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Implications of schooling on financial assets

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ABSTRACT
This research explores the impact of education on individuals' involvement with financial assets such as savings, annuities/IRAs, and stocks in the United States. Utilizing panel data and various identification strategies, the findings indicate that education is associated with greater investment in these assets, particularly among those with college and postgraduate degrees. The paper examines how higher incomes resulting from better education, improved financial behaviors, and an increased willingness to take risks contribute to these outcomes. This research provides insights into the relationship between education and financial management, highlighting potential avenues for enabling broader participation in asset accumulation.

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1. Introduction

This paper investigates how education affects individuals' ownership of financial assets, specifically savings, annuities/IRAs, and stocks, across the life cycle. These assets play a key role in shaping long-term financial well-being and economic resilience. Understanding who participates in financial markets, and why, is critical for addressing broader concerns around wealth inequality and household financial insecurity. Education is a potentially powerful lever in this regard, not only raising lifetime income but also influencing financial behavior and risk-taking.

Prior research has examined a range of factors influencing financial market participation. Factors such as cognitive ability (Agarwal and Mazumder 2013), trust (Guiso, Sapienza, and Zingales 2008), social networks (Hong, Kubik, and Stein 2004), genetics (Cesarini et al. 2010), institutional quality (Osili and Paulson 2008), and information frictions (Bogan 2008). However, the causal effect of education on financial asset ownership remains underexplored, particularly across the life cycle. Evidence suggests that family background strongly shapes financial behavior (Fagereng, Mogstad, and Ronning 2018; Karagiannaki 2017), and that limited participation in financial markets can lead to significant welfare losses (Cocco, Gomes, and Maenhout 2005). Financial literacy and sophistication also play a key role (Hastings, Madrian, and Skimmyhorn 2013; Lusardi and Mitchell 2007; Lusardi, Mitchell, and Curto 2014), but their relationship with formal education is complex and potentially endogenous.

Education is widely recognized as a central determinant of financial behavior. Higher educational attainment is associated with increased saving rates (Dynan, Skinner, and Zeldes 2004), higher stock ownership (Bertaut and Starr-McCluer 2000; Campbell 2006), greater risk tolerance (Black et al. 2018), and broader participation in risky assets (Ehrlich et al. 2008). It also influences pension annuity

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valuations (Bingley and Martinello 2017), entry into stock markets (Bertaut 1998), and outcomes such as credit scores, pension coverage, and reduced bankruptcy or foreclosure risk (Cole, Paulson, and Shastry 2012). Further, Girshina (2019) shows that education enhances financial decision-making, leading to higher portfolio returns and greater wealth accumulation.

This study contributes to this literature in two main ways. First, it provides new evidence on the causal effect of education on financial asset participation, using multiple identification strategies to address endogeneity. Second, it integrates parental background and a life-cycle perspective to assess how these effects vary across time and asset types. This approach offers a more comprehensive view of how education shapes financial outcomes across individuals' lives. The analysis addresses three core questions: Does higher education increase ownership of financial assets? Are these effects consistent across different asset types? And how do they vary over the life cycle and by education level?

To answer these questions, I use U.S. panel data from the Panel Study of Income Dynamics (PSID) and apply a range of empirical strategies. These include OLS regressions with detailed controls for parental background and cognitive ability, within-sibling variation, and instrumental variable (IV) regressions using compulsory schooling laws as an exogenous source of variation in education. The analysis focuses on three types of financial assets, savings, annuities/IRAs, and stocks, which differ in liquidity, risk, and time horizon.

The results show that education has a significant causal effect on financial asset ownership, particularly among individuals with college or postgraduate degrees. These effects are strongest for annuities and stocks, which typically involve greater risk and long-term planning. To explore the mechanisms behind these patterns, the paper examines income, financial behavior, and risk tolerance. The evidence suggests that education enhances financial participation both through income gains and improved financial competence.

Beyond documenting these effects, the study contributes to understanding how financial disparities evolve over the life course. While much of the existing literature focuses on average effects or early adulthood, this paper highlights that the returns to education in financial markets are heterogeneous, life-cycle dependent, and concentrated among more educated individuals. These findings suggest that educational attainment may be a promising lever to improve financial inclusion and long-term stability.

The remainder of the paper is organized as follows. Section 2 describes the empirical strategy and data. Section 3 presents the main results, and Section 4 explores the underlying mechanisms. Section 5 discusses implications, limitations, and avenues for future research. Section 6 concludes.

2. Empirical model

To estimate the relationship between education and financial assets, I first implement an ordinary least squares (OLS) model. While OLS provides a useful baseline estimate, additional strategies are required to address potential endogeneity and unobserved confounding factors that may bias the estimates. Studies on the impact of parents on their children's outcomes suggest that various factors, such as family composition, time effort, education, and financial and social status play a crucial role. Thus, controlling for these characteristics, such as individual ability and family background, allows us to isolate the effect of acquired education level on financial assets later in life. The equation used in this approach is:

$$Y_{it} = \alpha + \beta_0 \text{ Education}_i + \beta_1 \text{ X}_i + \beta_2 \text{ D}_{it} + \epsilon_t + \upsilon_{it} \tag{1}$$

where Y_{it} is a specific dependent variable related to financial assets, $Education_i$ is the level of education obtained by the individual, and X_i is a matrix of covariates that includes individual ability, and parental education and wealth. D_{it} includes some socio-demographic variables such as age, sex, race, inheritance, and parental presence during childhood. ϵ_t is a set of year dummy variables capturing time effects specific to year t, and lastly, υ_{it} is the idiosyncratic error term. Additionally, it is included in the analysis of age-cohorts effects to cover for additional sources of variation left out from the main control variables.

