similarly, Baumert et al. (2003, p.294) report that with respect to mathematical competencies as measured in the PISA survey e.g. in the state of Bavaria more than 40 (4) percent of pupils in middle (basic) schools surpassed the bottom quartile of the distribution of mathematical competencies observed at advanced schools. Thus more than a third of the middle school pupils are able to follow the Advanced School curriculum in mathematics. More relevant is whether pupils meet requirements in two competencies at the same time. For the state of Bavaria Baumert et al. (2003) report that 40 percent of middle school pupils reach the level of the bottom 10 percent of Advanced School requirements in both reading and math competencies.

This confirms that the streaming into school types in Germany is not purely based on ability. Other factors intervene and we have shown that their influence on advanced school participation has not been declining in recent decades. This suggests that the political objective of increasing equitable access to education has not yet been reached.

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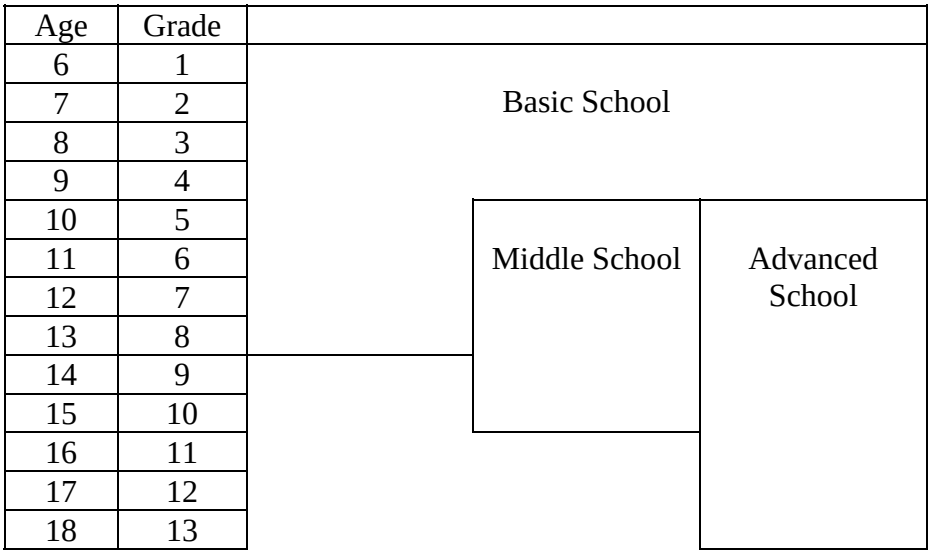
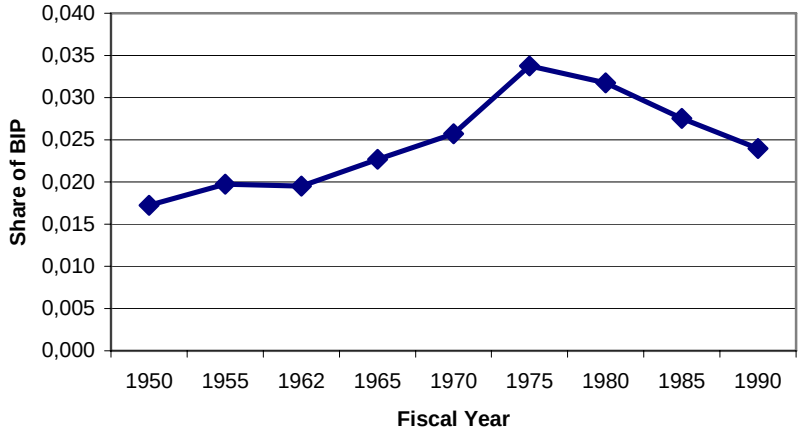
Figure 1 Sketch of the Traditional German Schooling System



