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PARENTAL WELFARE DEPENDENCY AND CHILDREN'S EDUCATIONAL ATTAINMENT IN DENMARK*

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ABSTRACT

Children of welfare recipients attain less education than do children whose parents do not receive welfare. In this study, we build on Boudon's (1974) distinction between primary and secondary effects of social background on educational attainment to develop a theoretical argument concerning how parental welfare dependency may affect children's educational performance and attainment, and test the argument empirically using Danish administrative data. We consider four educational outcomes: mandatory school leaving GPA, enrolling in an upper secondary program before turning 21, and having obtained an upper secondary education at age 21, and starting a tertiary education before turning 22. To control for selection into family contexts and other family-level confounders, we rely on sibling fixed effects models and control for endowments at births using birthweight. Duration of parental welfare dependency negatively affects likelihood of enrolling in, and completing, upper secondary education at age 21 for children whose parents had education above primary level. Parental welfare dependency does not substantially affect GPA, and only paternal welfare dependency affects the likelihood of enrolling in tertiary programs. Results indicate that duration of parental welfare dependency does not lower educational performance, and mainly lowers attainment of upper secondary degrees for individuals who never would progress beyond upper secondary level.

INTRODUCTION

Childhood poverty has detrimental effects for children's cognitive and noncognitive development and later educational attainment (Dickerson and Popli 2015; Duncan et al. 1998; Hanson et al. 2013; Ryan, Fauth and Brooks-Gunn 2006; Wodtke, Elwert and Harding 2016). Partly as a response to the adverse consequences of childhood poverty, and of poverty in general, governments across the Western world have enacted different types of poverty alleviation schemes, such as cash benefits, food stamps, and tax credits for low-income households. These public welfare programs are an integral part of welfare states.

Yet, the introduction of public welfare gave rise to fear of welfare cultures permeating through families, where children raised in welfare dependent household 'learned' to use welfare in lieu of investing in education and work. The evidence of adverse intergenerational effects of welfare dependency is however mixed (e.g., Black and Devereux 2011; Beaulieu et al. 2005; Cobb-Clark, Ryan and Sartbayeva 2012; Dahl, Kostøl and Mogstad 2014; Duncan, Hill and Hoffman 1988; Hill and Duncan 1987; Lee, Singelmann and Yom-Tov 2008; Levine and Zimmerman 2005; McLanahan 1988). Some studies do find intergenerational transmission of welfare dependency for certain groups (e.g., Beaulieu et al. 2005; Dahl, Kostøl and Mogstad 2014; Lee, Singelmann and Yom-Tov 2008; McLanahan 1988), ascribing the intergenerational transmission to culture and values (Beaulieu et al. 2005; Dahl, Kostøl and Mogstad 2014) or opportunity structures (Lee, Singelmann and Yom-Tov 2008). At the same time other studies have not found evidence of children suffering adverse behavioral or cognitive effects due to parents' welfare dependency (Cobb-Clark, Ryan and Sartbayeva 2012; Levine and Zimmerman 2005). So welfare dependency may have negative intergenerational effects increasing welfare take up in the second generation, but the effects appear smaller and qualitatively different from the negative effects caused by poverty.

There exist two main explanations of the intergenerational transmission of welfare dependency. The first explanation draws on a large stream of studies on poverty and welfare that point to the intergenerational transmission of a family culture or work ethics that supposedly favor welfare dependence (see, e.g., Duncan, Hill and Hoffman 1988; Somers and Block 2005 for critical discussion of this position). The second explanation refers to how material strains associated to episodes of parental welfare dependency hinder children's human capital development, thereby lowering their educational attainment and make them thus more vulnerable to fall into welfare dependence later on. In this paper, we offer a third, additional perspective on how welfare dependency may have intergenerational effects beyond inheritance of culture or structural opportunities embedded in the family context as such. We focus on educational attainment and study how differences in exposure to parental welfare dependency between full siblings affect their educational performance and attainment. Previous research links lack of educational attainment to future welfare dependency among students from welfare backgrounds (Coelli, Green and Warburton 2007), so understanding how parental welfare dependency affects educational attainment may have substantial implications for our understanding of transmission mechanisms. We consider an explanation based on relative risk aversion theory of inequality in educational attainment by social origins (e.g., Breen and Goldthorpe 1997). Within family differences in children's exposure to welfare dependency may change children's perceived utility of obtaining an education beyond compulsory education without adversely affecting the children's cognitive abilities and educational performance. By misidentifying their likely returns to education, children end up with less education than they would have attained absent their exposure to parental welfare dependency during their childhood. Essentially, we argue that longer exposure to parental welfare dependency affects educational choice.

To study empirically the link between parental welfare dependency and children's educational outcomes, we use data on educational performance and choices for all Danish children born 1984-1996 and link the data to parental information about duration and timing of welfare dependency. We capture all information across the entire childhood. Half of the children in the data experience a parent being on welfare for at least one month during the children's childhood. We consider four educational outcomes: (1) school leaving GPA at age 16 to 17 as a proxy for performance; (2) ever enrolled in secondary education at age 21; (3) completed secondary education at age 21; and (4) enrolled in tertiary education at 22 unconditional on completing upper secondary education.

To account for family-level confounding we employ sibling fixed effects models comparing full siblings to each other. The within-sibling design allows us to net out the explanation in terms of welfare dependency culture and structural obstacles, at least to the extent that such traits are time constant. We consider both the duration of parental welfare dependency that children experience during childhood, as well as the role of timing of parental welfare dependency. As a measure of available resources, we include parental education as well as information on if parents dissolved their union during children's upbringing. Taken together, our empirical strategy aims at identifying the effect of the true (intensive) margin of duration of parental welfare dependency on children's educational performance and attainment.

Three characteristics of the Danish context make it a particularly adequate case study to test whether duration of parental welfare dependency has a causal effect on children's educational performance and attainment. First, compulsory and post-compulsory education are free and students' at upper secondary level or higher receive monthly stipends. Second, the income level guaranteed to those who are on welfare benefits is in relative terms generous (Gough 2001; Hansen and Schultz-Nielsen 2015a,b) and predominantly above the relative

poverty line (see Van Mechelen and Marchal 2013 for comparison to several Western countries). Third, welfare benefits are universal (although means tested). Taken together, the free access to education, relatively high level of poverty alleviation, and universal access to benefits for citizens secure that in the case of Denmark, the scope of explanations in terms of the material strains associated to spells of welfare dependency therefore is reduced considerably.

We find that parental welfare dependency during childhood does not affect children's school-leaving GPA. Both maternal and paternal duration of parental welfare negatively affect the likelihood of having enrolled in and completed secondary education at age 21. We further find that parental welfare dependency affects educational outcomes mainly for children, whose parents have at least secondary level education, and more for children with low GPAs than for children with high GPAs. We discuss how these finding are incompatible with an explanation in terms of intergenerational transmission of welfare dependency culture. The impact of exposure to parental welfare dependency on enrolling in tertiary education is negligible. We further demonstrate that exposure to parental unemployment experienced during childhood does not affect our results.

Our paper offers three contributions to the literature on how childhood circumstances affect children's educational performance, choices, and attainment. First, we corroborate previous work by reproducing findings that demonstrate that parents' welfare dependency does not affect children's development, using school leaving GPA as a measure for educational performance. Second, we show that welfare dependency does affect the likelihood of enrolling in and attaining further education net of family context and educational performance. Third, we highlight the specific groups at risk and demonstrate that a high level of educational performance is a protective moderating factor. The rest of the paper progresses as follows: First, we present the context of our study, because the institutional context has

relevant theoretical implications. Second, we review and discuss the relevant literature and posit our contribution within it. Third, we present the Danish administrative data we use for our analysis, as well as our analytical strategy. Fourth, we report and discuss our findings. Last, we conclude.

THE DANISH CONTEXT

Welfare state researchers have routinely classified Denmark, with its roughly 5.73 million inhabitants as of 2017, as part of the Nordic, or Social Democratic, welfare regime (Esping-Andersen 1990; Gough 2001; Kammer, Niehuis and Peichl 2012; Powell and Barrientos 2004). Generous and inclusive welfare programs characterize the Nordic/Social-Democratic welfare regime. The following elements of the Danish welfare state are of particular interest to our study, as they have theoretical implications: i) easy access to hiring and firing combined with generous social security ('flexicurity'); ii) access to free and stipend-entitled upper-secondary and tertiary educational programs. We expand on these below.

Social welfare in Denmark

The term flexicurity represents the joint occurrence of a flexible labor market with easy access to hiring and firing together with a strong social safety net that covers those without employment (e.g., Andersen and Svarer 2007). In Denmark, welfare programs among working-age adults take two forms—unemployment insurance, which is a voluntary insurance scheme with a monthly premium with a take-up rate at 60% as of end of 2017, and social assistance, which is a universal but means-tested welfare benefit.[1] For this study, we focus on parents' reliance on social assistance (henceforth called welfare benefit dependency), due to the universality and similarities with poverty alleviation schemes known from other countries.

[1] Over time, different graded scales have been introduced for non-citizen residents.