The foundation of this approach is that it takes into account all the factors that can influence financial assets and education. By controlling for these important individual characteristics, I aim to isolate the effect of education on financial assets. However, additional unobserved heterogeneity or unmeasured variables may exist that could affect the estimates of the relationship between education and financial assets. If this is the case, the estimates may be biased due to endogeneity, which is when the causal variable is correlated with the error term.

2.1. Identification strategy

2.1.1. Within siblings variation

There is a concern that some influential factors from before education takes place may remain unobserved and included in the error term, potentially causing bias in the estimates. To address this issue, a strategy is proposed that utilizes a separate dataset based on sibling data. By studying siblings, it is assumed that they were raised under similar conditions, with comparable parental resources and treatment, and inherited similar privileges. The underlying assumption is that differences in early life before educational choices, such as individual abilities and family background, are minimized as siblings belong to the same family, and are likely to be more similar than a pair of strangers.

This strategy helps account for unobserved family-level characteristics, such as parental guidance, risk preferences, or financial behavior, that may influence both educational choices and financial asset accumulation. However, differences in treatment between siblings or other unobserved individual characteristics may still introduce bias. The additional advantage of this strategy is that it controls for factors that not only affect educational choices but also financial assets e.g. exposure to parents' investment choices. The equation that is used in this strategy is as follows:

$$\Delta Y_{jt} = \alpha + \beta_0 \ \Delta \text{Education}_{jt} + \beta_1 \ \Delta \text{Age}_{jt} + \epsilon_t + \upsilon_{jt} \tag{2}$$

where the indices j and t represent pairs of siblings and time, respectively. The letter Δ in front of the variables represents the difference between the value of one sibling to the other sibling, considering the same order for the pairs in all the subtractions. Y is a specific dependent variable related to financial assets. For the case of ΔY, it represents the difference in the level of a specific financial asset of a particular year between siblings 1 and 2. The variable ΔAge controls the age difference between the siblings, ϵ_t is a set of year dummy variables capturing time effects, and υ is the error term.

While this strategy has the potential to address the previous concerns, it also raises some questions about its reliability. For instance, parents may provide different treatment, such as monetary support or quality time, to their children, potentially favoring one child over the other in certain areas. This could violate the assumption of the strategy and lead to biased estimates of the relationship between education and financial assets. To address this issue, a final empirical strategy is proposed. It aims to overcome the limitations of the previous methods by considering other possible sources of bias.

2.1.2. Compulsory schooling laws

Since previous strategies may not fully account for unobserved heterogeneity, I employ an instrumental variables (IV) approach that exploits variation in compulsory schooling laws across U.S. states and birth cohorts. This strategy leverages plausibly exogenous variation in schooling duration to address concerns of endogeneity between education and financial outcomes. Following the approach of Lochner and Moretti (2004) and Acemoglu and Angrist (2000), I construct an instrument based on the number of years of compulsory schooling an individual was legally required to complete during their formative years, depending on their state and year of birth.

The validity of this IV strategy relies on two key assumptions. First, the relevance condition requires that variation in compulsory schooling laws significantly predicts educational attainment.

This is verified in the first-stage regression. Second, the exclusion restriction assumes that compulsory schooling laws affect financial asset accumulation only through their impact on education and not via other channels. This assumption has been debated in the literature, particularly due to concerns about potential cohort effects, differential enforcement across states, and unobserved state-level economic conditions that could influence both education policy and long-run financial behavior.

This approach estimates a Local Average Treatment Effect (LATE), capturing the causal impact of education on financial outcomes for individuals whose schooling decisions were influenced by compulsory schooling laws. As highlighted by Oreopoulos (2006), LATE estimates typically reflect the experience of individuals who are responsive to changes in educational mandates. In this case, the variation exploited spans a broad period of institutional reform across U.S. states, during which compulsory schooling laws played a central role in expanding educational attainment. As a result, the estimates are likely to capture effects for a substantial and policy-relevant segment of the population. I therefore interpret the IV results as internally valid and informative for understanding how exogenous increases in schooling affect long-run financial outcomes.

To mitigate further concerns, I include parental wealth, year fixed effects (γ_t), and birth cohort fixed effects (δ_c) in both stages of the regression to account for time-varying unobservables and generational differences. While these controls strengthen the design, I acknowledge that some residual bias may remain if state-level policies that correlate with education reforms also directly influence financial outcomes. This is a recognized limitation in CSL-based IV designs, as discussed in studies such as Angrist and Krueger (2001), which note that even with controls for cohort and time effects, regional policy trends or heterogeneous treatment effects could bias the results. The first-stage specification is as follows:

$$\text{Schooling}_{it} = \alpha + \beta_1 \text{ Compulsory}_i + \theta \text{ Par.Wealth}_i + \gamma_t + \delta_c + \epsilon_{it} \tag{3}$$

where *Schooling* is the educational attainment of individual i in year t, and *Compulsory* is the minimum legally required years of schooling based on state and cohort. Parental wealth (*Par.Wealth*), year fixed effects (γ_t), and cohort fixed effects (δ_c) are included as controls. The second stage estimates the causal effect of education on financial assets:

$$Y_{it} = \alpha + \beta_0 \widehat{\text{Schooling}}_{it} + \theta \text{ Par.Wealth}_i + \gamma_t + \delta_c + \upsilon_{it} \tag{4}$$

where Y_{it} denotes the financial asset outcome of interest, the resulting coefficient β_0 should be interpreted as a LATE for individuals whose education decisions were influenced by compulsory schooling laws. This approach is, therefore, most informative about the subset of compliers, rather than the general population.

2.2. Sample selection and data

This analysis utilizes two different datasets to examine inter- and intra-generational family links from 1999 to 2019. The first dataset, which is based on inter-generational family links (parent-child), is used for the ordinary least squares (OLS) specification and instrumental variable regression. The second dataset, based on intra-generational links, is used only for the within-siblings variation. In both cases, the sample is limited to individuals older than 30 years of age who served as the head of their family unit (FU). The first dataset includes both male and female heads of FU, while the second dataset is restricted to pairs of male siblings due to the higher availability of observations. It is also important to note that only biological parent-child or sibling relationships are included in the analysis to minimize differences between these groups. Adopted or step-children or siblings are therefore excluded.

