Essays on Financial Literacy and Poverty in Indonesia

A thesis submitted to The University of Manchester for the degree of Doctor of Philosophy in the Faculty of Humanities

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LIST OF ABBREVIATIONS

AIC	Akaike Information Criteria
ANZ	The Australia and New Zealand Banking
ATE	Average Treatment Effect
BIC	Bayesian Information Criteria
BPS	Statistics Indonesia
CI	Confidence Interval
DEFINIT	Definite Solutions for Infinite Problems
FII	Financial Inclusion Insight
FINRA	The Financial Industry Regulatory Authority
FSA	The Financial Service Authority
GAM	Generalized Additive Model
GDP	Gross Domestic Product
GLS	Generalized Least Square
GMM	Generalized Method of Moments
IDR	The Indonesian Rupiah
INFE	International Network on Financial Education
IPW	Inverse Probability Weighting
IPWRA	Inverse Probability Weighted Regression Adjustment
IV	Instrumental Variable
KMO	Kaiser Meyer Olkin
LPG	Liquified Petroleum Gas
LPM	Linear Probability Model
MENA	Middle East and North Africa
MORI	Market and Opinion Research International
NCEE	National Council on Economic Education
OECD	The Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PPI	Poverty Probability Index

PPP	Purchasing Power Parity
PPS	Proportionate to Population Size
PSM	Propensity Score Matching
SEADI	Support for Economic Analysis Development in Indonesia
SME	Small Medium Enterprise
SNLKI	Strategi Nasional Literasi Keuangan Indonesia
SURE	Seemingly Unrelated Regression Estimates
SUSENAS	The National Socioeconomic Survey
UI	Utility Index
UNESCO	The United Nations Educational, Scientific and Cultural Organisation

ABSTRACT

This thesis consists of three related essays on financial literacy in Indonesia. The first essay investigates the significance of financial literacy and seeks to address whether the poverty level is explained by differences in individuals' financial literacy. The study proposes a measure of financial literacy based on polychoric Principal Component Analysis (PCA) to address the limitations that have emerged from existing measures. The analysis is carried out employing the Ordinary Least Square (OLS) and the Instrumental Variable (IV) method, followed by the Propensity Score Matching (PSM) technique. The empirical findings suggest a significant association between financial literacy and poverty.

The second study aims to assess the transmission channels through which financial literacy affects poverty. A simultaneous equation approach, which allows precise inferences to be made regarding the channels of influence from financial literacy to poverty is used for this purpose. The results reveal that financial literacy affects poverty by promoting the use of financial services and by increasing savings. On the other hand, insufficient financial literacy hinders poverty reduction by raising the probability of over-indebtedness. The overall indirect effect of financial literacy on poverty is robust to various robustness checks.

The last essay focuses on the role of money attitude, which has received little attention in the literature. By employing a logistic regression technique and an average treatment effect estimation, this study aims to examine the impact of money attitude on the poverty level. It also offers an analysis of whether an interaction effect exists between money attitude and financial literacy. This essay has shown that persons with a healthier attitude towards money are more likely to avoid financial trouble. Furthermore, this empirical analysis reveals that the relationship between money attitude and financial struggle is not straightforward; instead, it is conditional upon the level of financial literacy and vice versa.

DECLARATION

that no portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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THE AUTHOR

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I dedicate this to my parents for their endless love, encouragement, and support

CHAPTER ONE

INTRODUCTION

"Wars of nations are fought to change maps. But wars of poverty are fought to map change."

Muhammad Ali (1975)

1.1. Background of the study

Financial institutions in developing countries have experienced tremendous growth in recent decades. Financial intermediaries, as well as financial markets, play a significant role in boosting economic growth. The view that everyone is bankable has been accepted as a leading driver of poverty alleviation and sustainable development. This is mainly because people's use of financial services allows them to save, to invest money, and to build up sufficient resources to deal with everyday finance. Financial institutions can also offer support in the form of loans to help the poor manage the negative financial consequences of unforseen expenditures, job losses, and/or crop failure (Kelkar, 2010). Empirical evidence has repeatedly shown that financial literacy promotes the use of financial services (e.g., Chaulagain, 2015, Cole et al., 2011, Atkinson and Messy, 2013). Limited knowledge of finance and how financial services works diminish the likelihood of using financial services. These issues may also hinder people from optimising their current financial products.

What is more, the economic importance of financial literacy is not limited to increased public participation in financial institutions; it also allows individuals to make informed financial decisions (Fernandes et al., 2014). The existing literature also suggests that financial literacy may help the poor to increase individual savings (Clark and d'Ambrosio, 2001, Jappelli and Padula, 2013, Beckmann, 2013a), to manage debt (French and McKillop, 2016, Brown and Graf, 2012, Gerardi et al., 2010), to build a sustainable business model (Ćumurović and Hyll,

2017), and to use formal sources of information, such as financial advisors (Calcagno and Monticone, 2015). In view of these advantages, financial literacy is becoming an increasingly essential field that has received considerable attention from scholars and policymakers in recent years.

However, there are substantial deficiencies in the literature on financial literacy. First, defining financial literacy is challenging because it is a multidisciplinary concept connected to (and often confused with) numerous other theories and perspectives. Second, there is disagreement regarding the best strategies to measure financial literacy. Several financial literacy measures have been proposed in the literature, but most of these measures have come under criticism, particularly with respect to their measurement strategies and choice of indicators. Third, a reading of the literature reveals that a debate is taking place concerning the issue of endogeneity. Endogeneity of financial literacy in the poverty equation may be present due to measurement error, reverse causality, and/or omitted variable bias, preventing us from making causal claims.

Thus, to shine new light on these debates, a comprehensive analysis of financial literacy needs to be developed. The findings of this study will contribute to a better understanding of the financial literacy implications of economic development and poverty alleviation, and can be used as a framework for policymakers to design, implement, and evaluate related policies.

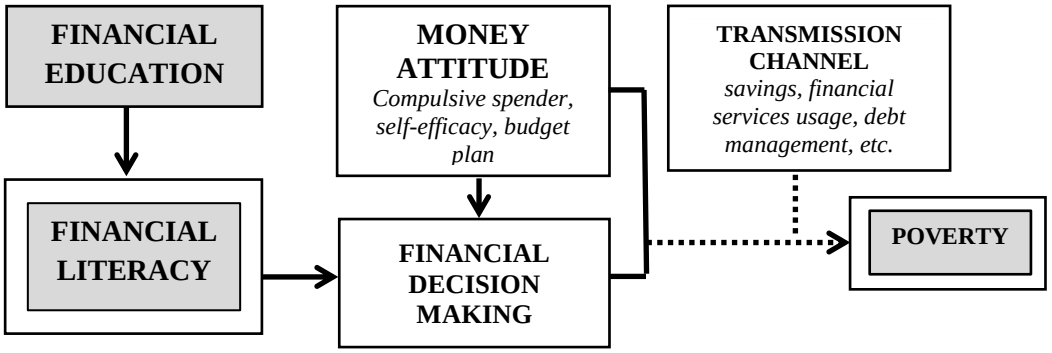
1.2. Problem statement, aims, objectives, and contributions of the study

One of the interesting public discussions on current trends in global economic development is the widespread assumption that many people are unable to deal with day-to-day monetary and financial matters. This view is supported by the fact that a large portion of the population knows very little about basic financial concepts, not only in developing countries but also in countries with a more advanced financial base and a high Human Development Index (HDI). The Standard and Poor's Ratings Services Global Financial Literacy report shows that

worldwide, only 1 in 3 adults is categorised as financially literate (Klapper et al., 2015). The report also reveals significant differences within populations, where especially poor, female, and less-educated people tend to have limited knowledge of finance, and often suffer negative consequences as a result. This is a great concern and requires a global action in the attempt to reduce poverty and narrow the income gap between rich and poor.

In this regard, financial literary promotion sounds perfectly sensible. It can help an individual improve the general quality of financial decision-making that is a stepping-stone to personal wealth. Therefore, the OECD and International Network on Financial Education (INFE) have designed standard guidelines to support governments attempting to develop national financial education strategies. Increasing financial literacy is extremely challenging, however, especially for low-income individuals. Obstacles such as inadequate numeracy skills and the complexities of the financial system still hinder progress on financial literacy (Vitt et al., 2000). Moreover, providing an understanding of how to manage money and to gain control of personal finances is much harder than is generally assumed. Financial literacy, which is commonly understood as *a basic understanding of financial concepts,* is indeed important to make the right financial choices. However, financial literacy alone cannot guarantee that people are able to make appropriate financial decisions (Ambuehl et al., 2017, Fernandes et al., 2014). As illustrated in Figure 1.1, money attitude is also a crucial determinant of economic outcomes (see Hira, 1997, Von Stumm et al., 2013, Shih and Ke, 2014, Barry, 2016). An individual's attitude towards money – for example, how and when income is obtained, and how and when it is spent – could sway his or her financial activities. Some people may save money for productive use, while others choose to spend it on unproductive, short-term activities. Of course, even financially literate individuals can run into financial trouble if they have unhealthy attitudes towards money. Thus, individuals' knowledge of finance and their attitude towards money must complement each other.

Figure 1.1. Hypothesised pathways linking financial literacy, money attitude and poverty



Source: Adopted and modified from Huston (2010)

The main objective of this thesis, therefore, is to analyse the linkages between financial literacy, money attitude, and poverty reduction, in the hopes of making a contribution to the scanty literature on financial literacy in developing countries. Developing countries are quite different from developed ones in that financial markets in the former are inherently incomplete and informationally deficient, and people there are more financially illiterate (Cole et al., 2011). Furthermore, instead of focusing on the impact of financial literacy on financial behaviour, as done in the existing literature, this thesis explores the effects of financial literacy on poverty, a welfare indicator far down the impact chain. If the attention from policymakers and researchers to financial literacy comes down to not just its role in influencing financial behaviour but, ultimately, its impact on people's financial and economic well-being, linking it with poverty in contexts where poverty is stark and prevalent has the potential to provide more useful and relevant empirical evidence.

Specifically, this study seeks to discuss the following fundamental questions and offer some critical insights into research on financial literacy in the context of Indonesia. The contributions of the empirical chapters are described below.

What is the impact of financial literacy on poverty reduction?

In response to the increasing availability of data on financial literacy in recent years, the goal of the first empirical chapter is to contribute to an understanding of the significance of financial literacy. One obstacle to this understanding is that there is not yet a consensus around an ideal technique to explore the impact of financial literacy; each technique proposed thus far has its own distinct advantages and disadvantages. This study attempts to address this problem by extending its empirical analysis to apply various methods to capture the relationship between financial literacy and poverty, providing robust, comparable statistics and analysis. Another novelty can be found in the construction of the financial literacy measure. Most existing studies either use a measure of financial literacy based on the total number of questions correctly answered by respondents in a questionnaire or construct a composite index based on the principal component (PCA) approach. However, the evidence grounded in conventional PCA is believed to be biased when using non-continuous data (Kolenikov and Angeles, 2005). Hence, this study adopts a modified PCA, namely polychoric PCA, to create a financial literacy index. This method is more appropriate when the underlying variables are binary (Kolenikov and Angeles, 2009), as is the case with the variables used to capture the respondents' financial literacy.

What are the channels through which financial literacy can reduce poverty?

Existing theoretical arguments point to links between financial literacy and a number of channels that influence poverty. However, empirical evidence on the pathways through which financial literacy affects poverty remains scanty. By investigating how financial literacy transmits to poverty, this second empirical chapter should make a significant contribution to the field of financial literacy. In fact, one of the most important contributions of this study may be its methodological approach. Moving away from the single-mediation model used by most existing studies (e.g., Fort et al., 2016, Van Rooij et al., 2012), the simultaneous equations method – used here – allows us to take into account the effect of financial literacy on various determinants of poverty and to present evidence regarding the relative influence of each channel on the overall impact of

financial literacy on poverty. This is the first empirical study to investigate financial literacy and poverty transmission mechanisms using the simultaneous equations approach both in Indonesia and internationally.

What impacts do attitudes about money have on poverty? Are these impacts contingent on financial literacy (and vice versa)?

There is a large literature investigating the concept of money attitude from a consumer behaviour perspective. So far, however, there has been little discussion about the importance of our attitude towards money as a tool for poverty alleviation. Only a few scholars have attempted to explore this question (e.g., Moav and Neeman, 2012, Banerjee and Duflo, 2007, Rao, 2001). Due to the lack of studies that estimate the role of money attitude in poverty reduction, the goal of this empirical chapter is to contribute to the understanding of the money attitude and analyse its role in the context of Indonesia. This third empirical chapter also contributes to the existing literature using a measure of money attitude that may demonstrate a crucial interactive effect (with financial literacy) on poverty. Thus, in addition to looking at the direct impact of money attitude on economic outcomes, this study would appear to be the first to address the question of whether the effect of money attitude on poverty is conditional on financial literacy level. Existing studies such as Von Stumm et al. (2013), Shih and Ke (2014) treat them as separate determinants of economic outcomes rather than investigating their interactions while this essay investigates the joint effects of money attitude and financial literacy on poverty. In order to understand the role of money attitude in more depth and to reach a robust conclusion about it, the present study also makes a noteworthy contribution by addressing the problem of endogeneity through the adoption of an average treatment approach.