One contrast however, is that the net income replacement rate by welfare benefit compared to earnings in Denmark is high compared to other countries. Hansen and Schultz-Nielsen (2015a,b) showed that in 2012, a Danish couple with two school-age children received 51% of what they could expect to earn on the labor market if relying on welfare benefits for income.[2] The net replacement rates were substantially lower for Sweden (28%), the UK (32%), Germany (31%) and the Netherlands (29%). The Danish welfare benefit level follows the progression of the wage index over time, so the benefit replacement level has remained at somewhat stable although slightly decreasing levels since the mid-1980s (Hansen and Schultz-Nielsen 2015a).[3] Further, the benefits are means-tested, so a recipient cannot have personal means (savings or wealth) worth more than 1,340€ in 2017-prices [further rules for working spouses and immigrants applies, see summary in Hansen and Schultz-Nielsen (2015a)]. Thus, welfare benefits in Denmark have high replacement rates, are universal but means-tested, and are aimed at, and broadly succeed in, alleviating poverty.

The Danish Educational System

The Danish educational system entails compulsory and comprehensive schooling for 9 years[4], with an optional and widely used year of kindergarten prior to starting primary school, as well as a noncompulsory extra year of lower secondary education following the 9th year.[5] After finishing lower secondary education, students either discontinue education or move into tracked upper secondary programs that distinguish between academic and vocational tracks, so tracking occurs late. Some vocational and all academic tracks give access to tertiary education. All clearing house recognized educational programs are publicly funded (including

[2] Calculated based on the wages of the OECD's average worker for each country (OECD 2013).
[3] Some reforms did lower benefit levels for especially long term recipients in the 2000s, which did have adverse effects on families (Wildeman and Fallesen 2017).
[4] For cohorts born in 2003 and later, 10 years of schooling from the year children turn six are compulsory.
[5] For cohorts finishing compulsory education in the period 2008-2012, more than 50 percent opted for an additional year of lower secondary education (Arendt and Greve 2016).

private compulsory schools, which receive subsidies), access is free of charge, and upon turning 18 students receive a monthly stipend from the state while undertaking studies (if they do not receive other forms of pay as part of their training or studies).[6] In 2017, students not living with parents received 810€ a month in stipend before taxes. Thus, in Denmark, financial constraints on access to education are less substantial than in most other contexts and tracking occurs late, allowing students more time to decide on their educational trajectory.

Theoretical implications of the country context

Two important and substantial theoretical implications arise from studying how parental welfare dependency affects children's educational performance and attainment in the specific context of Denmark. First, although economic hardship also affects families negatively in Denmark (e.g., Wildeman and Fallesen 2017), rates of childhood poverty, material deprivation, and lack of access to educational resources are amongst the lowest in the OECD (OECD 2017), likely at least partly because net replacement rate of welfare benefits are high and access universal. Second, because education is free and comes with stipends, parental financial constraints present less of an entrance barrier into education than in most other countries. In total, we study a context where we assume little direct damaging effects of childhood poverty, and can largely ignore concerns about tuition fees and similar direct financial barriers to educational attainment.

BACKGROUND

In his 1974 book, Boudon introduced the distinction between primary and secondary effects of class background on educational attainment (see also, e.g., Breen and Goldthorpe 1997;

[6] Receiving labor market earnings above a certain level while studying leads to a reduction in the allotted stipend. For tertiary educational programs, the stipend became time-limited in 1996, allowing students access to the stipend for the length of their educational program plus twelve months. Additional and increased stipends are available to parents undertaking studies.

Jackson et al. 2007). Stated broadly, primary effects cover initial (genetic) endowments and socio-cultural traits of parents' background that produce children's actual levels of academic performance. Secondary effects consist of the effect of class of origin on the educational choices holding prior academic performance constant. Jointly, the two effects form children's educational decisions on the basis of ability and ambition.

Parental Welfare Dependency and Educational Choice

Following Boudon's concepts, experiencing parental welfare dependency during childhood could affect children in two ways. First, it may directly affect the cognitive abilities and development, if welfare dependency leads parents to invest less in their children. Second, it may lower parents' or children's ambitions for educational attainment by signaling a lower parental class position. Previous work has found little to no evidence of parental welfare dependency affecting children's test score performance or antisocial behavior (e.g., Cobb-Clark, Ryan and Sartbayeva 2012; Levine and Zimmerman 2005), which speaks against a primary effect of parental welfare dependency on children's educational attainment. At the same time, a related strain of work using Norwegian administrative data finds strong evidence of an intergenerational link of welfare dependency where welfare dependency is handed down dynastically (Dahl, Kostøl, and Mogstad 2014).[7] Thus, existing work suggests that whereas growing up with parents who receive welfare benefits does not affect children's cognitive and behavioral development, it affects the likelihood of receiving benefits as an adult.

[7] The findings of Dahl et al. ties into an older debate in the social sciences. For instance, Hill and Duncan (1987) and Duncan, Hill and Hoffman (1988) found little to no evidence of intergenerational transmission of welfare dependency in the US using the Panel Study of Income Dynamics. Using the same data, McLanahan (1988) found that intergenerational transmission of welfare dependency did occur, but only for daughters from single parent families and only jointly with the likelihood of becoming household head. In his 1992 review on incentive effects of the US welfare system, Moffitt concluded that although there existed strong evidence on the intergenerational correlation of welfare dependency, there were still lacking strong causal tests of the relationship.

The main question is then through which channels the intergenerational transmission operates. We propose that educational choice is a salient channel through which the intergenerational transmission of welfare dependency may travel. Lower education leads on average to lower pay, which (among a number of other implications) means that the distance between income from earned salary and income from welfare is small in the relative sense. Related work in economics has also proposed a causal link between lack of educational attainment and subsequent welfare dependency (Coelli, Green and Warburton 2007). To understand how parental welfare take up may affect children's educational choices absent effects on the children's human capital development, we turn to the framework proposed by relative risk aversion (RRA) theory (e.g., Becker 2003; Breen and Goldthorpe 1997; Breen and Yaish 2006; Davies, Heinesen and Holm 2002; Holm and Jæger 2008).

Children's educational response to parental welfare dependency

In their 1997 paper on educational differentials, Breen and Goldthorpe outline three mechanisms through which class differentials in educational attainment may arise. We have already jointly discussed two of the mechanisms above—differences in ability and differences in resources. Breen and Goldthorpe's third proposed mechanism is RRA, which suggests that educational choices are partly driven by a desire to avoid downward social mobility—i.e., individuals obtain a utility bonus from achieving at least their social position of origin (e.g., Holm and Jæger 2008). Empirical studies have demonstrated the parents' class, status, and education have direct effects on education net of cognitive ability, even in countries with free access to tertiary education (e.g., Bukodi, Erikson and Goldthorpe 2014). Yet, the mechanism behind RRA hinges on children (and their parents) being able to identify their (latent) social origin precisely. We suggest that having parents on welfare changes, or confuses, the signal that children (and parents) observe about the parents' class position and the expected returns

to education, thereby affecting the perceived level of education needed to avoid downward mobility. It follows from RRA that only children with parents who have education above the compulsory level should respond to parental welfare dependency—for children whose parents did not obtain education above the compulsory level welfare dependency should not have an effect, because there is no educational signal to distort.

One could posit that receiving welfare positions individuals' social origin among the lower classes. Social class confounds the likelihood of individual welfare take up. People with lower class positions are less likely to have access to unemployment insurance (Parsons, Tranæs and Lilleør 2015), and likely face more precarious labor market prospects. Both conditions increase the likelihood of spending time on welfare. As we will also demonstrate in our empirical section, few children have parents who spend the children's entire childhood on welfare. Many parents instead have single or several welfare spells interrupted by periods of employment, self-sufficiency, or educational activities, and both high and low educated parents may spend time on welfare. Children may be exposed to parental welfare dependency at different times and for different lengths across their childhood—in this way duration is analogous to the strength of the disruption of the signal. Yet, as social class likely confounds the likelihood and duration of welfare dependency, it is not straightforward to distinguish between the effects of duration of paternal welfare dependency and the effect of social class on children's educational attainment.

We propose a theoretical assumption with an empirical application that allows us to address the problem of confounding: In terms of its relations to children's educational attainment, families' social origin are a (semi)persistent but unobserved trait within sibships and across children's early life courses. For our specific study, the argument corresponds to assuming that sibling-differences in the effect of intragenerational parental mobility beyond

differences in welfare dependency are negligible (we also test for this explicitly using mean annual parental gross income across childhood as proxy).

Recently, Erola, Jalonen and Lehti (2016) showed that for Finland, which shares a host of structural and institutional attributes with Denmark, the assumption is likely feasible. Erola and colleagues estimated the joint and individual contributions of parental social class (measured as the EGP-scale), parental income, and parental education on children's ISEI score in the children's late 20's. Their study demonstrated two important phenomena. First, within-family variations in parental class, income, and education across children's early life course had little impact on differences in siblings' outcomes. Second, parental education accounted for more than 80 percent of the family level variance between all three parental background characteristics and children's achievement. Thus, parental education likely functions as an adequate measure of social origin. Another related, but slightly different, explanation may also account for an effect of parental duration of welfare dependency on children's educational outcomes not caused by lowering ability or resources. Instead of distorting the signal concerning social origin, exposure to prolonged welfare dependency may simply lower the perceived value of obtaining an education, which in effect but not in explanation is analogous to the inheritance of welfare culture argument. If students lower their educational ambition because they do not perceive education as valuable, and ambition affects effort, we should expect performance to decrease as well (as suggested by, e.g., Breen 1999)—at least among students with higher educated parents.