The data for this analysis comes from the Panel Study of Income Dynamics (PSID). In 1984, the PSID asked households detailed questions about their wealth, creating a comprehensive picture of household financial wealth. From the wealth supplements of the PSID, three dependent variables were selected to capture different aspects of wealth accumulation. The first variable is savings, which includes money held in checking or savings accounts, money market funds, certificates of deposit, government savings bonds, or treasury bills. This variable does not include private annuities or Individual Retirement Accounts (IRAs), which are captured in a separate variable. The third dependent variable is the value of stocks, which reflects the amount of money a household would have if they sold any owned shares of stock in publicly held corporations, mutual funds, or investment trusts at a given point in time.

Many respondents report zero or negative values in these wealth variables, introducing significant right-skewness in the distributions. To address this, an inverse hyperbolic sine (IHS) transformation was applied. The IHS transformation retains zero and negative values while reducing the influence of extreme outliers, unlike the natural logarithm transformation, which cannot handle non-positive values (Bellemare and Wichman 2020; Pence 2006). Formally, the IHS transformation is defined as:

$$\operatorname{asinh}(x) = \ln\left(x + \sqrt{x^2 + 1}\right), \tag{5}$$

and in its generalized form as:

$$\mathrm{IHS}_\lambda(x) = \frac{1}{\lambda}\operatorname{asinh}(\lambda x) = \frac{1}{\lambda}\ln\left(\lambda x + \sqrt{(\lambda x)^2 + 1}\right), \tag{6}$$

where λ is a scaling parameter that adjusts for the magnitude of the variable. In this study, $\lambda = 0.0001$ is used for financial assets variables to improve numerical stability, given the wide range of monetary values, while $\lambda = 1$ is used in robustness checks for comparability with standard log-like transformations. The distributions of the original and transformed variables are displayed in Appendix Figures A1, A2, and A3, which illustrate the extent of skewness and the effectiveness of the IHS transformation in normalizing the distributions.

The education variable is obtained for every individual and reflects their highest level of educational attainment. It is assumed that after a certain age, individuals are unlikely to acquire additional education and primarily focus on their careers and accumulating wealth. Therefore, education is considered a time-invariant variable in this analysis. It is classified into five categories: high school dropouts (Education=0), high school degree (Education=1), up to two years (Education=2) or up to four years (Education=3) of college education, and at least one year of postgraduate education (Education=4). In addition to education, the analysis also considers socio-demographic characteristics, such as race, sex, and age; inherited wealth and parental presence at age 16; and parental background, including their education and net worth in 1984. The final variable is IQ test scores, which are used to control for individual ability. While there may be debate about the reliability of IQ tests for this purpose, this variable has been found to produce results similar to other, more robust measures of ability.

The data used for compulsory schooling laws as an instrumental variable was obtained from Acemoglu and Angrist (2000), and the coding follows their approach: the measure is defined as the maximum between two components. The first is the minimum number of years required before legally leaving school, based on the compulsory schooling age. The second is calculated as the difference between the minimum dropout age and the maximum enrollment age. This construction reflects the most binding aspect of the law at the time an individual would have attended school.

These laws vary across states and over time, but not continuously. As shown in Lochner and Moretti (2004), most U.S. states implemented only one or two major changes to their compulsory schooling requirements during the 20th century, typically concentrated between 1920 and 1970. As a result, only certain birth cohorts were exposed to changes in these laws, while others, especially those born just before or long after a reform, experienced no variation. This institutional pattern has important implications for identification. When estimating effects by cohort, the instrument may be weak or even uninformative if no policy change occurred around the relevant schooling period. For this reason, while the full-sample instrumental variable estimates are based on meaningful exogenous variation, the cohort-specific estimates should be interpreted with caution.

2.3. Descriptive analysis

The evolution of income sources over time is shown in Appendix Figure A4. Individuals in the lower-middle segment of the wealth distribution rely heavily on labor income, with wages comprising nearly 80% of total income. In contrast, wealthier individuals derive a more diversified income stream, with wages accounting for only about 40% of income, supplemented by capital gains, business income, and investment returns. This shift underscores the increasing relevance of financial assets as a mechanism for wealth accumulation among higher-income groups.

Beyond income composition, disparities in financial asset ownership also emerge across age cohorts. Table A1 reports mean and median values for savings, annuities and IRAs, and stocks by age group. On average, savings increase with age, likely reflecting life-cycle accumulation patterns. However, the widening gap between mean and median values, particularly in older cohorts, points to substantial within-group inequality. For annuities, IRAs, and stocks, median values remain zero across all age groups, reinforcing that ownership of these assets is concentrated among a relatively small segment of the population.

Differences by educational attainment reveal similarly unequal patterns. Appendix Figure A5 shows that individuals with higher levels of education have increasingly participated in financial markets over time. College-educated individuals are more likely to hold transaction accounts, retirement accounts, pooled investment funds, and stocks, while participation among less-educated individuals remains relatively flat.

Table A2 provides further detail by reporting financial asset holdings by education level. Mean values of all assets increase with education, but median values remain substantially lower, especially for stocks and retirement assets. Median ownership of annuities, IRAs, and stocks is zero for individuals with less than a college degree and only becomes positive among the college-educated and postgraduates. This suggests that while education may improve access to financial markets, participation remains highly skewed even within these groups.

These findings confirm that financial asset ownership is both age- and education-dependent, but also deeply unequal within groups. Given the right-skewed distributions of these variables, the analysis applies an inverse hyperbolic sine (IHS) transformation to mitigate the influence of extreme values and retain observations with zero or negative holdings, an important consideration when estimating relationships in later sections.

