Predicting the Impact of Parents' Savings for their Children's Education on the Children's Future Educational Outcomes

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Background

- Education is regarded as a key mechanism of long-term economic success and an important pathway to social mobility, providing children of the poor with the opportunity for a successful adulthood.

- However, the gap in educational achievement between children in poor families and their counterparts in higher income families has sharply widened over the last few decades. One of main reasons is the disparity of wealth between the poor and the wealthy, which is an important factor in determining children's human capital trajectories.

- One of the effective interventions for improving educational development and outcomes of children of the poor is asset-building programs, such as individual development account programs (IDAs) or child development account programs (CDAs), which are designed to support the poor in overcoming the barriers that keep them from building and sustaining assets.

Background (Cont.)

- However, some have pointed out that the effectiveness of savings on educational outcomes is unclear. There is little evidence that the poor have been enabled to achieve a postsecondary education. Savings from IDAs, as well, do not account for college completion and higher educational attainment.

- In addition, unlike previous studies that regarded parents' educational expectations as key mediators, this study has a different perspective that parents' educational expectations are one of the confounding variables that may have a ripple effect on their opening savings accounts for their children's education.

- This study extends the line of inquiry on the impact of parents' savings for their children's educational outcomes, given such statements on the limitations of savings' impact on higher educational attainment and given the different approach taken here.

Research Questions and Hypotheses

- **Research Question:** Do parents' savings for their children's education increase the children's future educational outcomes, controlling for other factors?

Hypothesis_1: The parents' savings have a positive effect on their children's grade completed.

Hypothesis_2: The parents' savings have a positive effect on their children's high school graduation.

Hypothesis_3: The parents' savings have a positive effect on their children's achieving a two-year post secondary associate's degree.

Hypothesis_4: The parents' savings have a positive effect on their children's college graduation.

Data

- The National Longitudinal Survey of Youth 97 (NLSY97), which consists of a nationally representative sample of approximately 9,000 youths who were born in the years 1980-84 and were ages 12-16 when first interviewed in 1997, was used.

- **Sample**
  - ➤ Sample consists of 3,118 youths who were selected because the important confounding variables are available for those who were 15 years old and older on December 31, 1996.
  - ➤ Round 1 was used for an independent variable and the confounding variables, because they were available only in Round 1.
  - ➤ Round 5 and 6 were used for the dependent variable of high school graduation when the children become 20 years old.
  - ➤ Round 10 and 11 were used for the dependent variables of post-secondary school and college graduation when the children become 25 years old.
  - ➤ Round 15 was used for the dependent variable of the highest grade completed because the age in which the children become 29 or 30 years old is old enough to have completed schooling.

Measurement

- **Dependent variable.** The dependent variables are children's future educational outcomes. The educational outcomes are measured by the highest grade completed, high school graduation, a two-year post secondary associate's degree, and college graduation. The highest grade completed variable is a continuous, whereas the other dependent variables are binary.

- **Independent variable.** The independent variable is whether parents hold savings for their children's education. Holding the savings is a dichotomous measurement, which is coded as 0 for no savings and 1 for holding the savings.

- **Confounding variables.** The confounding covariates are comprised of children/parents' demographic and socio-economic characteristics, children/parents' educational expectations, which should influence the treatment condition but not in reverse. See Table 2 for details.

- **Missing data.** The missing values were imputed with multiple imputation that replaces missing values with predictions based on the observed in the sample.

Estimands

- Average treatment effect (ATE) is chosen to compare difference in means between the treated and control group. The ATE is equal to:

$$\tau = E[Y(1) - Y(0)]$$
$$= E\big[E[Y|Z = 1, X] - E\big[Y[Z = 0, X]\big]$$

  Where Y(1) is defined as the potential outcome under exposure to the treatment, and Y(0) is defined as outcome under no exposure to the treatment. Z =1 refers to exposure to the treatment, whereas Z =0 indicates no exposure to the treatment. X indexes a vector of confounding covariates.