To sum up, the main contribution of this thesis lies in establishing a detailed and extensive empirical study of financial literacy. Few studies have been able to draw on any systematic research on this subject, which can lead to difficulties in designing suitable policies and programmes addressing financial education and

poverty reduction. Thus, the purpose of this study is not only to shine new light on this subject but also to discover useful insights that can help policymakers develop and refine financial education strategies and initiatives.

1.3. Research methodology and data

To accomplish the objectives described above, cross-sectional data are used, applying an appropriate econometrics approach based on the Financial Inclusion Insight (FII) survey. The first empirical analysis investigates the relationship between financial literacy and poverty. The methodology of this analysis involves the application of three methods: Ordinary Least Square (OLS), Instrumental Variable (IV) and Propensity Score Matching (PSM) technique.

The second empirical analysis uses the Three-Stage Least Square (3SLS) technique. In the third empirical chapter, the logistic regression method is adopted to examine the impact of money attitude on poverty. As an alternative to the logistic regression method with its potential limitations, the average treatment effect estimation is employed.

1.4. Personal anecdote

My interest in doing this research is based on my own experiences conducting community empowerment programmes in rural areas of Indonesia. I witnessed a situation in which people do not pay attention to the details of the loan they take out, particularly the interest rate. I found it surprising that so few people know how to calculate an interest rate, despite receiving a decent formal education. As a consequence, they are likely to engage with informal moneylenders who often provide loans at unfair interest rates and under costly schemes. The research assumptions of this thesis are further strengthened by my personal experience meeting with a low-income farmer named Maulana. He has two children, who were at that time at the middle school level. Maulana lives in a wooden house that is

significantly below the standard of his neighbours' homes. In fact, Maulana sometimes found it difficult to feed his family on a daily basis. Despite this, Maulana owned two motorbikes, a fact in stark contrast to the condition of his house and household needs. I asked him why he would choose to buy the motorbikes instead of using the money to fulfil his family's needs. He answered that he bought the motorcycles for his two children. Maulana said that it is difficult to see his children without motorcycles, when all the other kids in the neighbourhood own them. For Maulana, the fact that his credit must be repaid every month is not a problem as long as his children own motorbikes like any other child. Unfortunately, the two motorcycles are not used for productive activities, but for their children to play around the village. In addition, Maulana had to buy fuel for the motorbikes every few days. With his limited income and need to pay the monthly instalments for the motorbikes, it has been difficult for Maulana and his family to improve their lives and escape poverty.

These stories demonstrate how an individual's financial literacy influences their financial decisions. Their lack of financial literacy will lead them to obtain fewer benefits from their economic activities. In addition, unhealthier money attitudes may cause them to make financial decisions without considering the losses they may incur. Drawing from these experiences, I hope this thesis will enhance our understanding of the significance of financial literacy.

1.5. Country choice

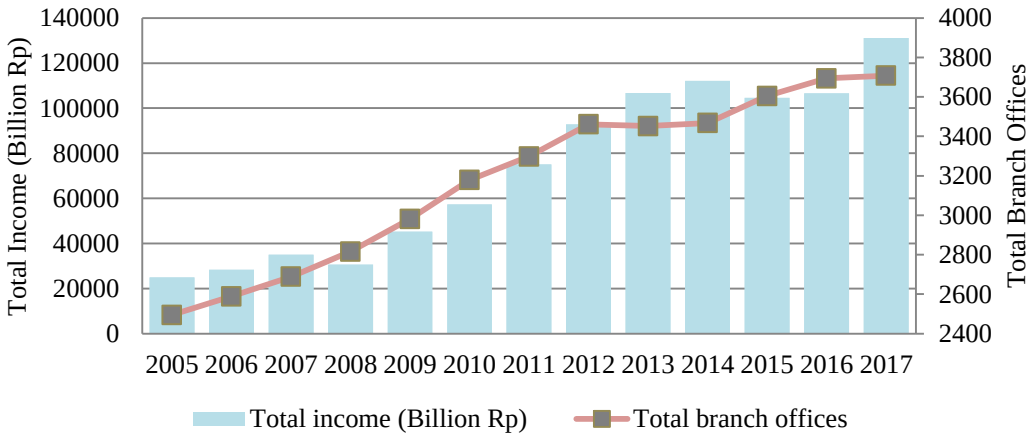
This thesis examines the impact of financial literacy in Indonesia on poverty reduction. The following section provides an economic analysis of the rationale in choosing Indonesia for a single-country analysis. First of all, there is less work on less developed countries, with exceptions such as Cole et al. (2011), Despard and Chowa (2014), Doi et al. (2014), Klapper et al. (2013), Murendo and Mutsonziwa (2017), Sayinzoga et al. (2016), Sevim et al. (2012). Partly this is due to the lack of reliable data on developing countries, which hinder researchers from constructing appropriate measurements of financial literacy. In addition, unlike developed

countries where financial systems have long become mature and sophisticated, many developing countries have less developed financial markets and institutions. It is only in recent decades when some less developed countries started reforming their financial systems and introducing ever-more multifaceted financial services and products that the issue of (low) financial literacy has increasingly attracted the attention of both policy makers and scholars. This warrants more empirical studies in the context of developing countries.

Second, choosing Indonesia as a single-country case study analysis allows us to employ more extensive micro-based data as well as investigate specific policy actions or reforms. In addition, the techniques that have developed in this study can be used in a number of useful ways. For scholars and policymakers, they can be used as a benchmark for evaluating financial literacy development in other developing countries. For example, this study develops a more reliable technique in constructing financial literacy index. This thesis's selected technique – polychoric PCA – is superior to existing measurements of financial literacy in its ability to compute binary data, as a proxy for plausible features of financial literacy. Future works can adopt this approach to construct index of financial literacy in a wide range of different countries.

Third, the rapidly emerging of financial market in Indonesia is one of the best examples to capture what is happening to many developing countries in the world. Indonesia, just like other developing countries, is one of the countries whose performance in financial development has been notable. Indonesia's banking industry has reported the highest rate of return on equity in the world (Bloomberg, 2014). In addition, the Central Bank of Indonesia records that banking sector profits reached 131 trillion rupiahs in 2017. Apart from macroeconomic performance, the country is also known as "the world's laboratory of rural financial market experiments" (González-Vega and Chavez, 1992) due to its overwhelming improvements in rural financial markets. The number of total bank branch offices in the country has increased significantly over past decades (see Figure 1.2).

Figure 1.2. Growth of total branch offices and commercial bank income statements

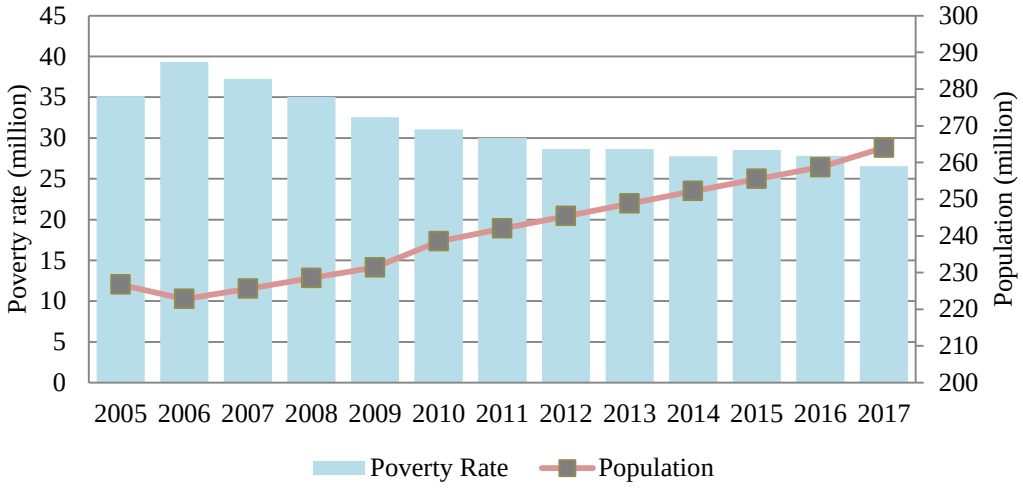


Source: The Financial Services Authority of Indonesia

However, the latest data has exposed worrying signs, notably some less than satisfactory progress in poverty reduction, at the same time as financial development is booming (see Figure 1.3). Although the absolute number of poor people in the country has continued to fall since the Asian financial crises of 1998, the rate of poverty reduction has been slowing down in the last few years and was a mere 4.6 percent in 2016-17. What is more, the amount of household debt has increased significantly, accompanied by a decline in household savings in recent years (see Figure 1.4).

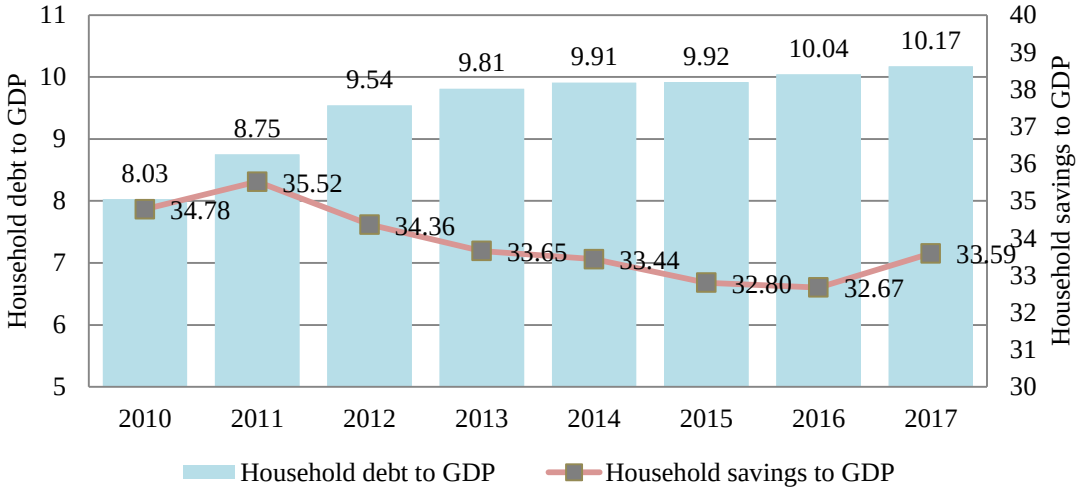
These issues may be related to a low level of financial literacy skills. The National Survey of Financial Literacy and Inclusion in 2016 recorded that only 29.7% of Indonesians are categorised as financially literate, and only 67.8% engaged in financial institutions. In light of this, some research attempts have been made to examine the impacts financial literacy in the country, but they use either a non-representative sample of households, aggregated data, or just provide descriptive information (e.g., Hidajat, 2015, Astuti and Trinugroho, 2016, Amidjono et al., 2016).

Figure 1.3. Total population and number of poor



Source: Statistics Indonesia

Figure 1.4. Indonesia's Household Debt and Household Savings: Percent of GDP



Source: The Financial Services Authority of Indonesia

The most influential study conducted on the basis of a nationally representative household survey is Cole et al. (2011), but it does not provide evidence regarding the impact of financial literacy capabilities on downstream welfare indicators. Moreover, it is also important to note that the Government of Indonesia has launched the Indonesian National Financial Literacy Strategy (SNLKI) in order to improve the quality of the financial market and to achieve inclusive development.

Nevertheless, the country is still in the early stages of the financial literacy development process, as the institution focused on improving financial literacy in Indonesia has only recently been established, and is still drawing up the ideal approaches to promote financial literacy.

Taking this into consideration, there is little doubt that this research would be very useful in offering insights and solutions to this increasingly salient problem. Exploring Indonesia's financial literacy and its impact on poverty gives researchers the chance to understand the significance of financial literacy from the perspective of a developing country. Furthermore, this study could provide suggestions on how to develop more comprehensive financial literacy programmes in the context of less developed nations.

1.6. Structure of the thesis

This thesis is divided into five main parts, where the first and the last chapters respectively provide the introduction and the conclusion. The rest of the thesis comprises three interdependent essays on financial literacy and poverty in Indonesia. Since each essay deals with a number of differing viewpoints on the subject, a relevant literature review, as well as discussions of methodologies, concepts, and definitions, are provided in each essay. Essay One (Chapter Two) examines the relationship between financial literacy and poverty. Essay Two (Chapter Three) investigates how financial literacy affects poverty through various transmission mechanisms. Essay Three (Chapter Four) focuses on the link between money attitude and poverty, and tests whether an interaction effect between money attitude and poverty causes different impacts on poverty. Each essay offers contributions to understanding the root causes of poverty that should prove valuable for policy purposes. The content of each essay is summarised in order below.

Chapter One: *Introduction*

This foreword to the thesis explains its relevant background. It first discusses the reasons why financial literacy merits examination. It then provides a statement of

the problems, aims, and objectives of the thesis. In addition, this chapter provides a summary of the research contribution and a brief descriptive outline of each essay.