As shown in Table A3, both the generalized IHS transformation ($\lambda = 0.0001$) and the standard asinh transformation ($\lambda = 1$) substantially reduce the dispersion of financial variables while preserving their relative order. The smaller λ value rescales large monetary amounts without altering the underlying distribution, ensuring numerical stability and comparability across assets with different magnitudes.

3. Empirical results

The empirical results are structured to present the relationship between education and the three key financial assets: savings, annuities/IRAs, and stocks. For each empirical strategy, OLS, within-sibling fixed effects, and instrumental variables, the estimates for all three outcomes are reported together in Tables 1, 2, and 3, respectively. This structure allows for direct comparison across financial outcomes within each identification approach. Additionally, the life-cycle effects are reported in the Appendix to maintain clarity in the main text.

3.1. Savings

Column 1 of Table 1 presents the results from an OLS regression examining the relationship between education and savings, controlling for parental background and individual ability. A one percent increase in inheritance received by the head of the household is associated with a 12% increase

Table 1. OLS regression: effects of education categories on assets.

	Savings	Annuities	Stocks
Education=1	231.10	−112.78	−158.13
	(261.58)	(277.83)	(189.60)
Education=2	1271.22***	983.70**	666.61*
	(287.03)	(327.27)	(263.19)
Education=3	2805.20***	3383.19***	2266.91***
	(352.87)	(402.14)	(332.01)
Education=4	4474.62***	5750.50***	3230.26***
	(439.84)	(536.21)	(470.44)
Parental Wealth	0.09***	0.11***	0.10***
	(0.01)	(0.01)	(0.01)
Par.Education W.	190.91+	291.47*	198.38
	(110.51)	(138.24)	(124.86)
Par.Education H.	417.58***	627.61***	633.03***
	(115.12)	(146.34)	(135.02)
Inheritance	0.12***	0.06***	0.06***
	(0.01)	(0.02)	(0.02)
Observations	18057	20558	20558
Adjusted R^2	0.23	0.25	0.17

Note: Source: PSID. Standard errors in parentheses. Significance levels are denoted as follows: + p<0.1, * p<0.05, ** p<0.01, *** p<0.001. Standard errors are heteroskedastic robust. The data uses sampling weights. Year, socio-demographic, and cohort effects are included. Socio-demographic variables include age, sex, and race of individuals. The constant term and all the control variables are included but not reported for brevity. The omitted category for education is 'Education = 0,' corresponding to high school dropouts.

Table 2. Within-siblings variation regression: effects of education categories on assets.

	Savings	Annuities	Stocks
D.Highschool	566.66***	905.71***	587.83***
	(166.93)	(189.68)	(151.71)
D.Some College	1810.02***	2110.27***	756.15***
	(199.94)	(243.06)	(184.79)
D.College	4052.51***	5485.06***	2760.94***
	(366.79)	(460.97)	(354.99)
D.Postgraduate	4413.40***	5121.57***	2265.55***
	(460.22)	(572.43)	(478.70)
Observations	13510	15111	15111
Adjusted R^2	0.02	0.02	0.01

Note: Source: PSID. Standard errors in parentheses. Significance levels: + p<0.1, * p<0.05, ** p<0.01, *** p<0.001. Standard errors are heteroskedastic robust. Time, socio-demographic, and cohort effects included but not reported. Socio-demographics include the difference in age between siblings. The constant term is included but not reported.

Table 3. I.V. regression: effects of college and postgraduate education on assets.

	Savings	Annuities	Stocks
College	30,253.63+	52,638.66+	25,584.07+
	(15,495.55)	(27,218.42)	(14,187.47)
F-statistic	24.46	18.64	6.49
Observations	9538.00	10,281.00	10,281.00
Postgraduate	47,848.87	82,917.54	40,976.99
	(34155.82)	(60,987.50)	(28,140.77)
F-statistic	17.68	12.61	4.44
Observations	9538.00	10,281.00	10,281.00

Note: Source: Panel Study of Income Dynamics. Standard errors in parentheses. Significance levels: + p<0.1, * p<0.05, ** p<0.01, *** p<0.001. The instrument is years of compulsory schooling by state. Year and cohort effects are included. Parental wealth is included but not reported.

in average savings over the life cycle, with the effect being strongest in late adulthood. Parental wealth also shows a consistent positive effect on savings, averaging 9% across the life cycle. Educational attainment is positively and significantly associated with savings across nearly all categories, with the exception of individuals whose highest qualification is a high school diploma. Column 1 of Table 2 reports results using within-sibling variation to identify a causal relationship. These estimates are broadly similar to the OLS results, supporting the conclusion that additional education is associated with higher savings. Here too, the effect is strongest and most robust for higher levels of education.

The life-cycle estimates from both strategies, reported in Table B1 in the Appendix, indicate that more years of education are associated with higher savings at each stage of life. The largest effects are observed in late adulthood and among those with college or postgraduate education. Interestingly, college graduates tend to have higher savings than those with postgraduate education earlier in life, possibly due to earlier entry into the labor market, although this pattern reverses in later stages. These patterns suggest that education may have long-term financial returns that only fully materialize later in life, particularly for higher education levels. The results also imply that a causal effect is less evident for lower levels of education, especially in early adulthood.

Table 3 presents the results using compulsory schooling laws (CSLs) as an instrumental variable to estimate the causal relationship between education and savings. Although first-stage results are not shown for brevity, they indicate that increases in compulsory schooling requirements significantly raise educational attainment, supporting the validity of the instrument in the pooled sample. The IV estimates show a positive and statistically significant effect of education on savings, particularly for individuals with a college education. These results provide evidence of a causal link for this subgroup, consistent with the pattern found using other empirical strategies.

