The Making and Unmaking of Opportunity
Educational Mobility in 20th Century-Denmark
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The making and unmaking of opportunity: educational mobility in 20th-century Denmark

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Abstract
We examine trends in intergenerational educational mobility throughout the 20th century in Denmark. We demonstrate that major reforms in compulsory schooling substantially increased not only the levels of education but also intergenerational mobility in education for children born in the 1940s through to the 1960s. However, even as college education has expanded significantly for children born in the 1970s and 1980s, educational mobility has been declining. We empirically test different mechanisms that could account for this decline in educational mobility.

Keywords: Educational mobility; inequality; schooling reforms; skills
JEL classification: I21; J18; N34

1. Introduction

Inequality in educational opportunities is a major political concern. Education not only represents one of the largest public investments, with around 4 percent of GDP being invested in education in OECD countries on average (OECD, 2021), but it is also regarded as a means for enabling children from disadvantaged backgrounds to pursue lives different from those of their parents. In this context, Denmark is often viewed as an exemplary case. It is characterized by a range of public policies, aimed at promoting equal opportunity among individuals from various family backgrounds (Mogstad and Torsvik, 2023). However, like most European countries, Denmark did not implement such policies until the introduction of major compulsory schooling reforms in the middle of the 20th century.¹ Subsequent research has shown

¹There is a large body of literature that has studied these reforms. One strand (e.g., Currie and Moretti, 2003; Meghir and Palme, 2005; Piopiunik, 2014) has studied direct reform effects on

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that the period following these reforms was characterized by increased social mobility (Björklund et al., 2009; Breen et al., 2009; Pekkarinen et al., 2017; Nybom and Stuhler, 2023). Yet, little evidence exists on the direct impact of these schooling reforms on educational mobility, or whether reform effects persist in the longer run.2

This paper studies intergenerational educational mobility for the generations born throughout most of the 20th century, using full population data supplemented by historical survey data. We first show how schooling reforms have led to increasing mobility. Thus, we contribute to the literature studying the effects of schooling reforms and intergenerational mobility by providing novel evidence of the causes and mechanisms behind changes in educational mobility across a century. The first reform in 1958 entailed large investments in educational infrastructure, including the construction of new schools and hiring of teachers, particularly in rural areas. The second reform, in 1972, changed the length of compulsory schooling from seven to nine years. We provide the first estimates of the effects of these reforms on educational mobility and document how the reforms have increased completion rates beyond the targeted grade levels (as also observed by, e.g., Meghir and Palme, 2005).

Having documented how reforms targeting the lower end of the education distribution led to increased mobility, we demonstrate that a reversal has occurred in recent decades. In line with evidence from Denmark and Norway concerning income mobility (Markussen and Roed, 2019; Harding and Munk, 2020), educational mobility has been declining, regardless of how we define or measure education and mobility. Therefore, in a broader context (and as observed by Shavit and Blossfeld, 1993), the high levels of educational mobility seen in the decades following the schooling reforms appear to be an exception rather than the norm. Examining three potential mechanisms behind the recent decline in mobility (drawing on Becker and Tomes, 1986; Nybom and Stuhler, 2023), we find that this decline cannot be attributed solely to the dynamic effects of earlier schooling reforms or changes in the returns to education. Instead, our results suggest that an increasing importance of non-cognitive skills in the intergenerational transmission of education partly explains the decline in mobility.

The paper proceeds as follows. In Section 2, we present the data and key definitions. In Section 3, we introduce trends in educational attainment

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2Nybom and Stuhler (2023) and Blanden and Macmillan (2016) study these questions for Sweden and the UK, respectively. Nybom and Stuhler analyze short- to medium-run effects of a Swedish reform, and they also cite the working paper version of our paper.

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and mobility across the 20th century. In Sections 4 and 5, we link schooling reforms to increasing mobility for cohorts born from the 1940s to the 1960s. In Section 6, we investigate the recent declining mobility for cohorts born from the 1970s onward, and we explore potential mechanisms. We conclude in Section 7.

2. Data and key definitions
2.1. Data sources and samples

We analyze full population register data for Danes born in 1921–1989.3 From the demographic register we obtain date and parish of birth, allowing us to analyze differences in education across place of birth for the entire population born throughout most of the 20th century. We merge these data with the education register, which is available from 1981 to 2020 with information on completed education. For cohorts born from 1956 onward, individuals’ unique identifiers can be linked to parents’ unique identifiers, allowing us to measure parents’ education as well.4 Online Appendix C.1 provides further details.

To study income-schooling associations, we add information on income (wage earnings, self-employment income, and capital income from the income register). To examine reform effects on skills, we merge the register data with cognitive test scores for all men born from 1939 onward.5 We supplement this with data from the Danish Longitudinal Survey of Youth (DLSY) and the Danish Longitudinal Survey of Children (DALSC). These surveys are based on cohorts from 1954 and 1995, respectively, and include the same non-cognitive skill measure (Rosenberg’s self-esteem scale; Rosenberg, 1965), facilitating a direct comparison of the association between education and skills across 40 years.

Because parents and children cannot be linked in the register for children born before 1956, we use surveys as a supplementary data source for cohorts

3We omit immigrants and descendants from our analyses.
4As the register data are first available in 1980, our data are based on individuals surviving to 1980. Figure A.1 presents the register data sample size by birth cohort. Cohort sizes vary from 42,000 to 82,000.
5This includes test scores for the 1989 cohort provided by the Ministry of Defense and The Danish Conscription Database (Department of Public Health, University of Copenhagen; Christensen et al., 2015) for the 1940–1958 cohorts. The test consists of four types of tasks related to logical reasoning: abstract reasoning (as in IQ tests), verbal ability, numerical ability, and spatial ability. The test is highly correlated with IQ (a correlation of 0.82; Mortensen et al., 1989) and taps into several key abilities for performance in school. We standardized the test (mean = 0, sd = 1) based on the 1940–1958 cohorts.
Educational mobility in 20th-century Denmark

born early in the 20th century. We select them based on three criteria: (i) they must be nationally representative; (ii) they must contain information about the education of both the child (respondent) and parent; and (iii) the education categories in the surveys must be sufficiently detailed to identify the main changes across the first half of the 20th century. These criteria resulted in seven surveys. In addition to information about own and father’s schooling, the survey data include information on respondents’ region of birth, which identifies individuals born in urban or rural areas. The pooled data comprise 8,620 respondents born in 1911–1976 (around 6,000 respondents born in 1911–1955). Online Appendix C.4 details the data for Denmark. We also report trends in educational mobility for Norway, Sweden, and the United States. Results from the two former countries are based on Nybom and Stuhler (2023) and Pekkarinen et al. (2017), respectively. Results for the US are based on the General Social Survey (described in Online Appendix C.5).