Alternative Explanations

Children may not only respond to parental welfare dependency, but also to other forms of parental inactivity, most important unemployment. Few studies consider how duration of unemployment, but instead focus on how parental (often paternal) unemployment, affects

children's education performance or ambitions at points in time. Andersen (2011) argues that parental unemployment affects children's educational ambitions, suggesting that the mechanisms are financial strain in the family, changing parenting practices, and children's changing perceptions of their parents as role models. Using data from the British Household Panel Survey, she finds that, conditioning on child-constant characteristics, children's educational ambition decreases when fathers are unemployed. Sadly, Andersen is not able to examine whether the decreased ambition translates into lower educational performance or attainment. Levine (2011) uses the 1979 the National Longitudinal Study of Youth to study how maternal unemployment affects children's academic performance. After controlling for family-level fixed effects, Levine finds no impact of parental unemployment, nor neighborhood-level unemployment, on educational performance. Levine specifically discusses how the inability to distinguish between different types of unemployment situations in the NLSY79 may mask important relationships between certain type of parental inactivity and children's educational performance. A Norwegian study by Rege, Telle and Vortruba (2011) focuses on the effect of parental job loss on children's performance and finds a discrete negative effect of father's job loss on children's educational performance. The effect appears unrelated to changing family life and employment circumstances, but is concentrated among low-income households and points towards changes in fathers' parenting practices through mental distress following job loss. Rege, Telle and Vortruba's findings resonate with previous North American work that links parental unemployment to grade retention among children of less-educated parents in the US (Stevens and Schaller 2009) and that job displacement of low-educated parents leads to lower earnings for Canadian children (Oreopoulos, Page and Stevens 2008). However, a Norwegian study similar to Oreopolos et al.'s found no effect of parental job loss on children's earnings (Brattberg, Nillsen and Vaage 2008).

In terms of educational attainment, few studies have examined the link to parental unemployment and children. Using data from the US, Conley (2001) studies how wealth predicts educational enrollment, and controls for length of unemployment as a way of capturing resource depletion. Conley shows a negative association between parental length of unemployment and children's educational attainment, with the association weakening as the outcomes moved up the educational ladder. Using Canadian data and fixed effects, Coelli (2011) found a negative effect of job loss for household breadwinners on children's enrollment in all post-secondary and university programs, with the effect concentrated among children whose parents were high earners but without education beyond high school level.

In total, the literature on the relationship between parental unemployment and children's educational performance and attainment has shown little attention to role of duration of unemployment, instead (partly due to data limitations) focusing on job loss. Results from Canada, the US, and the UK all point toward changes in income playing at least some role in creating the effect, with the effects highest for low educated parents. Further, the findings demonstrate clear timing effects around the period of educational transition. Results from Norway also showed effects of parental job loss on children's educational performance, but here income loss did not appear to drive part of the effect. The Danish context is very similar to the Norwegian. Yet, for the sake of completeness, we will examine both avenues of alternate explanations using measures of duration of unemployment and gross income across childhood and parents' income around the time of children's transition from compulsory education.

DATA AND METHODS

To study how parental welfare dependency affects children's educational performance and choices, we use administrative population data from Denmark on all children born 1984-1996. Through their social security numbers (assigned at birth) we can link children to their

educational records, as well as to their parents' demographic, educational and welfare uptake information. Statistics Denmark records all data annually, and the overall data quality and validity are assessed a very high (see below for specific references to documentation of different registers).

Educational Outcomes

We use four measures of educational outcomes for individuals in our data: (1) school-leaving grade point average [GPA] measured at end of lower secondary education (age 16 or 17) and comprising of both national exams and end-of-year grades; (2) ever enrolled in upper secondary at age 21; (3) completed upper-secondary education at age 21; (4) enrolled in tertiary education at 22. All data on completion and enrollment are obtained from the Attainment Register (see Statistics Denmark 2014 for documentation). Statistics Denmark also provides data on GPA, but the initial reporter of GPA data is the Danish Ministry of Education.

Table 1. Description of Outcome Variables

Educational outcome	Birth cohorts	Mean	S.D.	Share missing	N
9^{th} form GPA (range [-3;12])	1986-1996	6.374	(2.227)	.079	526448
Ever enrolled in upper secondary start of year turning 21	1984-1994	.705	(.456)	Not applic.	545309
Finished upper secondary no later than start of year turning 21	1984-1994	.549	(.498)	Not applic.	545309
Enrolled in tertiary program start of year turning 22	1984-1994	.324	(.468)	Not applic.	537500

Source: Own calculation on data from Statistics Denmark.

Table 1 provides a description of the outcomes in detail. Due to data limitations and time censoring, we do not have all information for all cohorts—most Danish schools did not report grades to Statistics Denmark for cohorts born prior to 1986, so those are not included. The high share of missing data on GPA (7.9 %) is due to certain schools not grading, some students failing to ever acquire a ninth form exam, and other students being ill at the exam time. The lowest pass grade in the Danish system is 02. See Table A1 in appendix for conversion of the Danish grading scale to the ECTS-scale. Table 1 also reports the share of individuals ever enrolled in and finished upper secondary education the year they turn 21. The oldest a student can be, while still graduating on time is 20. We allow students to have one more year to finish in order to not disregard students, who change track or were old-for-grade when starting primary school, both of which would set them back a year. An upper secondary degree is a prerequisite for acquiring tertiary education in Denmark. 71% of all individuals in our data have ever been enrolled in upper secondary education at age 21, but only 55% have finished an upper secondary degree (ISCED ≥ 3). Drop out and late starters account for the 26 -point difference between enrollment and graduation. 32% of the studied cohorts have enrolled in a tertiary education at 22—mortality and out-migration account for the difference in sample size between finishing secondary education and enrolling in tertiary. We use information on upper secondary education and tertiary enrollment for the cohorts born 1984-1994.

Welfare Dependency

The data on parental welfare dependency is supplied by Statistics Denmark on a monthly level from 1984 and onwards (Statistics Denmark 2015, 2017a). Across the included data

period, Statistics Denmark begins recording welfare dependency in a more nuanced way. For comparability, we combine all means-tested universal forms of social assistance into one monthly indicator of welfare dependency, equal to 1/12 if the parent received any social assistance benefits that month. That is, our welfare dependency measure includes all forms of mean-tested transfers for instances where individuals are unable to obtain income through other channels, such as employment, educational stipends, or relying on personal wealth. Welfare dependency consists of both transfers without activation requirements (cash benefits) and transfers while participating in active labor market programs (workfare).

Importantly, in our measure of duration of welfare dependency, we do not include not-means tested temporary or permanent forms of public transfers, such a parental leave benefits (for parents taking leave from employment or education), unemployment insurance, sick leave benefits, disability pension, or regular public pensions. Based on data from 1984 to the end of 2014, we create summarized measures for all children capturing, respectively, the duration of maternal and paternal welfare dependency from the child's birth months until the month where the child turned 18. Thus, accuracy of our welfare dependency measures are on the monthly level, but we measure dependency on the scale of years.

Measures of Parental Income and Unemployment

For robustness, we also examine to what extent the relationship between welfare dependency and children's educational performance and attainment may be confounded by general parental inactivity and by changes in income. We include all gross income from the Danish Income Statistics (Statistics Denmark 2016), and create a deflated measure of income the year children turn 16 years of age. We chose age 16 because it is the year where most children make their educational transition out of compulsory education. Income includes public

transfers. We further include measures of average gross income for both parents across children's entire childhood to capture economic resources during childhood. The average income measure also serves as a proxy for down- or upward social mobility. We measure income at 2014-level. Information on unemployment is obtained from the unemployment register (Statistics Denmark 2017c). Unemployment is measured as the annual share an individual is registered as unemployed, and either receiving unemployment insurance or welfare. We aggregate parental unemployment across children's first 18 years, from year of birth until the year prior to turning 18.

Demographic Characteristics

Demographic characteristics on children and parents come from the Danish Population Register (Statistics Denmark 2017b), the Attainment Register, and the Danish Fertility Database (Knudsen 1998). We include information on child birth year, child gender, child birth weight, child birth order (including all siblings, not only those born in the study window), mother's age at birth, whether parents divorced/dissolved their union before the child turned 18, and the parents' highest education at time of birth of the youngest sibling in the study window. Education is divided into three categories—less than upper secondary, upper secondary (high school), and tertiary (2+ year college degrees). Table 2 provides descriptive statistics for the three analytical samples. As evident from the table, there are no substantial differences across the three samples, which is unsurprising because the three samples include full birth cohorts, and the sample in Column 3 simply is a subset of the sample in Column 3, where 7809 of the sample either have emigrated or are deceased. Between 50 to 53 percent of the sample have parents that have spent at least one month receiving welfare during the child's first 18 years. While the shares appear high, four things should be noted. First, we include all forms of means-tested welfare benefits in our measure, which does mean that we cast a wide net. Second, we capture all occurrences for both parents

across 18 years, which is a long timeframe. Third, we use what are essentially prospective data, so we are not susceptible to forms of recall bias, where a respondent may forget the short time they spent on welfare years back. Fourth, although the share is high, most parents spent only small parts of their children's childhood on welfare, and the correlation between parental durations of welfare dependency is large for all three samples. The main take away is thus that exposure to any form of parental welfare dependency at any point in childhood is a common event.

Table 2. Descriptive Statistics for Samples across Outcomes. SD in parentheses.

