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Intergenerational Transmission of Educational Attainment

The Role of Household Assets

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Intergenerational Transmission of Educational Attainment: The Role of Household Assets

Intergenerational transmission of education from parents to children has been investigated extensively, and the parent-child correlation of schooling is about .46 in the US. A high intergenerational persistence of educational attainment is not only an indicator of educational inequality but also a barrier to equal opportunities in the labor market and beyond. This study uses data from the Panel Study of Income Dynamics (PSID) to generate a sample of two cohorts of white children ('84 and '94 cohorts), and examines whether intergenerational transmission of education varies by household economic resources, especially household assets. Results show that, in the '94 cohort, financial assets increase the parent-child association of schooling for male children, but decrease the parent-child association for female children. In addition, financial assets and net worth have a negative interaction effect with parental education on female child's educational attainment as measured by college completion. Research and policy implications of the findings are discussed.

Key words: *Intergenerational mobility, Educational mobility, Educational attainment, Assets, Wealth*

Introduction

Education is a primary determinant of long-term economic success and a key mechanism of social mobility, capable of lifting disadvantaged children and improving their chances for success as adults (Baum & Ma, 2007; Haveman & Wolfe, 1995; Kane, 2004). Child education outcomes are affected by family background, such as parental education and household economic resources (Björklund & Salvanes, 2010; Haveman & Wolfe, 1995). It is well known that children whose parents have more schooling tend to have better educational outcomes. There is a strong intergenerational association between parental schooling and child's schooling. The intergenerational transmission of education from parents to children is considered a measure of educational mobility, and high intergenerational persistence of educational attainment between generations is a barrier to equal opportunities in the labor market and beyond (Black & Devereux, 2010).

The intergenerational transmission of education has been investigated extensively in the theoretical and empirical literature. Hertz et al. (2007), for example, provide estimates of the parent-child correlation of schooling in a sample of 42 countries. The correlation coefficient is about .60 in South America, about .40 in Western Europe, .46 in the US, and is the lowest in Nordic countries. Vast differences in the parent-child association across countries suggest potential heterogeneity in intergenerational transmission by geography and institutional settings (e.g., the educational system). It implies that intergenerational transmission is not solely a process of genetic inheritance; educational mobility is also affected by external conditions (e.g., return on education, family investment in child development, and public policy) beyond biological factors. Intergenerational

association of education may vary by other family background factors (e.g., economic resources) as well. However, few studies have examined the heterogeneity and patterns of intergenerational transmission, which could be important to decomposing the causal mechanism underlying the schooling association between generations (Bauer & Riphahn, 2004).

In addition to parental education, it is believed that household assets are an important determinant of child's developmental outcomes. Extensive research shows a positive relationship between household assets and child's educational attainment (Conley, 2001; Elliott, Destin, & Friedline, 2011; Kim & Sherraden, 2011; Nam & Huang, 2009, 2011; Orr, 2003). Although both parental education and assets affect child's educational outcomes, there might be an interactive relationship between the two as they relate to child development. In other words, intergenerational transmission of education from parents to children may vary by level of household economic resources (e.g., assets or income). This study aims to understand the potential heterogeneity in intergenerational transmission of education by household economic resources (especially household assets), using data from the Panel Study of Income Dynamics (PSID) from which a sample of two cohorts of white children is generated.

Background

Intergenerational transmission of education as a measure of intergenerational mobility

The rising economic inequality in the US in the last few decades is closely related to decreased social mobility across generations (Anger, 2011). Existing literature on intergenerational mobility focuses predominantly on income and educational mobility. Intergenerational earnings elasticity or intergenerational correlation of earnings are commonly used as measures of income mobility, and the estimated earnings elasticity is about .50 to .60 in the US (Black & Devereux, 2010). Similarly, intergenerational transmission of education can be measured by the parent-child schooling correlation or the regression coefficient of parental education on child's educational attainment. For discrete variables of educational attainment, such as high school graduation, college entry, and college graduation, another strategy to measure educational mobility is transition matrices, which show parents' education (e.g., college completion) on one axis and child's education on the other, and compare child's education mobility rates conditional on different parental education (Bauer & Riphahn, 2004).

In addition to transnational comparisons of intergenerational correlations of education, empirical studies have examined whether the parent-child schooling association changes over time (Hertz et al., 2007), as the time trend may be considered a type of heterogeneity in intergenerational transmission as well. The study findings, however, are fairly mixed. For example, Hertz et al. (2007) suggest that, in the US, the coefficients of the parent-child schooling correlation have increased slightly for the 1967, 1972, and 1977 birth cohorts, but regression coefficients have fallen over time.

The strong intergenerational association of schooling does not necessarily reflect a causal relationship between parent's and child's education, however. Existing literature considers two main channels for the transmission of education between generations. On the one hand, skills may be transmitted from parents to their biological children by the inheritance of genes (nature). On the other hand, the transmission may work through parents' investment in child development (nurture). The research design and the PSID data used in the study cannot identify the "nurture" effects separately from genetic effects. That is, this study does not differentiate between genetic and behavioral determinants of intergenerational transmission, but rather focuses on discussing the pattern of intergenerational association of schooling across levels of household economic resources.

Do assets increase or decrease intergenerational transmission of education?

Household economic resources, namely, assets and income, play an important role in children's educational outcomes and intergenerational transmission of education. As reviewed in Elliott, Destin, and Friedline (2010), studies generally find a positive association between household assets and children's academic achievement and postsecondary education. Household assets may affect children's educational outcomes through similar channels of parental education. First, the positive association between household assets and children's educational attainment could be due to genetic endowments that affect both parent's capability of asset accumulation and children's schooling. Parents with higher innate ability accumulate more assets and have children who are able to obtain more schooling. Second, families with assets have financial resources to invest in children's human capital (e.g., academic and cognitive development), and to improve children's life chances (Conley, 2001; Mayer, 1997; Shapiro, 2004). Low-wealth children often live in physical environments offering less stimulation and fewer resources (e.g., educational toys and books) for learning. In contrast, children from wealthy families are more likely to receive high-quality education, and even have resources to pay for their post-secondary education. Furthermore, as asset holding can shape positive psychological well-being (Schreiner & Sherraden, 2007; Sherraden, 1991), children from families owning assets are more likely to develop future orientation, self-esteem, and self-efficacy, which are important to achieving academic success.