2.2. Measuring education

Figure A.2 provides a stylized illustration of the Danish education system. Before the 1972 compulsory schooling reform, students had to decide whether to leave school after seven years (primary school), complete nine years of schooling (lower secondary school), or complete a vocational apprenticeship-based degree. After the reform, students had to decide whether to leave school after nine years of schooling (lower secondary school) or continue to upper secondary education, which consists of either an academic high-school track (the Gymnasium) or a vocational apprenticeship-based track. Completing the academic high-school track makes students eligible for enrolling in tertiary education (college or university). Our primary measure of education is years of schooling measured as the minimum number of years required to complete the highest degree. We measure parents’ years of schooling as the average of the mother and father, but in analyses involving absolute mobility and/or

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6College in Denmark consists of two branches: semi-professional degrees of three to four years’ duration and bachelor degrees feeding directly into master’s programs of five to six years’ duration.

7For example, a three-year college degree takes 9 (compulsory schooling) + 3 (academic high school) + 3 (college) = 15 years. We measure children’s education at age 30 and parents’ education in the year the child turns 15. Figure A.3 shows that whether we measure child schooling at age 30 or 32, and whether we measure parental schooling at child ages 5, 12, or 15 do not affect the overall results. Because the education register is available only from 1981, we can only measure parents’ schooling at child age 15 from the 1966 birth cohort onward. For earlier cohorts, we measure parents’ educational attainment in 1981.

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categorical educational degrees, we use the highest level attained by either parent.8

2.3. Measuring educational mobility

Intergenerational educational mobility can be defined in several different ways (Online Appendix B presents the formal definitions of all measures used in this paper). We consider both absolute and relative mobility. Absolute mobility refers to any discrepancy in education between parents and children, e.g., the fraction of children with more schooling than their parents (upward mobility). Relative mobility refers to the association between parents’ and children’s schooling net of changes in the marginal distribution between generations. A widely used measure is the slope estimate from a regression of children’s years of schooling on parent years of schooling, which is a measure of the portion of inequality in parents’ schooling that is passed on to children’s schooling, on average, net of changes in average schooling from the parent to the child generation. The Pearson correlation coefficient nets out differences in the variance of parents’ and children’s schooling, and is closely related to the regression slope (the regression slope equals the correlation coefficient multiplied by the ratio of the standard deviations of children’s over parents’ years of schooling). The Spearman correlation coefficient captures the correlation between children’s and parents’ education ranks.

Another approach is to estimate mobility in discrete education levels. For this measure, absolute mobility is defined as any discrepancy in degrees between parents and children (e.g., the fraction of children with a higher degree than their parents). Relative mobility is often defined as odds ratios obtained from cross-classifying parents’ and children’s education levels, with the unidiff or “log-multiplicative layer-effect” model being a generalization that summarizes how the overall parent–child association in education (expressed in odds ratios) changes over time (Xie, 1992). Finally, sibling correlations in years of schooling provide a different way of gauging the overall importance of family background and local community for educational attainment. In contrast to the other measures, the sibling correlation does not depend on the distribution of parents’ schooling, a property we later exploit.

Despite the varying implications and interpretations of each measure, our analyses demonstrate that the trends observed throughout the 20th century remain consistent regardless of the measure employed. Sections 4 and 5 examine the role played by large schooling reforms in increasing

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8Measuring parents’ schooling in terms of their highest or average does not change any of the over-time trends we report in this paper. Regression coefficients are slightly larger for the average than for the highest.
mobility during the middle of the century. Section 6 examines the declining mobility for the youngest cohorts, and links this decline to the changing role of skills.

3. Trends in educational attainment and mobility

We first present the main trends in education levels over the 20th century to showcase the main transitions that the remainder of the paper will analyze.

Figure 1(a) shows average years of completed schooling and the highest completed education levels for cohorts born 1921–1989. Average years of schooling increased by about four years during the period in question. For those born in 1921–1957, the downward trend in the percentage with no more than seven years of schooling dominates: 60 percent of the 1921 birth cohort completed no more than seven years of schooling, while 40 percent of the 1941 cohort and only 5 percent of the 1956 cohort did so. For cohorts born in the middle of the 20th century onward, high school (vocational and academic) is the most prevalent highest education level, while college and university degree have increased for cohorts born from the mid-1960s onward.

Figure 1(b) shows the corresponding evolution, focusing on the fraction completing at least a given degree, to illustrate what parts of the education distribution have been expanding at different times. For example, high school completion rates increased by 10–15 percentage points for those born during the first half of the century, and more rapidly for those born during the 1950s to mid-1960s (30 percentage points). Cohorts born from the late 1960s through to the 1980s experienced significant expansion at the college and university levels: the percentage obtaining a college degree or higher increased from 15 percent in the 1965 birth cohort to almost 45 percent in the 1989 cohort, while the percentage completing a university degree quadrupled between cohorts born in the late 1960s through to the late 1980s.

Figure 1(c) provides a first illustration of how the expansion of education at different margins over the century is linked to overall trends in educational mobility. The figure shows the fraction of children completing at least nine years of schooling and the fraction completing at least college, separately for children whose parents were among those with the least education (bottom 30 percent within each cohort bin) and for children whose parents were among those with highest education (top 30 percent within each cohort). The figure shows a large gap in completion of at least nine years of schooling of around 40 percentage points for cohorts born in the first half of the century. However, from cohorts born in the 1940s, the gap closes within 10–15 years. In contrast, the college completion gap grows slowly until cohorts born in the
Figure 1. Education levels by child birth year

(a) Education levels and years of schooling

(b) Aggregate education levels

(c) Education levels by parents’ education

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Figure 1. Continued

Estimate

|---------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| (d) Children’s years of schooling regressed on parents’ years of schooling

Notes: Panel (a) shows the highest completed education and years of schooling by child birth cohort. Panel (b) shows aggregate education levels by birth cohort: lower secondary, 8–11.9; high school: 12–14.9; college, 15–16.9; university, 17–21.5 years. Panel (c) shows the fraction of children completing nine years of schooling and college by child birth cohort and parents’ education (bottom 30 percent and top 30 percent in each child birth cohort; we solve ties in the assignment to bottom or top 30 percent by random draws among the tied parents). Panel (d) shows educational mobility estimated as $\beta_t$ in $E_{Ct} = \alpha_t + \beta_t E_{Pit} + u_{it}$, where $E_{Ct}$, $E_{Pit}$ are years of schooling of children and parents (the average of the father and mother) in cohort bin $t$.

late 1960s. For subsequent cohorts, the gap widens significantly, particularly as a result the rapid growth among children born to well-educated parents, resulting in a gap of approximately 30 percentage points among those born in the mid-1980s.9

The differences in educational attainment by family background reported in Figure 1(c) are reflected in the rates of estimated educational mobility based on regression coefficients from children’s years of schooling regressed on parents’ equivalent, which we present in Figure 1(d).10 The figure shows that estimated mobility is low for the oldest cohorts with a coefficient of around 0.50. For cohorts born between the mid-1940s and late 1950s, the coefficients decrease (mobility increases) rapidly. Comparing cohorts born in

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9Our description of Figure 1(c) focuses on absolute differences. In Section 6.1, we show that conclusions remain the same when we focus on relative changes (odds ratios) by parents’ education levels.