Essay One (Chapter Two): *Financial Literacy and Poverty Reduction*

This essay addresses the effect of financial literacy on poverty reduction. In the first part of this essay, a brief overview of the key concepts of financial literacy is provided, including the definition of financial literacy used in this thesis. The next part presents a theoretical overview of the literature related to financial literacy. As this essay lies at the intersection of a wide range of finance theory, three basic premises guiding the research are discussed, namely the theories of financial development and poverty, financial inclusion and poverty, and financial literacy and poverty. These three theoretical arguments form a crucial chain needed to understand the concept and importance of financial literacy. Having discussed the relevant literature, this study attempts to describe the practical challenges of a contextual framework of financial literacy. It reviews what is really meant by financial literacy, and highlights related empirical studies of financial literacy. The next part of this essay is devoted to the measurement of financial literacy, providing a comprehensive overview of existing financial literacy measurements. This is followed by a justification of the choice of the Polychoric PCA-based measurement of financial literacy to address the confusion caused by existing financial literacy measurements. Furthermore, a detailed description of estimations including Ordinary Least Square (OLS), Instrumental Variable (IV) and Propensity Score Matching (PSM) are presented. The main part of this essay investigates the financial literacy-poverty nexus following the econometric model used by existing methods. The empirical analysis begins with the OLS regression method. Some would argue that the financial literacy-poverty nexus is problematic from a theoretical perspective, since correlation may not imply causation. A combination of IV and PSM methods is used to address potential endogeneity problems. This is followed by a conclusion.

Essay Two (Chapter Three): *Financial Literacy and Poverty: Transmission Mechanism.*

This essay builds on the first by putting more emphasis on the financial literacy-poverty transmission mechanism. This essay is among the few to investigate the transmission mechanism between financial literacy and poverty by applying a sophisticated methodological technique to financial literacy studies in developing countries. To analyse and understand the indirect effect of financial literacy on poverty, the financial literacy-channels-poverty causal chain is scrutinised link by link in the literature review section. The empirical studies that have investigated financial literacy and poverty transmission mechanism are reviewed, followed by a discussion of econometrics models and indirect methods. Rounding out the first part is a presentation of the estimation procedure, in which a comprehensive overview of the simultaneous equations method is provided.

The second part of this essay examines the impact of financial literacy on poverty via three essential channels, namely financial services usage, individual savings, and over-indebtedness. This essay employs a three-step procedure to check robustness. First, given that poverty and channel equations may be sensitive to different specifications, this study carries out an empirical specification search strategy. Second, it considers alternative measures of savings, financial services usage, and over-indebtedness, mainly because no single measure exhibits all the functions possessed by such channels. Third, an alternative poverty measure is used to check whether the results are sensitive to different measures of poverty. Finally, conclusions are presented.

Essay Three (Chapter Four): *Money Attitude, Financial Literacy and Poverty*

In the final essay, the effect of money attitude on poverty is explored. In addition to examining the impact of money attitude on poverty, this thesis also tests whether that impact is conditional upon the level of financial literacy and vice versa. This essay first discusses the related theoretical background regarding money attitude. It identifies and describes different kinds of attitudes toward money that are related to the poverty level. This essay also documents existing studies related to the nexus of money attitude and poverty. A subsequent section describes the empirical research

approach applied to test the hypotheses model and presents the data. Furthermore, an analysis of empirical evidence using two methods of measurement – logistic regression and average treatment effect – is presented. Finally, a conclusion sums up the key points of discussion and research findings.

Chapter Five: *Conclusion*

This chapter summarises the importance of the research findings of this study. In addition, this chapter presents a variety of policies supporting financial literacy that could be implemented in a case study country based on the analysis obtained. Lastly, directions for further research are proposed.

ESSAY ONE

CHAPTER TWO

FINANCIAL LITERACY AND POVERTY REDUCTION

"Poverty does not belong in civilised human society. Its proper place is in a museum. That's where it will be"

Muhammad Yunus (2007)

2.1. Introduction

It is widely recognised that financial development matters for economic growth and poverty reduction (Levine, 2005, Beck et al., 2007, Claessens and Perotti, 2007). There has been a surge of interest around the world in promoting financial inclusion, which is identified as an enabler for seven of the 17 Sustainable Development Goals. Indeed, many national governments have put in place enabling regulatory and policy environments, and efforts are being made by service providers to innovate with new products and/or make their services more accessible and affordable. However, according to the latest World Bank statistics on financial inclusion, 1.7 billion adults remain unbanked, virtually all of whom live in the developing world (Demirguc-Kunt et al., 2018). While there is a need to further reduce regulatory and supply-side barriers, it has become increasingly clear that a big challenge lies with how to reduce the obstacles to demand for financial services from those currently excluded. One such demand-side barrier is low financial literacy (Chaulagain, 2015, Cole et al., 2011, Simpson and Buckland, 2009, Atkinson and Messy, 2013, Chakrabarty, 2012, Grandolini, 2015).

Financial literacy, which can generally be defined as a person's ability to understand financial concepts, has recently emerged as an important component of financial reform efforts. There is a growing body of literature providing evidence

that financial literacy affects people's financial decisions and money-saving behaviour (e.g., Cohen and Nelson, 2011, Wachira and Kihiu, 2012, Hastings et al., 2013a, Bucher-Koenen and Lusardi, 2011). What is more, there is evidence suggesting relationships between financial literacy and over-indebtedness (e.g., Duca and Kumar, 2014, Disney and Gathergood, 2013), the use of financial advice (e.g., Van Rooij et al., 2007, Calcagno and Monticone, 2015, Stolper, 2018) and the probability of being self-employed (e.g., Mutegi et al., 2015, Ćumurović and Hyll, 2017).

There are at least three gaps in the literature, however. First, most of the existing studies stop far short of welfare analysis: that is to say, they attempt to examine only the (relatively) short-term effects of whether and to what extent financial literacy affects people's financial behaviour related to account ownership, investments, savings, insurance, retirement planning, debt behaviour, financial market participation, etc. Notwithstanding the fact that some studies do dwell a bit further on economic outcomes, they usually focus on the wealth accumulated from the relevant financial instruments (Cole et al., 2011). As noted by Karlan et al. (2014) in the case of savings, while improved financial knowledge has the potential to increase people's usage of savings products, it cannot be taken for granted that their net savings will increase (due to the possibility of crowd-out and crowd-in) or that their overall wealth will improve (due to the probability that putting more money in savings may have adverse impact on other decisions like borrowing, investment, health, consumption, etc.). Therefore, more empirical evidence is needed on the effects of financial literacy on downstream welfare indicators.

Second, significant debate continues regarding how scholars measure financial literacy itself. Indeed, the principal component (PCA) approach has been widely used as a method of constructing a financial literacy index. The conventional PCA approach is not explicitly designed for binary variables, however. As suggested by Kolenikov and Angeles (2009), regular PCA is only suitable for use with continuous variables, and the use of PCA in discrete variables has the potential to cause problems. In light of this, this empirical chapter contributes to the literature by adopting a modified PCA to construct a financial literacy index, namely

polychoric PCA as in Kolenikov and Angeles (2004), which provides a better estimate in cases where the underlying variables are binary.

Third, research on the subject has mostly been weakened by a limited analysis of endogeneity issues. Some studies have attempted to control the potential endogeneity of financial literacy by applying the Instrumental Variable (IV) method (e.g., Fort et al., 2016, Behrman et al., 2012, Morgan and Trinh, 2017). However, one criticism of much of the literature on financial literacy is that scholars have to rely on the 2SLS estimation, which is very sensitive to the finite sample bias, especially when there is a weak correlation between instruments and an endogenous regressor. Taking this into account, this essay proposes several novel and believably exogenous instruments to address endogeneity issues. This essay also goes one step further than the existing studies by comparing the IV results to the results provided by a method called propensity score matching (PSM). In employing this method, this study takes advantage of the matching technique to create a statistical comparison group of financially literate individuals that has the same characteristics as the financially illiterate individuals in order to examine the impact of financial literacy.

This essay is organised as follows. Section 2.2 reviews some important studies in the field. Section 2.3 and 2.4 discuss methodology and data, respectively. Section 2.5 discusses the estimation and results. Finally, section 2.6 presents conclusions.

2.2. Literature review

In this part of the essay, a brief overview of financial literacy concepts is provided. Understanding the fundamental concepts of financial literacy is important to conduct a clear analysis of the financial literacy-poverty nexus. This is followed by a review of the evolution of finance and poverty studies in order to establish a more comprehensive understanding of the relationship between financial literacy and poverty. Lastly, a summary of related empirical studies is presented.

2.2.1. The concept of financial literacy

Literacy generally refers to a person's ability to write and read. The OECD (1997) defines literacy as an individual's ability to use reading to comprehend and apply available information in daily life, so they can realise their objectives and optimise their knowledge and potential. Meanwhile, the National Institute for Literacy explains literacy as the ability of individuals to read, write, speak, count, and solve problems at a certain level of skill in daily life. Similarly, Carr-Hill and Pessoa (2008) suggest that the concept of literacy refers to a "range" of relative (not absolute) skills for reading, writing, communicating, and critical thinking.

By the mid-twentieth century, the concept of literacy had expanded, and became linked to more practical meanings and policies. Several developments led to a broader understanding of the concept of literacy. In this understanding, literacy is not only about reading and writing, but also an individual's understanding of specific skill areas; for example, technological literacy represents their ability to use the internet and communicate information (Bawden, 2001), while information literacy may reflect their ability to research and analyse information as a basis for decision making (Olsen and Coons, 1989). Aufderheide (1993) defines literacy, from the perspective of media, as the skills to generate, distribute, and evaluate the contents of media.

In the same way, financial literacy can be interpreted as a person's understanding of financial concepts. In accordance with this definition, a large number of studies define financial literacy as an individual's knowledge of finance (e.g., Cole et al., 2011, Dick and Jaroszek, 2013, Fort et al., 2016, Gathergood, 2012, Grohmann et al., 2014, Lusardi and Mitchell, 2011b, Lusardi and Mitchell, 2011a, Mahdzan and Tabiani, 2013, Millimet et al., 2015, Van Rooij et al., 2007). Van Rooij et al. (2007), for example, describe financial literacy as an individual's knowledge of necessary financial concepts, possession of basic financial numeracy skills, as well as an understanding of risk diversification in order to make good investment decisions. In a more practical way, Lusardi (2008a) defines financial literacy as the

knowledge of primary financial concepts, including compound interest, basic risk diversification, and the distinction between real and nominal values.

However, a broader perspective has been adopted by a number of studies that define financial literacy as part of financial behaviour and personal finance management. Jacob et al. (2000), for example, hold the view that financial literacy is the ability to manage financial decisions, especially regarding investment and savings. In the same way, the National Council on Economic Education (2005) argues that financial literacy reflects savings and investment behaviour and a basic understanding of economic principles. Even more broadly, Kim (2001) maintains that financial literacy is the concept that defines how a person survives in their community with all the complexity of economic reality, reducing social pressure and improving their living standard.

It is clear from the above definitions that there is no agreement on the meaning of financial literacy, notably whether the emphasis is either on financial knowledge or financial behaviour (i.e., the way to manage and assess finances). Some studies, such as Mason and Wilson (2000), even combine these two elements in their financial literacy definition. These authors describe financial literacy as the ability to comprehend and evaluate financial matters. The ability to comprehend financial information reflects a person's ability to understand the existing financial terms, while the ability to evaluate captures whether individuals can evaluate their existing financial options, analyse their resources, and optimise their usage of and benefit from available financial products.

Thus, financial literacy as *an individual's knowledge of financial materials* is often difficult to disentangle from the ideas of *financial behaviour* or *an individual's ability to manage their financial life*. Indeed, the two terms are used interchangeably in a great deal of financial literacy research. Nevertheless, to avoid the confusion that may arise from the various financial literacy definitions and to investigate adequately the importance of financial literacy, there is a need to make a clear-cut distinction in the definition. Following Lusardi and Mitchell (2009), among others, this study defines financial literacy as the sets of knowledge about

financial matters. As explained in what follows, the extent of a person's financial literacy level is measured by their ability to answer a set of objective knowledge questions using a standard financial literacy measure (see section 2.4.2.3).

2.2.2. Evolution of finance and poverty

In order to establish an appropriate framework for financial literacy analysis, this essay classifies the literature under review into three evolutionary trends in finance and poverty studies. The first trend deals with the impact of financial development on poverty (e.g., Demirgüç-Kunt et al., 2008, Jalilian and Kirkpatrick, 2005, Clarke et al., 2006, Odhiambo, 2009, Uddin et al., 2014). The second investigates the relationship between financial inclusion and poverty (e.g., Jin, 2017, Imboden, 2005a, Park and Mercado, 2015, Demirguc-Kunt et al., 2015, Sarma and Pais, 2008), and the third includes studies such as Fort et al. (2016), Behrman et al. (2012), and Van Rooij et al. (2012) who examine the link between financial literacy and poverty.

2.2.2.1. Financial development and poverty

This section recalls the initial debate about the relationship between financial development and poverty. Analysing the basic theory around finance and its link to poverty reduction is crucial because much of the intuition about financial literacy comes from studies on this particular issue. This will serve as background for the discussion that follows and help us to understand the wide array of financial literacy roles.