Additional results disaggregated by life-cycle stage are presented in Table B2 in the Appendix. While the estimates remain positive for college and postgraduate-educated individuals, these subgroup results should be interpreted with caution, as splitting the sample weakens the instrument in some cohorts. Therefore, non-significant findings at certain life stages may reflect limited statistical power or weaker first-stage relevance rather than a lack of causal effect. Nonetheless, the strong and significant findings in early adulthood for higher education levels remain noteworthy, as this period marks the transition from dependence to labor market entry and independent saving behavior. These findings highlight that savings behavior is not only the most widespread but also the most immediately responsive to educational attainment, reflecting both short-term budgeting skills and long-term planning.

3.2. Annuities/IRAs

This subsection focuses on the effects of education on annuities and individual retirement accounts (IRAs). The results of the OLS analysis for annuities/IRAs are presented in column 2 of Table 1. Control variables are found to have an impact on annuity/IRA participation with levels and significance similar to the previous subsection. Education categories are found to have a positive effect on annuities/IRAs, except for the first category. Higher levels of education are associated with higher participation in these financial assets. The second empirical strategy is presented in column 2 of Table 2. The within-sibling variation model produces positive and significant estimates for all educational categories. This provides consistent results for the relationship between education and annuities/IRAs, especially for higher levels of education.

The life cycle effects for the first two identification strategies are observed in Table B1 in the Appendix. These results suggest a general positive and significant effect across the life cycle. However, it is found that only college and postgraduate-educated individuals show a significant effect on annuities/IRAs during the early stages of the life cycle.

The results estimating the effect of education on participation in annuities and individual retirement accounts using instrumental variable analysis are presented in column 2 of Table 3. The first-stage results (not reported) indicate that increases in compulsory schooling requirements are associated with statistically significant increases in educational attainment, validating the instrument. In the second stage, the estimates show a positive and significant effect of education on annuity/

IRA participation only for the highest levels of education. The results for lower levels of education are omitted due to a lack of statistical significance. The life-cycle results presented in Table B4 in the Appendix show a positive and significant effect throughout life, even at early adulthood. With the same caution over the sensitivity of the life-cycle estimates detailed earlier, we can see that only for higher levels of education there is an effect on annuities. The larger magnitudes observed for annuities suggest that education may be especially important for navigating long-term, tax-advantaged financial products, which often require both financial literacy and institutional knowledge.

3.3. Stocks

This subsection focuses on the effects of education on stocks. The results of the first identification strategy are presented in column 3 of Table 1. The coefficients for parental education and wealth, and receiving an inheritance, are positive and significant. Interestingly, the results for education are less significant for lower levels of education than for previous assets. Still, the results are positive but only statistically significant for higher levels of education. Consistent results are found in the second strategy, in column 3 of Table 2. The results suggest a positive and significant effect of all categories of education on stocks. This combined with the previous results, provides strong support for college and postgraduate levels of education to affect stock participation.

Another interesting finding is that these estimates are consistent across the life cycle. These results, for both strategies, are presented in Table B5. The results show estimates with stronger statistical significance for individuals with college or postgraduate education. This strategy also suggests that lower levels of education may not necessarily lead to higher participation in stocks. The estimates show weaker significance for early adulthood, indicating higher and more relevant participation in this type of financial asset during the middle stages of the life cycle, decreasing its relevance at later stages. The more modest and selective effects for stockholding likely stem from the greater complexity and risk involved, implying that only the most financially literate, often those with college or postgraduate education, translate additional schooling into stock market participation.

The results of the third empirical strategy are presented in column 3 of Table 3. Even though it is not reported, the results show that the compulsory variation of education leads to an increase in education in the first stage of the instrumental variables. These second-stage results only find statistically significant results for college and postgraduate levels of education. It further supports the existence of a causal effect of education on stock holdings. The results of this strategy are consistent with those of the previous two strategies across the life cycle. The life cycle effects are presented in Table B6 in the Appendix. For this particular financial asset, the life-cycle coefficients are less significant at the early and late stages of life.

4. Mechanisms

It's important to understand the pathways through which college and postgraduate education might influence greater participation in financial assets. While it's possible that higher education directly leads to increased financial asset involvement, there may be underlying mechanisms at play. This section delves into the potential mechanisms that could explain the observed results. Specifically, I explore three key mechanisms: the income effect, financial behavior, and risk tolerance, all of which have been identified as potential factors contributing to this phenomenon.

4.1. Income effect

One of the reasons why educated individuals invest more in financial assets might be through the so-called income effect. Education enhances skills and knowledge that are valued in the labor market, allowing individuals to secure jobs with better earnings (Card 2001; Psacharopoulos and Patrinos

2018). With higher incomes, individuals can meet their consumption needs and allocate surplus income toward financial investments such as stocks, bonds, or retirement accounts. This mechanism suggests that education not only opens doors to higher-paying careers but also provides the financial means to save and invest for the future.

In this analysis, the variable representing the income effect is family income. Family income reflects total household taxable income plus transfers. The underlying logic is intuitive: education increases income, and income, in turn, increases financial asset participation. The sign of the coefficient is expected to be positive. Additional variables such as labor income and net worth were also tested but not presented for brevity. The results with the additional variables are consistent with the results obtained using Family income.

The results, including family income, are presented in Table 4. Family income shows a positive and statistically significant effect on financial asset participation, supporting the income effect mechanism. The life-cycle effects of this mediator are shown in Table D1 in the Appendix D.1. These results confirm that the positive income effect persists across all stages of the life cycle.

However, it is important to interpret these results with some caution. In the context of a life-cycle framework, current income may not fully capture long-term earning potential or accumulated savings. For instance, individuals with higher lifetime income may save earlier and reduce labor supply later in life, resulting in weaker observed relationships between current income and current asset holdings. Despite this limitation, the observed income effects remain consistent with the idea that education supports financial asset accumulation in part through increased financial capacity.