10Table A.1 presents the estimates of educational mobility in Denmark reported in earlier studies along with our corresponding estimates. We have limited our comparison to studies with results that are directly comparable to this paper’s results. Our estimates correspond very closely to those reported in earlier studies.
1936–1942 with those born in 1943–1949, regression coefficients drop from around 0.60 to 0.45, and for cohorts born in the early 1960s, the regression coefficient decreases to a level of around 0.30. Thus, intergenerational educational mobility increased substantially over roughly 30 years, with rates of transmission being halved. Yet, as Figure 1(d) also shows, cohorts born in the 1970s and 1980s see a reversal in the trend with significantly decreasing educational mobility.

4. Increasing mobility: expansion in rural areas

This section analyzes the 1958 schooling reform, which accounts for a large part of the mobility increase observed for cohorts born during the middle of the 20th century (Figure 1(d)). Section 4.1 describes the reform, Section 4.2 presents the direct reform effects on education along with balancing tests, and Section 4.3 presents the reform’s impact on mobility.

4.1. Background

Until 1958, the Danish school system was divided into a rural and an urban system. In the rural system, children had very few opportunities for continuing into lower and upper secondary education after primary school. Schools in rural areas only provided schooling from grades 1–7, adolescents constituted a substantial share of the labor force, and few peasant families could afford to lose able workers (by sending them to school). During the 1940s and 1950s, pressure for a modernization of the education system was building. The result was the “1958 reform”, which abolished the rural school system such that Denmark now had one unified system (Gjerløff et al., 2014). The reform had two components.

(i) Expanded access to schooling. Rural municipalities (the local government) should offer lower secondary schooling such that all children could pursue schooling beyond grade 7. The first cohort affected by the expansion of access to schooling was the 1943 cohort, but some born in 1942 (or even in 1941) were affected because they were redshirted in grades 1–7 or utilized the access to grades 8 and 9 to re-enroll in school after dropping out.

(ii) Improved quality of schooling. Pre-reform, children in rural areas were taught together with younger and older cohorts without any age-specific teaching material, and there were substantially fewer school days per year to allow children to help with household chores and labor. Post-reform, all children attended age-appropriate grade levels with corresponding
teaching material, and the number of school days were aligned with urban areas. Exposure to reform component (i) was binary (either with or without access to grades 8 and 9). For reform component (ii), however, children in rural areas were gradually exposed; those enrolled in grade 7 at the time of the reform had one to three years of exposure to the improved school quality while those about to start school had seven to nine years of exposure.

Figure A.4 in the Online Appendix illustrates the changes in Danish schools’ teaching resources following the reform. Figure A.4(a) shows that expenditures per child aged 7–16 increased substantially from 1958 onward. Similarly, Figure A.4(b) shows that the child-to-teacher ratio (counting all children aged 7–16 and not only those enrolled in school as that number was affected by the reform) from around 33 children per teacher before the reform to a level below 25 after the reform. The gradual changes in resources in Figure A.4 likely reflect the reform-induced, large-scale construction of new schools and recruitment of teachers.

The estimated effects reflect the different reform components and the roll-out period. An immediate effect likely results from the formal access to schooling while a gradually increasing effect over time instead suggests that the improved schooling quality which cohorts were gradually exposed to (perhaps with a delay due to the gradual roll-out) drives the effects.

4.2. Direct reform effects on education

Figures 2(a) and (b) show the average years of schooling and the fraction with only seven years of schooling for cohorts born in the years 1921–1965 separately for those born in rural and urban areas. Educational attainment was increasing among cohorts born in both urban and rural areas in the 1920s and 1930s, but with a large rural–urban gap. On average, children born in rural areas completed around one year less of schooling compared with children in urban areas, and they were approximately 20 percentage points more likely to complete no more than seven years of schooling. However, beginning with children born in the early 1940s (coinciding with the implementation of the 1958 reform, as we show below), a strong convergence between rural and urban areas begins, following a kink in the educational attainment trends, with trends being much steeper among children born in rural areas.

We estimate reform effects by difference-in-differences (DiD) comparing outcomes for children born in rural areas with children born in urban areas across year of birth. Let $Y^C_i$ be individual $i$’s education, YoB$_i$ an indicator equal to 1 if $i$ was born in three-year bins from 1925–1927 to 1958–1960, and rural$_i$ an indicator equal to 1 if $i$ was born in a rural area:
**Figure 2.** Education by region year of birth and placebo reforms

![Graph showing education by region and year of birth](image)

**Notes:** The figure shows (a) average years of schooling and (b) the fraction with seven years of schooling, by urban or rural origin and by birth cohort from 1921 to 1962.

\[ Y_i^C = \sum_{t=1925-27}^{t=1958-60} \alpha_t \cdot YoB_i + \sum_{t=1925-27, t\neq 1937-39}^{t=1958-60} \beta_t \cdot YoB_i \cdot rural_i + \gamma \cdot rural_i + \epsilon_i. \]  

(1)

Here, \( \alpha_t \) captures the average outcome in urban areas in year-of-birth bin \( t \), and \( \beta_t \) captures the difference between rural and urban areas in year-of-birth bin \( t \) relative to the difference for children born in 1937–1939. Estimates of \( \beta_t \) from equation (1) are the causal effect of the 1958 reform if the outcomes in urban and rural areas followed parallel trends pre-reform (and would have...
Educational mobility in 20th-century Denmark continued to do so in the absence of the reform).\textsuperscript{11} All estimates of $\beta_t$ (see below) follow similar pre-reform trends in urban and rural areas, respectively. Moreover, Figure A.4 shows that school expenditures were stable in the years leading up to the reform.

Figure A.5(a) shows by quarter of birth the gender composition and the fraction born in rural areas, and Figure A.5(b) shows the sample density. The fraction of males is completely stable at roughly 0.505, the fraction born in rural areas is steadily declining (reflecting the increased flow towards urban areas during the period), and the sample density is steadily increasing until 1947 when it starts to decline slightly. We also conduct a placebo test in which we randomly assign region of birth to individuals and estimate equation (1) with years of schooling as outcome to assess whether the estimated reform effects are likely to reflect random sample variation. Figure A.5(c) shows the cumulative distributions of the estimates following 1,000 repetitions along with vertical dashed lines indicating the actual estimates (which we present in detail below). The figure shows that the estimated “effects” from the placebo assignments for the 1943–1945, 1946–1948, 1949–1951, and 1952–1954 cohorts, respectively, are centered around zero while the actual estimated effects of the reform are positive, increasing across cohorts, and therefore not reflecting random sample variation.

To further assess whether our estimated reform effects simply capture one out of several changes in convergence between rural and urban areas, Figure A.6 presents a placebo test in which we estimate kinks in the difference between average years of schooling in rural and urban areas for different cohorts. We thereby test where in Figure 2 convergence between rural and urban areas starts/changes. Figure A.6 shows that there is one global maximum – exactly at the timing of the reform – while estimates for other points in time converge towards zero. Thus, there are no other changes in convergence than the reform.

Figure 3 shows the estimated reform effects based on equation (1). Rural–urban differences are stable in the pre-reform period for all outcomes, supporting the validity of our strategy (although we cannot verify that pre-reform trends would have continued absent the reform).