Studies of the potentiality of finance as a tool for poverty alleviation have been in the ascendency since the last few decades, as this era witnessed an upsurge of income inequality and a slow pace of poverty reduction. A number of studies have reported that financial development can help mitigate barriers to financial transactions, and establish a more poor-friendly banking system that influences the

financial outcomes of poor people (e.g., Demirgüç-Kunt et al., 2008, Jalilian and Kirkpatrick, 2005, Clarke et al., 2006, Odhiambo, 2009, Uddin et al., 2014). These studies outline the critical role of financial development in reducing poverty through savings mobilisation and easy access to credit markets, which allow people to pursue long-term investments and escape poverty. Indirectly, financial development also helps reduce poverty through the channel of economic growth (Levine, 1997, Honohan, 2004, Demetriades and Andrianova, 2004). If a trickle-down effect is present, economic growth will be a crucial stimulus for a country to increase its spending on infrastructure and social security, which could significantly reduce poverty. The literature also suggests that financial development can potentially reduce poverty via economic growth by enhancing the income share of the labour, which subsequently increases the demand for labour. In the case that economic growth boosts demand for low-skilled labour, then there is a greater chance that financial development could reduce poverty levels (Jerzmanowski and Nabar, 2013)

However, a positive relationship between financial development and poverty has been vigorously challenged by a number of studies in recent years. There has been growing debate about which income group receives the most benefits from financial development. For example, Greenwood and Jovanovic (1990), and Fowowe and Abidoye (2013) argue that a rapid increase of economic growth cannot really affect the level of poverty, especially when financial markets can only benefit those who have adequate funding and access. Even though finance has become more advanced, low-income individuals have limited access to mainstream financial services. This view is supported by Demirgüç-Kunt et al. (2008), who maintain that financial development could help reduce poverty when poor people have access to financial institutions during a period of economic growth. Promoting access for the poor is the critical strategy to enable finance to reduce poverty, not only to help people during financial shocks but also to allow the society to invest more in education, health, and retirement, which will have a positive long-term impact (Eswaran and Kotwal, 1990). Claessens and Perotti (2007) also provide important insights into financial access and maintain that financial development could benefit the poor as long as the financial market provides opportunities for

lower-income groups. When financial development fails to reach low-income groups, those with more wealth will continue to create an economic market that hinders the growth of the poor because the rich can pay to access the financial market.

In view of this, many scholars put initiatives offering financial services to the poor at the centre of research via an analysis of low income-based financial services known as microfinance (e.g., Lopatta et al., 2017, Banerjee et al., 2015, Imai et al., 2010, Mosley, 2001). Generally, microfinance is a form of financial service that is offered to poor people who would otherwise have no access to financial products. Microfinance provides a way to break through the risks associated with information asymmetries and the issue of credit history among low-income groups by implementing an effective strategy to assess the overall performance during the production activities of microfinance (Ortolani, 2006). It is believed to be among the most effective ways to reduce poverty through a safe small business loan (Morduch and Haley, 2002). The fundamental argument is that through providing financial services to the poor, they will have the opportunity to participate in the financial market and establish new businesses or expand current ones. In the long term, they will have the capacity to escape poverty and improve their personal situation steadily and independently. This view is supported by Snodgrass and Sebstad (2002), who emphasise that microfinance is an effective development scheme for a wide range of stakeholders by taking into account entrepreneurship, market-oriented value creation, empowerment strategy, and assistance to the poor.

From a broader perspective, microfinance also has a significant impact on sustainable development (e.g., Lopatta et al., 2017, Ramaswamy and Krishnamoorthy, 2016, Ferdousi, 2015). Besides providing low-income people with financial capital, microfinance helps to reduce gender inequality, which is an essential aspect of sustainable development and poverty reduction (see Swain and Wallentin, 2009, Rajasekhar, 2002).

2.2.2.2. Financial inclusion and poverty

The above discussion indicates that financial development helps to reduce poverty when the poor are given access to financial services. Nevertheless, concerns have been raised about the fact that the use of financial services among the poor remains limited despite a growing number of formal financial institutions (including microfinance institutions) in both rural and urban areas. Hence, scholars have begun to realise that discussion of the relationship between financial development and poverty was incomplete without providing analysis about the ways of enhancing participation in financial institutions.

Efforts to improve banking access for poor communities is often called financial inclusion. There is no universally accepted definition of financial inclusion. At first, Leyshon and Thrift (1995) described financial inclusion as the antithesis of financial exclusion. They used this term to distinguish individuals who are denied access to financial services, mainly due to lack of access and collateral, credit history, and network. Financial inclusion is defined as the process of ensuring that the poor have access to formal institutions and credit system at reasonable costs. It is also described as an effort not only to open financial access for the poor but also to provide protection for families and opportunities to improve their standard of living.

Over the past few years, the concept has developed significantly. Financial inclusion became more widely known as a process framework with three main dimensions: opening access to finance, supporting the poor, and providing affordable financial products (see Sarma and Pais, 2008, Demirgüç-Kunt et al., 2008, Khayum and Tasneem, 2018, Sherraden and Ansong, 2016). For instance, Sherraden and Ansong (2016) label financial inclusion as an opportunity to act in the current financial market. This opportunity to act depends on the preferences of financial institutions. Financial institutions must adapt to competitive practices in the market system, creating agile banking systems to make business more efficient. This process, therefore, promotes an environment in which financial organisations

only seek potential customers with higher capital to gain more significant profit margins. They are more likely to give credit to the wealthier community with a better financial history in order to guarantee higher returns. To counteract this trend, the concept of financial inclusion ensures equal opportunity for everyone, in both high and low-income groups, to access financial services. To accomplish this, financial institutions are usually bound by some form of government regulation. Governments also provide incentives for institutions that support the principle of equality in accessing banking institutions and offer guarantees to small credit schemes. All of this is part of the poverty eradication agenda.

Several studies have revealed a significant role for inclusive financial systems in alleviating poverty and reducing income disparities (e.g., Jin, 2017, Imboden, 2005a, Park and Mercado, 2015, Demirguc-Kunt et al., 2015, Sarma and Pais, 2008). Formal financial institutions can be used as vehicles to administer subsidy programmes. This opportunity may reduce market imperfections and provide financial access to the poor by raising their income (Pande, 2012). This view is supported by Guha-Khasnobis and Mavrotas (2008) who suggest that an efficient and inclusive financial system will help empower individuals, facilitate the exchange of goods and services, and integrate the community into the economy as well as protect them from financial shocks.

To examine the relationship between financial inclusion and poverty, Levine (2005) develops a framework for supply-side and demand-side financial inclusion. Pertaining to the supply-side, as described above, is the fact that formal financial institutions face market disincentives to offering affordable financial products to the poor. Another critical challenge on the supply side is improving the technological capacities of formal financial institutions. Electronic payment technologies, internet banking, and information exchanges are among the ‘smart’ programmes that can be utilised to improve financial inclusion (Berger, 2003). These programmes could potentially reduce poverty by improving the individual’s ability to cope with financial shocks and to empower low-income individuals to get involved in income-generating activities (Asongu, 2013).

On the demand side, difficulties arise when attempts are made to open banking access for the poor particularly due to the lack of human resources, inadequate information, as well as burdensome requirements for opening financial accounts (Dupas et al., 2012). Moreover, there is a very limited range of policies that can affect the structural determinants of demand, and governments therefore often fail to attract their own people to participate in savings and credit programmes. Among all these factors, the one that cannot be ignored is the financial literacy dimension.

Put differently, if the poor are not aware of the importance of financial institutions, they may not be interested in joining them, and such a lack of financial inclusion can create several problems. For instance, it may negatively affect an individual's consumption as well as their investments in education, health, and income-generating programmes. In addition, the poor are unable to participate in credit programmes that could help those who want to start a business (Nawaz, 2015, Imai and Azam, 2012). This lack of inclusion can be exploited by middlemen who are often seen to be promising fast service, cash availability, and a flexible repayment process. Money lenders grow faster because the lower middle class requires access to quick credit over short time periods, but in return, they must pay higher and wasteful costs (Quartey et al., 2012).

Another example of the impact of financial exclusion is the fact that low-income people have to accept salary transfers in cash or are forced to use accounts belonging to family members (Herbert and Finnegan, 2010). This method is risky due to the absence of clear regulations and rules. In addition, since the poor are excluded from formal financial institutions, they may lose an opportunity to get lower prices, such as the kinds of discounts that are available for debit cards and bank account holders (Gibbons, 2010). This is especially true for poor individuals in urban areas, where the development of a start-up company can open up a variety of banking products, such as discounts on credit card payments.

2.2.2.3. Financial literacy and poverty

In the third trend, scholars considered the linkages between financial literacy and poverty. In general, knowledge of finance is associated with better financial decision-making. Financial decision-making is a process that can have a lasting effect on individual welfare. Every individual makes frequent financial decisions, some of which are substantial and difficult. They must decide whether to spend or save money, whether and how much to borrow, and how to manage their assets. In this regard, financial literacy influences the process of financial decision-making because it constitutes an intrinsic factor which motivates an individual to seek out information and act on what they know (Hira, 2010). Given that an individual's financial decision-making reflects a broad range of subjects associated with personal finances, this section looks at a number of financial decisions affected by financial literacy through the lens of poverty.

First, financial literacy is critical for everyday financial transactions. Indeed, financial literacy improves individuals' ability to make the "right" decisions, to minimise risks, fraud losses, and costly financial transactions (see Shih and Ke, 2014, Peachey and Roe, 2004, Smits and Günther, 2017, Barua and Sane, 2014). Those who do not understand what an interest rate is, for example, are likely to have difficulty evaluating and comparing the suitability of financial products offered by money lenders or formal financial institutions (Fong and Rahman, 2016). As noted by Calvet et al. (2007) and Van Rooij et al. (2011b), financially illiterate households find it difficult to manage their daily expenditures, economic transactions, and financial resources. This is particularly true of and troubling for the poor, who on the one hand are more likely to be financially illiterate and, on the other hand, face constant and cumulative financial pressure.

Therefore, compounding the material hardship arising from their low and unstable incomes is their lack of skills and ability to manage these already limited resources to meet various basic living needs (Collins et al., 2010). Cohen and Nelson (2011) argue that financial literacy could help individuals by making them aware of

financial issues and choices they face and helping them to develop strategies to deal with their financial condition. For instance, a body of research has found a strong correlation between financial literacy and investment efficiency. Those who are more financially savvy are more likely to choose a low-fee investment portfolio (Choi et al., 2009) and/or show better portfolio diversification (Calvet et al., 2007, Graham et al., 2009).

Second, low financial literacy is often cited as a potential cause of undersaving. Banerjee (1992) develops a theoretical argument to support this view based on the concept of the low-knowledge trap, which refers to a situation where the uninformed end up herding for sub-optimal choices. The extant literature indicate a strong correlation between low knowledge and undersaving (see Hastings et al., 2013a). For the poor, and in particular, those in developing countries, accumulating savings can help even out consumption, finance productive investments in human and business capital, and guard against shocks (Karlan et al., 2014).

Given their low and uncertain incomes, saving money itself is not easy (although they do save), and transforming small amounts of money into more substantial savings is more difficult. This is where having a savings account with a financial institution may help. The main concern for the poor who attempt to use savings products is to find deposit security and a reasonable return. Calvet et al. (2007) find that, when savings returns are risky (including the risk of fraud), people with low financial literacy may opt-out of the market. Cole et al. (2011) also find that financial literacy is a strong predictor of demand for savings services, and providing financial training to those with a low initial measure of financial knowledge makes them more likely to open and use a savings account. Although more research is needed to provide empirical evidence of the impact on people's financial condition and economic well-being, there are some studies which have found positive effects of access to subsidised or specialised savings products on downstream income, expenditures and/or wealth (Brune et al., 2011, Dupas and Robinson, 2013, Prina, 2015, Schaner, 2018).

Third, financial literacy helps to raise awareness and usage of financial services. Recent research indicates that low financial literacy presents a demand-side barrier for poor households to take up financial services provided by financial institutions (Chaulagain, 2015, Simpson and Buckland, 2009, Chakrabarty, 2012, Grandolini, 2015). The use of financial services is key in tackling poverty, mainly through providing micro-credit to run a business (e.g., Banerjee et al., 2015, Imai and Azam, 2012, Morduch and Haley, 2002, Johnson and Rogaly, 1997), enabling poor households to take advantage of micro-insurance (Mukhtar, 2013, Hamid et al., 2011), providing access to the stock market (Van Rooij et al., 2011a, Almenberg and Dreber, 2015), and facilitating asset accumulation via savings accounts (Fletschner and Kenney, 2014).

Furthermore, financial literacy is positively related to retirement planning and insurance awareness (Brown and Graf, 2013, Agnew et al., 2012, OECD, 2008). Failure to prepare for the retirement period makes an individual more vulnerable to being trapped in poverty. In this case, financial literacy is widely considered to increase awareness among people of the need to prepare for their future, join a retirement plan, and escape poverty (Van Rooij et al., 2012, Bucher-Koenen and Lusardi, 2011). In addition, a related study by Clark and d'Ambrosio (2001) maintains that financially literate groups are expected to have twice as much income as retirees who do not plan for retirement. This is mainly because financially illiterate people are likely to pay for expensive debt and purchase unimportant products.