It is not unexpected that household assets and parental education may have a confounded association with child's educational attainment as they are highly correlated and may affect child development in similar ways. Beyond the confounded relationship, an interesting question is whether intergenerational association of schooling differs by the level of household assets, or whether there is an interactive relationship between household assets and parental education on child's educational outcomes. Findings regarding this research question have important implications for policy that aims to promote educational mobility. If household assets increase intergenerational association of education, policy should address the interaction of lack of financial resources and low parental education to prevent children of such families becoming more disadvantaged. On the contrary, if household assets lessen intergenerational transmission from parents to children, this

suggests that the asset-building approach may have double effects on educational inequality caused by both liquidity constraints and low parental education.

Nonetheless, the direction of the interactive relationship between household assets and parental education (if it exists) is less clear. One hypothesis is that intergenerational transmission of education increases along with the level of household assets, which means there is a positive interaction between household assets and parental education. Thus, children of highly educated parents have the inherited ability to obtain more schooling, yet a lack of financial resources could limit their parents' investment in child development (Kane, 2004) and consequently constrain these children in reaching their full educational potential. This implies that educational disparity among children with low and high parental education may be small due to the liquidity constraint of low-wealth families.

An alternative hypothesis is that household assets can reduce intergenerational transmission of education. Previous studies suggest that household economic resources have greater marginal effects on child development for disadvantaged children (Duncan, Ziol-Guest, & Kalil, 2010; Huang, 2011; Huang, Guo, Kim, & Sherraden, 2010). In other words, children whose parents have low education benefit more from the growth of household assets, and educational disparity decreases along with the increase of household assets. This hypothesis indicates a negative interaction between household assets and parental education.

Similar to the second one, the third hypothesis postulates that higher level of household assets is associated with lower level of intergenerational transmission of education. Household assets may show a greater association with parental education as they increase. This changing association between parental education and household assets would also result in a negative interaction effect on a child's educational attainment. All these hypotheses will be tested in this study using the PSID data to understand intergenerational transmission of education by the level of household economic resources.

Methods

Data and sample

The PSID is a longitudinal survey that is publicly available through the Institute for Social Research at the University of Michigan. The PSID collects demographic information and socioeconomic characteristics (e.g., educational attainment and household income) from a nationally representative sample of individuals and their families annually from 1968-1997 and biennially thereafter. Household assets are measured in the PSID in 1984, 1989, 1994, 1999, and biennially thereafter.

Taking advantage of the longitudinal data provided by the PSID, the study creates two cohorts: (1) children who were 13 to 20 years old and living in the parental household in 1984 (the '84 cohort) and (2) children who were 13 to 20 years old and living in the parental household in 1994 (the '94 cohort). The age range of eight years helps increase the sample size of this study. In order to control

for racial differences in education and household economic resources, the sample only includes white children. The final sample is composed of 1,773 white adolescents and young adults, 875 from the '84 cohort and 898 from the '94 cohort.

Measures

Dependent Variable. The dependent variable is individual educational attainment measured in 1996 for the '84 cohort and in 2007 for the '94 cohort. The study uses three indicators of educational attainment: a continuous measure of number of schooling years ranging from 1 to 17 and two dichotomous measures of college entry (Yes=1/No=0) and four-year college completion (Yes=1/No=0).

Independent Variables. Major independent variables are mother's educational attainment and household economic resources. Mother's educational attainment is also measured by number of schooling years, college entry (Yes=1/No=0), and four-year college completion (Yes=1/No=0).

Household economic resources include assets and income. Household assets are measured in 1984 for the older cohort and in 1994 for the younger cohort. The study uses two asset measures: net worth and financial assets. Net worth is defined as the total amount of household wealth (i.e., the sum of values of all assets net of all liabilities). Financial assets exclude home equity, business, and car from the net worth measure. The variable of parents' income is created by averaging the three years of family income (namely, 1982 to 1984 for the '84 cohort and 1992 to 1994 for the '94 cohort) to account for income fluctuation (Solon, 1992).

Control Variables. The study includes three groups of control variables. The first group is child's characteristics, including age, gender (Male=1/Female=0), and the birth order to mother (the first, second, third, or fourth child). The second group is householder's characteristics measured in 1984 and 1994, respectively, for the two cohorts. These characteristics are age, gender (Male=1/Female=0), marital status (Married=1/Not married=0), and employment status (Employed=1/Not employed=0). Finally, two household characteristics, household size and number of children, are controlled for in the analysis.

Analysis

As discussed above, intergenerational educational transmission is generally measured by the parent-child correlation of schooling, transition matrices, and regression coefficient of parental education on child education (Black & Devereux, 2010). The study first reports (1) the correlation of schooling and (2) transition matrices of college entry and college completion by the level of household economic resources. Since household economic resources (i.e., income and assets) are continuous variables, they are categorized into low-, mid-, and high-level groups in the descriptive analyses.

The cut-off lines of mid-level and high-level household resources are drawn at the 33rd and 67th percentile on the distributions of the resource variables to create three groups of the same size. While the cut-off lines are somewhat arbitrary, this allows the study to explore the potential heterogeneity in intergenerational transmission of education across different levels of economic resources. This categorization results in three groups similar to those using a different set of cut-off lines applied by Krueger (2012), in which a +/-50% band around the median household income is suggested. With presence of heterogeneity in intergenerational transmission of education by household economic resources, measures of intergenerational transmission should differ across the three groups.