While the income channel appears central to explaining the education-asset relationship, additional mechanisms are explored given the nuanced ways education influences financial decision-making and behavior. Beyond income, education may also increase financial literacy and shape individual preferences and risk tolerance, both of which can further influence investment patterns and financial market participation.

4.2. Financial behavior

Education equips individuals with essential financial skills (Zhou, Yang, and Gan 2023), reducing the likelihood of declaring bankruptcy, experiencing foreclosure, or being delinquent on a loan (Cole, Paulson, and Shastry 2012) and fostering responsible financial behaviors such as more adequate portfolio choices (Chu et al. 2017), and lower overindebtedness (Lusardi and Tufano 2015). Educated individuals navigate the complexities of the financial landscape more adeptly, consistently exhibiting financially responsible behaviors. This enhanced financial behavior, nurtured by education, encourages active participation in investments.

Table 4. Income effect mechanism: family income.

	Savings	Annuities	Stocks
Education=1	−97.08	−506.40+	−380.83*
	(240.45)	(269.68)	(189.32)
Education=2	693.50*	354.82	312.22
	(270.02)	(320.93)	(264.77)
Education=3	1718.45***	2231.87***	1607.88***
	(331.87)	(390.11)	(326.53)
Education=4	2964.77***	4255.16***	2363.20***
	(419.39)	(525.03)	(472.25)
Family Income	0.27***	0.24***	0.14***
	(0.01)	(0.01)	(0.01)
Adjusted R^2	0.32	0.29	0.20
Observations	18,057	20,558	20,558

Note: Source: PSID. Standard errors in parentheses. Significance levels are denoted as follows: + $p<0.1$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$. Standard errors are heteroskedastic robust. The data uses sampling weights. Year, socio-demographic, and cohort effects are included. The constant term and all the control variables are included but not reported for brevity. The omitted category for education corresponds to high school dropouts.

In this analysis, I employ 'Money Problem' and 'Debt' as variables to represent financial behavior. Specifically, the first variable is constructed based on individuals' experiences of being unable to pay their bills when due in 1996. Rather than viewing it solely as a reflection of momentary financial constraints in each specific year of the panel, I consider the variable as an intrinsic characteristic of the individual e.g. financial instability. This time-invariant variable encapsulates an individual's financial behavior and circumstances that persist over time. By treating it as an enduring trait, I aim to explore how this intrinsic aspect influences their financial decisions throughout the entire panel period. The second is a time-variant variable that reports all the added debt of the family in a particular year. As for the previous variable, this is not meant to reflect a momentary financial constraint but the lack of good financial behavior.

In general, the mechanism proposed is that higher levels of education lead to increased financial asset participation due to enhanced financial behavior. However, in this model, the opposite direction of the mechanism is explored due to the nature of the data. This means that a marginal increase in the 'Money Problem' or 'Debt' variables signifies poor financial behavior, which, in turn, correlates with decreased financial asset participation. The results of the inclusion of these mediators in the analysis are presented in Table 5 for money problems and in Table 6 for debt. Additionally, life-cycle results are presented in Tables D2 and D3 in the Appendix. The results are highly significant and negative, including the life-cycle effects. The estimates of the educational categories, after

Table 5. Financial behavior mechanism: money problems.

	Savings	Annuities	Stocks
Education=1	67.41	−205.14	−214.95
	(266.28)	(288.62)	(199.95)
Education=2	1075.50***	867.29*	606.11*
	(293.39)	(338.22)	(275.28)
Education=3	2543.52***	3213.29***	2175.86***
	(359.80)	(407.49)	(339.28)
Education=4	4121.85***	5521.39***	3105.03***
	(441.15)	(535.05)	(475.93)
Money Problem	−2408.72***	−2175.75***	−1107.38***
	(221.22)	(251.10)	(204.60)
Observations	17510	19929	19929
Adjusted R^2	0.25	0.25	0.18

Note: Source: PSID. Standard errors in parentheses. Significance levels are denoted as follows: + p<0.1, * p<0.05, ** p<0.01, *** p<0.001. Standard errors are heteroskedastic robust. The data uses sampling weights. Year, socio-demographic, and cohort effects are included. The constant term and all the control variables are included but not reported for brevity. The omitted category for education corresponds to high school dropouts.

Table 6. Financial behavior mechanism: debt.

	Savings	Annuities	Stocks
Education=1	440.93	195.32	−498.00+
	(288.17)	(320.93)	(265.95)
Education=2	1448.81***	1045.73**	374.06
	(325.58)	(380.67)	(339.72)
Education=3	3338.46***	3887.61***	2690.90***
	(397.98)	(493.98)	(484.00)
Education=4	4034.46***	6021.95***	3599.65***
	(507.48)	(695.06)	(672.99)
Debt	−0.02***	−0.02**	−0.01*
	(0.00)	(0.01)	(0.00)
Observations	9276	9276	9276
Adjusted R^2	0.22	0.22	0.18

Note: Source: PSID. Standard errors in parentheses. Significance levels are denoted as follows: + p<0.1, * p<0.05, ** p<0.01, *** p<0.001. Standard errors are heteroskedastic robust. The data uses sampling weights. Year, socio-demographic, and cohort effects are included. The constant term and all the control variables are included but not reported for brevity. The omitted category for education corresponds to high school dropouts.

the inclusion of the mediators, compared to the baseline model for the same variables, show smaller coefficients.

The negative sign suggests that individuals who exhibit bad financial practices are less likely to allocate a larger portion of their income to savings, annuities, and stocks, at any stage of their life cycle. The intuition can be, for example, that annuities represent a long-term financial commitment often associated with retirement planning. Individuals with poor financial behavior (higher 'money problems' and 'debts') are less likely to prioritize retirement planning and consider annuities as a reliable income source. Even though the majority of coefficients in these regression analyses are negative and significant, for stocks, the levels of significance decrease. Investing in stocks typically requires a higher level of financial literacy and comfort with risk. In addition to financial behavior, another crucial mechanism influencing financial asset participation is individuals' risk tolerance.