Figure 3(a) shows the effects on years of schooling. The gradually increasing estimates suggest that school quality (and not simply access to grades 8 and 9) drives the effects. Following a borderline significant estimate for children born in 1940–1942 (reflecting that some returned to school as a result of improved access caused by the reform), estimates increase from year

\textsuperscript{11}As grade 9 was available in some rural parishes (and some children may have been able to commute to cities) before the reform, our specification will likely result in a lower bound of the actual reform effect.

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Figure 3. Effects of 1958 reform on education, cognitive test scores, and income.
Figure 3. Continued

Notes: The figure shows the effects of the 1958 reform (with vertical lines marking the first cohorts exposed to the reform) on (a) years of schooling, (b) education levels, (c) cognitive test scores (standardized to mean = 0, sd = 1), (d) test score quintile dummies, (e) income ranks, and (f) income quartile dummies. Estimates based on administrative register data. Standard errors are clustered at the level of birth parish.

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to year until they trail off for cohorts born in the mid- and late-1950s, with an increase of almost one year of schooling in rural areas compared with urban areas.

Figure 3(b) presents the corresponding estimates for different education levels. The figure shows that the reform resulted in an increase of roughly 5 percentage points to the fraction of children completing nine years of schooling as their highest level. The main effect on years of schooling is driven by completion of vocational degrees, a finding that suggests that the reform also acted as a stepping stone towards higher levels of education, although the reform did not affect the fraction completing academic high school or college.

When we consider conscription test scores, the data are only available for cohorts 1940 onward, and we use cohorts born in 1940–1942 as the index period. Figure 3(c) shows that the reform effect on test scores gradually increases over time. Figure 3(d) assesses where in the distribution the reform affected test scores by showing the corresponding estimates using dummies for test scores equal to or higher than each quintile (in the full distribution of test score data) $1[\text{test score quint.} \geq x]$ varying $x$ from 2 to 5. The figure shows that the reform improved children’s skills gradually with the earliest onset in the bottom of the test score distribution. For example, the probability that children are in the second to fifth quintile (i.e., not in the first quintile) increases by 5 percentage points with significant estimates shortly after reform implementation, while the probability of scoring in the fifth quintile are not significantly different from zero until cohorts born around 1950 (i.e., for children who have been fully exposed to the reform from grade 1 onward). Thus, the least able students experienced improvements from reform exposure immediately after the reform, whereas the most able students’ skills were only improved from reform exposure after the reform was fully implemented.

The reform also affected income. Figure 3(e) shows that the average income rank of children from rural areas increased by 3 percentiles compared with children from urban areas, eliminating most of the pre-reform gap of 4–5 percentiles. Figure 3(f) presents the effects across different income quartiles by using as outcome dummies indicating if income quartile is equal to or greater than a given level $x$, $1[\text{inc. quart.} \geq x]$. The reform increased the income of children from rural areas compared with children from urban areas.

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12 We measure income as the within-cohort rank (in the full population sample) at age 40 in 1980 (the first year of income data) for cohorts born before 1940 (similar results if we define ranks by cohort and gender).

13 While the reform reduced income differences by region of birth, the effects by region of residence as an adult are ambiguous, as the effects on individuals’ income may be related to out-migration from rural areas.
4.3. Reform effects on inequality in education and mobility

We now turn to the 1958 reform’s effects on educational mobility among the group of children directly affected by the reform. As the full population register data do not contain links between children and parents earlier than the 1956 cohort, we rely instead on representative survey data described in Section 2. We consider three different measures: (i) the reform effect on $p(\text{years of schooling } \geq 9)$ for children whose parents have less than or at least nine years of schooling; (ii) the reform’s effect on upward absolute mobility; and (iii) the reform’s effect on the regression coefficient between children’s and parents’ years of schooling. We estimate the two former mobility measures by a DiD strategy as presented in equation (2) in which we compare rural–urban differences in outcomes $Y^C_i$ in the last nine cohorts before the reform implementation (1934–1942) with the first nine cohorts born after the implementation (1943–1951) indicated by a reform dummy $ref_i = 1[\text{YoB}_i \geq 1943]$. To estimate reform effects on the regression coefficient between children’s and parents’ years of schooling ($Y^C_i$, $Y^P_i$), we extend the framework and add interactions involving parents’ education, as shown in equation (3),

\begin{align*}
Y^C_i &= \gamma_0 + \gamma_1 \cdot ref_i + \gamma_2 \cdot \text{rural}_i + \gamma_3 \cdot \text{rural}_i \cdot ref_i + \epsilon_i, \quad (2) \\
Y^C_i &= \tilde{\gamma}_0 + \tilde{\gamma}_1 \cdot ref_i + \tilde{\gamma}_2 \cdot \text{rural}_i + \tilde{\gamma}_3 \cdot \text{rural}_i \cdot ref_i + \gamma_0 \cdot Y^P_i \\
&\quad + \tilde{\gamma}_1 \cdot ref_i \cdot Y^P_i + \tilde{\gamma}_2 \cdot \text{rural}_i \cdot Y^P_i + \tilde{\gamma}_3 \cdot \text{rural}_i \cdot ref_i \cdot Y^P_i + \epsilon_i, \quad (3)
\end{align*}

where $\gamma_3$, $\tilde{\gamma}_3$ capture the reform effects. Table 1 presents the estimates. Columns 1 and 2 present the estimates of $\gamma_0-\gamma_3$ from equation (2) on whether a child has completed at least nine years of schooling, and Column 3 presents estimates of $\gamma_0-\gamma_3$ from equation (2) on upward mobility. Column 4 shows the estimates of $\gamma_0-\gamma_3$ from equation (3) on relative mobility.\(^{14}\)

The table shows that significant rural–urban gaps were in place before the reform ($\gamma_2$). However, these gaps were eliminated by the reform ($\gamma_3$). For example, Column 3 shows that the percentage experiencing upward mobility increased by 14 points on average in rural areas relative to urban areas in the first nine cohorts affected by the reform. Similarly, Column 4 shows that

\(^{14}\)Pekkarinen et al. (2009) and Büttikofer et al. (2022) use a similar DiD strategy to study a Finish school reform on income mobility and the effects of Norwegian oil booms on social mobility, respectively.