To further examine the relationship between intergenerational transmission of education and household economic resources in multivariate analyses, the study takes the strategy similar to that of Bauer et al. (2007). The study runs OLS regression for the continuous measure of schooling years and logit regression for the dichotomous measures of educational attainment (college entry and four-year college completion). The model includes an interaction term of mother's education and household economic resources:

$$Y = \beta_0 + \beta_1 * ME + \beta_2 * HE + \beta_3 * (MT * HE) + \beta_4 * X + \epsilon \quad (1)$$

where Y indicates child's education; ME denotes mother's education; HE is household economic resources measured by assets or income; X is a vector of control variables; and ϵ indicates random errors. Following the convention in the literature to address skewness and to obtain a semi-elasticity explanation (Conley, 2001; Nam & Huang, 2009; Orr, 2003), the logarithm of assets and income are created for regression analyses. In equation (1), the coefficient of the interaction terms (β_3) is the parameter of interest because a significant estimate of β_3 indicates significant heterogeneity in intergenerational mobility across the levels of household economic resources. That is, the association between mother's and child's education varies by household economic resources.

The study runs additional analyses to check the robustness of the findings. First, the continuous measures of household economic resources in equation (1) are replaced by the three-level categorical measures created for descriptive analyses. Second, mother's schooling years is used to replace the dichotomous measures of mother's college entry and completion in logit regressions on college entry and college completion. Third, the study also conducts analyses on college entry and college completion using conditional models. Only those who finished high school or those who had college experiences are included in the conditional models for college entry or college completion.

All these analyses are conducted separately for males and females in each cohort to control for gender differences and cohort differences, and the Wald test is used to examine whether gender differences and cohort differences, if any, are statistically significant.

Results

Sample characteristics

Sample characteristics by cohort and child's gender are reported in Table 1. Child's educational attainment is measured at about age 29 for both cohorts. Child's mean schooling years is around 13-14 years. More than half of children have college experience. Less than 30% of children graduate from a four-year college except for women in the second cohort who have a graduation rate of 39%. Educational attainment of female children is higher, and also increases faster than that of male children over time.

The mean number of mother's schooling years is about 1-1.5 years lower than child's schooling years, indicating an intergenerational improvement in education. The likelihood of having college experiences for mothers in the '94 cohort is 47%, higher than that for mothers in the '84 cohort (27%). Similarly, the probability of four-year college completion for mothers doubles from about 10% to 20% between the two cohorts. Overall, household characteristics are similar across four columns in Table 1, although parents of the '94 cohort are less likely to be married. In addition, Table 1 reports mean and median values of household assets and income, as well as cut-off lines to create categorical measures of household economic resources.

Parent-child correlation of schooling

Table 2 lists parent-child correlations of schooling across the levels of household economic resources by cohort and child's gender. First, the overall correlation is .43 and .46 for females and .47 and .50 for males in two cohorts (Panel A of Table 2). These correlations are consistent with the findings in previous studies (e.g., .46; Hertz et al., 2007), and also suggest that intergenerational persistence increases slightly between the two cohorts.

Panel B reports schooling correlations by income. The correlation coefficient ranges from .25 to .47. Although these correlation coefficients are different across income within each column, it is not clear whether these differences are statistically significant or not. One pattern identified in Columns 2-4 (except for Column 1 of females in the '84 cohort) is that the correlation coefficient for the mid-level income group is the lowest, and correlation coefficients for the other two are similar. This may imply a nonlinear association between income and intergenerational transmission of education, and there is a higher level of educational mobility in the mid-level income group.

In the '84 cohort, the schooling correlation by level of financial assets has a similar pattern as that in Panel B—the mid-level financial assets group has the lowest coefficient value (.23 for females and .33 for males). However, the magnitude of the correlation coefficient for the mid-level group has a drastic increase in the '94 cohort (.54 for females and .50 for males), which seems to indicate a decrease of educational mobility over time for the middle group measured by assets. In addition, when financial assets increase, parent-child correlation of schooling has an increasing trend for

males and a decreasing trend for females in the '94 cohort. The schooling correlation between mothers and female children is the lowest in the high-level assets group (either financial assets or net worth). While it is not clear why household assets show opposite associations with intergenerational transmission by child's gender, the increased educational mobility across the levels of economic resources could be a contributing factor to improved educational attainment for women.

Transition matrices of college entry

Table 3 describes child's probability of college entry by cohort and gender conditional on mother's college experience. For instance, the first two columns (Columns 1 and 2) list the likelihood of entering college for female children in the '84 cohort depending on mother's college experience. First, it is clear that children of mothers with college experience are more likely to enroll in college (the column difference reported in Columns 2-1, 4-3, 6-5, and 8-7). The probability difference in child's college enrollment by parental education can be considered a measure of intergenerational educational persistence. For example, in the '94 cohort, the probability of college enrollment for male children of mothers with college experience is 40 percentage points higher than that of mothers without college experience (Panel A, Column 8-7). Second, regardless of mother's educational attainment, child's probability of college entry increases across the levels of household assets and income (the row difference). From child development perspective, the column difference and row difference in Table 3 show findings consistent with previous studies that both parental education and household wealth are positively related to child's educational attainment. However, from the social inequality perspective, family background in terms of parental education and household economic resources also contributes to educational inequality.

One approach to investigate whether intergenerational transmission of education varies with household economic resources is to compare column differences across rows for one gender in a specific cohort in transition matrices. If the column difference increasing across rows, this indicates a rising intergenerational transmission with household economic resources, and vice versa. For example, in Panel C of Table 3, the difference between Columns 4 and 3 decreases from .44, to .35, and then to .20 across low-, mid-, and high-level of financial assets for male children in the '84 cohort (reported in Column 4-3). It shows that intergenerational transmission of education reduces when household assets increase. While this example does not reflect the general pattern found in Table 3, a similar finding is that the low-level resource group has the highest intergenerational association. Another finding in Table 3 is that intergenerational transmission for the '94 female children living in households with high-level net worth is low, which is consistent with the finding in Table 2.