4.3. Risk tolerance

Another factor potentially driving these results is the educated individuals' propensity for taking calculated financial risks (Hryshko, Luengo-Prado, and Sørensen 2011; Tawiah 2022). Risk tolerance reflects an individual's willingness and capacity to take on financial risk in pursuit of potential returns. This mechanism tries to explain how the increases in financial assets might be due to individuals' attitudes toward risk. In this analysis, to try to address the risk tolerance mechanism, five different variables measuring risk tolerance are considered. The variables are constructed with individuals choosing between a new job that doubles their income or risking losing 10%, and half of their current income, with 50-50 chances. Due to data constraints, these variables were measured in 1996, before the panel data period, and are included with the idea that it will measure the level of risk tolerance of each individual. This analysis seeks to understand how pre-existing levels of risk tolerance, established before the panel's commencement, interact with educational attainment to influence financial decisions. Additional mediators, such as the risk of losing 20%, 75%, or a third of their current income, were tested to capture varying levels of willingness to take financial risks but were omitted for brevity. These mediators provided similar results as the ones included here.

The results for 10% income cut are presented in Table 7 and for a half income cut in Table 8. Additionally, the life-cycle results for these mediators are presented in Tables D4 and D5 in the Appendix D.3. For savings, it is shown that lower levels of risk tolerance have non-significant coefficients for the average and the early stages of the life cycle. However, more risk-tolerant individuals show significant and negative estimates at later stages of their life cycle. The negative coefficients suggest that those who are comfortable with risk are less likely to stash their money in traditional

Table 7. Risk tolerance mechanism: 10% income cut.

	Savings	Annuities	Stocks
Education=1	642.57	496.58	−167.50
	(500.25)	(550.44)	(350.89)
Education=2	1800.94***	1051.18+	1069.22+
	(503.02)	(605.31)	(564.09)
Education=3	3350.22***	3790.26***	1575.90**
	(581.41)	(713.33)	(541.10)
Education=4	5285.86***	5114.88***	2825.49***
	(731.22)	(891.35)	(681.20)
10% Income Cut	222.87	860.88+	771.37+
	(401.27)	(473.98)	(410.70)
Observations	6299	7177	7177
Adjusted R^2	0.25	0.22	0.15

Note: Source: PSID. Standard errors in parentheses. Significance levels are denoted as follows: + $p<0.1$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$. Standard errors are heteroskedastic robust. The data uses sampling weights. Year, socio-demographic, and cohort effects are included. The constant term and all the control variables are included but not reported for brevity. The omitted category for education corresponds to high school dropouts.

Table 8. Risk tolerance mechanism: half income cut.

	Savings	Annuities	Stocks
Education=1	−99.86	−558.44	278.96
	(559.58)	(697.88)	(481.46)
Education=2	890.86	991.66	1258.03*
	(586.18)	(753.43)	(560.93)
Education=3	2751.87***	3289.39***	3381.28***
	(666.07)	(848.51)	(743.46)
Education=4	3704.99***	4859.08***	3786.46***
	(807.23)	(1042.07)	(979.46)
Half Income Cut	−1.44	−323.00	552.35
	(479.24)	(580.55)	(547.13)
Observations	5727	6467	6467
Adjusted R^2	0.19	0.24	0.18

Note: Source: PSID. Standard errors in parentheses. Significance levels are denoted as follows: + p<0.1, * p<0.05, ** p<0.01, *** p<0.001. Standard errors are heteroskedastic robust. The data uses sampling weights. Year, socio-demographic, and cohort effects are included. The constant term and all the control variables are included but not reported for brevity. The omitted category for education corresponds to high school dropouts.

savings accounts. This makes sense because individuals who don't mind a bit of risk might prefer investing in assets that offer higher potential returns, even if they come with higher risks.

On the flip side, there are positive and statistically significant coefficients for annuities for individuals with lower levels of risk tolerance. This suggests that individuals are more inclined to invest in these financial products, which provide a steady income stream over time. However, it's interesting to note that the direction of this preference for very high levels of risk tolerance turns negative. This suggests that extremely risk-loving individuals at later stages of their lives reduce their investment in annuities. These individuals might seek out even riskier investments instead of settling for annuities, which are typically considered safer but offer lower returns compared to other options like stocks.

Lastly, there are positive life cycle effects of higher risk tolerance on stock participation. The positive and significant coefficients for stocks indicate that individuals with higher risk tolerance are more likely to dabble in the stock market. This makes sense because stocks offer the potential for substantial returns, but they also come with significant risks. Moreover, as risk tolerance increases, so does the likelihood of investing in stocks.

5. Discussion

This paper finds that individuals with higher levels of education accumulate significantly greater financial assets, including savings, annuities, and stocks. These effects vary by education category, wealth level, and life cycle stage. The identification strategy draws strength from the triangulation of three complementary approaches, OLS, within-sibling variations, and IV estimation, each designed to address potential endogeneity biases. While the IV estimates provide the strongest causal interpretation, the consistency of results across all methods indicates that the findings are robust to alternative identification strategies.

As detailed earlier, the analysis applies the IHS transformation to address the strong right-skewness of financial variables and the presence of zero or negative values. This approach allows all observations to be retained while producing coefficients that can be interpreted in semi-elasticity form through back-transformation. Table E1 shows that using either the generalized IHS ($\lambda = 0.0001$) or the standard asinh ($\lambda = 1$) transformation yields consistent results in direction, significance, and relative magnitude, confirming that scaling choices do not affect the substantive conclusions.