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Table 1. Effects of the 1958 schooling reform on intergenerational mobility

<table>
<thead>
<tr>
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<th>(1) Child years of schooling ≥9, low-educated parents</th>
<th>(2) Child years of schooling ≥9, not low-educated parents</th>
<th>(3) Upward mobility</th>
<th>(4) Regression coefficient, child and parents’ years of schooling</th>
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<tr>
<td></td>
<td>(0.034)</td>
<td>(0.029)</td>
<td>(0.026)</td>
<td></td>
</tr>
<tr>
<td>γ₃ (reform eff.)</td>
<td>0.240***</td>
<td>0.057</td>
<td>0.135***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.050)</td>
<td>(0.037)</td>
<td>(0.037)</td>
<td></td>
</tr>
<tr>
<td>̴γ₀ (intercept × Yₚ)</td>
<td></td>
<td></td>
<td></td>
<td>0.469***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.040)</td>
</tr>
<tr>
<td>̴γ₁ (time diff. × Yₚ)</td>
<td></td>
<td></td>
<td></td>
<td>-0.034</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.055)</td>
</tr>
<tr>
<td>̴γ₂ (Ru–Urb diff. × Yₚ)</td>
<td></td>
<td></td>
<td></td>
<td>0.149**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.051)</td>
</tr>
<tr>
<td>̴γ₃ (reform eff. × Yₚ)</td>
<td></td>
<td></td>
<td></td>
<td>-0.143*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.072)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,647</td>
<td>1,242</td>
<td>2,889</td>
<td>2,889</td>
</tr>
</tbody>
</table>

Notes: In Columns 1 and 2, the outcome is the share of children with nine or more years of schooling (i.e., at least lower secondary). Column 1 shows the results for children whose parents have less than nine years of schooling (“low-educated parents”). Column 2 shows the results for children whose parents have at least nine years of schooling (“not low-educated parents”). In Column 3, the outcome is absolute upward mobility (children completing more years of schooling than their parents). In Column 4, the outcome is the slope from regressing children’s years of schooling on parents’ equivalent. We use a bandwidth of nine birth cohorts on both sides of the reform and Huber/White robust standard errors. * p < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001.

The regression coefficient between children’s and parents’ years of schooling decreased by around 0.14. Using the decomposition of aggregate effects into group-specific components in Hertz (2008), we find that the reform...
increased upward mobility increased by 8 percentage points and reduced the regression coefficient between children’s and parents’ years of schooling by 0.09 at the national level. Moreover, the reform effects being largely concentrated among children growing up in low-educated families illustrates the mobility-promoting impact of the reform. In sum, the 1958 reform had substantial impacts on not only levels of education but also both absolute and relative educational mobility.

5. Increasing mobility: compulsory schooling

We next turn to the 1972 compulsory schooling reform, which drives the observed trend for cohorts born during the late 1950s (see Figure 1(d)). We first describe the reform in Section 5.1. Here, we also present balancing tests and a visual illustration of the discontinuous increase in education. We then present the direct effects of the reform on educational attainment in Section 5.2, and finally Section 5.3 presents the reform effects on educational mobility.

5.1. Background

The percentage completing no more than nine years of schooling continued to decline in the years following the 1958 reform (see Figure 2). However, it was not until the “1972 reform” that the minimum years of compulsory schooling increased from seven to nine (see de Coninck-Smith and Rasmussen, 2015). The 1972 reform did not include any further changes (such as funding or curriculum). The reform was announced in 1972 and implemented in 1974, making the 1959 birth cohort the first cohort to be affected by the full implementation of the reform as this cohort had only reached grade 7 by the time of the reform’s implementation. However, the reform also affected cohorts born in 1957 and 1958 (i.e., cohorts who had not yet completed nine years of schooling at the announcement of the reform), as the reform stipulated children had to complete at least nine years of schooling even if they had dropped out (or planned to do so).

Figure 4(a) presents years of schooling and the fraction with only seven years of schooling by quarter of birth for children born in 1953–1961.
Figure 4. Outcomes and covariates, around the 1972 reform by birth quarter, and placebo reforms

(a) Years of schooling/fraction with only seven years of schooling

(b) Cognitive test score/income

(c) Gender
Notes: (a) Average years of schooling and the fraction that only complete seven years of schooling. (b) Average cognitive test scores (standardized to mean = 0 and sd = 1 in the data from 1940 to 1958) and ln(income). (c) Gender composition. (d) Parents’ years of schooling by birth quarter. (e) Sample density by birth quarter. (f) Estimates and 95 percent confidence intervals from placebo reforms from 1953 to 1961. Tests for discontinuity: parents’ years of schooling 0.009 (0.013); gender 0.001 (0.001); sample density −0.011 (0.009) following McCrary (2008).

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The figure shows an upward trend in years of schooling interrupted by a discontinuity at 1957 along with a downward trend in the fraction completing no more than seven years of schooling, leading up to a discontinuity at 1957. Thus, the figure clearly shows that the main reform response kicked in for the 1957 cohort, although the fraction completing only seven years of schooling did not reach zero until the 1958 cohort, reflecting the staggered implementation for those already in grades 8 and 9 at the announcement of the reform. Figure 4(b) presents the corresponding levels of cognitive test scores and income. Here, we do not observe changes across reform implementation.

### 5.2. Direct reform effects on education

We estimate the effect of the 1972 reform using a regression-discontinuity design (RDD),

\[ Y_i^C = \beta_0 + \beta_1 \cdot z_i + \beta_2 \cdot z_i \cdot 1[z_i \geq \text{reform}] + \beta_3 \cdot 1[z_i \geq \text{reform}] + q_i + \epsilon_i, \]

where \( z_i \) counts time of birth relative to the reform and \( 1[z_i \geq \text{reform}] \) is a dummy indicating reform exposure (born 1957 or later). The estimate of \( \beta_0 \) captures the pre-reform level of \( Y_i^C \), \( \beta_1 \) and \( \beta_2 \) capture any pre- and post-reform trends in \( Y_i^C \), and \( \beta_3 \) captures the effect of the reform on \( Y_i^C \) under the assumption that the reform did not coincide with any discontinuities in children’s characteristics and the sample density. \( q_i \) is quarter of birth dummies (q1–q4).

Figures 4(c) and (d) present the average gender composition and parents’ years of schooling, respectively, by birth quarter around the implementation of the 1972 reform. Figure 4(e) presents the corresponding sample density. There is no sign of any discontinuities (the corresponding tests all have \( p \)-values > 0.25). Figure 4(f) presents the point estimates and 95 percent confidence intervals from placebo reforms where we have estimated equation (4) but changed the reform dummy and running variables (\( 1[z_i \geq 0], z_i^{\text{pre}}, z_i^{\text{post}} \)) as if the reform took place in a different time. The figure shows that the estimates quickly converge to zero as we move the placebo reforms away from the actual reform (the negative placebo estimates reflect the tilted linear running variables when placebo reforms deviate from the actual discrete jump in the outcome).

Table 2 shows the estimated reform effects on children’s years of schooling, the fraction completing at least nine years of schooling, cognitive test scores, and income. We use \( \ln(\text{income at age 36–40}) \) as “cohort” defines reform exposure, making within-cohort ranks unsuitable.