Table 1. Sample Characteristics (N=1,773)

Variables <i>Column Number</i>	84 Cohort		94 Cohort	
	Female (n=446) (1)	Male (n=429) (2)	Female (n=459) (3)	Male (n=439) (4)
Children's Characteristics				
Educational Attainment				
Schooling years (mean)	13.6	13.4	14.1	13.6
College entry (%)	55.2	51.7	65.6	58.4
Four-year college graduation (%)	29.3	27.6	39.0	26.9
Age when educational attainment measured	28.8	28.6	29.1	29.3
Birth order (%)				
First child	33.0	32.9	36.4	46.2
Second child	21.5	22.1	36.0	29.2
Third child	33.9	36.8	20.7	19.4
Fourth child and above	11.7	8.16	7.0	5.2
Mother's Characteristics				
Educational Attainment				
Schooling years (mean)	12.1	12.4	13.2	13.2
College entry (%)	27.2	27.8	47.1	45.0
Four-year college graduation (%)	9.9	11.9	21.5	21.0
Household Characteristics				
Householder's Gender (male, %)	83.7	87.1	76.9	83.5
Householder's Age (mean)	43.3	44.0	42.4	43.2
Householder's Employment (Yes, %)	86.1	80.8	89.3	91.5
Householder's Marital Status (Yes, %)	81.4	80.8	72.6	76.8
Household Size (mean)	3.9	4.0	3.9	3.9
Number of children (mean)	1.7	1.8	1.9	1.8
Household Economic Resources				
Three-year average income (mean)	40,909	38,068	53,955	63,037
33th percentile	23,133	23,133	40,028	40,028
50th percentile (median)	32,929	32,929	50,924	50,924
67th percentile	40,530	40,530	65,842	65,842
Financial Assets (mean)	161,106	86,011	101,542	107,727
33th percentile	5,400	5,400	7,400	7,400
50th percentile (median)	17,500	17,500	25,950	25,950
67th percentile	32,570	32,570	51,100	51,100
Net worth with home equity (mean)	208,773	133,411	148,528	164,026
33th percentile	25,000	25,000	25,500	25,500
50th percentile (median)	58,200	58,200	64,600	64,600
67th percentile	86,500	86,500	112,000	112,000

Table 2. Correlation of Schooling Years between Children and Mothers (N=1,773)

Correlation	84 Cohort		94 Cohort	
	Female (n=446)	Male (n=429)	Female (n=459)	Male (n=439)
<i>Column Number</i>	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>
Panel A: Correlation of Schooling Years	0.43	0.47	0.46	0.50
Panel B: Correlation by the Level of Income				
Low-level	0.33	0.40	0.38	0.47
Mid-level	0.43	0.25	0.25	0.37
High-level	0.31	0.42	0.39	0.45
Panel C: Correlation by the Level of Financial Assets				
Low-level	0.44	0.37	0.46	0.18
Mid-level	0.23	0.33	0.54	0.50
High-level	0.40	0.47	0.25	0.57
Panel D: Correlation by the Level of Net Worth (with home equity)				
Low-level	0.39	0.39	0.47	0.41
Mid-level	0.37	0.37	0.55	0.32
High-level	0.34	0.41	0.14	0.52

Transition matrices of college completion

Table 4 presents child's probability of four-year college completion conditional on mother's college completion. First, the difference in male children's college completion rates by parental education is similar for the two cohorts (.45 for the '84 cohort and .46 for the '94 cohort; see Columns 4-3 and 8-7), indicating hardly any change in intergenerational transmission for male children during the observation years. In contrast, this difference decreases by ten percentage points from .47 to .37 between the two cohorts for female children (see Columns 2-1 and 6-5), showing an improved educational mobility for women measured by intergenerational transmission of college graduation. The comparison of Columns 5 and 1 suggests that this improvement is mainly caused by increased college graduation rates among female children of mothers without college degrees, especially those with mid- or high-level assets or income.

Second, it is worth noting that the '84 female children of mothers with a college degree in the low-level financial assets group have a very high probability (100%) of college completion due to the fact that a very low proportion of mothers have a four-year college degree. This may suggest that the estimations for the '84 female children of mothers with college degrees in the low-level resource group may be less reliable (Column 2 of Panel C), the same as that for the '84 male children of mothers with college degrees in the low-level resource group (Column 4 of Panel C).

Focusing on the '94 cohort, Table 4 suggests that intergenerational transmission of college completion does not seem to vary by household income (Columns 6-5 and 8-7 of Panel B). While financial assets increase intergenerational persistence of college completion for male children (Column 8-7 of Panel C), both financial assets and net worth decrease intergenerational association for female children (Column 6-5 of Panels C and D).

Table 3. Transition Matrices of College Entry

Transition Matrices	84 Cohort						94 Cohort					
	Female		Male		Female		Male		Female		Male	
	MCE=	MCE=	MCE=	MCE=	MCE=	MCE=	MCE=	MCE=	MCE=	MCE=	MCE=	MCE=
<i>Column Number</i>	0	1	0	1	0	1	0	1	0	1	0	1
	(1)	(2)	(2-1)	(3)	(4)	(4-3)	(5)	(6)	(6-5)	(7)	(8)	(8-7)
Panel A: Whole Sample	0.49	0.75	0.26	0.40	0.77	0.37	0.53	0.85	0.32	0.41	0.81	0.40
Panel B: By the level of income												
Low-level	0.28	0.49	0.21	0.17	0.62	0.45	0.42	0.71	0.29	0.24	0.65	0.41
Mid-level	0.43	0.76	0.33	0.43	0.53	0.10	0.71	0.86	0.15	0.44	0.79	0.35
High-level	0.74	0.84	0.10	0.69	0.93	0.24	0.64	0.92	0.28	0.73	0.93	0.20
Panel C: by the Level of Financial Assets												
Low-level	0.29	0.62	0.33	0.21	0.65	0.44	0.40	0.74	0.34	0.28	0.61	0.33
Mid-level	0.55	0.69	0.14	0.38	0.73	0.35	0.59	0.92	0.33	0.45	0.81	0.36
High-level	0.65	0.87	0.22	0.63	0.83	0.20	0.67	0.85	0.18	0.55	0.86	0.31
Panel D: by the Level of Net Worth												
Low-level	0.20	0.51	0.31	0.19	0.56	0.37	0.38	0.70	0.32	0.23	0.65	0.42
Mid-level	0.57	0.71	0.14	0.33	0.72	0.39	0.49	0.93	0.44	0.47	0.76	0.29
High-level	0.67	0.91	0.24	0.70	0.87	0.17	0.81	0.87	0.06	0.57	0.88	0.31

MCE=0: Mothers do not have college experiences.