	School leaving GPA	Attained or enrolled upper secondary at 21	Enrolled in tertiary at 22
Child's birth year	1991.291	1989.852	1989.312
	(3.120)	(3.428)	(3.148)
Child birthweight in grams	3475.659	3456.382	3451.255
	(567.2)	(569.7)	(567.9)
Child female	0.497	0.486	0.486
	(0.500)	(0.500)	(0.500)
Birth order			
1st born	0.510	0.511	0.513
	(0.500)	(0.500)	(0.500)
2nd born	0.358	0.357	0.357
	(0.479)	(0.479)	(0.479)
3rd born	0.105	0.104	0.103
	(0.307)	(0.305)	(0.304)
4th+ born	0.027	0.028	0.027
	(0.163)	(0.164)	(0.163)
Parents not together entire childhood	0.365	0.373	0.370
	(0.482)	(0.484)	(0.483)
Mother or father graduated high school	0.501	0.503	0.503
	(0.500)	(0.500)	(0.500)
Mother or father graduated college (2+ yrs)	0.354	0.362	0.360
	(0.485)	(0.481)	(0.480)
Mother's age at birth	28.795	28.484	28.393
	(4.596)	(4.646)	(4.644)
No parental welfare dependency	0.500	0.471	0.466
	(0.500)	(0.499)	(0.499)
Duration of maternal welfare dependency	1.181	1.344	1.336
	(2.926)	(3.140)	(3.117)
Duration of paternal welfare dependency	0.834	0.974	0.992
	(2.277)	(2.461)	(2.473)
ρ(Paternal Duration, Maternal Duration)	.523	.507	.501
N	526488	545309	537500

Source: Own calculation on data from Statistics Denmark.

Analytical Strategy

In this study, we examine how duration of parental welfare dependency affects children's educational performance and attainment. Explicitly, we consider school leaving GPA as a measure of performance, and study enrollment/completion of upper secondary degrees at age 21, and enrollment in tertiary programs at age 22. Thus, we want to estimate the following relationship for all educational outcomes Y:

$$Y_{if} = \beta_o + \boldsymbol{X_{if}\beta} + \gamma_1 Duration_{if}^{M} + \gamma_2 Duration_{if}^{F} + \omega NoDuration_{if} + \alpha_f + \epsilon_{if} \quad (1)$$

Here, *i* denotes an individual located in family *f*, β_o is the constant term, **X** is the set of demographic covariates, and *Duration* measures parental duration of welfare dependency in years for mother (*M*) and father (*F*), *NoDuration* is a dummy indicator that neither parent received any welfare during child *i*'s childhood (a welfare specific intercept), $alpha_f$ is shared unobserved characteristics between siblings who share the same father *and* mother, and ϵ_{if} is the individual-specific error term.

If the relationship between children's educational outcomes and their parents' durations of welfare dependency is unrelated to unobserved individual or family-level characteristics, we can simply estimate Eq. (1) using standard ordinary least squares. Yet, this is likely not the case. Unobserved family characteristics, such as parental tendency to suffer from somatic or mental health issues, or even just parental distaste or taste for work likely affect both whether parents spend time on welfare, and the duration of such welfare spells and children educational outcomes. To address these types of confounding, we include family-specific fixed effects, thereby controlling for α_i by only examining within-sibling differences among full siblings. The approach has the added bonus of further controlling for, on average, 50 percent of children's shared genetic make-up. Yet, although sibling fixed effects are prevalent as an identification strategy (e.g., Colen and Ramey 2014; De Neve and Oswald, 2012;), they

are in no way a silver bullet. Other confounding variables, such as birth order and year must also be controlled for (see Sigle-Rushton et al. 2014 for an especially illustrative example), and other issues persist. We discuss these below.

Although controlling for sibling fixed effects allows us to disregard shared constant family level characteristics, it also limits the effect of welfare duration we can study, and still leaves issues concerning the role of timing of welfare dependency. In terms of what effect of duration on educational outcomes we recover for the sample, it is necessary to have in mind that the maximum difference in duration of welfare dependency that can occur between two siblings in our sample is delimited by their difference in age. For some sets of siblings, we may observe instances where one sibling experiences no parental welfare dependency during childhood, and the other experiences an amount at maximum the length of the spacing between siblings. Yet for most siblings we will likely observe only differences in positive durations. Less than 3 percent of families in the data experience a mix, where one sibling is exposed to parental welfare dependency, and another is not. Thus, the effect we recover is captured on the true, or intensive, margin, leaving us ill equipped to make inference about how children would fare absent their parents spending time on welfare. Instead, we are equipped better to make inference on how spending less or more time on welfare would affect the educational outcomes of welfare recipients' children.

In terms of timing, within-sibling differences in exposure to parental welfare dependency will also translate into differences in the age the children had when exposed. If it is the timing of parental welfare dependency that matters and not the duration of exposure, we may still observe a significant estimate for duration, simply because a longer duration during childhood by construction increases the risk that some of the duration covers any critical ages. To test for this case, we estimate models with more flexible specifications of parental welfare dependency duration in a series of robustness test. In these test we also test for the alternative

explanations discussed in the Background section, as well as account for downward mobility captured through changes in parental income.

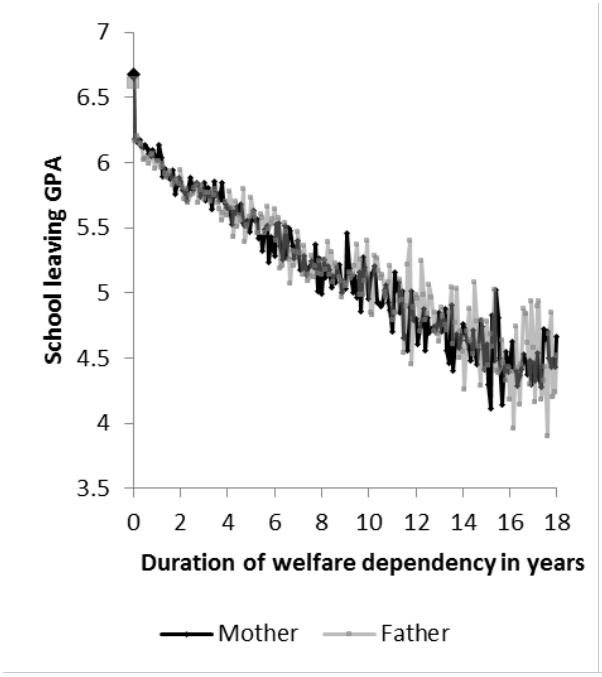
Last, using sibling fixed effects leaves singletons unaccounted for, because singletons have no sibling we can compare them to. The disregard of singletons raises issues of external validity—that is, even if we recover a causal effect, is the effect then only valid for children who have at least one sibling? Given the data at hand, there is no way to directly test for this. Instead, we examine whether the OLS estimates for singletons are similar to those for sibling groups. If the two groups of estimates are similar, it at least indicates similar forms of selection, which makes it feasible that results also would be similar after controlling for such selection.

FINDINGS

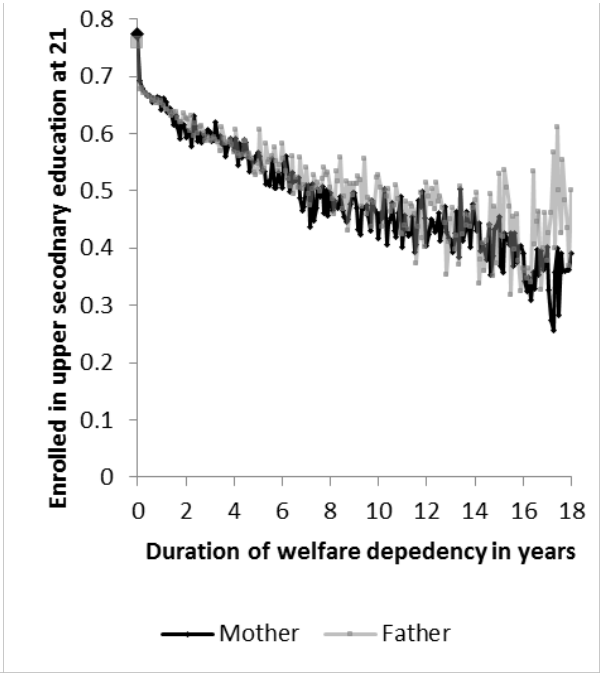
Descriptive Results

In this subsection, we present descriptive results on the association between parental welfare dependency during children's upbringing separate for each parent, and the children's educational performance and attainment. Figure 1 shows the relationship between the duration of maternal and paternal welfare uptake and children's educational outcomes. For all four outcomes, there exist a discrete difference between parents not receiving any welfare and parents receiving at least one month of welfare during a child's first 18 years. Among those whose parents do receive welfare, the relationship appears linear, negative, and practically identical for fathers and mothers' duration of welfare dependency.