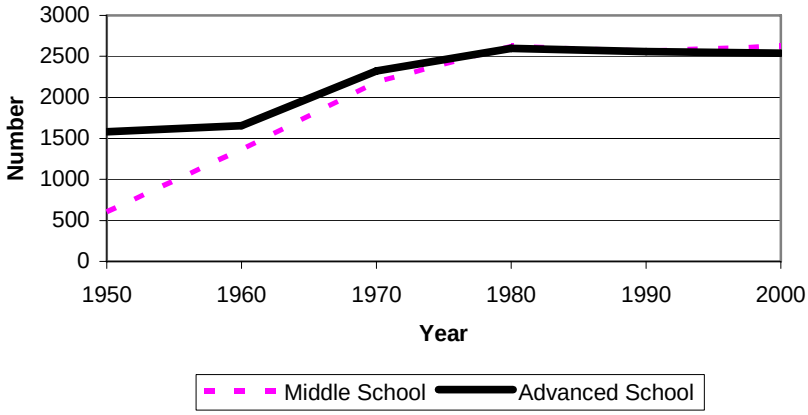
Source: Own presentation

Figure 2 Education Expansion after WWII in Germany

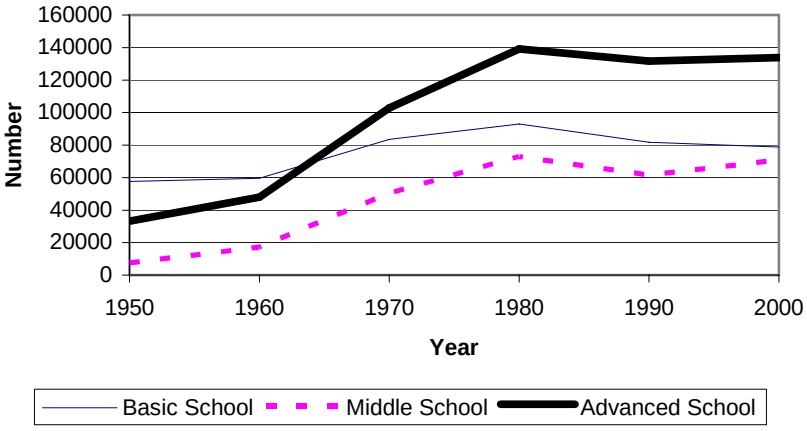
(a) Total Expenditures on Schools as a Share of GDP