MCE=1: Mothers have college experiences.

Table 4. Transition Matrices of College Graduation

Transition Matrices	84 Cohort						94 Cohort					
	Female		Male		Female		Male		Female		Male	
	MCD =0 <i>(1)</i>	MCD =1 <i>(2)</i>	MCD =0 <i>(2-1)</i>	MCD =1 <i>(3)</i>	MCD =0 <i>(4)</i>	MCD =1 <i>(4-3)</i>	MCD =0 <i>(5)</i>	MCD =1 <i>(6)</i>	MCD =0 <i>(6-5)</i>	MCD =1 <i>(7)</i>	MCD =0 <i>(8)</i>	MCD =1 <i>(8-7)</i>
Panel A: Whole Sample	0.25	0.72	0.47	0.22	0.67	0.45	0.33	0.70	0.37	0.18	0.64	0.46
Panel B: By the level of income												
Low-level	0.12	0.18	0.06	0.05	0.27	0.22	0.18	0.38	0.20	0.05	0.39	0.34
Mid-level	0.21	0.64	0.43	0.22	0.53	0.31	0.43	0.64	0.21	0.13	0.49	0.36
High-level	0.40	0.84	0.44	0.40	0.77	0.37	0.53	0.80	0.27	0.44	0.76	0.32
Panel C: by the Level of Financial Assets												
Low-level	0.15	1.00	0.85	0.10	0.89	0.79	0.16	0.55	0.39	0.07	0.24	0.17
Mid-level	0.26	0.53	0.27	0.22	0.36	0.14	0.40	0.76	0.36	0.12	0.49	0.37
High-level	0.37	0.77	0.40	0.33	0.77	0.44	0.48	0.73	0.25	0.34	0.84	0.50
Panel D: by the Level of Net Worth												
Low-level	0.13	0.55	0.42	0.10	0.55	0.45	0.13	0.65	0.52	0.06	0.44	0.38
Mid-level	0.20	0.90	0.70	0.20	0.37	0.17	0.36	0.68	0.32	0.18	0.56	0.38
High-level	0.42	0.71	0.29	0.35	0.77	0.42	0.57	0.74	0.17	0.28	0.71	0.43

MCD=0: Mothers do not have four-year college degree.

MCD=1: Mothers have four-year college degree.

Regression results

Tables 5-7 present regression results of child's schooling years, college entry, and four-year college completion. Each cell in Columns 1, 2, 3, and 4 represents one regression model. The table reports regression coefficients of parental education and its interaction terms with household economic resources. Gender differences are reported in Columns 2-1 and 4-3, and cohort differences in Columns 3-1 and 4-2.

Schooling Years. Table 5 reports OLS regression results of child's schooling years. None of the interaction terms of parental education and household income in Columns 1, 2, 3, and 4 is statistically significant, indicating the invariable association between child's and mother's schooling regardless the level of household income. In addition, this study confirms that there is no gender difference or cohort difference.

In the '94 cohort, the parent-child association of schooling years differs by household assets. For female children, the association between child's and mother's schooling years decreases significantly when financial assets increase (Column 3: $b = -.016$, $p < .05$); that is, financial assets increase female children's educational mobility measured by schooling years. However, for male children, household assets, either financial assets or net worth, increase parent-child association of schooling significantly (Column 4: $b = .031$, $p < .1$; $b = .028$, $p < .01$). These are consistent with descriptive findings of the parent-child correlations reported in Panel C of Table 2. That is, household assets have opposite associations with intergenerational transmission of education for female and male children. In addition, this gender difference is statistically significant (Column 4-3: $b = .047$, $p < .01$ in Panel B; $b = .033$, $p < .01$ in Panel C). In terms of cohort differences, heterogeneity in intergenerational transmission of education by financial assets is also statistically different between the two cohorts for both female and male children (Column 3-1: $b = -.021$, $p < .1$ and Column 4-2: $.039$, $p < .1$).

College Entry and College Completion. None of the interaction terms between mother's college entry and household economic resources (including income, financial assets, and net worth) has a statistically significant association with child's probability of college entry in Table 6. Table 6 does not provide empirical support that intergenerational transmission of college entry varies by household economic resources.

Regarding child's college completion, only two analyses in Table 7 show a statistically significant interaction for mother's college completion and household economic resources. For the '94 female children, household assets (either financial assets or net worth) statistically lessen intergenerational persistence of college completion (Column 3: $b = -.188$, $p < .01$ in Panel B; $b = -.217$, $p < .01$ in Panel C).