---

16We use \( \ln(\text{income at age 36–40}) \) as “cohort” defines reform exposure, making within-cohort ranks unsuitable.
Table 2. Effects of the 1972 reform on education, cognitive test scores, and income rank: direct effects

<table>
<thead>
<tr>
<th></th>
<th>Child years of schooling</th>
<th>Child years of schooling ≥ 9</th>
<th>Cognitive test scores</th>
<th>ln(income)</th>
</tr>
</thead>
<tbody>
<tr>
<td>β₃ (reform effect)</td>
<td>0.237**</td>
<td>0.041*</td>
<td>−0.015</td>
<td>−0.011</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.006)</td>
<td>(0.009)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Observations</td>
<td>560,345</td>
<td>560,345</td>
<td>155,117</td>
<td>550,508</td>
</tr>
</tbody>
</table>

Notes: The estimated reform effects using an RDD estimation strategy, based on equation (4) using a bandwidth of ±3 birth cohorts around the reform and quarter of birth in each cohort as running variable while controlling for birth quarter (q1–q4) fixed effects (except for cognitive test scores, where the bandwidth post-reform is limited due to lower test score availability). We cluster standard errors at the level of the running variable. * p < 0.1; † p < 0.05; ** p < 0.01; *** p < 0.001.

and income. Columns 1 and 2 show that the reform increased years of schooling by 0.24 (corresponding to estimates in, for example, Arendt et al., 2021) and the fraction with at least nine years of schooling by 4 percentage points. Yet, Columns 3 and 4 show that the reform did not affect cognitive test scores or income.

5.3. Reform effects on inequality in education and mobility

We estimate effects of the reform on three measures of educational mobility: the fraction completing at least nine years of schooling by parents’ education level, the fraction of upwardly mobile, and the regression coefficient between children’s and parents’ years of schooling. For the two former measures, we estimate equation (4). To estimate the change in regression coefficients, we expand equation (4) with interaction terms of parents’ years of schooling $Y_P$,

$$Y_i^C = \tilde{\beta}_0 + \tilde{\beta}_1 \cdot z_i + \tilde{\beta}_2 \cdot z_i \cdot 1[z_i \geq \text{reform}] + \tilde{\beta}_3 \cdot 1[z_i \geq \text{reform}] + q_i$$

$$+ \tilde{\beta}_0 \cdot Y_{i}^P + \tilde{\beta}_1 \cdot z_i \cdot Y_{i}^P + \tilde{\beta}_2 \cdot z_i \cdot 1[z_i \geq \text{reform}] \cdot Y_{i}^P$$

$$+ \tilde{\beta}_3 \cdot 1[z_i \geq \text{reform}] \cdot Y_{i}^P + \epsilon_i,$$

where $\tilde{\beta}_0$, $\tilde{\beta}_1$, $\tilde{\beta}_2$, and $\tilde{\beta}_3$ are the parameters of interest, with $\tilde{\beta}_3$ being the reform’s effect on the association between children’s and parents’ years of schooling.

Table 3 presents the results (Columns 1–3 based on equation (4), and Column 4 based on equation (5)). Columns 1 and 2 show that the reform...
Table 3. Effects of the 1972 reform on education, cognitive test scores, and income rank: effects on mobility

<table>
<thead>
<tr>
<th></th>
<th>Child years of schooling ≥ 9, low-educated parents</th>
<th>Child years of schooling ≥ 9, not low-educated parents</th>
<th>Upward mobility</th>
<th>Regression coefficient, child and parents’ years of schooling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>$\beta_0$ (intercept)</td>
<td>0.872***</td>
<td>0.952***</td>
<td>0.573***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td>$\beta_1$ (pre-slope)</td>
<td>-0.003*</td>
<td>-0.002</td>
<td>-0.080***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td></td>
</tr>
<tr>
<td>$\beta_2$ (post-slope)</td>
<td>0.010*</td>
<td>0.052***</td>
<td>0.051***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.001)</td>
<td>(0.003)</td>
<td></td>
</tr>
<tr>
<td>$\beta_3$ (reform effect)</td>
<td>0.057***</td>
<td>0.025*</td>
<td>0.072***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.002)</td>
<td>(0.009)</td>
<td></td>
</tr>
</tbody>
</table>

| $\hat{\beta}_0$ (intercept $\times Y_P$) | 0.327*** |
|                      | (0.004) |
| $\hat{\beta}_1$ (pre-slope $\times Y_P$) | 0.001 |
|                      | (0.010) |
| $\hat{\beta}_2$ (post-slope $\times Y_P$) | -0.000 |
|                      | (0.003) |
| $\hat{\beta}_3$ (reform eff. $\times Y_P$) | -0.032* |
|                      | (0.004) |

Observations 126,079 103,428 229,507 229,507

Notes: The reform effects on intergenerational educational mobility based on equations (4) and (5). In Columns 1 and 2, the outcome is the fraction completing nine or more years of schooling. Column 1 shows the results for children whose parents have completed less than nine years of schooling (low-educated parents). Column 2 shows results for children whose parents have completed at least nine years of schooling (not low-educated parents). In Column 3, the outcome is absolute upward mobility, defined as children having completed more years of schooling than their parents. In Column 4, the outcome is the coefficient from regressing children’s years of schooling on parents’ years of schooling. The running variable is quarters born pre-/post-reform. Columns 3 and 4 are based on a bandwidth of one cohort pre-reform and four cohorts post-reform (it is only possible to match children to parents’ in the register data from the 1956 cohort onward). Table A.2 shows that the results are robust to considering a bandwidth of one cohort both pre- and post-reform. We cluster standard errors at the level of the running variable.

* $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

mainly affected children with low-educated parents. The estimates of $\beta_0$ document a large pre-reform gap in completion of nine years of schooling (87 percent with low-educated parents versus 95 percent with highly educated parents). The estimates of $\beta_3$ show that the fraction with at least nine years of schooling increased by 6 percentage points among children with low-educated parents and only 2 percentage points among those with highly educated parents. Column 3 shows that the reform led to an increase in absolute upward mobility by 7 percentage points. Finally, Column 4 shows that the regression coefficient between children’s and parents’ years of schooling decreased by...
0.03 from a pre-reform level of 0.33. As a result of the different reform implementations and estimation strategies (DiD versus RDD), we cannot directly compare effect sizes of the 1958 and 1972 reforms. Nonetheless, while there were upward trends in completion of lower secondary education, which would arguably have continued irrespective of the two schooling reforms, considered together, the two reforms account for a substantial increase in educational attainment at the lower end of the education ladder, leading to levels of educational mobility not seen previously in Denmark.

6. Recent declines in mobility

The intergenerational mobility for Danes born in the 1960s was considerable, also in an international perspective (Hertz et al., 2008). As Figure 5 shows, trends in educational mobility were very similar in Denmark, Sweden, and Norway18 (who implemented similar schooling reforms).19 From low mobility for cohorts born in the 1930s, it increased substantially across the following decades. To place these changes in further perspective, Figure 5 also plots the corresponding estimates for the US.20 US estimates drop from a level around 0.5 to 0.4 among cohorts born early in the 20th century and remain at around that level. Thus, mobility was higher in the Scandinavian countries than in the US for cohorts born in the 1960s and 1970s. However, while we cannot follow the trends in Norway and Sweden further than through cohorts born in the mid-1970s, the trend for Denmark shows a clear reversal for cohorts born in the 1970s onward, with rapid declines in mobility for those born in the 1980s. For the youngest cohorts born in the late 1980s, education mobility is similar in Denmark and the US, at around 0.40–0.45.21 These are also the cohorts for which the underlying educational distributions are virtually similar in Denmark and the US (see Figure A.10).