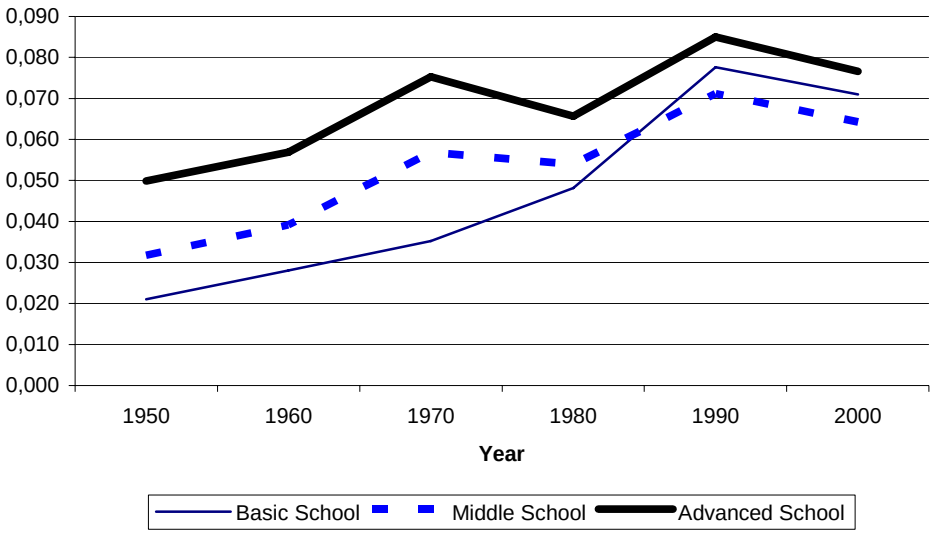
(b) Number of Schools



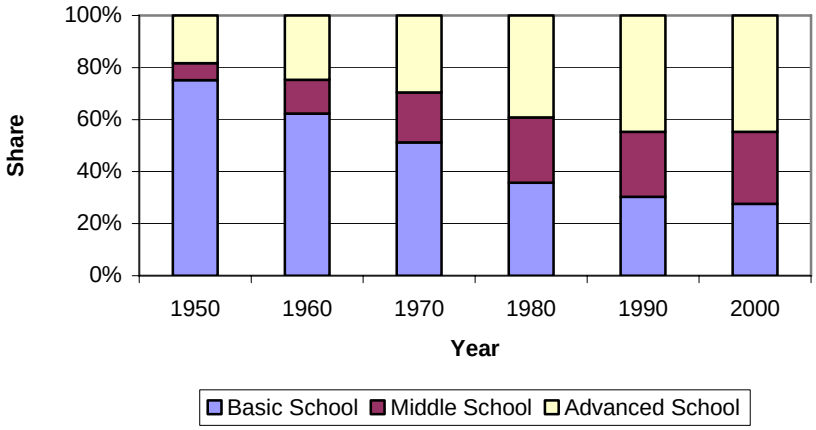
(c) Number of Teachers



(d) Teachers per Pupil



(e) Distribution of Pupils

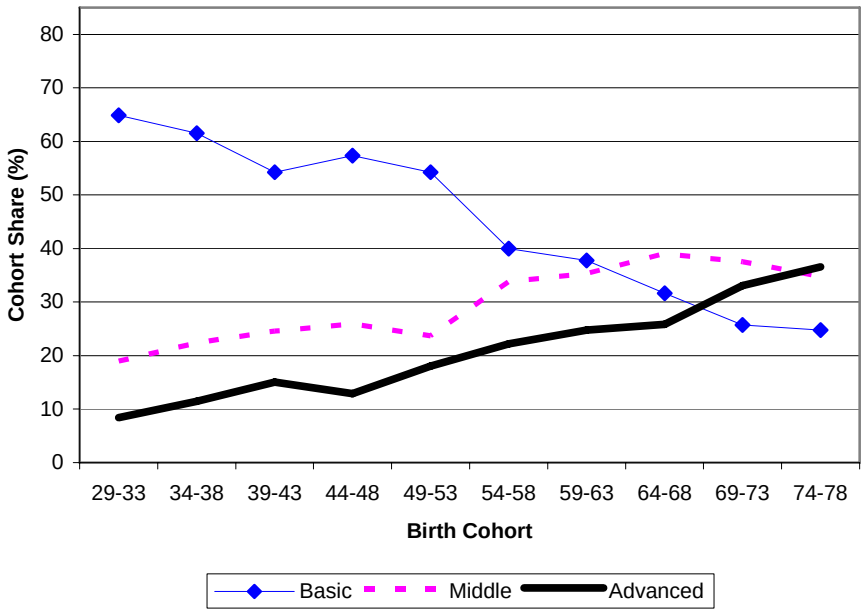


Note: Prior to 1990 the number of basic schools was not provided separately from primary schools. Based on the available data for 1990 we calculated the share of basic schools in the sum of basic and primary schools by state and applied this share to the number of schools for prior years. Basic schools are omitted in (b) because their high absolute number leaves the other developments difficult to discern, when presented using the same scale. The number of basic schools declined from 8761 in 1950 to 5195 in 2000. - All figures describe the situation in West Germany only.

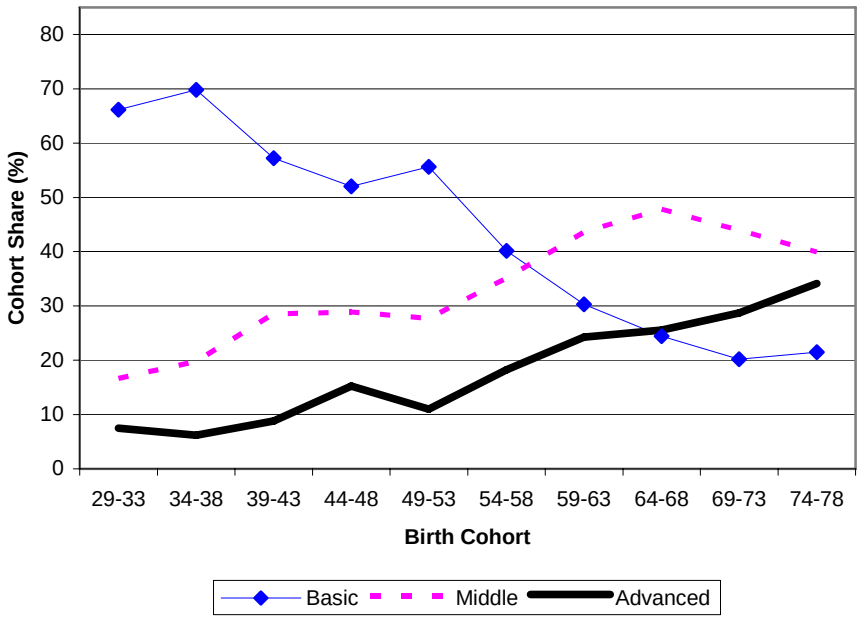
Source: (a) Federal Statistical Office, Fachserie 14 Reihe 3.1 (b)-(e) Federal Statistical Office, Fachserie 11 Reihe S.2, various years.