Regarding insurance awareness, the poor are particularly vulnerable to external shocks such as illness, job losses, crop failure, the death of wage earners, etc. Insurance plays a crucial role in society and individuals' financial well-being by offering protection against such adverse events. The extreme vulnerability of the poor to these shocks, combined with unstable income and low savings, translate into much greater levels of material hardship, as adverse events jeopardize the poor's ability to meet basic living needs. Despite the high threat of adverse events, poor individuals are less likely to buy insurance, and they rely mainly on informal mechanisms through social networks, which only have a limited ability to protect

the households against risk (Banerjee and Duflo, 2007). In addition to supply-side barriers such as unsuitability of available insurance products to the risks faced by low-income households, demand-side issues like low awareness and financial literacy also contribute to low coverage of insurance among the poor (Dalkilic and Kirkbesoglu, 2015).

Fourth, financial literacy affects the sources from which people get loans and is strongly related to the level of over-indebtedness. There is an assumption that lack of financial literacy makes people susceptible to fraud and abuse, and is correlated with default, delinquency and another borrower behaviour that increases financial fragility (Campbell, 2006, Disney and Gathergood, 2013, Duca and Kumar, 2014, Gerardi et al., 2010). Lack of financial knowledge and capability leads to poor financial choices and investment mistakes, which may result in undesired economic consequences such as over-indebtedness (Agarwal et al., 2010, Calvet et al., 2007). In addition, people with higher financial literacy are less likely to rely on informal borrowing sources with high interest rates, which is common in developing countries (Lusardi and Tufano, 2009, Stango and Zinman, 2009, Klapper et al., 2013).

In the same vein, Sevim et al. (2012) showed that individuals with higher financial literacy were less likely to exhibit excessive borrowing, resulting from the informed use of selected beneficial financial services and consumer finance schemes emerging in most developing countries. In some less-developed countries which have recently witnessed a microfinance crisis, a big lesson learned is that the most financially vulnerable (who are also the least financially literate) can easily fall into debt traps which would leave them in even greater financial hardship (Young, 2010).

Fifth, a number of studies indicate that individuals with higher financial literacy tend to seek out formal financial advice from someone like a financial advisor, while financially illiterate individuals are more likely to engage with informal bases, including neighbours, relatives, and friends (Van Rooij et al., 2007). According to Hackethal et al. (2012), there appears to be complementarity between

financial literacy and the use of financial advisor. When individuals can optimise via the assistance of experts, they will make better financial decisions, improve savings habits and can derive more benefits from financial institutions (see Marsden et al., 2011, Hudson and Palmer, 2014).

Lastly, recent studies on financial literacy indicate that it may affect the likelihood of being self-employed (Mabula, Mutegi et al., 2015, Ćumurović and Hyll, 2017). These studies point to the fact that financially literate individuals tend to take more initiatives to open businesses and survive as an entrepreneur than individuals with lower levels of financial literacy. Relatively more knowledgeable people are more likely to be aware of sources of information, advice, and capital before attempting self-employment. On the other hand, low levels of financial literacy could lead to business failure due to an inability to analyse basic financial principles, to make smart business decisions, or to build a sustainable business model. Hence, there are reasons to believe that when financial literacy is attainable, the number of successful entrepreneurs is likely to increase by improving financial literacy. Entrepreneurship is widely believed to be an important means of poverty alleviation (Peredo and Chrisman, 2006, Sutter et al., 2019).

To summarise, the above discussion suggests that financial development has the potential to promote economic growth and decrease the rate of poverty, but not if the poor are excluded from financial markets. Hence, financial institutions must provide affordable products, ensure that the poor have access to open a bank account, and guarantee that the related information is sufficiently distributed. Expanding low-income individuals' access to financial services can improve their opportunities and help them escape poverty. Further, financial literacy not only improves public participation in financial institutions but also reduces poverty via numerous channels that subsequently help individuals in improving their living standards.

2.2.3. Empirical literature

This section is divided into three sub-sections. The first sub-section discusses related empirical studies regarding the important role of financial development to stimulate poverty reduction. The next sub-section reviews existing studies regarding the importance of financial inclusion in reducing poverty income. In the last sub-section, a summary of previous studies regarding the implication of financial literacy on poverty alleviation is provided.

Financial development and poverty

The way in which finance is used as a tool for poverty reduction is studied extensively in existing literature. There are two different types of studies in literature: macro and microfinance analyses. At the macro level, the growing empirical literature about a financial services usage-poverty relationship can be traced back to the empirical work of Beck et al. (2007). The author argues that causality runs from financial development to poverty, emphasising that at higher levels of financial development, more people use financial services which in return help financial market benefit a greater proportion of society more. Subsequent studies, mostly based on cross-sectional analysis, try to test and verify the findings of Beck et al. (2007). Inoue (2019), for example, uses the Generalised Method of Moments (GMM) estimation to study the link between financial development and poverty through a case study of commercial banks in India. Using the ownership of bank accounts as a measure of financial services usage, the author finds that financial services usage reduces poverty levels. Almost a similar conclusion is drawn by Bakari et al. (2019), who use panel data estimation to examine the role of financial services on poverty reduction in 49 Sub-Saharan African countries. The authors discovered that financial services, such as saving accounts and credits, play a significant role in poverty reduction. Also, there is evidence that the average loan size significantly reduces poverty rate by approximately 12 percent. These results are fully consistent with the majority of empirical studies where the overall effect

of financial services usage on poverty level is positive and significant (e.g., Zeller and Sharma, 1998, Park and Mercado, 2015, Fadun, 2014).

On the other hand, numerous empirical studies have been devoted to examining the nature and the extent of the relationship between microfinance and poverty. In general, the empirical findings indicate that microfinance is the most effective tool for delivering financial services to low-income people and subsequently reducing poverty rate (e.g., Banerjee et al., 2015, Imai and Azam, 2012, Hermes and Lensink, 2011, Johnson and Rogaly, 1997, Geda et al., 2008). Geda et al. (2008), for example, estimate the substantial role of microfinance on poverty reduction in Ethiopia. Using panel data with a parsimonious finance-poverty model and addressing endogeneity problems between the credit access and poverty status of the respondents, the results indicate that financial services usage helps to reduce poverty through several significant channels in that they smoothen consumption and support households to deal with a liquidity problem. Similarly, other studies, such as by Khandker (2005) indicate that microfinance plays a significant role in reducing poverty by providing small loans to poor clients, enabling them to build assets through income-generating activities. Empirical evidence found by Khandker (2005) is consistent with Banerjee et al. (2015), Morduch and Haley (2002), and Imai and Azam (2012) who suggest that microfinance or the provision of micro-credit to low-income people can help lift people out of poverty.

Financial inclusion and poverty

A large number of studies have also explored the impact of financial inclusion on poverty reduction. With a focus on a large sample from both developed and developing countries, Park and Mercado (2015), for example, analysed the impact of financial inclusion on the level of poverty; they employed OLS estimation and controlling for growth rates, low-income economies, and the rule of law. Using the poverty headcount ratio as the proxy for poverty, the results show that a strong correlation exists between financial inclusion and poverty level. The results further emphasise that governments must continue to expand financial access to the poor.

Furthermore, the empirical evidence by Kelkar (2010), Muritala and Fasanya (2013), Jin (2017), and Imboden (2005b) also supports the hypothesis that inclusive finance has a substantial effect on alleviating poverty. These studies show that an inclusive financial system should be developed in order to facilitate payment and saving schemes as well as effective resource allocation. In the long term, promoting financial services to low-income individuals is part of the policy for economic growth and sustainable development.

In contrast, Neaime and Gaysset (2018), using Generalized Method of Moments (GMM) and Generalised Least Squares (GLS) analysis, found that financial inclusion has no impact on poverty for a sample of Middle East and North Africa (MENA) countries. However, they found that financial inclusion decreases income inequality. They argued that this might be due to the quality of banking structures that have not been developed sufficiently, and the banking services are still not reaching the poor who need them most.

Focusing on a specific country, Yang and Fu (2019) employed a large panel of datasets to examine the impact of financial inclusion on poverty reduction in China for the period 2010-2016. Using OLS estimation, the author found that financial inclusion leads to a decrease in multidimensional poverty. The author then re-estimated the model by dividing respondents into two groups: working-age and non-working-age groups and found that the impact of financial inclusion is much larger among the age-working respondents in rural areas. In contrast, insignificant results were obtained for the non-working-age groups. This study is consistent with the findings of Zhang and Posso (2019), where financial inclusion was found to increase the overall level of household income. This effect is even more substantial on low-income households compared to mid and high-level income households.

In the same way, Ageme et al. (2018) investigated the impact of financial inclusion on poverty reduction in Nigeria from 2009 to 2014, applying the Augmented Dickey-Fuller unit root test. Using an alternative financial inclusion measure, specifically automated teller machines (ATMs) and volume of credit to the rural populace, the authors concluded that financial inclusion plays a significant role in

poverty reduction. Similarly, Zia and Prasetyo (2018) investigated the significance of financial inclusion in Indonesia. Using cross-section data from 33 provinces in Indonesia for the period 2014-2016, the OLS estimation revealed three primary findings. First, most provinces in Indonesia have a moderate level of financial inclusion. Second, a strong correlation exists between financial inclusion and poverty reduction. Third, despite the fact that financial inclusion has been able to reduce poverty levels, the results indicate there is an insignificant impact of financial inclusion on inequality levels.

Financial literacy and poverty

One strand of the literature focused on the link between financial literacy and poverty. However, unlike the financial development or financial inclusion link to poverty, which has received a great deal of attention, studies regarding the financial literacy and poverty nexus are scarce. An essential impact of financial literacy on wealth accumulation was explored by Behrman et al. (2012), who focused on household datasets in Chile. The author employed both OLS estimation and IV method controlling for several socioeconomic characteristics. The results show that individuals with adequate financial literacy are likely to have high salaries and high levels of wealth. The authors provided evidence that the effect of financial literacy using OLS estimates is smaller, especially due to measurement errors and unobserved factors. Furthermore, the instrumental variables technique which controls the causal effects of financial literacy on household wealth shows that a 0.2 standard deviation increase in financial literacy score would, on average, increase net wealth by $13,800, divided into an approximate gain of $6,900 in other wealth, a $1,600 rise in net housing wealth, and a $5,200 boost in pension wealth.

Along the same lines, Fort et al. (2016) investigated the impact of financial literacy on household wealth in Italy. They found that financial literacy is beneficial in that it increases an individual's financial assets as a whole. However, the authors emphasise that the effect partly depends on banking information policies. Further, the results suggest that bank information policies have the potential to improve an

individual's financial literacy skill, which in turn impacts on their asset accumulation.

In a similar vein, using Japanese household data, Sekita (2013) examined the link between financial literacy and household wealth in her article entitled *"Financial Literacy and Wealth Accumulation: Evidence from Japan."* By considering endogeneity issues in financial literacy, the author found that financial literacy has a sizeable positive influence on asset accumulation. Van Rooij et al. (2012) recorded similar findings for the Netherlands samples after controlling other determinants of wealth. The authors argued that financial literacy affects wealth via two channels. One is that financial literacy increases the possibility of investing in the stock market, enabling people to reap the advantages of the equity premium. Second, there is a positive relationship between financial literacy and retirement, and savings planning, which have been demonstrated to increase wealth. All in all, financial literacy, whether directly or indirectly, has a robust effect on wealth accumulation.

Along this line, Dinkova et al. (2016) used a simple life-cycle model to estimate the impact of financial literacy. The authors began by exploring the link between financial literacy and the likelihood of investing in financial assets, i.e., controlling a set of socio-economic variables. This was followed by an analysis of whether financial literacy helps improve an individual's consumption expenditure. The authors found a positive correlation between financial literacy and the probability of holding financial assets. In addition, a significant relationship between financial literacy and consumption expenditure was found. There seems to be evidence that financially literate individuals are likely to have a higher level of consumption expenditure.

Table 2.1 summarises the empirical studies in respect of financial literacy and poverty nexus. The present essay differs from existing studies in the following aspects: first, unlike previous studies that focused on a sample of developed countries, this empirical study investigates the impact of financial literacy in developing countries, in particular, Indonesia. Second, it studies the financial

literacy-poverty nexus using two alternative poverty measures, namely consumption expenditure and the Poverty Probability Index (PPI). Third, this essay uses a large array of financial literacy measures in order to check the robustness of the findings. This study also provides an assessment of the existing financial literacy measures and proposes a more robust financial literacy index. Fourth, this empirical chapter explores the use of innovative or alternative econometric techniques, specifically an IV estimation of regression models as well as Propensity Score Matching (PSM). The IV technique is used for addressing problems with endogeneity bias. The PSM technique, unlike the IV method, does not require valid assumptions, and so is used as an alternative method of cross-validation. It allows researchers to reconstruct counterfactuals using observational data and addresses the problem of endogeneity. This, in turn, provides a comparative analysis to come closer to the actual role of financial literacy. Taken together, the present essay makes several noteworthy contributions to existing literature, especially in the field of financial literacy.