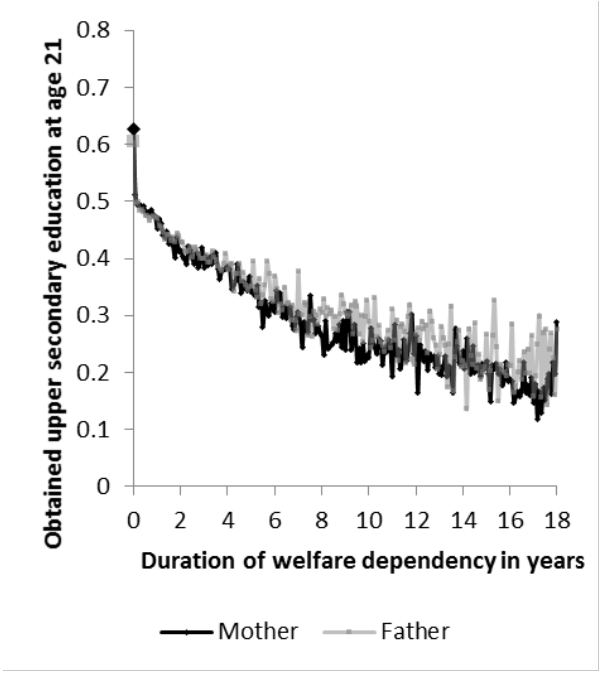
Figure 1. Duration of maternal and paternal welfare dependency during childhood/ adolescence and children's educational outcomes



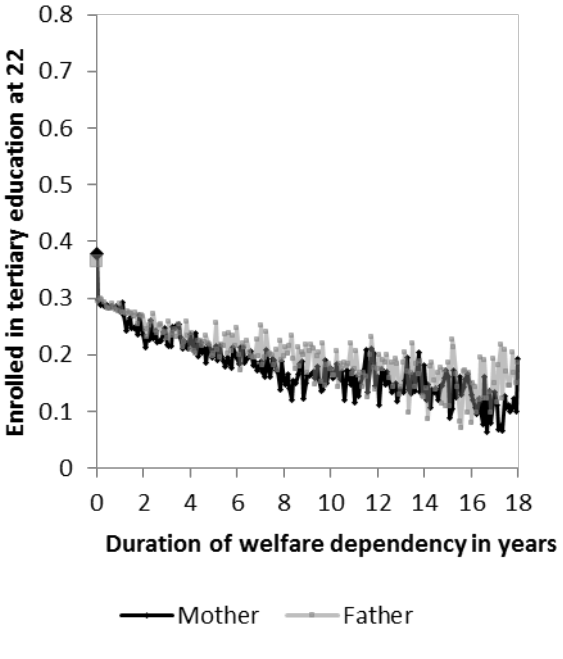
(a) GPA



(b) Enrollment in upper secondary



(c) Completion of upper secondary



(d) Enrollment in tertiary

Source: Own calculation on data from Statistics Denmark.

Jointly, the four graphs shown in Figure 1 paint a picture of two distinct dimensions of association between parental welfare dependency and children's educational performance. First, on the extensive margin, distinguishing children of parents who never use welfare and children of parents who are ever on welfare, we see a substantial difference in GPA, enrollment, and completion. Given the construction of the sample (as discussed above), it is differences between families that likely drive the differences across the extensive margin—that is, selection at the family level.[8] Second, we also observe a linear negative relationship between duration of welfare dependency and children's educational outcomes. Yet, it is unclear to what extent these negative linear relationships simply represent family-level selection, or if differences in exposure between siblings in itself contribute to differences in educational attainment and performance. For that, we turn to sibling fixed effects models.

Estimation Results

We now turn to our estimation results. We present results from sibling fixed effects models on the same four educational outcomes—school leaving GPA, enrollment in upper secondary education, completion of upper secondary education, and enrollment in tertiary education.[9] We also estimate a number of extra specifications designed to test our theoretical arguments. Table 3 reports the results from sibling fixed effects models, where we control for family-level effects that remain constant between siblings. Column 1 reports results for FE estimates on school leaving GPA, which is the mean of school leaving exams and final grades based on teacher evaluations. Girl children have on average a GPA that is 10 percent higher than the sample mean. *log*(Birth weight) is also positively associated with GPA (we use log[birth weight] after having examined with functional form of birth weight best fit the data following

[8] Family-level variation accounts for 72 percent of the variation in which children have parents who ever receive welfare.
[9] OLS models estimated for reference presented in Table A2 in appendix.

the test suggested by Mizon and Richard [1986]). Comparing the sibling fixed effect estimates to the OLS estimates found in Table A2 in appendix, we see that the fixed effect barely changes the gender association, but adding the sibling fixed effect cuts in half the association between birth weight and GPA. There exist well-established arguments for how family-level characteristics confound birth weight through pre-natal maternal behavior and available resources (e.g., Grote et al. 2010; Kramer 1987; Parker, Schoendorf and Kiely 1994). The same likely does not hold for child gender (at least in a Western context). The substantial change to the birth weight association indicates that the sibling fixed effect captures important and substantial unobservable variation at the family level.

Table 3. Results from Sibling Fixed Effects Models on (a) School Leaving GPA; (b) Enrolled in Upper Secondary Year Turning 21; (c) Attained Upper Secondary at 21; (d) Enrolled in Tertiary at Year Turning 22

	School leaving GPA		Enrolled in up. sec.		Attained upper sec.		Enrolled in tertiary	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female=1	0.636***	0.636***	0.192***	0.192***	0.175***	0.175***	0.142***	0.142***
	(0.008)	(0.008)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Mother's age	0.091***	0.091***	0.012***	0.012***	0.015***	0.015***	0.015***	0.015***
at birth	(0.004)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
log(Birth weight)	0.310***	0.309***	0.073***	0.073***	0.099***	0.099***	0.062***	0.062***
	(0.032)	(0.032)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
2nd born	-0.363***	-0.364***	-0.046***	-0.046***	-0.061***	-0.061***	-0.068***	-0.068***
	(0.013)	(0.013)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
3rd born	-0.528***	-0.528***	-0.064***	-0.064***	-0.094***	-0.094***	-0.102***	-0.102***
	(0.026)	(0.026)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
4th + born	-0.685***	-0.684***	-0.075***	-0.076***	-0.119***	-0.119***	-0.122***	-0.123***
	(0.043)	(0.043)	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)	(0.010)
Parents' divorced	-0.142***	-0.141***	-0.017**	-0.015**	-0.035***	-0.034***	-0.009	-0.010
	(0.024)	(0.025)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
No parental		0.044		-0.014*		-0.014*		-0.011
welfare dependency		(0.022)		(0.005)		(0.006)		(0.006)
Duration, maternal		-0.002		-0.011***		-0.006**		-0.001
welfare dependency		(0.009)		(0.002)		(0.002)		(0.002)
Duration, paternal		0.002		-0.010***		-0.008***		-0.005*
welfare dependency		(0.009)		(0.002)		(0.002)		(0.002)
N	526448	526448	545309	545309	545309	545309	537500	537500
Outcome mean	6.374	6.374	.705	.705	.549	.549	.324	.324

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Dummies for birth years not shown.
Source: Own calculation on data from Statistics Denmark.

The associations between maternal age at birth and birth order should be interpreted jointly, because, mechanically, mothers are older when giving birth to child number two than when giving birth to number one. Thus, whereas the birth order estimates appear large, the average spacing between siblings in the sample is 3.1 years, which means that the association between maternal age and GPA counters most of the birth order association. The estimate for whether parents divorced or dissolved the union during the focal child's childhood translates to a 2 percent decrease in GPA. Since we compare variation within full siblings, the estimate is contingent on being a younger sibling.

In Column 3, we include the welfare dependency covariates and see that little changes in terms of the parameter estimates in Column 2, indicating little remaining confounding at the family level between parental welfare dependency and the other covariates.[10] The dummy for both parents never receiving welfare is insignificant and the estimate is small. Both maternal and paternal duration are insignificant, and the estimates close to zero with small standard errors. Assuming that GPA is a proxy for cognitive ability, our results line up with a previous study by Levine and Zimmerman (2005), who found that growing up with parents receiving welfare did not affect children's cognitive abilities development. Thus, there are no indications that maternal or paternal welfare dependency affect children's educational performance after controlling for family-level confounding.

Turning our attention to the estimates for the models for enrolling in and completing upper secondary education before turning 21 in Columns 3-6, the first striking difference is the large and highly significant association between being female and enrollment and completion of upper secondary education. Women are 27 percent more likely to enroll in

[10] When comparing to the OLS results reported in Table A.2 in appendix, the difference in striking and indicates that there exists strong confounding at the family level, which the sibling fixed effect appears to capture.

upper secondary education, and 32 percent more likely to complete, compared to the average.[11] The gender difference reflects partly women's higher educational participation rates (as found across Western countries), as well as the fact that certain historically gendered occupations, such as hairdresser, mercantile clerk, and a number of health care service-type jobs, is an upper secondary degree in Denmark, requiring 2-4 years of schooling after finishing 9th form. The parameter estimates for birth weight, maternal age at birth, birth order, and parental divorce/dissolution are of similar sign as the estimates for GPA, and all significant and of non-negligible size. Of particular note is the different size of the parameter estimate for parental divorce/dissolution between the enrollment and attainment results. In percentage points, the estimate for divorce/dissolution for the completion model is more than twice the size than the estimate for enrollment—thus, experiencing parental union dissolution before turning 18 entails an increased likelihood of non-enrollment in upper secondary education, but also higher dropout rates or delayed completion among those who enroll.

Unlike for GPA outcome, the parameter estimates for maternal and paternal welfare dependency are of a substantial magnitude for both enrollment in and completion of upper secondary education. One additional year of maternal welfare duration increases the likelihood of not enrolling in upper secondary education with 1.1 percentage points, and the likelihood of completing upper secondary with .6 percentage points. For parental welfare dependency, the likelihood of enrollment decreases with 1 percentage per year of duration, and the likelihood of completion decreases with .8 percentage point. The average child in the data that experiences any parental welfare dependency, experiences 1.8 years of paternal dependency and 2.6 years of maternal dependency, which translates into a 4.7 percentage

[11] Calculated as the parameter estimate for female divided the sample average.

points (7 percent) lower likelihood of enrolling, and a 2.7 percentage point (5 percent) lower likelihood of finishing upper secondary education.

