

Using High School Financial Literacy Education to Predict Future Income: A Story of Selection Bias

Tyler Kent.

Faculty Mentor: Abdullah Al-Bahrani
Economics

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Tyler Kent

Tyler Kent graduated from Northern Kentucky University with a bachelors of science in Economics in December of 2019. During his time at NKU he served as a teaching and research fellow for the Center for Economic Education under the guise of Dr. Abdullah Al-Bahrani. Tyler would like to thank Dr. Al-Bahrani for his dedication to Economics and to his students. Tyler taught high school financial literacy courses in the Northern Kentucky area as well as preformed research into financial literacy retention rates of Americans, as well as unemployment benefit usage patterns of Americans. Tyler accepted a position at Fidelity Investments after graduation as a workplace investing service representative.

Abstract

I use data from the National Financial Capabilities Study for 2009 to 2015 to analyze the effect high school financial literacy education has on future income levels. I use Ordinary Least Squared regression to measure this relationship. Finding evidence of selection bias with a negative coefficient on the education participants, I control for it with a Heckman 2-step model. After adjusting for selection bias, I find participation in high school literacy education has no effect on future levels of income and is driven by confidence. Lower levels of confidence are correlated with higher participation in financial literacy education and lower levels of confidence are associated with lower incomes.

Introduction

Financial literacy is something that has overarching effects for society. If individuals had better knowledge of their finances, countless poor financial behaviors could be avoided. Research has shown that: foreclosures, bankruptcies, and high credit costs could all be drastically lower if people had a better understanding of basic personal finance topics. (Bernheim et al. 2010). Financial literacy can be described as the ability an individual has to understand and apply personal financial concepts and has been measured using Lusardi's "Big 5" measures of financial literacy (Lusardi, 2008). Research has also shown that financial literacy levels increase with income levels (Monticone, 2010). What has yet to be shown is how financial literacy education influences future income.

Existing literature has studied the returns to financial literacy education with respect to race (Al-Bahrani et al. 2018), access and use of student debt (Stoddard & Urban, 2019), use of high cost loans (Harvey, 2019) and how preexisting levels of income affect the outcomes of financial literacy education (Hamilton & Darity, 2017). These findings are important building blocks for the study of how financial literacy education affects a participant's future income level. The literature has yet to attempt to connect participation in financial literacy education on future levels of income. Connecting participation in financial education to future income levels is difficult because we cannot identify income levels before participation, and we cannot identify if low income individuals select into education at higher or lower rates. I use high school participation in financial education to estimate future earnings. I assume that the decision to participate at the high school level is not determined by income because future earning is not determined yet.

Using Ordinary Least Squares analysis (OLS) I find evidence that students actually do select into high school financial literacy education. Using a Heckman Two-Stage Least Squares to control for selection into financial literacy education, I find that there is no evidence that future incomes increase for participants. I find that those with lower confidence in their financial understanding are more likely to select into financial education.

Literature review

The effect of preexisting income on financial literacy education outcomes has several important articles in the literature. Income has been shown to have a positive effect on financial literacy (Monticone, 2010; Buckland, 2010). In situations where individuals had lower income their financial literacy was lower than those of their middle- class and upper-class counterparts (Buckland, 2010). This leads us towards the theory that there may be differences in demographic subgroups in their relation to benefits gained from financial literacy education. More

specifically, that lower income brackets would benefit more from more targeted financial literacy education than those of higher income brackets (Lyons et al. 2007). This evidence suggests that there may be a correlation between financial literacy education and the participants' income levels.

These papers show that trends are emerging in the relation between financial literacy education and income. They establish the basis for the claim that lower income earners have lower levels of financial literacy, as well as that lower income earners could benefit from financial literacy education more than higher income earners.

Additional support for the theory of financial literacy education's effects on income exists. The literature shows that schooling and financial literacy levels are positively correlated with important income related factors such as retirement planning and pension contributions. Financial literacy education has a stronger effect on the attainment of higher income levels than that of normal schooling (Behrman et al. 2010). In addition, financial literacy education has a positive correlation to other financial behaviors such as saving and participation in retirement savings instruments (Lusardi, 2008).

The contrary argument is that an individual's socioeconomic status is a determinant for outcomes of financial literacy education. The case is made that regardless of the amount of education they receive, their gains from it are limited based on their status, as they do not have the assets to fix their situation post treatment (Hamilton and Darity 2017).

What has yet to be shown in this literature is the direct effect financial literacy education has on income levels. This paper looks to add to the literature by showing correlation between participation in financial literacy education and future income level.

In Figure 1 I present the proposed relationship between high school financial literacy education and future outcomes. I assume that participation in financial education leads to an increase in financial literacy which leads to better overall decision making. Choice of major, understanding of markets, and career choices will all lead to better jobs that are possibly associated with higher incomes.