Table 2.1. Empirical evidence of financial literacy and poverty nexus

Research Study	Purpose of the study	Country	Level of Study	Financial literacy indicator	Methods used	Key findings
Behrman et al. (2012)	To examine how financial literacy affects household wealth accumulation	Chile	Single country analysis	12 sets financial literacy questions	OLS and instrumental variables	Financial literacy increases household net wealth
Fort et al. (2016)	To investigate the link between financial literacy and financial assets	Italy	Single country analysis	The percentage of correct answers to the questions about inflation, mortgage, and portfolio diversification	OLS and instrumental variables	The causal effect of financial literacy on financial assets
Sekita (2013)	To explore the relationship between financial literacy and wealth accumulation	Japan	Single country analysis	The percentage of correct answers to the questions about numeracy, inflation, risk diversification and bond prices	OLS and GMM estimation	Financial literacy increases the total wealth
Van Rooij et al. (2011b)	To evaluate the association between financial literacy, retirement planning, and household wealth	Netherlands	Single country analysis	Basic (numeracy, inflation, interest rate, time value of money, money illusion) and 11 sets of advanced financial literacy questions	OLS and instrumental variables	Financial literacy is found to have a strong link to household wealth and retirement planning
Dinkova et al. (2016)	To test the association between financial literacy, household consumption and investments in financial assets	Netherlands	Single country analysis	The percentage of correct answers to the questions about inflation, interest rate, risk diversification, and bond prices	Binomial probit model and OLS regression	Financially literate households tend to have higher investments in financial assets and a higher level of consumption

2.3. Methodology

This section begins by describing the empirical model used in the analysis of financial literacy-poverty nexus. Subsequently, an estimation procedure of investigating the impact of financial literacy is described. It starts with the OLS regression and the IV method in this context. This is followed by the propensity score matching technique proposed by Rosenbaum and Rubin (1985).

2.3.1. Model specification

The econometric model used in this analysis is an adapted version of the model proposed by Fort et al. (2016) and Van Rooij et al. (2011b). Thus, the econometric model that describes the impact of financial literacy on poverty can be expressed in the following form:

$$Y_i = \beta_0 + \beta_1 FL_i + \beta'_{2i} X_i + \eta_i + \varepsilon_i \quad (2.1)$$

Where *Y* is the poverty indicator, *FL* represents financial literacy index, and *X* is a vector of control variables. The parameter of interest is β_1, which captures the effect of financial literacy on poverty. η is the regional fixed effects. Subscripts *i* represent individuals and ε is the error term.

Following the existing literature, the variable included in *X* can be divided into two categories. First, this study uses a set of socioeconomic factors such as gender, marital status, age, and education level of the respondent, household size, a dummy for individuals who have more than one family member earning money to take care of the household, and a dummy capturing urban location. These variables appear to be natural candidates for inclusion in poverty regression. For instance, a wide range of literature indicates that women are more likely than men to live in poverty, especially because of the deprivation of capabilities, gender wage gaps and socio-cultural issues (Malach Pines et al., 2010, Chulu, 2015, Kehler, 2001). In terms of education, a better education background should guarantee an individual's well-being, and it is expected to reduce one's poverty level (Awan et al., 2011, Song,

2012). Furthermore, it is widely assumed that income-earning members and marital status are two of the primary poverty determinants (see Anyanwu, 2014). Also, individuals living within relatively large-sized families are more likely to live in poverty. When it comes to the relationship between age and poverty, a significant number of studies show that elderly people are subject to economic vulnerability (Kakwani and Subbarao, 2005, Rodrigues and Andrade, 2014).

Second, this study includes a series of variables associated with the respondent's financial situation, namely a dummy for experiencing financial shocks in the past year[1]. Individuals may experience shocks, either from the household itself, the environment, or macroeconomic conditions. The risk of financial shock can threaten individuals or society by increasing the level of vulnerability (Conley and Maloney, 1995, Cruces and Wodon, 2007, Mendoza and Strand, 2009). The model also considers the respondent's occupation (distinguishing respondents with a professional qualification) which usually minimises the probability of being poor (Dunga and Sekatane, 2014). Following Prina (2015), bank account ownership is also included as a control variable on the basis that access to financial services can help people get out of poverty.

Lastly, this study extends the conventional model further by including regional fixed effects – η_i – to control other regional unobservables and accommodate regional heterogeneity. There appears to be some evidence that the western part of Indonesia has a higher level of inequality than the eastern part (Aji, 2015). The higher level of inequality is associated with a large number of cities with a higher income per capita, especially in Java Island. The higher level of inequality between the western and eastern parts of Indonesia is mainly caused by a massive gap in terms of infrastructure facilities. Regions with better economic development are more capable of reducing poverty. Intuitively, omitting this factor may result in a biased estimate.

[1] The dataset only provides data about individuals experiencing a financial shock in the past year

2.3.2. Estimation procedure

2.3.2.1. OLS and IV regressions

This study starts by estimating model (2.1) using OLS, which is the most widely used regression method in financial literacy literature. However, it is essential to address some of the empirical concerns. Indeed, when estimating a model such as (2.1), it is possible that the variable of interest, i.e., financial literacy, is endogenous. It could be that those who are poor are the ones with low financial literacy scores. One of the issues is the rationality that individual prosperity can influence the level of financial literacy regarding the opportunity to access financial education, providing an insight into how financial systems work (Jappelli and Padula, 2013). This reverse causality may bias the results obtained from the estimating model (2.1). What is more, there may be unobservables which correlate with both the financial literacy variable and the error term. This indicates a violation of the condition of exogeneity, thus confirming that endogeneity exists.

To circumvent these issues, a number of different approaches have been adopted in literature. For example, some studies use field experiments to parse out the effects of financial literacy on economic outcomes (Cole et al., 2011, Sayinzoga et al., 2016). Another strategy which has been widely used in the literature is the use of instrumental variable (IV) method based on the two-stage least square estimation (2SLS). This study adopts the later approach following, among others, Behrman et al. (2012), Fort et al. (2016), (Van Rooij et al., 2011b). Principally, IV relies on the variations in financial literacy (FL) that are uncorrelated with the error term (ε_i) and disregards the variations in financial literacy that bias the OLS estimates. Considering model (2.1) with financial literacy as endogenous variable, the IV technique focuses on other variables, denoted *Z* or usually known as "instruments", to determine in a two-step process the causal impact of financial literacy (*FL*) on poverty (*Y*), in the presence of control variables (*X*).

In the first step, the endogenous variable, financial literacy in this case, is regressed on the instruments and control variables. The purpose of this is to isolate the

variation in financial literacy that is not correlated with the error term (ε_i). The resulting predicted values, labelled ($\widehat{FL_i}$), are then employed in the second stage rather than the endogenous variable, the endogenous variable FL_i. Specifically, the first stage regression can be formulated as follows:

$$FL_i = \alpha_0 + \alpha_1 Z_i + X_i\beta_2 + \eta_i + u_i \tag{2.2}$$

where Z refers to the instruments. The estimate of α_1 represents the effect of the instruments on financial literacy. Furthermore, in the second stage, variable poverty (Y) is regressed on the exogenous variables and resulting fitted values, as

$$POV_i = \beta_0 + \beta_1 \widehat{FL_i} + X_i\beta_2 + \eta_i + \varepsilon_i \tag{2.3}$$

Control variables, which are assumed to be uncorrelated with the error term (ε_i) play a crucial role in the process of IV estimation. These variables are included to address self-selection bias produced by instruments and to ensure that the instrument is "as good as randomly assigned" or unconnected to any potential confounders (Wooldridge, 2015, Bascle, 2008). More importantly, including control variables in the equation may help to increase statistical efficiency through a reduction in the sampling variance (Angrist, 2006).

Specification tests for instrumental variables

Practically, the instruments (Z) for financial literacy must be unrelated to the error term (ε_i), must be related to the endogenous variable (X), and must not have a direct effect on the outcome (Y) except through the endogenous variable (X). A particular concern of using the instrumental variable technique is the validity of instruments. Instruments are valid when the following two requirements are fulfiled: instrument relevance, and instrument exogeneity. The relevance conditions refer to the assumption that the endogenous variables, *FL*, and the instruments, *Z*, are highly correlated even after controlling the exogenous variables. Thus, the instrument is said to be robust if there is a high correlation between the two. When this correlation is weak and not significant, the instrument is said to be weak and

irrelevant, respectively. A common technique used in literature to check the relevance condition is the first-stage F-statistic developed by Stock and Yogo (2002) The instruments are assumed to be strong if the F-statistics of the 2SLS regression have a value higher than 10 and fulfil the relevance condition.

Regarding the instrument exogeneity assumption, instruments are valid if they are not correlated with the error term (ε). The rationale for this assumption is that when the instruments are not exogenous, they cannot isolate the exogenous variation in the endogeneous variable, *FL*, leading to inconsistencies in the IV estimates. In order to check the instrument exogeneity (also known as tests of overidentifying restrictions), there must be at least as many instruments as endogenous variables (i.e., the equation is over identified) and at least one instrument should be exogenous (Wooldridge, 2015). The standard technique adopted in literature to check the exogeneity condition is the Hansen J-statistic test. A failure to reject the null hypothesis means that the instruments are valid.

2.3.2.2. Propensity Score Matching (PSM)

The regressional analysis is the most popular method for measuring the impact of financial literacy (e.g., Van Rooij et al., 2011b, Behrman et al., 2012, Fort et al., 2016). However, this method may produce inconsistent estimates as this technique identifies the effect of financial literacy for all samples, which includes financially literate and financially illiterate individuals. This method is built on the assumption that individuals are randomly chosen for being financially literate and assumes that financial literacy affects all individuals in a similar characteristic. Despite that, these two groups of samples (financially literate and illiterate) may have substantially different characteristics. OLS regression may not fulfil the assumption of a linear form among poverty and financial literacy, mainly if the distribution of control variables significantly varies between financially literate and illiterate groups. In this regard, employing the OLS technique to examine the impact of financial literacy of all individuals in a sample essentially means to “compare the incomparable” (see Heckman, 1997). Also, the instrumental variable technique

remains commonly used for addressing problems with endogeneity bias. However, a primary concern of the IV method is that it needs at least one instrument that is highly correlated to endogenous regressors, financial literacy, and does not determine the outcome, i.e., poverty. Heckman and Li (2004) suggest that most instruments used in the IV estimation model in applied work are likely to be correlated to unobservables; thus rendering them invalid and possibly leading to inconsistent estimators.

In light of this, this empirical chapter also uses an alternative method of propensity score matching technique proposed by Rosenbaum and Rubin (1983). There are some advantages of using matching in comparison to other non-experiment approaches. First, in the absence of randomising, matching is a technique which allows researchers to reconstruct counterfactuals using observational data. It addresses the problem of endogeneity or selection bias by assuming selection is unrelated to the outcome indicator in the untreated units, and is conditional on some set of observed variables. Second, propensity score matching allows us to compare outcomes among two groups of samples which are not comparable (Heckman, 1997). It reduces the biases arising from the lack of distribution overlap between two sub-samples. It is possible, in the present context, that the range of poverty levels of the financially savvy does not overlap with that of the financially illiterate. Regression analyses usually adjust the covariance by allegedly applying to each group a mean consumption at or near which neither group has observations, and thereby produces biased estimates. The matching method can detect the lack of covariate distribution between the groups and adjust the distribution accordingly (Li, 2013). Third, propensity score matching is a semi-parametric method which, in comparison to parametric regressions, is less susceptible to the violation of model assumptions.

Basically, the match method uses a non-linear regression model to estimate the propensity scores, where the binary dependent variable (i.e., being treated or not) is regressed upon observational covariates. Each treated unit is then matched with an (or a set of) untreated units based on proximity in the propensity score. The difference in outcome between a treated unit and its matched pair can be seen as

the average treatment effect. One assumption of the method is that selection is based on observables, or the relevant differences between the treated and untreated are captured by their observable characteristics.

In implementing the technique in this study, individuals in the sample are divided into a financially literate group (the treatment group) and a financially illiterate group (the control group) based on whether they were able in the survey to correctly answer at least one of the three financial literacy questions. Specifically, the propensity score matching employs a two-step procedure. At the first stage, propensity scores are estimated using the probit model, which regresses the binary variable of being financial literate upon some observable variables. The propensity score is described below (Rosenbaum and Rubin, 1983):

$$\mathrm{p(T)} = \mathrm{Pr(T = 1|X)} = \mathrm{E(T = 0|X)} \qquad (2.4.)$$

where $p(T)$ is the propensity to be placed into financial literacy, T indicates whether an individual is financially literate ($T = 1$) or financially illiterate ($T = 0$) , and X is a vector of control variables.

Choosing the control variables is critical, and a general rule is to include variables which are thought to influence both the treatment status and outcome indicators. In the analysis, the control variables included in the main analysis are used as regressors in the probit regression, as they are widely examined as determinants of financial literacy and are often included as controls when examining the impact on poverty. The variables included in X are: gender, marital status, family size, education, income-earning members, occupation, age, location, financial shock, and ownership of a bank account.