Figure 3 Educational Attainment by Sex and Birth Cohort

(a) Males



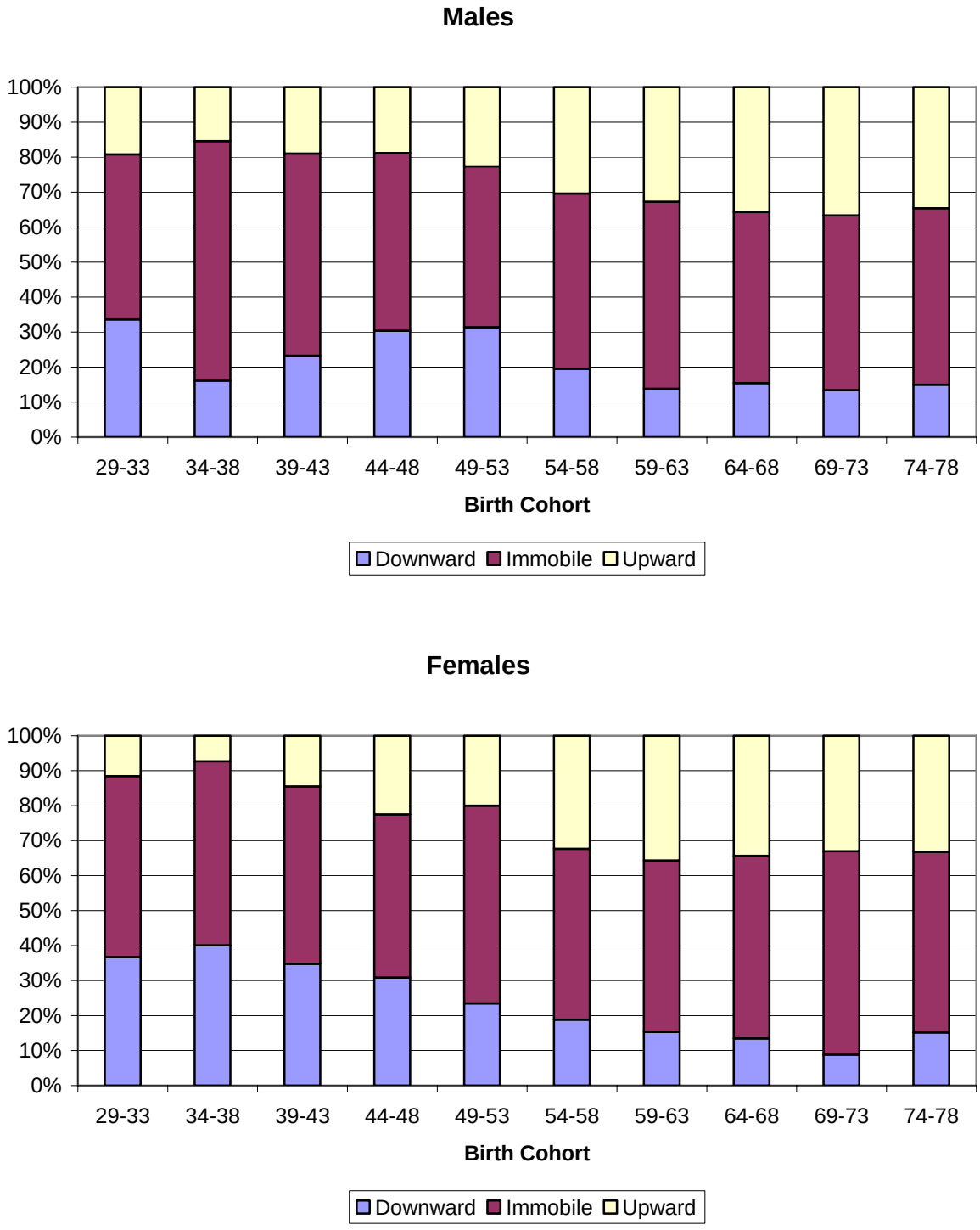
(b) Females



Note: For clarity we do not depict the share of individuals with missing education information. The share averages to about 4 percent.

Source: German Socio-Economic Panel (2003), own calculations using weighted data.

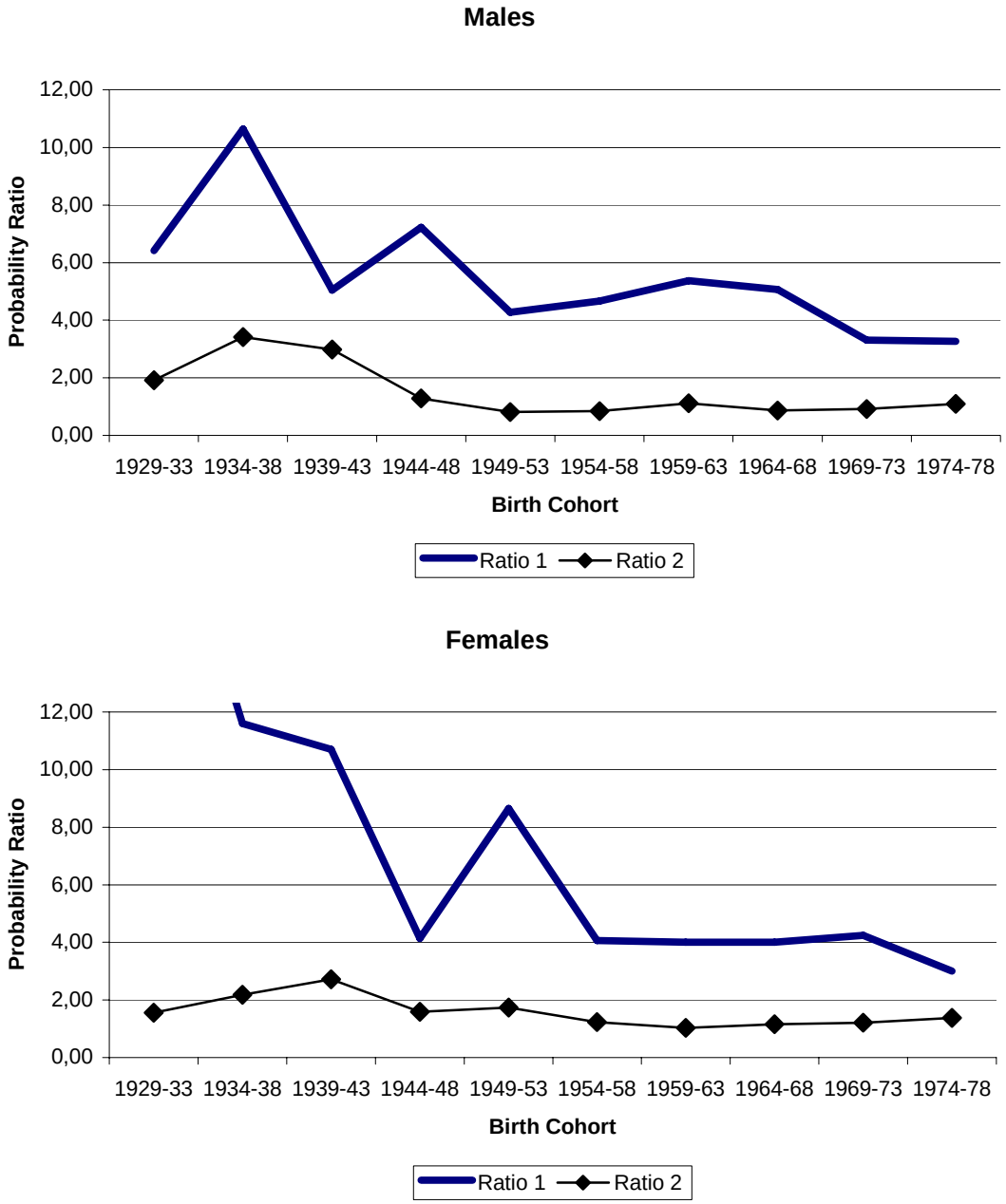
Figure 4 Educational Mobility by Sex and Birth Cohort