- In theory, the ATE is identical to average treatment effect for treated (ATT) if adjusting for differences in the distribution of X between treated and control removes all confounding. Therefore, the estimand is measured by the ATT. The ATT is as follows:

$$\tau_t = E[Y(1) - Y(0)|Z = 1]$$
$$= E\big[E[Y|Z = 1, X] - E[Y|[Z = 0, X]|Z = 1\big]$$

  Where all definitions are identical to the above ones, except for the given condition, |Z=1, which indicates that we can use the matched groups to estimate each mean. Thus, the treatment effect of savings on the educational outcome is estimated with the ATT.

Data Analysis Strategies

- First, descriptive statistics were used to summarize the sample of this study.

- In addition, based on an assumption that data from non-experimental design may incur a selection bias on estimating the effectiveness of the program, this study used propensity score matching (PSM) to provide a robust method of comparison between the treatment and the control group.

- Throughout analyses, the study uses a *p*-value of .1 to test for significance.

Propensity Scores

- Propensity scores are created by logistic regression, which predicts each participant's probability of being assigned to the treatment group based on the characteristics of covariates listed in Table 2.

- In an observational study, propensity scores are unknown and must be estimated based on confounding covariates in the sample. In order to obtain an estimate $\hat{\pi}_i$ of each individual's true propensity score π_i, logistic regression model of the conditional probability of receiving treatment (i.e., parents' having savings) is as follows:

$$\hat{\pi}_i = \frac{e^{\hat{\eta}_i}}{1 + e^{\hat{\eta}_i}} = \frac{1}{1 + e^{-\hat{\eta}_i}}$$

Where

$$\hat{\eta}_i = \hat{\beta}_0 + \sum_{j=1}^{J} \hat{\beta}_j X_{ij}$$

Where X_i is the vector of covariates for individual i, β is a vector of regression coefficients that are estimated by maximum likelihood, and j indexes the covariates included in the model.

Assumptions

- The most important assumptions required for propensity score matching are ignorability, sufficient overlap, appropriate specification of the propensity score model/ balance achieved, and stable unit treatment values assumption (SUTVA).

  - First, the ignorability assumption holds because important confounding variables were included in this model, which assumes that the covariates in X are the only confounding covariates.
  - Second, Figure 1 and Figure 2 show that there is sufficient overlap so that the sufficient overlap assumption holds.
  - Third, Table 1 indicates that balance was achieved.
  - Finally, SUTVA holds because units do not interfere with each other and have the same potential outcome for the same treatment.

