Review of Economic Dynamics 20 (2016) 63–89

Contents lists available at ScienceDirect

Review of Economic Dynamics

www.elsevier.com/locate/red

# Household finance over the life-cycle: What does education contribute? ☆

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ARTICLE INFO

*Article history:*
Received 9 December 2014
Received in revised form 25 November 2015
Available online 8 December 2015

*JEL classification:*
E21
E27
G11

*Keywords:*
Household finance
Life-cycle choices
Role of education

ABSTRACT

This paper studies household financial choices: why are these decisions dependent on the education level of the household? A life-cycle model is constructed to understand a rich set of facts about decisions of households with different levels of educational attainment regarding stock market participation, the stock share in wealth, the stock adjustment rate and the wealth–income ratio. Model parameters, including preferences, the costs of stock market participation and portfolio adjustment, are estimated to match financial decisions by different education groups. Based on the estimated model, education affects household finance mainly through increased average income. The estimation also finds evidence that higher educational attainment is associated with a lower stock market entry cost and a larger discount factor. Education specific differences in income risks, medical expenses, mortality risks and the life-cycle pattern of income explain relatively little of the observed differences in household financial choices.



## 1. Motivation

Empirical studies have consistently revealed the importance of education for household financial decisions. Asset market participation decisions, the stock adjustment rate, the savings rate and portfolio choice are frequently linked to educational attainment.

For example, Campbell (2006) presents evidence on the determinants of public equity market participation and portfolio composition. His regressions indicate that both income and education have a significant influence on household financial choices. Using changes in compulsory schooling laws as instruments, Cole et al. (2014) show empirically that education causes higher investment income and equity ownership.

But what is the underlying impact of education on financial decisions? Are different household decisions a consequence of education specific observables such as income processes, health risks and mortality rates, and/or unobservable types of heterogeneity that are correlated with educational attainment, such as risk aversion and cognitive abilities? Addressing these questions is the purpose of this paper.[1]

☆ Zhu acknowledges China National Science Foundation (Project no. 71473004) for financial support. Cooper acknowledges China National Science Foundation (#0819682) for financial support. We are grateful to the NSF for financial support. Participants at seminars at Pennsylvania State University, SUFE and SED 2014 provided helpful questions and comments. Thanks to David Lander and Qi Wu for research assistance. Comments and suggestions from the referees and the editor are much appreciated.

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[1] Cole et al. (2014) offer an informal discussion about why education leads to different financial decisions. We formally answer the above questions based on an estimated structural model.

http://dx.doi.org/10.1016/j.red.2015.12.001
1094-2025/

The analysis is built upon empirical evidence linking education and household financial choices including: asset market participation, the share of risky assets in household portfolios, the frequency of portfolio adjustment and wealth–income ratios. While a few studies have focused on one or more of these components of household financial decisions, one contribution of the paper is to understand these choices jointly.[2] This is important not just as means of generating a more complete picture of these choices but in allowing us to identify the sources of these differences. For example, a household considering asset market participation will recognize the subsequent cost of portfolio adjustment which is evidenced by the low stock adjustment rate. Factors, such as attitudes towards risk, that determine the share of assets in a household portfolio will also influence wealth accumulation and the stock market participation decision of the household. Another example is that with a fixed portfolio adjustment cost, a higher wealth level may lead to a higher stock share as wealthy households bear a lower cost (per unit) of adjustment. This stock share decision interacts with the participation decision, creating identification problems when participation is not modeled explicitly.

Our approach to determining the dependence of financial choices on education starts with the specification and estimation of a life-cycle model of household financial choices. Regression analysis, as in Campbell (2006), reveals how household finance depends on education and income in a static way. Our framework allows us to study the dynamic effects of education specific traits. For example, the model shows the important role of permanent income over the life-cycle, rather than realized income at a point in time. The life-cycle framework, rather than the infinitely lived agent model, is needed to examine the affects of post-retirement income and stochastic medical expenses on pre-retirement financial decisions.

Most of the existing quantitative studies on household portfolio choice are based on calibrated parameters, including important papers such as Cocco et al. (2005), Gomes and Michaelides (2005, 2008), and Wachter and Yogo (2010).[3] By contrast, estimation is an integral part of our analysis as it allows us to construct counterfactuals. Based on the estimated model parameters, we are able to quantify the channels of influence from education to household financial decisions. Further, we would not be able to analyze the link between education and the parameters of household preferences and the entry and adjustment costs without estimating the parameters. The estimation uses a simulated method of moments approach, where the moments reflect the key household financial decisions by education group. These moments are selected to identify key parameters.

More specifically, the analysis puts households into four groups according to the educational attainment of house-heads.[4] From the Survey of Consumer Finance (SCF), the average stock market participation rate and the financial wealth to income ratio increase sharply with education. Stock share also increases with education, but not as sharply. From the Panel Study of Income Dynamics (PSID), the stock (portfolio) adjustment rate is higher for more educated households.

Parameter estimates come from using the structural model to match the life-cycle profiles of stock market participation rates, the stock share in wealth, stock adjustment rates and wealth–income ratios of the four education groups.[5] The coefficients from regressing these household financial variables on, *inter alia*, age and age-squared and education dummies generate moments that are very informative about costs and risk preferences. By matching these moments, we estimate costs associated with stock market participation and adjustment along with preference parameters. In addition, by allowing heterogeneity in preferences and costs across education groups, the estimation results enable us to study the roles played by risk aversion, patience and other unobservables.

The recent literature provides insights that costs associated with stock market participation (e.g. Vissing-Jorgensen, 2002b; Alan, 2006; Gomes and Michaelides, 2005) and costs of stock transactions (e.g. Bonaparte et al., 2012) are important. We consider both types of costs, assuming both are fixed rather than proportional to income or wealth. In the presence of these costs, our model is able to match the increase of participation, adjustment rate, portfolio share and wealth–income ratio with education. Further, our structural estimation allows us the test to what extent these costs are education specific.

In the absence of costs, predictions based on common representations of risk preferences tend to contradict the data. For example, standard household portfolio models typically predict that every household should participate in the stock market, and that the stock share in total financial wealth should be high, e.g. Heaton and Lucas (1997).

As pointed out by Campbell (2006), a fundamental issue that confronts the household finance literature is how to specify the household utility function. We carry out the estimation using three specifications: constant absolute risk aversion (CARA), constant relative risk aversion (CRRA) and recursive utility (EZW) taken from Epstein and Zin (1989) and Weil (1990). Our estimation results indicate that recursive utility brings the model and data moments closer together than do the CARA and CRRA representations. Apart from understanding the link between education and financial choices, the finding in support of the recursive utility specification in an estimated model is of independent interest. This result based on estimating the competing models, complements existing simulation based exercises that have documented the contribution of this specification of utility.

[2] For example, Hubbard et al. (1995) study why more educated households save more. Achury et al. (2012) and Wachter and Yogo (2010) study the relation between education (or wealth) and the stock share in wealth.

[3] Structural estimation is employed in Alan (2006) and Bonaparte et al. (2012). But the former studies participation only and the latter stock share only, neither looks at education differences. Gomes et al. (2009) estimate the discount factor and inter-temporal elasticity of substitution using simulated method of moments, and studies the different patterns of wealth accumulation and portfolio choice between those who directly invest in the stock market and those who participate only through tax-deferred retirement accounts.

[4] To be clear, the model does not explain education. Rather it looks at the household financial choices given education.

[5] The estimation of parameters from life-cycle profiles is a main feature distinguishing this paper from our earlier study (Cooper and Zhu, 2013).