Note: For clarity we do not depict the share of individuals with missing education information. The share averages to about 4 percent. Downward (upward) mobility is calculated as the average value of the three entries below (above) the diagonal of the birth cohort and sex-specific transition matrices. Immobility is calculated as the average value of the three entries on the main diagonal of these matrices.

Source: German Socio-Economic Panel (2003), own calculations.

Figure 5 Relative Educational Attainment by Sex and Birth Cohort



Note: Ratio 1: P (child advanced | parent advanced) / P (child advanced | parent basic)
Ratio 2: P (child middle | parent middle) / P (child middle | parent basic)

Source: German Socio-Economic Panel (2003), own calculations.

Table 1 Hypothetical Transition Matrix

Parent	Child			
	Basic	Middle	High	
Basic	0.6	0.2	0.2	1.0
Middle	0.2	0.6	0.2	1.0
High	0.2	0.2	0.6	1.0

Table 2 Descriptive Statistics

	Mean	**Std. Dev.**	**Min**	**Max**
Age	44.537	(10.3323)	25	63
Gender: male	0.4840	(0.4997)	0	1
Birth cohort: 1940-49	0.2339	(0.4233)	0	1
Birth cohort: 1950-59	0.2811	(0.4495)	0	1
Birth cohort: 1960-69	0.3246	(0.4682)	0	1
Birth cohort: 1970-78	0.1603	(0.3669)	0	1
Childhood in rural area	0.3460	(0.4757)	0	1
Number of siblings: 0	0.1505	(0.3576)	0	1
Number of siblings: 1	0.3446	(0.4752)	0	1
Number of siblings: 2	0.2482	(0.4319)	0	1
Number of siblings: 3 or more	0.2565	(0.4367)	0	1
Education: Missing	0.0241	(0.1534)	0	1
Education: Basic	0.3634	(0.4810)	0	1
Education: Middle	0.3657	(0.4816)	0	1
Education: Advanced	0.2467	(0.4311)	0	1
Father's education: Missing	0.0964	(0.2952)	0	1
Father's education: Basic	0.6458	(0.4782)	0	1
Father's education: Middle	0.1284	(0.3345)	0	1
Father's education: Advanced	0.1180	(0.3227)	0	1
Mother's education: Missing	0.0826	(0.2753)	0	1
Mother's education: Basic	0.7021	(0.4573)	0	1
Mother's education: Middle	0.1548	(0.3617)	0	1
Mother's education: Advanced	0.0456	(0.2087)	0	1
Highest parental education: Missing	0.0729	(0.2601)	0	1
Highest parental education: Basic	0.6239	(0.4844)	0	1
Highest parental education: Middle	0.1726	(0.3779)	0	1
Highest parental education: Advanced	0.1304	(0.3367)	0	1
Federal state: Berlin	0.0275	(0.163)	0	1
Federal state: Schleswig-Holstein	0.0420	(0.2006)	0	1
Federal state: Hamburg	0.0201	(0.1405)	0	1
Federal state: Lower Saxony	0.1156	(0.3198)	0	1
Federal state: Bremen	0.0101	(0.1003)	0	1
Federal state: North-Rhine Westphalia	0.2764	(0.4472)	0	1
Federal state: Hesse	0.0898	(0.2859)	0	1
Federal state: Rhineland-Palatinate, Saarland	0.0767	(0.2661)	0	1
Federal state: Baden-Wuerttemberg	0.1473	(0.3544)	0	1
Federal state: Bavaria	0.1940	(0.3955)	0	1

Note: The sample contains 9,331 observations.
Source: German Socio-Economic Panel (2003), own calculations.