Figure 1: Description of how high school financial literacy education impacts future income

Data

I used the National Financial Capabilities Study (NFCS) from the years 2009, 2012, and 2015. The NFCS is administered every three years and samples roughly 500 individuals from every state per survey. California, Texas, New York, and Illinois are considered large states and are sampled at 1,000 individuals. I provide summary statistics for key variables in Table 1.

The income variable in this data set is broken up into buckets of the respondent's income. For example, if a respondent indicated their income was \$38,000 a year, they would fall into the 35-50k income bracket. I convert income to a continuous variable using the midpoint method, this will allow me to measure the dollar returns to high school financial literacy education.

Fully employed individuals make up 38% of the data, about 5% are currently students, and about 8% are self-employed. Using the income buckets, the sample is evenly distributed across the eight categories, with the highest number of respondents in the 50-75K range at just under 20%. The NFCS asks individuals about their participation in financial literacy education. Approximately, 14% of the respondents were offered and participated in some form of financial literacy education while in high school. The NFCS uses the "Big Five" financial literacy test to determine a respondent's financial knowledge. The average score on this exam was a 60% or 3 out of 5 correct answers, which is in line with the findings on average (Lusardi 2008, Al-Bahrani et al. 2018).

Methodology

I use an OLS regression to estimate the returns to financial literacy education. The regression I estimate is presented in equation 1.

$$I_i = \beta_0 + \beta_1 X_i + \beta_2 F + \beta_3 L + \beta_4 \text{STATEMANDATE} + \varepsilon \quad (1)$$

The dependent variable I is individual i 's income using the midpoint method. The returns to financial education participation is measured by β_2 . The variable F is a dummy variable indicating whether individual " i " participated in financial literacy education at the high school level. The variable L controls for current financial knowledge using the score on the Big Five questions. To control for state level variation in financial behaviors, I use variations in state mandates to teach financial literacy education at the high school level. This measure will capture any variations in state level efforts to influence financial behaviors, which might be correlated with other outcomes. This variable does not reflect if the individual was actually mandated to take a financial literacy course, because we do not observe when the mandate was passed and in which state the individual attended high school. I use the Stoddard and Urban (2019) database to indicate if a state

Table 1. Summary Statistics

Variable	Observations	Mean
Offered & Participated	81,219	0.139
		[0.346]
Average Income	76,255	53,494
		[35.833]
Financial Literacy Score	81,219	60.476
		[28.959]
<15k	81,219	0.125
		[0.333]
15-25K	81,219	0.116
		[0.32]
25-35K	81,219	0.115
		[0.319]
35-50k	81,219	0.151
		[0.359]
50-75k	81,219	0.196
		[0.397]
75-100k	81,219	0.125
		[0.333]
100-150k	81,219	0.111
		[0.315]
150k+	81,219	0.061
		[0.24]
Student	81,219	0.047
		[0.212]
Full time	81,219	0.379
		[0.485]
Part time	81,219	0.096
		[0.295]
Self employed	81,219	0.079
		[0.269]

Brackets contain standard errors

Table 2. Confidence Classifications

	Confidence (n)	Percent of population
High	64,163	79
Low	17,056	21

currently mandates financial literacy education. The error term is represented by ε .

The OLS regression allows me to establish any correlation between participation in financial literacy education and future levels of income. I assume that a participant in high school financial literacy education is currently earning 0 and, therefore, financial literacy education is not driven by their current income. I do recognize that this is assumption of independence is strong, especially if individual behavior is a function of expected income. The original income variable in the NFCS was not continuous because the survey used income buckets. I transformed income into a continuous variable using the midpoint method. The results simplify the interpretation of the coefficient to a dollar measure of the return to financial education. Based on the conceptual model above, my hypothesis is that the coefficient on financial education is positive and significant. This would be evidence that participation in high school financial literacy education impact future income.

It is possible that there is selection into financial education participation. This would violate the assumptions of random selection in OLS and bias the results. Selection into financial education can be due to lack of confidence in financial understanding. If low confidence individuals are participating in financial education at higher rates, then that would bias our results because the coefficient of interest would be measuring confidence as measured through selecting to participate in financial education. I test for this possibility by using a Heckman selection model. This approach isolates the decision to participate in financial education from estimation of the returns to financial education. The two-step approach estimates equation 2.

$$P(FHS=1) = \beta_0 + \beta_1 \text{CONFIDENCE} + \beta_2 \text{STATEMANDATE} + \varepsilon \quad (2)$$

$$I = \beta_0 + \beta_1 X_1 + \beta_2 F + \beta_3 \text{ACTLITP} + \varepsilon \quad (3)$$

The Heckman works by estimating parameters (with a probit model) and then running an OLS regression with residuals of those parameters. This allows me to take into account a participant's confidence in their own financial ability. By estimating the probability of someone with low confidence in their financial ability taking a course, I can tease out the selection bias associated with confidence in a respondent's financial ability. I am able to control for financial confidence

by using the NFCS survey. The NFCS rates an individual's confidence on a scale from 1-7 with 7 being the highest. I define individuals who answer the NFCS confidence in financial ability question with a 3 or below as Low. Table 2 reports the number of people labeled as confident.