The estimate for the dummy indicating no maternal or paternal welfare dependency appears puzzling at first, but is understandable once we consider the nature of the sample. A small group of individuals in the sample has siblings who experience their parents on welfare (four percent individuals in the sample from families where at least one sibling experiences parents being on welfare), but do not experience the exposure themselves. Exposed siblings in this small group generally experience exposure for a short period.[12] Because the parameter estimates for both paternal and maternal welfare duration is negative, this evens out the effect of the no-duration dummy between siblings.

The final two columns show the results for the estimates for enrollment into a tertiary program at age 22. Most of the observable characteristics exhibit similar estimates as for the earlier educational outcomes. The estimates for having experienced parental union dissolution are insignificant in both models, but the signs are still negative. The estimate for duration of maternal welfare dependency becomes insignificant and close to zero. The small and insignificant estimate indicates that the duration of maternal welfare dependency only affects the educational attainment of children who would have ended their educational attainment at upper secondary level absent any maternal welfare dependency. Children with the ambition and ability to proceed to tertiary degrees do so unaffected by maternal welfare dependency. Yet, paternal welfare dependency still affects enrollment into tertiary education, and while the parameter estimate is smaller than the estimates for enrollment in and completion of upper secondary education, the marginal effect is almost constant across the three outcomes. An increase in one year of duration is, respectively, equal to a 1.4, 1.5, and 1.5 percent decrease

[12]Individuals who experience parental welfare exposure, but have siblings that do not, experience .28 year of paternal welfare, and .39 year of maternal welfare with the correlation between the two duration being -.070.

in enrolling in upper secondary education, completing upper secondary education, and enrolling in tertiary education.

Our main results show that once we control for family-level confounding, duration of parental welfare dependency does not affect educational performance, but does affect educational attainment. The results further indicate that maternal and paternal welfare dependency perhaps do not function in identical ways. To investigate the results further, we unpack the relationships between welfare dependency and educational attainment. First, we examine whether the impact of welfare dependency is constant across social background, or if certain groups are affected more than other groups. RRA suggest that children of parents with education above compulsory level likely will be affected more than children, for whom welfare dependency does not confuse a signal of higher social position. Similarly, we also study whether timing of welfare dependency is important. Further, maternal and paternal welfare dependency do not appear to have identical effects. Mothers mainly affect children who, no matter their mother's welfare history, never would have entered tertiary education, but if their mother spent less time on welfare would be terminal at the upper secondary level. Fathers affect all children across educational transitions. The response to parental duration of welfare dependency may differ, for example, by cognitive ability, essentially a question of moderation. We do not observe academic ability, but GPA can likely function as a viable proxy. Below, we explore these considerations.

Parental Background and Timing of Welfare Dependency

We divide parental background into three categories defined by the highest attained level of education among the two parents: Tertiary degree (2+ years of college, ISCED > 4), upper secondary degree (high school equivalent, ISCED $\in \{3,4\}$), and below upper secondary (less than high school, ISCED < 3). Further, to consider timing we divide both maternal and

paternal duration of welfare dependency into three groups consisting of duration from the child was born until it turned six, from six until it turned twelve, and from twelve until the child turned eighteen.[13]

Table 4 report the results for duration of maternal and paternal welfare dependency for the full sample, and for subsamples conditioned on parents' highest level of education. For the sake of brevity, we do not show parameters for demographic characteristics. The first panel show results for GPA. For the full sample, we do not observe any significant effects of duration during specific periods of childhood on educational performance. When conditioning on educational level, a couple of parameters do become significant, but effects are neither uniform in direction nor especially sizeable. Panel two to four show results on educational enrollment and completion. Here, a clear patterns emerges—the effect of parental welfare dependency is concentrated among children of parents with education above the compulsory level, and highest in families where at least one of the parents have a tertiary degree. For children whose parents do not have education above compulsory level, duration of parental welfare dependency plays no role in explaining educational attainment.

[13] For the estimates of parental welfare dependency across parental educational background not divided into age groups, see Table A3 in appendix.

Table 4. Results from Sibling Fixed Effects Models using Timing Welfare Dependency as Independent Variables for Full Sample and Conditional on Highest Parental Education

		Full sample	Parents' ISCED = 1,2	Parents' ISCED = 3,4	Parents' ISCED >4
Panel 1 School leaving GPA	Maternal duration of welfare, age 0-5	-0.002	0.028	0.009	-0.040
		(0.011)	(0.017)	(0.018)	(0.023)
	Maternal duration of welfare, age 6-11	-0.001	-0.020	0.047*	-0.079**
		(0.012)	(0.018)	(0.019)	(0.027)
	Maternal duration of welfare, age 12-17	0.005	-0.010	0.033	-0.053
		(0.012)	(0.020)	(0.019)	(0.027)
	Paternal duration of welfare, age 0-5	0.011	0.018	-0.016	0.029
		(0.012)	(0.020)	(0.021)	(0.023)
	Paternal duration of welfare, age 6-11	-0.004	0.017	-0.040	0.017
		(0.012)	(0.021)	(0.021)	(0.024)
	Paternal duration of welfare, age 12-17	0.006	0.018	-0.016	0.004
		(0.015)	(0.023)	(0.024)	(0.032)
	N	526448	78433	261918	186097
	Outcome mean	6.374	5.069	6.083	7.332
Panel 2 Ever enrolled in upper secondary at age 21	Maternal duration of welfare, age 0-5	-0.007**	0.001	-0.013**	-0.021***
		(0.003)	(0.004)	(0.005)	(0.006)
	Maternal duration of welfare, age 6-11	-0.013***	-0.006	-0.018***	-0.028***
		(0.003)	(0.004)	(0.005)	(0.006)
	Maternal duration of welfare, age 12-17	-0.009**	-0.003	-0.011*	-0.027***
		(0.003)	(0.004)	(0.005)	(0.007)
	Paternal duration of welfare, age 0-5	-0.005	0.003	-0.012*	-0.015**
		(0.003)	(0.005)	(0.005)	(0.006)
	Paternal duration of welfare, age 6-11	-0.011***	-0.004	-0.012*	-0.025***
		(0.003)	(0.005)	(0.005)	(0.004)
	Paternal duration of welfare, age 12-17	-0.008*	-0.003	-0.012*	-0.015*
		(0.003)	(0.005)	(0.006)	(0.007)
	N	545309	96290	267032	181987
	Outcome mean	.705	.497	.668	.868
Panel 3 Completed upper secondary at age 21	Maternal duration of welfare, age 0-5	0.002	0.006	0.001	-0.014*
		(0.002)	(0.003)	(0.004)	(0.006)
	Maternal duration of welfare, age 6-11	-0.005*	0.005	-0.006	-0.030***
		(0.002)	(0.003)	(0.004)	(0.006)
	Maternal duration of welfare, age 12-17	-0.007**	-0.004	-0.006	-0.023***
		(0.002)	(0.003)	(0.004)	(0.007)
	Paternal duration of welfare, age 0-5	-0.005	-0.002	-0.007	-0.006
		(0.003)	(0.004)	(0.004)	(0.006)
	Paternal duration of welfare, age 6-11	-0.009***	-0.007	-0.008	-0.018**
		(0.003)	(0.004)	(0.004)	(0.006)
	Paternal duration of welfare, age 12-17	-0.004	-0.004	-0.001	-0.008
		(0.003)	(0.004)	(0.005)	(0.007)
		545309	96290	267032	181987
	Outcome mean	.549	.321	.509	.730
Panel 4 Enrolled in tertiary education at 22	Maternal duration of welfare, age 0-5	0.005*	0.009**	0.003	-0.003
		(0.002)	(0.003)	(0.006)	(0.006)
	Maternal duration of welfare, age 6-11	-0.003	-0.001	-0.005	-0.005
		(0.002)	(0.003)	(0.004)	(0.007)
	Maternal duration of welfare, age 12-17	-0.004	0.003	-0.009*	-0.007
		(0.002)	(0.003)	(0.004)	(0.007)
	Paternal duration of welfare, age 0-5	-0.003	0.004	-0.006	-0.009
		(0.003)	(0.004)	(0.005)	(0.007)
	Paternal duration of welfare, age 6-11	-0.003	0.001	0.006	-0.025***
		(0.003)	(0.004)	(0.004)	(0.006)
	Paternal duration of welfare, age 12-17	-0.001	0.001	0.007	-0.021**
		(0.003)	(0.004)	(0.005)	(0.008)
	N	537500	94302	263801	179397
	Outcome mean	.324	.170	.274	.480

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Models estimated with full set of covariates.
Source: Own calculation on data from Statistics Denmark.

Further, one distinct difference across childhood timing does emerge. For children of parents with tertiary degrees, there does appear to be a distinct timing effect of duration of paternal welfare dependency on children's likelihood of enrolling in tertiary education. Panel 4 shows that the effect of an additional year of duration is significantly and substantially higher when it occurs after children turn six than before.

In total, exposure to parental welfare dependency predominantly affects the educational attainment of children of educated parents, and duration of exposure appears to be a viable metric to measure it by, indicating a form of dosage-response relationship. There is some evidence that timing of paternal welfare dependency matters for transition into tertiary education.