Table 3 Average Transition Matrices by Sex of Child (Birth Cohorts 1929-1978)

	Daughter			
Parent	**Basic**	**Middle**	**High**	**Total**
Basic	51.8	34.5	9.3	100
Middle	13.4	52.7	29.2	100
Advanced	7.8	36.3	52.1	100
Total	40.4	37.8	17.3	100

	Son			
Parent	**Basic**	**Middle**	**High**	**Total**
Basic	51.5	32.9	11.8	100
Middle	17.3	44.1	34.6	100
Advanced	9.4	28.5	58.1	100
Total	40.8	34.6	20.6	100

Note: The row entries do not add up to 100 percent because the share of children with missing information is not depicted.

Source: German Socio-Economic Panel (2003), own calculations.

Table 4 Baseline Specification - Educational Attainment of Birth Cohorts 1940 - 1978: Marginal Effects from Multinomial Logit Estimation

	Pr(y=basic)	**Pr(y=middle)**	**Pr(y=advanced)**
Marginal Effects			
Male	0.029***	-0.073***	0.044***
	(0.010)	(0.010)	(0.009)
Parental education: missing	0.058***	-0.054***	-0.014
	(0.020)	(0.020)	(0.020)
Parental education: middle	-0.270***	-0.000	0.274***
	(0.009)	(0.014)	(0.014)
Parental education: advanced	-0.351***	-0.145***	0.499***
	(0.007)	(0.014)	(0.015)
Birth cohort: 1950-59	-0.152***	0.066***	0.092***
	(0.012)	(0.014)	(0.015)
Birth cohort: 1960-69	-0.217***	0.131***	0.090***
	(0.012)	(0.015)	(0.014)
Birth cohort: 1970-78	-0.217***	0.104***	0.101***
	(0.012)	(0.018)	(0.017)
Number of siblings: 1	0.035**	-0.025	-0.018
	(0.017)	(0.016)	(0.013)
Number of siblings: 2	0.087***	-0.039**	-0.058***
	(0.018)	(0.017)	(0.013)
Number of siblings: 3 or more	0.200***	-0.098***	-0.115***
	(0.018)	(0.016)	(0.012)
Childhood in rural area	0.040***	0.013	-0.048***
	(0.011)	(0.011)	(0.010)
Log likelihood		-9536.4387	
Predicted Probabilities			
Pr(...| parental educ=basic)	0.453	0.380	0.142
	(0.139)	(0.093)	(0.055)
Pr(...| parental educ=middle)	0.170	0.422	0.384
	(0.091)	(0.058)	(0.087)
Pr(...| parental educ=advanced)	0.072	0.285	0.616
	(0.048)	(0.051)	(0.082)

Note: N = 9,331 observations. The estimation controlled for fixed effects at the level of federal states.

Source: German Socio-Economic Panel (2003), own calculations.

Table 5 Extended Specification - Educational Attainment of Birth Cohorts 1940 - 1978: Marginal Effects from Multinomial Logit Estimation: Adding Interactions of Parental Education with Time Trend

(a) Coefficient Estimates

	Pr(y=missing)	**Pr(y=middle)**	**Pr(y=advanced)**
Parental educ.: missing * trend	0.0034 (0.031)	0.0449*** (0.013)	0.0691*** (0.018)
Parental educ.: basic * trend	0.0312 (0.025)	0.0480*** (0.0092)	0.0294*** (0.011)
Parental educ.: middle * trend	0.0426 (0.028)	0.0430*** (0.011)	0.0291** (0.013)
Parental educ.: advanced * trend	0.0646** (0.030)	0.0219 (0.014)	0.0367** (0.015)
Log likelihood	-9504.9641		

(b) Simulation Results: Predicted Conditional Probabilities

	Year=1940	**Year=1960**	**Year=1978**	**Diff. 78-40**	Std. Err.
P(High | parents=low, year)	0.0917	0.1525	0.1549	**0.0632*** **	(0.0178)
P(High | parents=middle, year)	0.3247	0.4013	0.3908	**0.0661**	(0.0420)
P(High | parents=high, year)	0.4807	0.6392	0.6943	**0.2136*** **	(0.0503)
Diff. parents high – low	**0.3890*** ** (0.0303)	**0.4867*** ** (0.0172)	**0.5394*** ** (0.0310)		
P(Low | parents=low, year)	0.6680	0.4169	0.3083	**-0.3597*** **	(0.0288)
P(Low | parents=middle, year)	0.3120	0.1444	0.1018	**-0.2102*** **	(0.0371)
P(Low | parents=high, year)	0.1416	0.0603	0.0414	**-0.1002*** **	(0.0310)
Diff. parents high – low	**-0.5264*** ** (0.0270)	**-0.3566*** ** (0.0141)	**-0.2669*** ** (0.0206)		

Note: (i) The baseline model from Table 3 was extended by four interaction terms. Their coefficient estimates are presented above, where the outcome 'basic education' is the omitted category. (ii) Standard errors are in parentheses. The standard errors in Panel (b) are obtained via bootstrap with 500 repeated draws.