Results

Table 3 holds the initial OLS regression in which I use to find correlation between participation in high school financial literacy education and higher levels of income, the continuous income variable is the dependent variable. I find that a single person makes \$18,644.04 less annually than a married person, which is in line with research indicating that married individuals out-earn singles (Town & Antonovics, 2004). In addition, a respondent's income increases by \$269.23 for each additional percentage point increase in financial literacy score.

Table 3: Original OLS Regression

	Confidence (n)	Percent of population
Variable	Coefficient	P>T
Single	-18644.04	0
	[773.24]	
SelfEmployed	15482.89	0
	[1370.42]	
Fulltime	26198.35	0
	[919.87]	
Parttime	4456.14	0
	[1270.09]	
Unemployed	-6764.29	0
	[1536.39]	
Retired	11567.48	0
	[1146.17]	
Child1	2853.19	0
	[926.21]	
Child2	7265.31	0
	[1013.92]	
Child3	5408.15	0
	[1487.11]	
Child4plus	9216.71	0
	[1888.04]	
Offered & Participated	-3017.56	0
	[642.93]	
Financial Literacy Score	269.23	0
	[12.45]	
State Mandates	705.56	0.29
	[669.4]	

Adj R- Squared: 0.268, Prob > F: 0.000, Standard Error in brackets

Table 4: Heckman Controlled Regression

Variable	Coefficient	P>z
Single	-14996.69	0
	[707.54]	
Selfemp	12162.38	0
	[1163.69]	
Fulltime	22898.84	0
	[842.99]	
Parttime	4015.23	0
	[1178.35]	
Unemp	-5915.06	0
	[1512.53]	
Retired	9643.16	0
	[984.64]	
Child1	3680.13	0
	[802.94]	
Child2	6199.34	0
	[841.35]	
Child3	5657.39	0
	[1247.15]	
Child4plus	6864.88	0
	[1523.16]	
Offered & Participated	-1214.64	0.09
	[711.73]	
Actlitp	237.95	0
	[11.42]	
Controls for Heckman		
Offered&Part	0.09	0
	[0.03]	
Finbad	-0.16	0
	[0.04]	
Statemandate	-0.02	0.32
	[0.02]	
Robustness Checks		
Rho	0.98	
Sigma	37118.54	
Lambda	36335.29	

Chi2= 793.73

However, I find evidence of a selection bias with the high school financial literacy education participation variable. I observe a negative coefficient of \$3017.56, implying that someone who was offered and participated in financial literacy education in high school makes less than someone who didn't. This contradicts my conceptual model and would suggest that participating in financial literacy education is associated with lower incomes.

I report the results of the Heckman selection model in Table 4. This model controls for selection bias on the basis of confidence by estimating the likelihood that someone with a positive opinion of their financial ability would take a financial literacy education course. After controlling for selection, I find that participation in financial literacy in high school is insignificant and thus is not a predictor of financial outcomes. The result of the OLS were driven by confidence and indicate that less confident individuals participate in education but that results in lower labor market outcomes. Less confident individuals make less money than more confident individuals.

Interpretation of Results

I find no evidence that financial literacy education effects future incomes using a Heckman 2-Step model. My research cannot be used to assume that financial education has no impact on other financial behaviors such as saving or investing. That research is beyond the scope of this paper. These results show that a respondent who is less confident in their financial literacy knowledge is more likely to take a financial literacy course in high school than someone who is confident in their abilities. Thus, the initial OLS was measuring the impact of confidence via selection into financial literacy education. Since the OLS measure is negative, it indicates that further research should test for variations in financial confidence throughout life, and especially how it varies with participation in financial education.

Conclusions

The literature on financial literacy education supports the theory that there are positive effects of financial behaviors; from increased knowledge about credit reports, to better understanding of mortgages (Bernheim et al. 2010). This paper has shown that participation in high school financial literacy education has no effect on future income levels when controlling for selection bias based on confidence in financial ability. It also shows that an individual's confidence in their ability is an important factor in determining financial literacy knowledge and likelihood to participate in education. The implications of these results could be used to provide support for expanding research into if other levels of financial literacy education have any effect on income levels.

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APPENDIX A.

Variable Names

SINGLE: respondent was not married

SELFEMP: respondent identified as self employed

FULLTIME: respondent identified as a full-time employee

UNEMP: respondent identified as unemployed

RETIRED: respondent identified as retired

CHILD1: respondent has 1 child

CHILD2: respondent has 2 children

CHILD3: respondent has 3 children

CHILD4PLUS: respondent has 4 or more children

F: respondent was offered and participated in financial literacy education in high school

ACTLITP: respondent's financial literacy score in percentage form

FINBAD: indicated the respondent's confidence in their financial ability as either positive or negative (dummy variable)

STATEMANDATE: participant was in a state that mandated financial literacy