Diagnostics
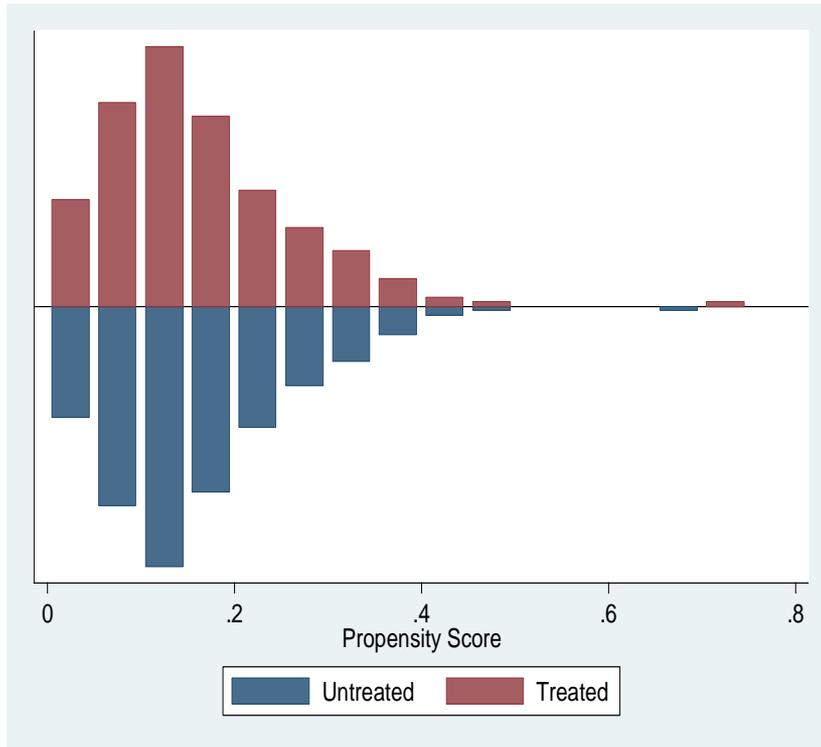
Figure 1. Checking balance with overlap between the treatment group and the control group.
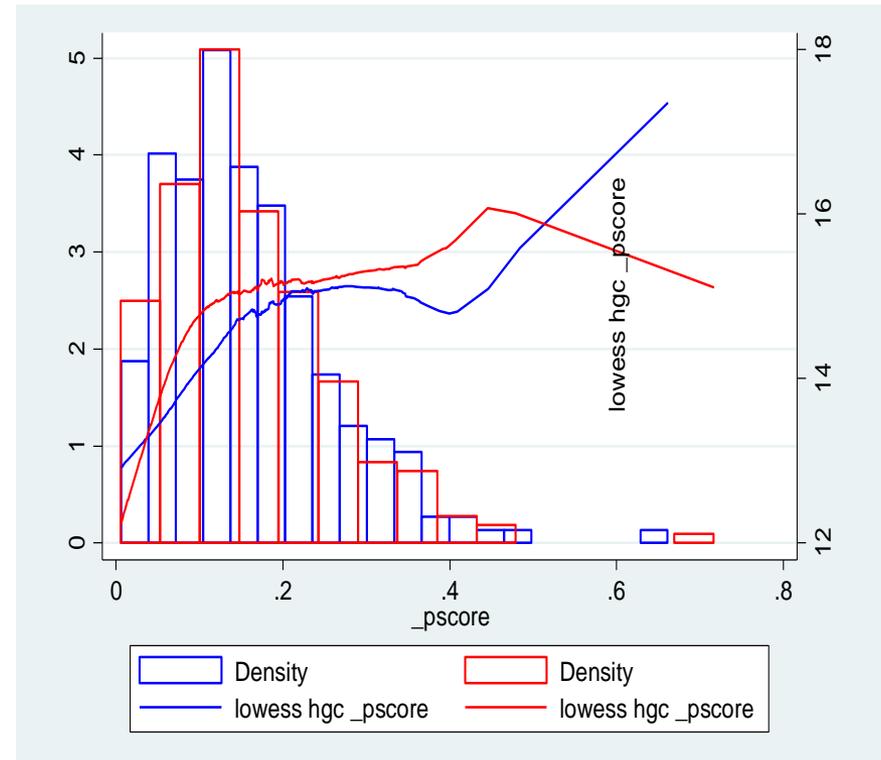
Figure 2. Histogram/response surface plot, showing heterogeneity, which indicates that ATE, ATT, and ATC are different.

Results: Descriptive Statistics

Table 2.
Summary of Variables

Variables	Frequencies (%) Mean (S.D.)
Dependent Variable	
Highest grade completed	13.8 (2.94)
High school degree(1 = Yes)	84.3
Associate's degree(1 = Yes)	31.7
College degree (1 = Yes)	25.7
Independent Variable	
Parents' savings for their children's education (1 = Yes)	8.5
Covariates	
Parents' debts on children's edu. (1 = Yes)	5.5
Parents' homeownership (1 = Yes)	69.7
Parents' net worth	116728 (152875.5)
Parental expectations for high school graduation by 20	95.1 (16.63)
Parental expectations for college graduation by 30	69.7 (32.40)

Children's gender (1 = Female)	48.8
Children's age	15.49 (.50)
Children's ethnicity	
Non-Black/Non-Hispanic	72.5
Black	14.9
Hispanic	12.6
Mother's age at the child's birth	25.6 (5.44)
Mother's religion	
Catholic	24.3
Christian	63.1
Others	12.6
Mother's education	
< High school	24.8
High school	16.6
< Post-secondary	39.1
Post-secondary	19.4
Mother's parenting style	2.8 (1.07)
Household in poverty (1=poverty)	12.4
Household income	53451 (45301.7)
Family size	4.4 (1.42)
Residence (1 = urban)	71.3
Sample Size (N)	3,118

Table 3.