Source: German Socio-Economic Panel (2003), own calculations.

Table 6 Extended Specification - Educational Attainment of Birth Cohorts 1940 - 1978: Marginal Effects from Multinomial Logit Estimation: Adding Interactions of Sibling and Rural Origin with Time Trend

(a) Coefficient estimates.

	Pr(y=missing)	**Pr(y=middle)**	**Pr(y=advanced)**
Number of siblings=0 * trend	0.0386 (0.030)	0.0282*** (0.011)	0.0291** (0.013)
Number of siblings=1 * trend	0.0508* (0.026)	0.0444*** (0.0098)	0.0409*** (0.012)
Number of siblings=2 * trend	0.0338 (0.027)	0.0385*** (0.010)	0.0411*** (0.013)
Number of siblings=3 * trend	0.0309 (0.027)	0.0381*** (0.010)	0.0193 (0.013)
Childhood in rural area * trend	-0.0062 (0.015)	0.0157*** (0.0055)	-0.0007 (0.0069)
Log likelihood	-9511.2295		

(b) Simulation Results: Rural vs. Urban Origin

	Year=1940	**Year=1960**	**Year=1978**
P(High | urban, year) P(High | rural, year)	0.2169 0.2044	0.2672 0.2254	0.2651 0.2012
Difference	**0.0125** (0.0179)	**0.0418***** (0.0093)	**0.0638***** (0.0177)
P(Low | urban, year) P(Low | rural, year)	0.3822 0.4520	0.3364 0.3655	0.3840 0.3808
Difference	**-0.0698***** (0.0197)	**-0.0291***** (0.0099)	**0.0032** (0.0241)

(c) Simulation Results: Number of Siblings

	Year=1940	**Year=1960**	**Year=1978**
P(High | sibs3, year) P(High | sibs1, year)	0.1539 0.1929	0.1969 0.2873	0.1853 0.3189
Difference	**-0.0389**** (0.0181)	**-0.0904***** (0.0118)	**-0.1336***** (0.0245)
P(Low | sibs3, year) P(Low | sibs1, year)	0.6095 0.5133	0.4303 0.2882	0.3601 0.2003
Difference	**0.0961***** (0.0255)	**0.1421***** (0.0124)	**0.1598***** (0.0258)

Note: (i) The baseline model from Table 3 was extended by five interaction terms. Their coefficient estimates are presented above. (ii) Standard errors are in parentheses. The standard errors in Panels (b) and (c) are obtained via bootstrap with 500 repeated draws.

Source: German Socio-Economic Panel (2003), own calculations.

Table 7 Extended Specification - Educational Attainment of Birth Cohorts 1940 - 1978: Marginal Effects from Multinomial Logit Estimation: Adding Interactions of Child Sex with Time Trend

(a) Coefficient estimates

	Pr(y=missing)	**Pr(y=middle)**	**Pr(y=advanced)**
Male	0.201 (0.29)	0.0736 (0.11)	0.761*** (0.13)
Male * trend	-0.0180 (0.012)	-0.0186*** (0.0049)	-0.0335*** (0.0059)
Log likelihood	-9519.7957		

(b) Simulation Results

	Year=1940	**Year=1960**	**Year=1978**
P(High | male, year) P(High | female, year)	0.2392 0.1539	0.2926 0.2485	0.2560 0.2725
Difference	**0.0853***** (0.0137)	**0.0441***** (0.0083)	**-0.0165** (0.0169)
P(Low | male, year) P(Low | female, year)	0.4717 0.5232	0.3085 0.2714	0.3469 0.2374
Difference	**-0.0515***** (0.0187)	**0.0371***** (0.0083)	**0.1095***** (0.0189)

Note: (i) The baseline model from Table 3 was extended by one interaction term. Their coefficient estimates are presented above. (ii) Standard errors in parentheses. The standard errors in Panel (b) are obtained via bootstrap with 500 repeated draws.

Source: German Socio-Economic Panel (2003), own calculations.

Table 8 Extended Specification - Educational Attainment of Birth Cohorts 1940 - 1978: Marginal Effects Parental Education from Multinomial Logit Estimation by Child Sex

(a) Females

	Pr(y=basic)	**Pr(y=middle)**	**Pr(y= advanced)**
Marginal Effects			
Father's education: missing	0.0065	0.0085	-0.0044
	(0.0305)	(0.0343)	(0.0296)
Father's education: middle	-0.2215***	0.0441*	0.1749***
	(0.0158)	(0.0250)	(0.0241)
Father's education: advanced	-0.2751***	-0.0874***	0.3618***
	(0.0144)	(0.0274)	(0.0275)
Mother's education: missing	0.0378	-0.0412	-0.0270
	(0.0342)	(0.0366)	(0.0298)
Mother's education: middle	-0.2060***	0.0234	0.1817***
	(0.0181)	(0.0242)	(0.0225)
Mother's education: advanced	-0.2689***	-0.0718*	0.3341***
	(0.0190)	(0.0430)	(0.0431)
Log likelihood		-4748.8893	