---

18The estimates from Norway and Sweden are based on Pekkarinen et al. (2017) and Nybom and Stuhler (2023), respectively. Nybom and Stuhler report associations between children’s and parents’ years of schooling making them directly comparable to the estimates for Denmark. Pekkarinen et al. report associations between children’s years of schooling and parents’ income rank making a 1 : 1 comparison more difficult.

19Studies of these reforms show that they led to substantial increases in educational attainment (Black et al., 2005; Meghir and Palme, 2005; Lundborg et al., 2014; Nybom and Stuhler, 2023).

20The educational mobility estimates for the US we report here are based on the General Social Surveys (see Online Appendix C.5). The estimates correspond to those reported by Hilger (2017), Hout and Janus (2011), and Pfeffer and Hertel (2015), who all use the same data as we do.

The recent decline in educational mobility in Denmark is surprising given the substantial impacts of the compulsory schooling reforms and the many public services that target the promotion of educational opportunity (e.g., Heckman and Landersø, 2022), even if recent studies of intergenerational income mobility also show declining mobility in Denmark (Harding and Munk, 2020) and in Norway (Markussen and Røed, 2019). Moreover, as we demonstrate via counterfactual simulations in Figures A.11 and A.12, the majority of the increasing association between children’s and parents’ years of schooling is driven by college becoming more selective on family background over time. Thus, education expansion in general – and college expansion in particular – plays a central role in the mobility decline.

What explains the recent declines to educational mobility in Denmark? Drawing on the extension of Becker and Tomes (1986) by Nybom and Stuhler (2023), we evaluate three potential mechanisms behind the recent decline in education mobility in the next three subsections, as follows.22

(i) The change in coefficients $\beta$ from children’s years of schooling $Y_C$ regressed on parents’ years of schooling $Y_P$ may merely reflect changes

---

22Nybom and Stuhler (2023) consider mobility in income, not education, and present several mechanisms that can explain changes to mobility over time.
in the variance of years of schooling over the century, as those cohorts who experienced the compression of the lower tail in the 1940s–1960s become parents to those born in the 1980s (see Section 6.1).23

(ii) Increasing returns to education result in a stronger push towards tertiary education among children from affluent backgrounds (see Section 6.2).

(iii) Associations among parental education, skills, and child education change over time, with some skill dimensions becoming more important while other skill dimensions are either unchanged or decrease in importance (see Section 6.3).

6.1. Robustness of declining education mobility

Insofar as increasing regression coefficients for recent cohorts (see Figure 1(d)) reflect changes in the variance of years of schooling with a compression at the lower tail for older cohorts and expansion at the upper tail for younger cohorts, as suggested in mechanism (i), we should only observe decreases to mobility for the most recent cohorts when it is measured with regression coefficients. To examine this, we therefore present in Figure 6 trends in mobility using a wide range of alternative mobility measures. Figure 6(a) shows that regression coefficients when children’s years of schooling are regressed on parents’ equivalent increased from less than 0.3 to around 0.45. As Figure 6(b) shows, we see a similar upward trend in both Pearson and Spearman (rank–rank) correlation coefficients. 24 We also see the same trend in correlation coefficients if we assume that education is a proxy of an underlying normally distributed latent variable (see Figure A.9; Fletcher and Han, 2019). Moreover, Figure 6(c) shows a large increase in sibling correlations in years of schooling, an omnibus measure of the total impact of family background on educational attainment (Solon, 1999), which does not depend on marginal education distributions (Figure A.13 shows the same results for gender-specific siblings and twins). Thus, the decreasing estimated mobility is not driven by changing variances.

We also examine trends in mobility, treating education as a categorical variable in which we also distinguish vocational and academic students. Figure 6(d) shows unidiff phi-parameters (see Section 2.3) and displays the same substantial decline in educational mobility as observed in the other measures (a 35 percent decline between the 1960 and 1989 cohorts).

23The OLS estimate is \( \beta = \text{corr}(Y_C, Y_P) \times \frac{sd(Y_C)}{sd(Y_P)} \).

24Changing variances affect regression coefficients for the very youngest cohorts (compare Figures 6(a) and 6(b)).
Figure 6. Educational mobility by child birth year and mobility type (1956–1989 cohorts)

(a) Regression coefficient, years of schooling

(b) Correlation coefficients

(c) Sibling correlations

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Figure 6. Continued

Notes: Panel (a) shows coefficients from regressions of children’s schooling on parents’ equivalent. Panel (b) shows Spearman’s rank-order and Pearson’s product-moment correlations between children’s schooling on parents’ schooling. Panel (c) shows trends in sibling correlations in years of schooling among closely spaced siblings born in a three-year window (e.g., for a person born in 1970, we consider siblings born 1969–1971). Panel (d) shows trends in phi-parameters from the unidiff model using 1960 as index cohort and using the following ISCED 2011 classification: primary education (1), lower secondary (2), academic upper secondary (3, 34), vocational upper secondary (3, 35), short-cycle higher education (5), medium-cycle higher education (6), university degree or higher (7–8), and a six-level classification for children where primary and lower secondary are collapsed.

Figure A.14 extends the time horizon to the full period from the 1911 birth cohort onward by plotting regression coefficients, correlation coefficients, the fraction with upward mobility, and unidiff estimates for the full time period considered in the paper. All measures present the same pattern: mobility increases rapidly, starting for cohorts born in the early 1940s, and peaking for cohorts born in the late 1950s or 1960s, followed by decreasing mobility for cohorts born in the 1970s and 1980s.

6.2. Changing returns to education

To examine whether changing returns to education can explain the decline in educational mobility (e.g., if higher returns increase selectivity into college for children of highly educated parents), we examine the association between...
Table 4. Decomposing increasing association between child income and parental education

<table>
<thead>
<tr>
<th></th>
<th>Actual</th>
<th>Fixing ( \pi ), returns to education</th>
<th>Fixing ( \beta ) influence of parental education through child education</th>
<th>Fixing ( \tilde{\gamma} ) residual influence of parental education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate</td>
<td>0.015</td>
<td>0.023</td>
<td>0.021</td>
<td>0.015</td>
</tr>
<tr>
<td>Change in percent</td>
<td></td>
<td>– 50%</td>
<td>39%</td>
<td>-1%</td>
</tr>
</tbody>
</table>

Notes: The table shows the estimates of children’s income rank at age 30 regressed on parents’ years of schooling for the 1960 and 1989 cohorts in Columns 1 and 2, and the corresponding estimates had each of the three components (\( \pi, \beta, \tilde{\gamma} \)) remained fixed, such that Column 3 shows \( (\pi_{1960} \ast \beta_{1989}) + \gamma_{1989} \), Column 4 shows \( (\pi_{1989} \ast \beta_{1960}) + \gamma_{1989} \), and Column 5 shows \( (\pi_{1989} \ast \beta_{1989}) + \gamma_{1960} \).