Furthermore, the PSM approach creates a statistical comparison group of financially literate individuals that have the same characteristics with the financially illiterate individuals. There are various ways to do this, and there is no consensus in the literature on which matching method to use. In this research, two different matching

estimators are used and compared: the nearest-neighbour matching and Kernel-based matching.

With the nearest-neighbour matching, every treated respondent is matched with untreated respondents. For each financially literate individual, the closest observations with the same socio-economic characteristics is selected from the financially illiterate respondents and compared. Thus, the impact of financial literacy is estimated as the average change in the poverty level among each pair of matched observations. However, the nearest-neighbour matching is often criticised as not meeting the *common support* assumption that units are compared only if they are close enough to each other.

Unlike the nearest-neighbour matching, with Kernel-based matching, the impacts of financial literacy are computed based on the weighted average of all individuals in the untreated group. This is important to address potential biases caused by only a few observations from the untreated group that are used to compute the counterfactual outcome of a treated group. This technique is beneficial in that more information is used, leading to a decrease in variance. Nevertheless, this procedure comes at a cost as bad matches are also used to construct the counterfactual outcome (Caliendo and Kopeinig, 2008).

To summarise, this study makes use of three different methods to investigate the impact of financial literacy on poverty. The purpose is not to select the best method but to come closer to the actual financial literacy impact. A summary of the brief strengths and weaknesses of each method can be described as follows: this essay begins with the use of OLS regression. Although OLS regression has been a widely used regression method in examining financial literacy, OLS estimation is inconsistent if there is an endogeneity issue. In order to address the endogeneity problem, the IV method is applied. The main challenge is to find appropriate instruments and to satisfy the relevance and exogeneity assumptions. Therefore, the Propensity Score Matching technique is estimated as an alternative method of cross-validation. By contrast to OLS estimation, it is valid even if distributions of

the explanatory variables of financially literate and financially illiterate groups overlap relatively little. What is more, unlike the IV method, it does not require valid assumptions.

However, it is important to note that no statistical technique can be perfect. Even though PSM allows researcher to make causal inferences with observational data via its ability in balancing observed baseline variables among groups, the technique is still unable to balance unobserved variables. In this regards, remaining unobservable confounding factors may still exist and could bring to biased estimations (Nuttall and Houle, 2008).

2.4.Data

This section provides a description of the data used in this essay. As its aim is to investigate the impact of financial literacy on poverty, it also provides sub-sections consisting of a discussion of the measurement of poverty and financial literacy.

The primary data source for this research comes from the Financial Inclusion Insights (FII) database. This database, which is compiled by Intermedia, is based on nationally representative surveys focusing on the adult population (15 years and older). The FII survey's samples include the country's adult population, not the whole populations. The while-rounded questionnaire is established on a modular approach with items including bank and non-bank financial institutions, mobile money as well as financial activities. Every item investigates knowledge, access as well as usage of finance. This database also contains cross-sectional and individual-level microdata on numerical skills, and how individuals save, borrow, make payments, and manage risks. The survey was undertaken in eight African and Asian countries, including Indonesia. The surveys used questionnaires which assess individuals' financial and digital literacy. Additionally, they were collected demographic and socioeconomic attributes of the respondents. In the context of Indonesia, it is worth noting that, whilst cross-sectional data was collected for the years 2014, 2015, 2016, and 2017, the current study is based on the 2014 dataset.

The selection of the survey year is purely based on the availability of annual observations on poverty variables. As this study employs consumption expenditures as poverty measure, consumption expenditure data are not available for 2015 onwards dataset.

All in all, the dataset includes 6000 respondents surveyed from 24 out of the 34 provinces in Indonesia. These 24 provinces account for approximately 94 percent of the national population, and thus the sample can be considered as nationally representative[2]. The initial step of the sampling process was to distribute the sample in the 24 provinces proportionately with the target respondents aged 15 and over. This survey uses a proportionate-to-population size (PPS) technique to randomly select rural and urban areas in each district in every province. Small administrative units, namely census blocks were created from that primary sampling units are randomly nominated using a PPS technique, are registered to choose the districts. The data from the Indonesian Bureau of Statistics was then used as a guide in choosing a household. Furthermore, ten households were randomly selected within each selected census block. Using the Kish and Grid technique, a respondent was selected for every household and had to fulfil the survey requirement. Variables used for choosing eligible respondent are sex and age starting from the oldest male to the youngest, followed by the oldest female to the youngest. Given the sequence number, the eligible respondent is selected as the sample based on the intersection between the household serial number sequences columns with the number of eligible household members in the household.

The dependent variable, as shown in model (2.1) is poverty, which is measured as consumption expenditures, i.e., the inability to fulfil a minimum of living standards based on consumption. Further, financial literacy is measured using a set of questions that assessed knowledge on finance. The detailed poverty and financial literacy measures are discussed in the following sections. Appendix A, Table A2.8, and Table A2.9 describes the control variables included in the model specification and reports the summary statistics. About 39 percent of the respondents were male,

[2] Ten provinces were excluded from the survey due to cost and logistical considerations.

17 percent were single, and about 52 percent lived in urban areas. Most respondents had a small family – less than four members, and most lived in a household where there was only one member earning income. Of the sample, only 18 percent of the respondents had a managerial or professional occupation. The education level of the sample was relatively low, with an average of 4.85 years of schooling. The ownership of bank accounts was low in the sample, and only 21 percent of the respondent claimed to have an account.

2.4.1. Measures of poverty

Most studies of poverty use income and expenditure as indicators of individual welfare. Theoretically, the income and expenditure measurements of poverty should be equal. However, the expenditure measure of poverty is more commonly used than the income measure in the context of developing countries. This is mainly because people in developing countries depend on the informal sector, and often attempt to under-report income in order to avoid taxes (Schneider and Enste, 2000). For individuals in countries that depend primarily on agriculture, salary is not paid in the form of money, but in agricultural products, and turning these products into cash is not an easy thing to do (Coudouel et al., 2002).

The use of income as a poverty measure in the context of developing countries is problematic in other ways as well. Income tends to be short-term and variable over time, especially for those with irregular incomes and temporary jobs, or those who are entrepreneurs or farmers. By contrast, the use of expenditure as a poverty measure allows us to describe a person's spending over the long term and can thereby capture an individual’s long-term prospects better than income (see Poterba, 1991, Meyer and Sullivan, 2003). As pointed out by Ravallion (1992), in developing countries, where most people have irregular income and depend on the agricultural sector, expenditure is a better way to capture individual wealth. For this reason, following studies such as Cutler and Katz (1992), Ravallion (1992), Slesnick (1993), Grootaert (1999), Balisacan et al. (2003), Pradhan et al. (2000), Ravallion and Lokshin (2005), and Meyer and Sullivan (2003), consumption

expenditure is used as a proxy for poverty rather than income. In addition, it is also important to note that income data was not reported in the FII survey.

In this study, consumption expenditure refers to the aggregate purchase of specific food and nonfood items over the last month. This is in line with the World Bank's definition of poverty, i.e., the inability to fulfil a minimum of living standards based on consumption (World Bank, 1990). Consumption expenditures are also used by the Indonesian government to determine the country's poverty lines. In fact, Meyer and Sullivan (2003) and Lewis (2014) maintain that consumption expenditure is a suitable measure of poverty as it captures the overall consumption of goods and services used by people to fulfil their needs over time.

With respect to the relationship between financial literacy and consumption expenditure, it is widely argued that a higher financial literacy level may cause individuals to achieve better investment behaviour, higher savings, higher investment income and ultimately lead to a higher total income and consumption (see Lusardi and Mitchell, 2014, Brown and Graf, 2012, Babiarz and Robb, 2014, Dinkova et al., 2016, Behrman et al., 2012). Furthermore, one of the main effects of increased consumption expenditure is to improve the quantity and/or quality of goods and services. The higher the level of consumption expenditure, the greater the share of spending that goes to food, education, and health care, which should enable people to escape poverty. Thus, it is clear that financial literacy is positively associated with consumption expenditure, and would subsequently lead to a reduction in levels of poverty.

For robustness, an alternative measure of poverty, namely the Poverty Probability Index (PPI) is employed. The PPI was used in some earlier studies such as Desiere et al. (2015), Schreiner (2012), Chakraborty et al. (2016), Stark et al. (2015), Jalil and Azam (2014), Karlan and Thuysbaert (2016), and Polk and Johnson (2012). This measure was developed by the Grameen Foundation, and it estimates the probability that an individual falls below the poverty line based on answers to a series of country-specific questions. Since the PPI is country-specific, it can be used to capture the real poverty trend in a country and provide objective evidence

for stakeholders. The tool consists of ten multiple-choice questions, with each answer assigned a score[3]. The index ranges from 0 (extremely poor) to 100 (not poor). It is subsequently converted into a likelihood or probability of being below a given poverty line (national or international) by defining it as the share of households in the calibration sub-sample who fall below a given poverty line.

2.4.2. Measures of financial literacy

This section is divided into three sub-sections. It begins by explaining different approaches and techniques for measuring financial literacy. Subsequently, a novel measure of financial literacy is described and computed. A discussion of the weaknesses of available methods for assessing financial literacy follows, along with a brief explanation of the statistical method adopted in this study for measuring financial literacy level. Lastly, the steps in the construction of the financial literacy index are explained.

2.4.2.1. Existing financial literacy measures

A considerable number of methods have been proposed to measure financial literacy levels. Examples in the existing literature mainly use either subjective or objective measures of financial literacy. Subjective approaches result from the views of respondents based on their own responses to subjective questions. Some studies use subjective financial literacy measurements such as Aprea and Wuttke (2016), FSA (2004), and Bellofatto et al. (2018). This technique has not been widely adopted because of its risk of underestimating financial literacy levels (Leutner et al., 2008, Agnew and Szykman, 2005, Lusardi and Mitchell, 2014). The objective approach, on the other hand, focuses on a limited set of items that are based on specific knowledge of finance. As shown in Table 2.2, the objective approach appears to be more widely used in the literature (see Cole et al., 2011, Dick and Jaroszek, 2013, Fort et al., 2016, Gathergood, 2012, Grohmann et al.,

[3] For details on construction of PPI, see Appendix D

2014, Lusardi and Mitchell, 2011b, Lusardi and Mitchell, 2011a, Mahdzan and Tabiani, 2013, Millimet et al., 2015, Van Rooij et al., 2007, Balasubramnian and Brisker, 2016).

Table 2.2. Financial literacy measurement

Source	Financial literacy measure: Objective questions
Cole et al., (2011), Lusardi and Tufano (2008), Lusardi and Mitchell (2009), Grohmann et al., (2014), Mahdzan and Tabiani (2012), Dick and Jaroszek (2013), Fort et al., (2014), Millimet et al., (2015), Balasubramnian and Brisker (2016), Gathergood, (2012)	Correct responses to 3 individual multiple-choice items including interest rates, inflation and risk diversifications
The FINRA Investor Education (2014)	Percentage correct on a knowledge test which consists of interest rate, inflation, bond and stocks
Lusardi and Mitchell (2007)	Correct responses to 3 computational items including winning a lottery, interest rates, and numerical skill
Van Rooij, Lusardi, &Alessie (2007)	Correct responses to 16 basic and advanced financial literacy questions.
Guiso and Japelli (2008)	Correct responses to the questions on inflation, interest rate, risk diversification, and financial risks
Paiella (2016)	Correct responses to the questions on inflation, risk diversification and the questions about a bank statement, mortgages, mortgage and bonds
Moore (2003)	Correct responses to the questions on financial knowledge, financial behaviour, financial experiences, and debt confidence
Hastings and Tejeda (2008)	Percentage correct of general knowledge on retirement, savings behaviour and reasons for choosing a financial programme
Mandell (2007)	Percentage correct on a knowledge test
National Council on Economic Education (NCEE) (2005)	Percentage correct on 24 item financial knowledge questions
Hilgert, Hogarth, & Beverley (2003	Percentage correct on a knowledge test
Chen and Volpe (1998)	Percentage correct of general knowledge on finance, including savings, loan, investment, insurance, financial decisions, financial opinions, and financial training
OECD (2011)	Percentage correct to the questions on financial capability, financial culture, financial product awareness, and financial insight

To compute this financial literacy measure, respondents are asked multiple-choice questions, and each respondent's score is calculated based on the number of correct responses. The questions often relate to topics such as inflation, interest rates, diversification, exchange rates, risk-return, insurance, financial awareness, cost of living, and bonds

These objective questions are further used to compute the relevant financial literacy index. Several approaches have been adopted in this regard. For instance, Lusardi and Mitchelli (2007), Cole et al. (2011), and Klapper et al. (2013), among others, derived a financial literacy index by adding each score obtained by respondents. Brown and Graf (2012), on the other hand, rely on a binary financial literacy score which consists of giving one point to respondents answering all questions correctly and zero to those who failed to answer one or more questions accurately. However, these approaches suffer from the major drawback of giving the same weight to all the questions. This procedure strikes one as intuitively incorrect, for instance, since it treats the ability to answer questions regarding interest rate and inflation as of equal importance. In other words, it tends to overlook the fact that the questions are different both in difficulty and concepts involved.