Treatment Effect Between the Treatment Group with Parents' Savings for Children's Education and the Control Group without them

Dependent Variables	Regression		Greedy Matching			Optimal Matching
	Complete case[a]	MI[b]	One-to-one M[c]	Caliper M[d]	Kernel M[e]	FM[f]
	β (OR) (*SE*)	β (OR) (*SE*)	TE (*SE*)	TE (*SE*)	TE (*SE*)	TE (*SE*)
HGC	.46* (.228)	.35* (.168)	.08 (.392)	.51[+] (.328)	.24 (.260)	.75* (.333)
HS_D	2.97[+] (1.846)	2.48* (1.002)	.00 (.023)	.01 (.035)	.04[+] (.023)	2.12* (1.396)
Post_AA	2.18** (.553)	1.52** (.233)	.21** (.074)	.16** (.067)	.12* (.054)	1.35[+] (1.173)
Col_D	2.54*** (.662)	1.56** (.234)	.22** (.073)	.17** (.067)	.14** (.053)	1.48* (1.180)

Notes: p+ < 0.1; p* < 0.05; p** < 0.01; p*** < 0.001. Covariates are composed of parent's assets (e.g., debts on children's education, homeownership, and net worth), parental educational expectation, children's gender, age, ethnicity, mother's age at the child's birth, mothers' religion, mothers' education, mothers' parenting style, poverty status, household income, family size, and residence. HGC = Highest grade completed; HS_D = High school degree; Post_AA = Associate's degree; Col_D = College degree.

a Complete case data for HGC (n= 1664); HS_D (n=1443); Post_AA (n=1370); and Col_D (n=1370); β coefficient is applied to HGC while OR coefficient is applied to HS_D, Post_AA, and Col_D.

b MI = multiple imputation; n =3118; β coefficient is applied to HGC while OR coefficient is applied to HS_D, Post_AA, and Col_D.

c One-to-one M = one-to-one with replacement; HGC (n= 1664); HS_D (n=1443); Post_AA (n=1370); and Col_D (n=1370).

d Caliper M = Caliper matching; HGC (n= 1664); HS_D (n=1443); Post_AA (n=1370); and Col_D (n=1370).

e Kernel M = Kernel matching; HGC (n= 1664); HS_D (n=1443); Post_AA (n=1370); and Col_D (n=1370).

f FM = Full matching; n =1664; Full matching was run with R and z-distribution was applied instead of t-distribution.

Discussion

- **Findings**

  - Compared to what would happen if parents had not held savings for their children's future education, children with parents who were holding savings increase associate and college graduation rates by 21% and 22% of likelihood, respectively.

  - The results indicate that parents' savings for education has positive effects on increases in their children's future educational outcomes.

  - Findings show that savings for education are an important predictor of associate and college graduation. This means that the savings for education may be a key proxy to represent parents' economic status, so it could reflect the extent to which parents can afford their children's college graduation and higher degree attainment.

Discussion (Cont.)

- **Limitations**
  - First, the study pays attention only to predicting the impact of parents' savings on children's future educational outcomes with a limitation to control for time-varying effects as time goes by.
  - Second, this study does not take school and teacher quality into account, which influences students' preference and decision for further study.
  - Third, this study does not take the size of savings for education into account when examining the effectiveness of savings due to data limitations.
- **Conclusion**
  - The results suggest that asset-based policies and programs encouraging the poor to hold savings and build assets may be a desirable policy strategy to help improve higher educational attainment of children of the poor.