Children’s income, their education, and parents’ education. Columns 1 and 2 of Table 4 report estimates of children’s income rank regressed on parents’ years of schooling for the 1960 and 1989 cohorts, respectively:26

\[
I^C_i = \alpha_t + \gamma_i Y^P_i + u_i. \tag{6}
\]

The association between children’s income and parents’ education has increased by 50 percent. We next decompose the estimate of \( \gamma_i \) into three components, \( \pi, \beta, \) and \( \tilde{\gamma} \):

\[
I^C_i = \alpha_{1,t} + \pi_i Y^C_i + u_i; \\
Y^C_i = \alpha_{2,t} + \beta_i Y^P_i + \varepsilon_i; \tag{7}
\]

\[
Y^C_i = \alpha_{3,t} + \kappa_i Y^C_i + \tilde{\gamma}_i Y^P_i + \varepsilon_i.
\]

We estimate these as three separate regressions: \( \pi \) captures the returns to education (years of schooling), \( Y^C \); \( \beta \) captures the association between children’s and parents’ years of schooling; and \( \tilde{\gamma} \) is the residual (or unexplained) part of the association between children’s income rank and parents’ years of schooling such that \( \gamma \) from equation (6) equals \( (\pi \ast \beta) + \tilde{\gamma} \) from equation (7). Columns 3–5 in Table 4 present the association if we

26We do not have income data beyond age 30 for the 1989 cohort. Table A.3 shows the corresponding results for the 1960 and 1984 cohorts with income measured at age 35. Conclusions are unaffected.
fix each of the three components to the level for the 1960 cohort. We find that returns to education (Column 3) and the residual influence of parental education (Column 5) account for only a minor portion of the increasing association, whereas the direct association between children’s and parents’ education (Column 4) accounts for the majority. These findings suggest that changing returns to education is an unlikely explanation of the recent declines to education mobility.

### 6.3. Changing importance of skill dimensions

While educational attainment has consistently been linked to skills throughout the period we study, the interplay between family background and different skills may have changed. For instance, a recent survey of heads of studies at Danish tertiary institutions revealed that the education at their institutions focuses on developing skills and general competencies related to collaboration, communication, innovation, creativity, curiosity, and independence, while also promoting digital and cross-disciplinary work (EVA, 2022). These findings suggest that disparities in soft skills could be significant contributors to inequality in college-level education, particularly if they are influenced by family background.

To evaluate whether different skill dimensions have become more important for the association between the education of children and their parents over time, we first document in Figure A.16 how the association between parent education and child educational levels, net of cognitive skills, has changed from the 1958 birth cohort to the 1989 birth cohort. The estimates indicate that this association has remained constant for lower levels of education, while it has increased over time for higher levels, particularly for college and university education. Thus, although higher education has become more selective based on family background over time, this trend appears to be driven by factors other than cognitive skills.

As a next step, Table 5 reports correlations between cognitive and non-cognitive skills, parental education, and child education levels, for cohorts born in 1958 and 1954, and in 1989 and 1995, respectively. Panel A shows no substantial difference in the correlation between cognitive skills and parental education over time. However, the correlation between cognitive skills and high school completion (vocational and academic) decreases by around 33 percent while the correlation between cognitive skills and college completion is unchanged. In contrast, Panel B shows that the correlations between non-cognitive skills and parental and child

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27 Table A.4 compares the association between the Rosenberg scale and big-five personality traits, and high school and college education in the DALSC.

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Table 5. Correlation between skills and education

<table>
<thead>
<tr>
<th></th>
<th>Parents’ years of schooling</th>
<th>Child high school completion</th>
<th>Child college completion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Panel A. Cognitive skills, conscription test score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation</td>
<td>0.323***</td>
<td>0.279***</td>
<td>0.375***</td>
</tr>
<tr>
<td>(0.006)</td>
<td>(0.007)</td>
<td>(0.005)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Observations</td>
<td>25,002</td>
<td>24,397</td>
<td>27,203</td>
</tr>
<tr>
<td><strong>Panel B. Non-cognitive skills, Rosenberg scale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation</td>
<td>0.015</td>
<td>0.092***</td>
<td>0.081***</td>
</tr>
<tr>
<td>(0.025)</td>
<td>(0.016)</td>
<td>(0.020)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Observations</td>
<td>2,032</td>
<td>4,166</td>
<td>2,571</td>
</tr>
</tbody>
</table>

Notes: The table shows the correlation between children’s cognitive and non-cognitive skills (conscription test scores and Rosenberg’s self-esteem scale), and parents’ and children’s education in Panels A and B, respectively. Panel A uses full population register data (for males). Panel B uses the DLSY (1954 cohort) and the DALSC (1995 cohort) linked to register data with information on parent’s and children’s education. See Online Appendix C.3 for further data details. *p < 0.1; **p < 0.05; ***p < 0.01.

education have increased substantially. These results echo those reported by Edin et al. (2022) for Sweden. Our results thus indicate that over time non-cognitive skills have become closer related to both parents’ and own education, and thereby a more important component of the intergenerational transmission of education in Denmark. For college completion in particular, both cognitive and non-cognitive skills play a major role in the youngest cohort. Given that the expansion of college accounts for a substantial part of the overall decline in mobility (cf. Figures A.11 and A.12), we take these findings to suggest that sorting into college on skills has played a significant role in the mobility decline.

7. Discussion and conclusion

This paper documents substantial changes to intergenerational educational mobility for cohorts born over most of the 20th century in Denmark. We show that educational mobility increased significantly for cohorts born from

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28 Edin et al. (2022) find a constant association between college and cognitive skills for cohorts born 1950–1980, while the association between non-cognitive skills and college graduation has increased by around 60 percent, and labor market returns to non-cognitive skills have doubled over the period in question.
the 1940s through to the 1960s, an increase that is causally linked to large schooling reforms in 1958 and 1972. The 1958 reform, which abolished the rural school system and led to large investments in secondary schools especially in rural areas, raised not only educational attainment and mobility but also cognitive skills and income as adults, pointing to a general and long-lasting impact on human capital. In contrast, the 1972 reform, which increased the minimum years of compulsory schooling from seven to nine, affected educational attainment and thereby intergenerational mobility, but it did not affect skill formation and adult income, possibly because the reform merely pushed a small, remaining fraction of a cohort into completing lower secondary school.

Although intergenerational mobility increased dramatically for cohorts affected by the schooling reforms, it has been declining among cohorts born in the 1970s and 1980s. We link this decline to the expansion of college education and – testing three mechanisms potentially accounting for this decline – we find support for an increasing importance of non-cognitive skills at the college level driving the decline. Our findings point to two challenges.

First, the large variation in mobility reported in this paper stresses the inherent difficulties in interpreting differences in intergenerational mobility. Snapshot estimates of mobility do not necessarily represent what is occurring in steady state, and conclusions drawn from comparisons of different areas may be highly dependent on the particular cohorts included.

Second, the recent decline in mobility is in stark contrast to the policies offered by the comprehensive Danish welfare state: the youngest cohorts have experienced universal childcare, free access to college, and generous public education support, services aimed at improving disadvantaged children’s opportunities. Nevertheless, skill-related inequalities have enabled mainly affluent families to promote their children’s access to higher education.

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Supporting information

Additional supporting information can be found online in the supporting information section at the end of the article.

Online appendix

References


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