Academic Performance as a Moderating Factor

Children appear to respond differently to maternal and paternal welfare dependency — maternal welfare dependency appears to predominately matter for whether children enroll in and complete upper secondary education, whereas paternal welfare dependency also matters for enrollment into tertiary education. At the same time, Table 4 demonstrated that the effect of duration of welfare dependency is concentrated among children of parents with education above primary level. Together, these findings suggest that among children with higher educated parents, it is the children who would have ended their educational trajectory at upper secondary level that are affected by maternal welfare dependency. From Table 3 we also know that academic performance is not affected by parental welfare dependency after controlling for family-level constant traits, and is thus feasibly exogenous. At the same time a large body of research has shown that educational attainment is linked to academic performance (Jackson 2013) and that low performing students from socio-economically advantaged backgrounds tend to have a disproportionally higher attainment, when compared

to equally low performing students from socio-economically disadvantaged backgrounds (Bernardi and Cebolla 2014).

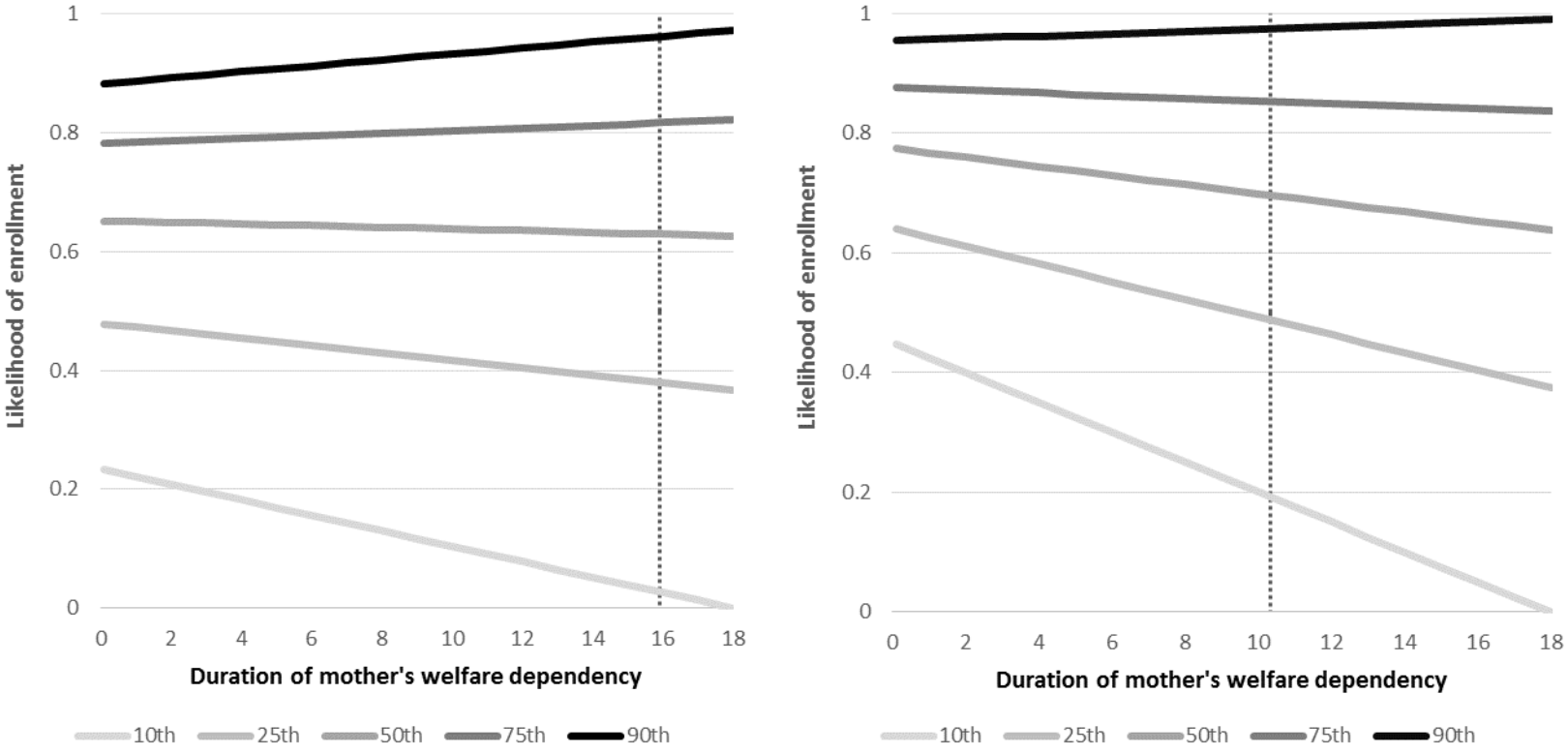
Thus, low performing students from high educated backgrounds could be the main drivers of the effect of welfare duration on educational attainment. For this reason, we interact our measure of performance (GPA) with duration of maternal welfare dependency and estimate how performance may moderate the relationship between welfare dependency and educational attainment. We run the regressions separately across parental academic background. For the sake of brevity, we only report results from models using enrollment in upper secondary education and interacting GPA with duration of maternal welfare dependency, and do so graphically.

Figure 2 shows the relationship between duration of maternal welfare dependency and enrollment in upper secondary education for different parts of the GPA distribution and separately for children whose parents did not have education above compulsory level [Figure 2(a)] and children where at least one parent had a two-year college degree or higher [Figure 2(b)].[14] First, not surprisingly, across both graphs children with higher GPA are more likely to enroll in upper secondary education than children with lower GPA are. However, there is little difference in the welfare duration gradient for different parts of the GPA distribution for children with parents, who have compulsory education as their highest level. The interaction between GPA and welfare duration (not shown) is insignificant. For children of parents with at least a two-year college degree, we see a substantial difference in slopes across the GPA distribution. The interaction is also significant at the .1 percent level. For the group of children from families where the parents' highest level of education is high-school equivalent, the result falls between the two shown. Across all three groups, the results for paternal

[14] The two youngest cohorts in the data do not have information on GPA. We add dummy variables to account for this, and code their GPA as equal to the lowest grade.

welfare dependency takes a similar shape. In total, once we control for selection at the family-level, the negative effect of parental welfare dependency on educational enrollment and completion is concentrated among low performing students whose parents have education above the compulsory level.

Figure 2. The Moderating Effect of Academic Performance on the Relationship between Maternal Welfare Dependency and the Likelihood of ever Having Enrolled in an Upper Secondary Program at Age 21 across Highest Parental Level of Education



(a) Parents' ISCED < 3

(b) Parents' ISCED > 4

Note: The dashed line indicates the 95th percentile of duration of maternal welfare dependency for all with maternal welfare dependency larger than zero in each subsample.
Source: Own calculation on data from Statistics Denmark.

Robustness of Results

To test the robustness of our findings, we first test possible confounding factors: parental unemployment and parental income. As discussed in the Background section, previous work has made a compelling case for the impact of parental unemployment on children's education (at least in an Anglo-Saxon context). To test whether our measures of parental welfare dependency simply just capture part of the underlying effect of unemployment, we re-estimate Eq. (1) but also include maternal and paternal aggregated unemployment across the children's childhood on the right hand side. Further, to test for whether material conditions affect children's educational outcomes, we also include deflated gross income for both parents measured the year children turn 16, where most children make their first educational transition. We present these results in Table A3 in appendix. Neither gross income nor unemployment changes the estimates on duration of parental welfare dependency, indicating that neither parental inactivity nor available resources at time of educational transition confounds or mediates the relationship between parental welfare dependency and children's educational attainment.

Further, our empirical strategy compares siblings, which questions whether the findings are generalizable to singletons as well. Whereas we cannot run fixed effect estimates for singletons to compare to our main estimates, we can as a second best option run OLS models and compare these to the models for the entire sample (as found in Table A2 in the appendix). Table A4 in the appendix presents the results from the OLS models for singletons. The differences between results from the singleton sample and the results for the full sample are numerically small and the overall patterns in the associations remain the same. Whereas not ironclad proof, this is suggestive of the underlying selection issues that confound the relationship between parental welfare dependency and children's educational attainment, and

performance is identical, whether we examine singleton or sibling sets. Thus, our results likely generalize to the full child population.

CONCLUSION

In this paper, we have studied how parental welfare dependency affects children's educational attainment in Denmark. Building upon relative risk aversion theory of educational choice, we hypothesized that exposure to parental welfare dependency likely affects children's educational attainment by causing the children to underestimate their social origin position and their expected returns to education, thereby lowering children's educational ambitions. We further hypothesized that exposure functioned partly as a dosage-response relationship, so that the duration of parents' dependence on welfare was a viable metric for examining the relationship. Using complete population data on twelve Danish birth cohorts, we used sibling fixed effect models to demonstrate that duration of exposure to both parental and maternal welfare dependency lowered the probability of enrolling in and completing upper secondary education, as well as the probability of enrolling in a tertiary program. The effect was not mediated by parental welfare causing children's educational performance to decrease, which also speaks against a "welfare culture"-type explanation of our findings. Instead, low-ability children from highly educated families who lowered educational enrollment and attainment drove the effect. This is in accordance with an explanation of children lowering their educational ambition based on their parents' welfare dependency distorting the signal the children observe about their social origin position and the expected returns to education. One finding does however suggest that another theoretical explanation should also be considered—we did observe differences across timing of paternal duration of welfare on the likelihood of enrolling in tertiary education.