N= 4798

(b) Males

	Pr(y=basic)	**Pr(y=middle)**	**Pr(y= advanced)**
Marginal Effects			
Father's education: missing	0.0277	-0.0137	-0.0135
	(0.0349)	(0.0357)	(0.0337)
Father's education: middle	-0.2295***	0.0306	0.2044***
	(0.0191)	(0.0249)	(0.0253)
Father's education: advanced	-0.3248***	-0.0603**	0.3857***
	(0.0172)	(0.0278)	(0.0289)
Mother's education: missing	0.0527	-0.0576	-0.0009
	(0.0383)	(0.0360)	(0.0361)
Mother's education: middle	-0.1703***	-0.0177	0.1845***
	(0.0231)	(0.0239)	(0.0243)
Mother's education: advanced	-0.1138**	-0.1467***	0.2481***
	(0.0499)	(0.0390)	(0.0478)
Log likelihood		-4648.2808	

N= 4508

Note: The baseline model from Table 3 was extended by separating fathers' and mothers' education and estimated separately for male and female youth. The marginal effects are presented above with standard errors in parentheses.

Source: German Socio-Economic Panel (2003), own calculations.

Table 9 Baseline Specification - Educational Attainment by Birth Cohort Groups

(a) Descriptive Statistics by Birth Cohort Group

	Mean (1940-52)	**Mean (1953-65)**	**Mean (1966-78)**
Gender: male	0.4998	0.4788	0.4743
Childhood in rural area	0.3504	0.3675	0.3111
Number of siblings: 0	0.1831	0.1275	0.1475
Number of siblings: 1	0.3208	0.3014	0.4312
Number of siblings: 2	0.2323	0.2719	0.2321
Number of siblings: 3 or more	0.2636	0.2990	0.1890
Education: Missing	0.0234	0.0197	0.0310
Education: Basic	0.4905	0.3443	0.2519
Education: Middle	0.2857	0.3832	0.4283
Education: Advanced	0.2003	0.2527	0.2886
Highest parental education: Missing	0.0564	0.0758	0.0868
Highest parental education: Basic	0.6585	0.6617	0.5331
Highest parental education: Middle	0.1459	0.1435	0.2426
Highest parental education: Advanced	0.1390	0.1187	0.1374
N	2905	3755	2671

(b) Marginal Effects from Multinomial Logit Estimation

	Pr(basic) 1940-52	**Pr(basic) 1966-78**	**Pr(mid.) 1940-52**	**Pr(mid.) 1966-78**	**Pr(adv.) 1940-52**	**Pr(adv.) 1966-78**
Marginal Effects						
Male	-0.0607***	0.0851***	-0.0313*	-0.1023***	0.0939***	0.0208
	(0.0208)	(0.0165)	(0.0184)	(0.0200)	(0.0147)	(0.0188)
Par. educ.: missg.	0.0670	0.0162	0.0243	-0.0510	-0.1156***	0.0325
	(0.0443)	(0.0271)	(0.0429)	(0.0380)	(0.0259)	(0.0403)
Par. educ.: mid.	-0.3249***	-0.2046***	0.0491**	-0.0549**	0.2780***	0.2603***
	(0.0228)	(0.0147)	(0.0271)	(0.0251)	(0.0283)	(0.0252)
Par. educ.: adv.	-0.4785***	-0.2451***	0.0386	-0.2768***	0.4476***	0.5144***
	(0.0172)	(0.0121)	(0.0271)	(0.0257)	(0.0283)	(0.0268)
# Sibl. = 1	0.0936***	0.0125	-0.0666***	0.0251	-0.0352*	-0.0411
	(0.0303)	(0.0262)	(0.0251)	(0.0307)	(0.0186)	(0.0265)
# Sibl. = 2	0.1219***	0.0740**	-0.0683**	-0.0047	-0.0699***	-0.0713**
	(0.0320)	(0.0313)	(0.0263)	(0.0341)	(0.0182)	(0.0276)
# Sibl. = 3 +	0.2235***	0.1700***	-0.1547***	-0.0244	-0.0833***	-0.1545***
	(0.0301)	(0.0357)	(0.0242)	(0.0361)	(0.0179)	(0.0251)
Childh: rural area	0.0904***	-0.0048	-0.0533***	0.0752***	-0.0367**	-0.0594***
	(0.0221)	(0.0175)	(0.0200)	(0.0225)	(0.0158)	(0.0207)
Trend	-0.0107***	-0.0001	0.0038	-0.0072***	0.0072***	0.0045*
	(0.0027)	(0.0022)	(0.0024)	(0.0027)	(0.0019)	(0.0025)
N	2905	2671	2905	2671	2905	2671
Log likelihood	-2806.74	-2744.74	-2806.74	-2744.74	-2806.74	-2744.74

Source: German Socio-Economic Panel (2003), own calculations.