Table 5. OLS Regression Results of Schooling Years

Variables	84 Cohort			94 Cohort			Cohort Difference	
	Female	Male	(Male-Female)	Female	Male	(Male-Female)	(Female-Female)	(Male-Male)
<i>Column Number</i>	<i>(1)</i>	<i>(2)</i>	<i>(2-1)</i>	<i>(3)</i>	<i>(4)</i>	<i>(4-3)</i>	<i>(3-1)</i>	<i>(4-2)</i>
Panel A. Income								
Mother's schooling years	.115	.646	.531	.713	.023	-.690	.595	-.623
Log(income)*Mother's schooling years	.014	-.022	-.036	-.039	.036	.075	-.053	.058
Panel B. Financial Assets								
Mother's schooling years	.286***	.518***	.232	.495***	.146	-.349	.209*	-.371
Log(financial assets)*Mother's schooling years	.005	-.008	-.012	-.016**	.031*	.047***	-.021*	.039*
Panel C. Net Worth								
Mother's schooling years	.177*	.299*	.122	.407***	.141*	-.267**	.230*	-.158
Log(net worth)*Mother's schooling years	.014	.012	-.002	-.005	.028***	.033***	-.020*	.015

*p<.1, **p<.05, ***p<.01

Table 6. Logit Regression Results of College Entry

Variables	84 Cohort			94 Cohort			Cohort Difference	
	Female	Male	(Male-Female)	Female	Male	(Male-Female)	(Female-Female)	(Male-Male)
<i>Column Number</i>	<i>(1)</i>	<i>(2)</i>	<i>(2-1)</i>	<i>(3)</i>	<i>(4)</i>	<i>(4-3)</i>	<i>(3-1)</i>	<i>(4-2)</i>
Panel A. Income								
Mother's college entry	.790	2.139	1.348	.064	-2.811	-2.876	-.726	-4.950
Log(income)*Mother's college entry	.003	-.094	-.097	.109	.410	.301	.106	-.504
Panel B. Financial Assets								
Mother's college entry	.725	2.794**	2.069	1.504***	1.958***	.454	.779	-.837
Log(financial assets)** Mother's college entry	.043	-.136	-.179	.003	-.021	-.024	-.040	.115
Panel C. Net Worth								
Mother's college entry	.975	3.724*	2.750	1.484**	1.765*	.281	.510	-1.959
Log(financial assets)** Mother's college entry	.016	-.208	-.223	.004	-.003	-.007	-.012	.205

*p<.1, **p<.05, ***p<.01

Table 7. Logit Regression Results of College Graduation

Variables	84 Cohort			94 Cohort			Cohort Difference	
	Female	Male	(Male-Female)	Female	Male	(Male-Female)	(Female-Female)	(Male-Male)
<i>Column Number</i>	<i>(1)</i>	<i>(2)</i>	<i>(2-1)</i>	<i>(3)</i>	<i>(4)</i>	<i>(4-3)</i>	<i>(3-1)</i>	<i>(4-2)</i>
Panel A. Income								
Mother's college graduation	-2.346	3.852	6.197	4.328	11.365	7.037	6.674	7.513
Log(income)*Mother's college graduation	.348	-.239	-.588	-.313	-.869	-.556	-.662	-.630
Panel B. Financial Assets								
Mother's college graduation	2.342	2.803*	.462	3.118***	2.468**	-.649	.776	-.334
Log(financial assets)*Mother's college graduation	-.074	-.116	-.042	-.188***	-.037	.150	-.113	.079
Panel C. Net worth								
Mother's college graduation	4.363**	1.736	-2.627	3.637**	4.046**	.408	-.726	2.310
Log(net worth)* Mother's college graduation	-.246&	-.028	.218	-.217**	-.176	.041	.029	-.148

*p<.1, **p<.05, ***p<.01

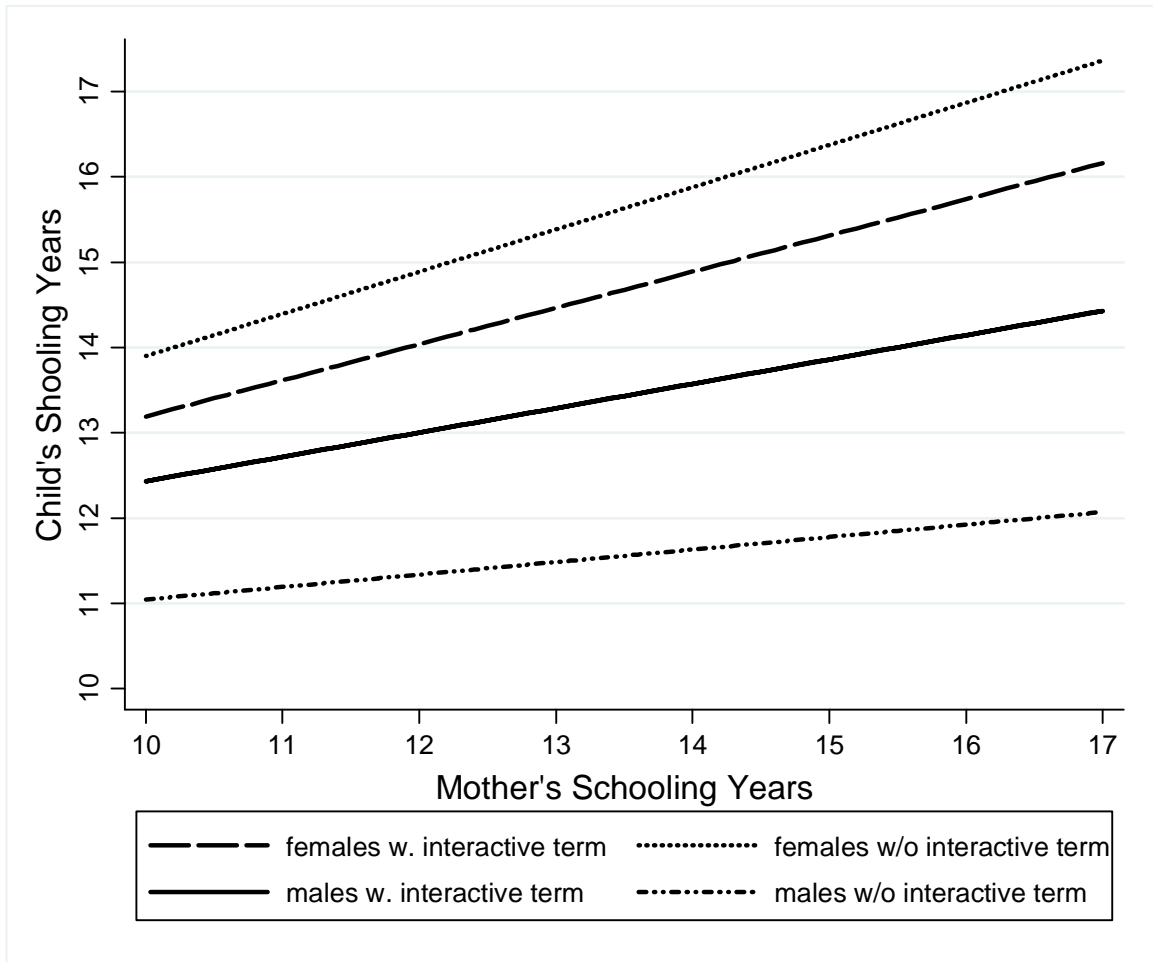
Magnitudes of the interactive associations of household assets