Perspective

Although we have demonstrated that parental welfare dependency negatively affects children's educational attainment, this should not be seen as a tacit argument for limiting the access to welfare benefits for parents in order to promote better educational outcomes for children. It is important to have the counterfactual situation in mind—in our study, parents are likely either employed or undertaking studies when not on welfare. If we simply limited access to welfare without increasing the supply of employment or education, we would instead likely create a situation of poverty. Although welfare, at least in Denmark, lowers the educational attainment, there is ample evidence that the effect of poverty is considerably worse. Poverty does not only affect children's educational attainment but also negatively affects their cognitive development and educational performance. Thus, if we wish to increase the educational attainment of children of welfare recipients, the aim should be to get parents off welfare through employment and other types of gainful activities, not by limiting access to the welfare rolls.

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APPENDIX

Table A1. Conversion of Danish grading scale to ECTS scale

Danish grade	ECTS grade
12	A
10	B
7	C
4	D
02	E
00	Fx
-3	F

Table A2. Results from OLS Models on (a) School Leaving GPA; (b) Enrolled in Upper Secondary Year Turning 21; (c) Attained Upper Secondary at 21; (d) Enrolled in Tertiary at Year Turning 22

	School leaving GPA		Enrolled in up. sec.		Attained upper sec.		Enrolled in tertiary	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
At least one parent	0.856***	0.659***	0.169***	0.131***	0.167***	0.123***	0.103***	0.081***
graduated high school	(0.009)	(0.010)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
At least one parent	1.713***	1.548***	0.304***	0.272***	0.310***	0.272***	0.257***	0.238***
Graduated college (2+ yrs)	(0.010)	(0.010)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Female=1	0.637***	0.631***	0.188***	0.185***	0.176***	0.173***	0.139***	0.138***
	(0.006)	(0.006)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
log(Birth weight)	0.674***	0.528***	0.115***	0.084***	0.153***	0.117***	0.076***	0.058***
	(0.016)	(0.016)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Mother's age	0.067***	0.052***	0.009***	0.006***	0.010***	0.007***	0.007***	0.005***
at birth	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
2nd born	-0.466***	-0.447***	-0.057***	-0.054***	-0.058***	-0.055***	-0.066***	-0.064***
	(0.006)	(0.006)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
3rd born	-0.789***	-0.693***	-0.096***	-0.080***	-0.106***	-0.086***	-0.104***	-0.094***
	(0.010)	(0.010)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
4th + born	-1.375***	-1.072***	-0.163***	-0.110***	-0.187***	-0.124***	-0.144***	-0.114***
	(0.018)	(0.018)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Parents' divorced	-0.473***	-0.315***	-0.091***	-0.056***	-0.134***	-0.092***	-0.100***	-0.078***
	(0.006)	(0.006)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
No parental		0.227***		0.045***		0.069***		0.044***
welfare dependency		(0.006)		(0.001)		(0.001)		(0.001)
Duration of maternal		-0.070***		-0.014***		-0.014***		-0.007***
welfare dependency		(0.001)		(0.000)		(0.000)		(0.000)
Duration of paternal		-0.043***		-0.007***		-0.008***		-0.003***
welfare dependency		(0.001)		(0.000)		(0.000)		(0.000)
Constant term	-2.106***	-0.417**	-0.724***	-0.382***	-1.206***	-0.811***	-0.695***	-0.501***
	(0.129)	(0.129)	(0.026)	(0.026)	(0.029)	(0.028)	(0.028)	(0.028)
N	526448	526448	545309	545309	545309	545309	537500	537500
Outcome mean	6.374	6.374	.705	.705	.549	.549	.324	.324

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Estimates for birth year not shown.
Source: Own calculation on data from Statistics Denmark.

Table A3. Results from Sibling Fixed Effects Models using Timing Welfare Dependency as Independent Variables for Full Sample and Conditional on Highest Parental Education

		Parents' ISCED = 1,2	Parents' ISCED = 3,4	Parents' ISCED >4
School leaving GPA	Maternal duration of welfare	0.001	0.013	-0.054**
		(0.013)	(0.013)	(0.020)
	Paternal duration of welfare	0.003	-0.022	0.005
		(0.015)	(0.015)	(0.018)
	N	78433	261918	186097
	Outcome mean	5.069	6.083	7.332
Ever enrolled in upper secondary at age 21	Maternal duration of welfare	-0.004	-0.014***	-0.026***
		(0.003)	(0.003)	(0.005)
	Paternal duration of welfare	-0.005	-0.010*	-0.022***
		(0.004)	(0.004)	(0.005)
	N	96290	267032	181987
	Outcome mean	.497	.668	.868
Completed upper secondary at age 21	Maternal duration of welfare	0.001	-0.006	-0.027***
		(0.003)	(0.003)	(0.006)
	Paternal duration of welfare	-0.007*	-0.005	-0.016**
		(0.003)	(0.004)	(0.005)
	N	96290	267032	181987
	Outcome mean	.321	.509	.730
Enrolled in tertiary education at 22	Maternal duration of welfare	0.003	-0.004	-0.006
		(0.002)	(0.003)	(0.005)
	Paternal duration of welfare	0.000	0.000	-0.021***
		(0.003)	(0.004)	(0.005)
	N	94302	263801	179397
	Outcome mean	.170	.274	.480

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Models estimated with full set of covariates.

Source: Own calculation on data from Statistics Denmark.

Table A4. Fixed Effects Results for Educational Outcomes for Including Control for Parental Unemployment and Children's School Leaving Grade

	GPA	Enrolled in up. sec.	Attained upper sec.	Enrolled in tertiary
	(1)	(2)	(3)	(4)
Female=1	0.763***	0.192***	0.175***	0.141***
	(0.008)	(0.002)	(0.002)	(0.002)
Mother's age	0.084***	0.012***	0.015***	0.015***
at birth	(0.004)	(0.001)	(0.001)	(0.001)
log(Birth weight)	0.288***	0.073***	0.098***	0.062***
	(0.030)	(0.008)	(0.008)	(0.008)
2nd born	-0.357***	-0.046***	-0.061***	-0.067***
	(0.012)	(0.003)	(0.003)	(0.003)
3rd born	-0.524***	-0.064***	-0.094***	-0.101***
	(0.025)	(0.006)	(0.006)	(0.006)
4th + born	-0.702***	-0.076***	-0.120***	-0.123***
	(0.041)	(0.010)	(0.011)	(0.010)
Parents' divorced	-0.144***	-0.015**	-0.034***	-0.010
	(0.023)	(0.006)	(0.006)	(0.006)
No parental	0.037	-0.014*	-0.014*	-0.011
welfare dependency	(0.021)	(0.005)	(0.006)	(0.006)
Duration of maternal	-0.002	-0.011***	-0.006**	-0.001
welfare dependency	(0.009)	(0.002)	(0.002)	(0.002)
Duration of paternal	0.003	-0.011***	-0.007**	-0.005*
welfare dependency	(0.009)	(0.002)	(0.002)	(0.002)
Maternal Duration of	0.042***	-0.003	0.001	0.001
Unemployment	(0.008)	(0.002)	(0.002)	(0.002)
Paternal Duration of	0.010	-0.001	-0.005	-0.003
Unemployment	(0.010)	(0.003)	(0.003)	(0.002)
Maternal average gross	0.018*	-0.001	0.000	-0.002
income across childhood	(0.008)	(0.001)	(0.001)	(0.002)
Paternal average gross	0.034***	-0.002	0.000	-0.004
income across childhood	(0.006)	(0.001)	(0.001)	(0.002)
Maternal gross income at	-0.003*	0.000	0.000	0.000
child's age 16	(0.001)	(0.000)	(0.000)	(0.000)
Paternal gross income at	-0.003***	0.000	-0.001*	-0.001
child's age 16	(0.001)	(0.000)	(0.000)	(0.000)
N	526448	545309	545309	537500
Outcome mean	6.374	.705	.549	.324

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note: Gross income is calculated at the 2014-level and measured in € 10,000.
Source: Own calculation on data from Statistics Denmark.

Table A5. OLS Results for Educational Outcomes for Singletons

	GPA	Enrolled in up. sec.	Attained upper sec.	Enrolled in tertiary
	(1)	(2)	(3)	(4)
At least one parent	0.664***	0.109***	0.115***	0.067***
graduated high school	(0.011)	(0.002)	(0.003)	(0.002)
At least one parent	1.699***	0.261***	0.284***	0.249***
Graduated college (2+ yrs)	(0.013)	(0.003)	(0.003)	(0.003)
Female=1	0.755***	0.180***	0.171***	0.141***
	(0.008)	(0.002)	(0.002)	(0.002)
Mother's age	0.028***	0.003***	0.003***	0.003***
at birth	(0.001)	(0.000)	(0.000)	(0.000)
log(Birth weight)	0.435***	0.079***	0.107***	0.044***
	(0.022)	(0.004)	(0.005)	(0.005)
Parents' divorced	-0.394***	-0.060***	-0.097***	-0.088***
	(0.008)	(0.002)	(0.002)	(0.002)
No parental	0.213***	0.038***	0.064***	0.041***
welfare dependency	(0.009)	(0.002)	(0.002)	(0.002)
Duration of maternal	-0.064***	-0.014***	-0.014***	-0.007***
welfare dependency	(0.002)	(0.000)	(0.000)	(0.000)
Duration of paternal	-0.027***	-0.005***	-0.006***	-0.002***
welfare dependency	(0.002)	(0.000)	(0.000)	(0.000)
Constant term	0.885***	-0.218***	-0.619***	-0.302***
	(0.178)	(0.037)	(0.041)	(0.040)
N	268501	275149	275149	271156

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Own calculation on data from Statistics Denmark.