In Table E1, under the preferred specification with $\lambda = 0.0001$, a coefficient of 766 on education in the savings regression corresponds to an estimated increase of about 11% in savings for an individual with \$10,000, and about 77% for someone with \$1000.[1] The $\lambda = 1$ specification produces a comparable elasticity of approximately 0.43, implying a 43% increase for large values of Y.

Differences in coefficient magnitudes across the two transformations are expected and reflect only the numerical scaling of the dependent variable, not changes in the underlying relationships. Thus, both specifications point to the same conclusion: education significantly increases financial asset accumulation, and this substantive interpretation is robust to the choice of scaling parameter.

The clearest effects of education emerge at the upper end of the educational distribution. The strongest impacts are found for college and postgraduate education, particularly in stock ownership and retirement savings. These results persist across specifications. Within-sibling models confirm that the observed relationship is not solely driven by shared family background, while instrumental variable (IV) estimates using compulsory schooling laws (CSLs) provide additional causal evidence. The results also show that education influences financial behavior and market participation beyond its role in increasing income. Because the generalized IHS transformation is non-linear, the implied percentage change depends on the baseline value of financial assets. The examples reported (e.g. at \$1000 and \$10,000) therefore illustrate the range of effects rather than a single constant elasticity.

To account for limited participation in financial markets, especially in riskier asset classes such as annuities and stocks, the analysis retains zero values. Many individuals report no holdings in these assets, reflecting incomplete market participation. Although alternative specifications such as Tobit or two-part models could separately analyze the decision to participate (extensive margin) and the amount invested (intensive margin), results using OLS with IHS closely mirror the intensive margin. Hence, the main conclusions remain robust.

The effect of education is not constant across the wealth distribution. Its magnitude increases with higher education levels but exhibits diminishing marginal returns at higher financial asset levels. For instance, postgraduate education shows particularly strong effects on savings, consistent with a higher capacity for financial accumulation among the most educated. This pattern indicates that while education substantially enhances asset accumulation at lower wealth levels, its relative impact declines as wealth increases. The robustness check using $\lambda = 1$ confirms that this pattern holds regardless of the transformation scale.

Beyond total accumulation, education also shapes portfolio composition. Table C1 in Appendix C shows that higher education is associated with greater shares of annuities and stocks–assets typically viewed as riskier or longer-term. For instance, college education is associated with a 16% higher annuity share and a 10% higher stock share. These findings align with household finance theory, suggesting that more educated individuals exhibit higher risk tolerance and longer planning horizons. Savings shares, by contrast, show weaker or no associations, underscoring heterogeneity in portfolio choices. While not the main focus of this study, these results suggest that education not only affects total wealth accumulation but also influences how individuals allocate their assets.

Several limitations are acknowledged. First, while the IHS transformation offers clear advantages for skewed data, it complicates the direct interpretation of coefficients compared to standard log transformations. To address this, results under both scaling choices ($\lambda = 0.0001$ and $\lambda = 1$) are reported, illustrating that the scaling parameter affects coefficient magnitude but not substantive conclusions. Second, the models cannot fully capture unobserved individual traits such as risk aversion, financial literacy, or behavioral biases. Third, the analysis focuses on wealth levels rather than flows; future research could distinguish between active saving behavior and passive capital accumulation. Finally, education is treated as static; future work could examine the role of lifelong learning and financial education initiatives.

6. Conclusions

This study provides robust evidence that higher education is a key predictor of long-term financial outcomes in the United States. Individuals with college or postgraduate degrees are significantly more likely to accumulate financial assets such as savings, annuities, and stocks. These findings are consistent across multiple identification strategies, reinforcing the interpretation that education has a causal effect on financial behavior for those with higher levels of educational attainment. While the relationship between education and financial assets persists across the life cycle, its strength varies with age and asset type.

The evidence also shows that education shapes not only the accumulation of financial assets but also their composition. More educated individuals allocate a larger share of their financial wealth to long-term and riskier assets, namely annuities and stocks, consistent with greater risk tolerance, longer planning horizons, or improved financial literacy. These patterns align with insights from the household portfolio choice literature and reflect deeper behavioral differences linked to educational attainment.

The results point to several mechanisms through which education may influence financial outcomes. Beyond its impact on income and financial strain, education may enhance cognitive and non-cognitive skills relevant to financial planning, such as patience, confidence, and the ability to process complex information. Although the available data do not permit definitive identification of all channels, the consistency of the results across empirical strategies and asset categories suggests a broad behavioral influence of education on financial decision-making.

Taken together, these findings underscore the role of human capital in promoting financial inclusion and long-term resilience. Expanding access to higher education, alongside efforts to strengthen financial capability, may be important levers to improve household financial security and reduce disparities in wealth accumulation.

Note

1. For illustration, using the generalized inverse hyperbolic sine (IHS) transformation defined in Equations (5)–(6) and detailed in Appendix E.1 with $\lambda = 0.0001$, the implied percentage change at a baseline value Y_0 is calculated as $\%\Delta Y = 100 \times \frac{\sinh(\operatorname{asinh}(\lambda Y_0)+\lambda\beta)-\lambda Y_0}{\lambda Y_0}$. For $\beta = 766$ and $Y_0 = \$10{,}000$ (so $\lambda Y_0 = 1$), this yields $\%\Delta Y \approx 100 \times [\sinh(0.8814 + 0.0766) - 1] = 10.8\%$. For $Y_0 = \$1000$ (so $\lambda Y_0 = 0.1$), the corresponding value is $\%\Delta Y \approx 100 \times [\sinh(0.0998 + 0.0766) - 0.1]/0.1 = 77.5\%$.

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Data availability statement

The data of the Panel Study of Income Dynamics, published by the Institute for Social Research at the University of Michigan, is publicly available (https://psidonline.isr.umich.edu/).

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