Figures 1 and 2 display the magnitude of associations between household assets and intergenerational transmission of education. Based on those analyses in Table 5, Figure 1 presents four predicted regression lines of schooling years for a typical child in the '94 cohort. Using the median values of control variables, a typical case is defined as a 29-year-old individual who is the second child to his/her mother; whose household head was male, 42 years old, married, and employed in 1994; and whose household had four members (including two children), financial assets of \$26,000, and net worth of \$65,000 in 1994. The long-dash line (second from top) is the predicted schooling years for the '94 female children based on the model of Column 3 in Panel B; the dotted line (the first one) is predicted using the same analysis but assumes no interactive association between parental education and household financial assets. A comparison of the two lines reveals a one year reduction in child's schooling in the presence of an interaction of parental education and household financial assets. That is, household financial assets reduce the parent-child schooling correlation. Similarly, the solid line (third from the top) is the predicted schooling years for the '94 male children based on the model of Column 4 in Panel B; the dot-dash line (fourth from the top) assumes no interactive association between parental education and household financial assets. Male child's schooling years in the solid line is about 1.5 years more than that in the dot-dash line.

Based on the analyses in Table 7, Figure 2 shows female children's predicted probability of college completion using financial assets (Column 3 in Panel B) and net worth (Column 3 in Panel C). The black bars represent the predicted probability of college completion given that mothers have a college degree (80% for financial assets and 71% for net worth) and the grey bars are the probability given that mothers do not have a college degree (30% for financial assets and 42% for net worth). Assuming there is not an interactive association between household assets and parental education in these analyses, the dark-grey bars then simulate the probability of college completion for children whose mothers do not a college degree (21% for financial assets and 6% for net worth). As shown in Figure 2, the inclusion of the interactive association between household assets and parental education substantively reduces children's educational disparity by parental education.

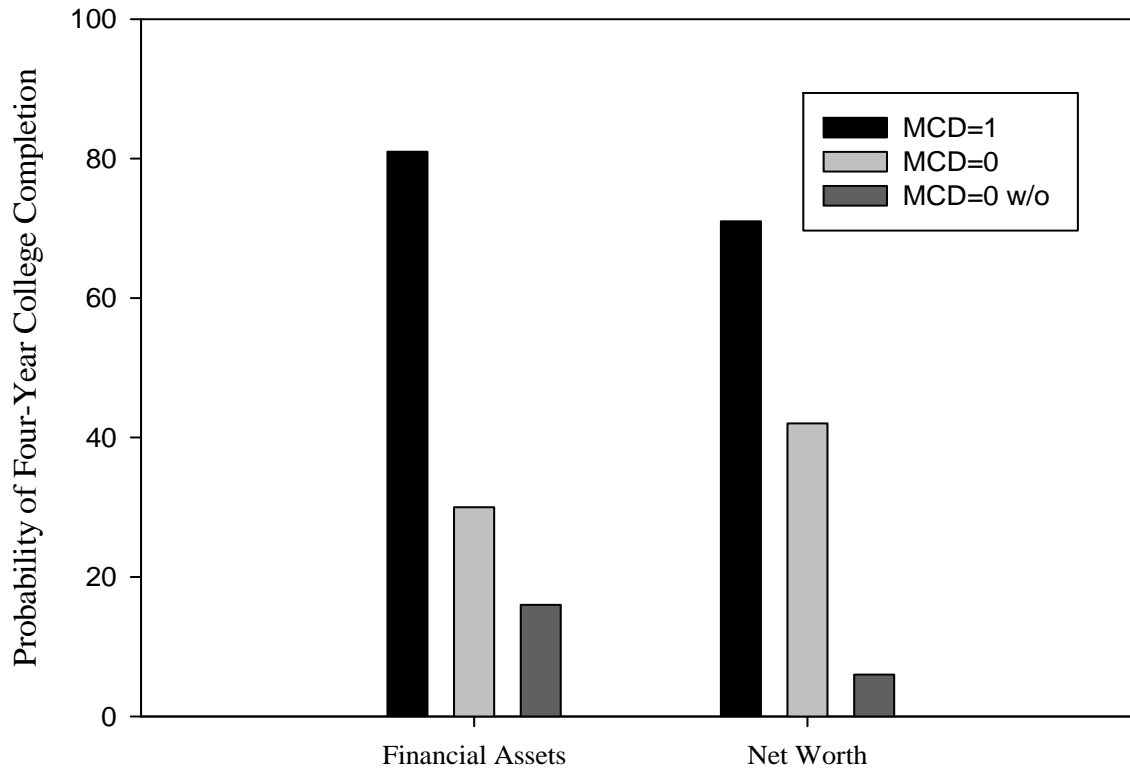
In sum, regression analyses do not provide evidence for a differential parent-child schooling association by level of household income. It is in the '94 cohort that household assets not only improve educational mobility measured by schooling years or college completion for female children but also increase intergenerational persistence of education as measured by schooling years for male children. The robustness analyses generate findings similar to those in the main analyses. The interactive association between household assets and parental education weakens when categorical asset measures are used in analyses.

Figure 1. Predicted Schooling Years for a Typical Child in the '94 Cohort



Note: The dash line (the second one) and the solid line (the third one) are predicted regression lines based on the analyses in Table 5 (Columns 3 and 4 in Panel B). The dotted line (the first one) and the dash-dot line (the fourth one) assume a zero interaction term between parental education and financial assets in Columns 3 and 4 in Panel B.

Figure 2. Predicted Probability of College Completion for a Typical Female Child in the '94 Cohort



Note: Predicted probability of four-year college completion based on analyses in Table 7 (Column 3 in Panels B and C). “MCD=1” indicates that mothers have a four-year college degree; “MCD=0” denotes that mothers does not have a four-year college degree; “MCD=0 w/o” means that mothers does not have a four-year college degree and no interactive association between mother’s education and household assets.

Discussion and Conclusion

Patterns of intergenerational transmission

The study examines heterogeneity of intergenerational transmission of education from parents to children by household economic resources in two cohorts. Separate analyses are conducted for females and males. Multivariate analyses do not identify a consistent relationship between household economic resources and intergenerational transmission of education across child's gender and cohorts. Although the relationship between household assets and intergenerational transmission may possibly change over time and vary by child's gender, this finding suggests that our current understanding is rather limited regarding the dynamics of household economic resources, parental education, and child's education. An improved conceptualization is needed to explain these different patterns of intergenerational transmission.

Gender, household assets, and intergenerational association

Results show that household assets, especially financial assets, have opposite associations with intergenerational transmission of education for female and male children. Household assets increase intergenerational persistence of education for male children but reduce the parent-child association for female children.

The study proposes three hypotheses regarding the heterogeneity in intergenerational transmission of education by household economic resources. The first hypothesis is that household assets increase intergenerational association because capable children living in low-wealth families are more likely to be limited by liquidity constraints. The second is that household assets decrease intergenerational transmission because disadvantaged children benefit more from financial resources. The third hypothesis also assumes a negative interaction between parental education and household economic resources on child's education because household assets are more closely related to parental education when household assets increase.

Findings regarding child's gender do not support the third hypothesis. If this hypothesis is true, the pattern of intergenerational transmission should not differ by child's gender.

Since the findings of this study vary by child's gender, the first two hypotheses do not seem to be supported. Nonetheless, there are descriptive findings that support these hypotheses. For instance, as shown in Panel B of Table 4, the hypothesis of liquidity constraint seems to apply to the '84 cohort. When household income increases from the low level to the medium level, the probability of college graduation increases more for children with high parental education than those with low parental education. On the other hand, greater marginal effects for disadvantaged children are observed in the '84 cohort (Panel C of Table 3) with respect to college entry. When financial assets increase from the low to medium level, college entry rates improve more for children with low parental education than those with high parental education. Both hypotheses could be true in the

long process of child development. Liquidity constraint is more likely to occur for post-secondary education, whereas financial resources may have greater marginal effects in terms of “nurture” effects for disadvantaged children in early childhood (Huang, Guo, Kim, & Sherraden, 2010).

Descriptive results in Tables 3 and 4 also explain why the relationship between household assets and intergenerational transmission of education differs by child’s gender in the ’94 cohort. Regarding college entry (Table 3), the improved educational mobility for female children is mainly caused by the increased college entry rate of mid-wealth children with high parental education and high-wealth children with low parental education. This is also true for the college graduation rate (Table 4). In contrast, high-wealth male children with low parental education have a decreased college entry rate and a decreased college graduation rate in the two cohorts. The combined effect of household wealth and child’s gender on educational mobility is consistent with the findings in Bailey and Dynarski (2011) which also suggest that the change in educational mobility is largely driven by women. A possible explanation of the gender difference is that wealthy families with female children respond more readily than those with male children to increases of educational return.

Can asset building reduce intergenerational education inequality?

While not a general pattern, the relationship between household assets and intergenerational transmission of education for the ’94 female children suggests that asset building has the potential to reduce intergenerational education inequality. As shown in Tables 3 and 4, current distributions of family background (including parental education and household economic resources) increase educational inequality. If household wealth can reduce intergenerational transmission of education as it does for the ’94 female children in the sample, asset building, especially progressive asset building to include disadvantaged families, may generate double effects against educational inequality.

The key to the success of the asset-building approach in promoting intergenerational educational mobility is to understand the underlying causes of differential effects of household assets on intergenerational transmission of education by child’s gender. It would be interesting to examine factors and policies that may affect women and men differently. As suggested by Bailey and Dynarski (2011), some of these factors could be gender difference in classroom interaction, returns to education, marriage, and labor market opportunities.

Limitations

The study has several limitations. First, as is known, the process to achieve educational success is complex, and many factors that affect child educational outcomes, such as school system, educational policy, and labor market returns to education are not included in the analysis. It is not clear how these factors may interact with household economic resources and intergenerational transmission of education; a more complete model should be developed in future research. Second, as discussed above, the study cannot separate “nurture” effects from “nature” effects, neither is it focused on the causal mechanism of household assets, parental education, and child’s educational

outcomes. Rather the study describes the pattern of intergenerational transmission of education by household economic resources. Third, the study includes white children only in the sample in order to create a relatively homogeneous sample and avoid complexity associated with racial inequality. The association between household economic resources and intergenerational transmission of education by race should be investigated in the future. In addition, while the literature has mixed findings on whether mother's or father's education has a stronger association with child's educational attainment, this study only uses mother's education as a proxy of parental education. It would be better to consider both mother's and father's education.

In summary, the study shows that the association between household assets and intergenerational transmission of education has changed over time, and also that such association varies by child's gender. Progressive and inclusive asset-building policies may have the potential to promote educational mobility, but the achievement of this potential, to some extent, depends on an accurate understanding of how household assets interact with other determinants of child education.

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