To address this shortcoming, other studies (e.g., Behrman et al., 2012, Lusardi and Mitchell, 2011b, Müller and Theuvsen, 2015) derived a composite index based on the principal component analysis (PCA) method. Instead of adding up the total correct answers in the financial literacy question, the PCA method assigns weights to the estimated variables relative to their importance in determining the general variations in the data. The coefficient of each individual variable is associated with how much information it offers about the other variables. For example, if the ability to answer one of the financial literacy questions is highly indicative of giving a correct answer to the other questions, then it receives a positive coefficient. If the ability to answer a particular question suggests no information about the responses to other questions, then it has a near-zero coefficient. Lastly, if the ability to answer certain financial literacy questions indicates that an individual is likely to answer a few correct answers, it receives a negative coefficient. Thus, higher and lower coefficients indicate whether individuals get a large or small

number of correct answers on the other financial literacy questions. Another advantage of the PCA technique is that the analysis of data on financial literacy is complicated by the fact that there are many financial literacy indicators that could be used, of which some have largely similar characteristics. Hence, the PCA technique is used in order to reduce its dimensionality with little information loss (Giri, 2014). The PCA method is described in more detail in the following sections.

A brief overview of standard PCA

The standard PCA is basically a statistical technique used to reduce the number of variables in a dataset. This technique creates orthogonal principal components from a set of original connected variables with the maximum retention of variation. The principal components are uncorrelated and are ordered such that the first component retains most of the variability in the original data (Hyvärinen et al., 2009). This technique is useful and appropriate, especially when there are significant correlations among variables in a dataset (Jolliffe, 2011).

In mathematical terms, given a dataset with j correlated variables capturing financial literacy, PCA derives components where every component is a linear weighted combination of the original variables. In a set of variables X_1 through X_j, PCA derives components as follows:

$$PC_1 = a_1'X_1 = a_{11}X_1 + a_{12}X_2 + \cdots + a_{1j}X_j = \sum_{i=1}^{j} a_{1i}X_i \quad (2.5)$$

$$PC_k = a_k'X_k = a_{1k}X_1 + a_{1k}X_2 + \cdots + a_{jk}X_j = \sum_{i=1}^{j} a_{ki}X_i \quad (2.6)$$

Taken together, given a derived component $k^{th}(k = 1,2, \dots, m; m \ll j)$, the above equations equal to

$$PC_k = a_k'X_k = \sum_{i=1}^{j} a_{ki}X_i \quad (2.7)$$

where a_k denotes eigenvector of $X_k(X_{1k}, X_{2k}, \dots X_{jk})$ related to its greatest eigenivalue, λ_k. The variance of $\sum_{i=1}^{j} a_{ki} X_i$ represents $\sum_{i=1}^{j} \sum_{n=1}^{j} a_1 a_n \sigma_{in}$, reflecting the covariance among i^{th} and j^{th} variables. The variance of a linear composite can be computed using matrix algebra by looking at eigenvectors of the matrix $a_k' C a_k$, dependent on the condition $a_k' C a_k = 1$, where C refers to the covariance matrix. As $a_k' C a_k$ equal to 1, the variance of the k^{th} component represents the largest eigenvalue, $var(PC_k) = \lambda_k$. In this regard, it is likely that the first principal component contains most of the total variance in original variables. Alongside the correlation matrix, the PCA method also employs the co-variations matrix when the raw data has been standardized. By doing so, PCA addresses the issue of multiple correlations by transforming a large number of correlated variables into a set of the uncorrelated principal component.

2.4.2.2. The Polychoric PCA

Although the standard PCA method has now become the primary technique used to compute financial literacy, it is important to note that it may not be suitable in all cases. The applicability of the index of the standard PCA is basically limited by the type of data. Specifically, the standard PCA works best if all the variables are continuous, and the correlation between variables is expected to be linear. By contrast, the estimated financial literacy indicators in this study (like many indicators employed in financial literacy studies), are binary. Moreover, when non-continuous variables are treated as though they are continuous variables, the assumption of a normally distributed variable will be violated, and can lead to biased estimates in the covariance structure, spurious correlations, and/or a smaller proportion of described variance (see Kolenikov and Angeles, 2009, Filmer and Pritchett, 2001). Therefore, working with the kind of non-continuous variables that are used in financial literacy studies requires a modification of the PCA method.

In light of this, Kolenikov and Angeles (2004) developed the polychoric PCA method for categorical variables. Unlike conventional PCA, which estimates the eigenvalues and scoring factors using a linear correlation approach, the polychoric

PCA computes them using non-linear polychoric correlation relying on the *tetrachoric* correlation technique. This computes a bivariate normal correlation in a 2x2 cross-tabulation, and estimates the coefficient through the two-step maximum likelihood method (Olsson, 1979, Pearson and Pearson, 1922). Kolenikov and Angeles (2004) provide evidence that the regular PCA method is inferior to the polychoric PCA method for analysing binary data because it increases the likelihood that the normality assumption will be violated.. By contrast, since polychoric PCA is able to assign weights to different characteristics of variables, it may more accurately predict levels of financial literacy, and would therefore appear to be a valuable approach in this regard.

Technically, as discussed in Kolenikov and Angeles (2004), the polychoric PCA is computed using the following procedures. First, suppose two binary variables x_i and x_j reflect the financial literacy level. These two variables are classified in d_m groups $(m = 1,0)$, and d_n groups $(n = 1,0)$, respectively. Furthermore, the thresholds of x_i and x_j equal to τ_i and τ_j related to d_m and d_n. It is also presumed that there are two latent continuous variables x_i' and x_j' corresponding to x_i and x_j,

$$x_i = m \; i \; f f d_{m-1} < \tau_{im} < d_m \tag{2.8}$$

$$x_j = n \; i \; f f d_{n-1} < \tau_{in} < d_n \tag{2.9}$$

and τ_i and τ_j, equal to

$$-\varphi = \tau_{i0} < \tau_{i1} < \tau_{i2} < \cdots < \tau_{i(m-1)} < \tau_{im} = +\varphi, \tag{2.10}$$

$$-\varphi = \tau_{j0} < \tau_{j1} < \tau_{j2} < \cdots < \tau_{i(n-1)} < \tau_{in} = +\varphi, \tag{2.11}$$

These formulas result in (p x q) cross-tabulation data. The frequency from the (p x q) table equal to f_{mn} and the statistical likelihood where an observation is classified into cell (m n) can be defined as a_{mn}. The sample likelihood can be computed as

$$L = a_{mn}^{f_{mn}} \tag{2.12}$$

where

$$\omega = \ln(L) = \sum_{m=1}^{p} \sum_{n=1}^{q} f_{mn} \ln(a_{mn}) \quad (2.13)$$

and

$$a_{mn} = \emptyset(\tau_i, \tau_j) - \emptyset(\tau_{i-1}, \tau_j) - \emptyset(\tau_i, \tau_{j-1}) + \emptyset(\tau_{i-1}, \tau_{j-1}) \quad (2.14)$$

where $\emptyset$ denotes the joint cumulative distribution function corresponding to the unknown polychoric correlation of coefficient σ.

For the second procedure, the value of σ is achieved by optimisation of ω function corresponding to the thresholds x_i and x_j, which represent the inverse cumulative distribution function of the estimated fraction in unit (m n) of the table:

$$\tau_i = \emptyset^{-1}(\rho_i) \quad (2.15)$$

$$\tau_j = \emptyset^{-1}(\rho_j) \quad (2.16)$$

Based on equations (2.15) and (2.16), the thresholds are used to obtain coefficient scores for every binary financial literacy variable. For instance, the coefficient score for variable x_i related to the d_m groups can be computed as

$$\gamma_i | d_m = \frac{\left(exp^{-\frac{\tau^2_{(1-1)}}{2}} - exp^{-\frac{\tau^1_i}{2}} \right)}{\sqrt{2\pi}\ [\emptyset(\tau_1) - (\tau_{1-1})]} \lambda_i \quad (2.17)$$

where $\gamma_i | d_m$ is the coefficient score of the polychoric PCA of x_i corresponding to d_m groups, and λ_i represents the first principal component of x_i. Therefore, using this formula, the coefficient score is expected to be different across financial literacy indicators (e.g., interest rate). Thus, this method allows us to capture varying levels of ability in performing the test with different types of financial literacy indicators.

To sum up, as in conventional PCA, the polychoric PCA reduces the number of variables in a dataset to a smaller number of dimensions or components. However, the main advantage of using the polychoric PCA method is that it can better handle

non-continuous variables. Thus, it achieves more accurate estimates of coefficients compared to standard PCA.

2.4.2.3. Constructing a financial literacy index with polychoric PCA

A polychoric PCA-based financial literacy measure is derived in this section. This section is divided into three sub-sections to describe the primary steps in constructing a financial literacy index: a selection of financial literacy indicators, application of polychoric PCA, and classification of individuals into socio-economic groups. The first step discusses the issues relating to the selection of financial literacy indicators that have been proposed by the existing literature. The second step provides the methodological examination, including data preparation and identifying the principal component used as a financial literacy index. Lastly, the results of polychoric PCA are used to categorise individuals into various socio-economic characteristics.

Selection of financial literacy variables

Previous studies have employed a broad range of financial literacy indicators to measure financial literacy. This essay uses several questions representing financial concepts, including the capacity to perform calculations with regards to interest rates, inflation, and risk diversification[4]. The questions are relatively similar to those first used by Lusardi and Mitchelli (2007) and later widely adopted in other studies (Cole et al., 2011, Dick and Jaroszek, 2013, Fort et al., 2016, Gathergood, 2012, Grohmann et al., 2014, Lusardi and Mitchell, 2011b, Lusardi and Mitchell, 2011a, Mahdzan and Tabiani, 2013, Millimet et al., 2015). As previously shown in Table 2.2, these three concepts, also known as *the big three* (see Lusardi and Mitchell, 2011c), have been used in most financial literacy studies; and have now been adopted in more than 20 countries to measure financial literacy. The indicators mentioned are assumed to be the primary knowledge at the foundation of

[4] See appendix B for detailed construction of the questions

most financial decision-making. The concepts are universally accepted and can be implemented in various contexts and economic circumstances (Lusardi, 2019).

The polychoric PCA technique works best when financial literacy indicators are correlated. Therefore, as suggested by Hanson et al. (2005), correlation analysis for the related indicators should be conducted to justify their selection. Thus, only financial literacy indicators that are significantly correlated with poverty are included in the construction of financial literacy index. Table A2.10 in Appendix A shows that the three main financial literacy indicators (interest rate, inflation, and risk diversification) are indeed strongly correlated with poverty level.

Further, a descriptive analysis is carried out for all the financial literacy indicators to justify decisions regarding their selection. The summary of respondents' answers is presented in Table 2.3. The first question captures the inflation aspect, while the second and the third questions reflect respondents' knowledge of interest rates and risk diversification, respectively.

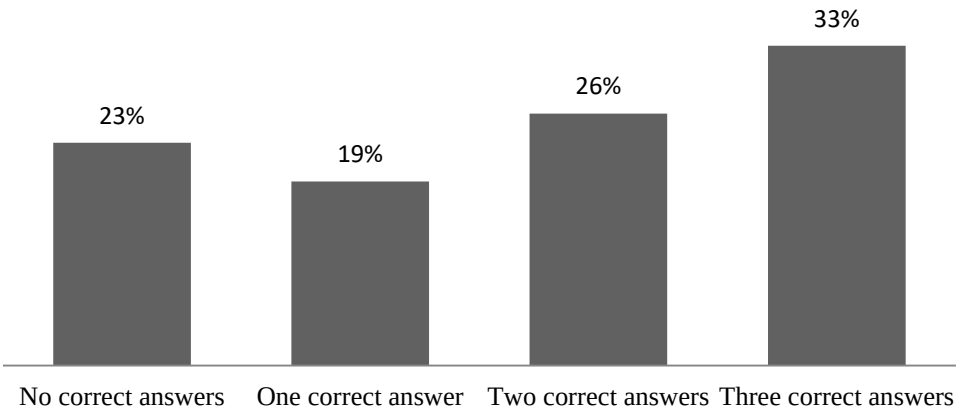
Table 2.3. Summary of respondent's answers

	Observations	Percentage
Question 1: Inflation		
Correct answer	2486	41.4
Incorrect answer	1359	22.6
Refused to answer	2155	35.9
Question 2: Interest rate calculation		
Correct answer	4232	70.5
Incorrect answer	657	10.9
Refused to answer	1110	18.5
Question 3: Risk Diversification calculation		
Correct answer	3446	57.4
Incorrect answer	1000	16.6
Refused to answer	1554	25.9

The data show that the three questions have different levels of difficulty: notably, the inflation question received a lower number of correct answers. Approximately 41.4 percent answered the inflation question correctly, while the number of incorrect answers and refused/did not answer was quite high, at 22.6 and 35.9

percent respectively. The total number of respondents who answered the interest rate question correctly was significantly higher, approximately 70.5 percent, while those who responded incorrectly and refused to answer were 10.9 percent and 18.5 percent respectively. As for the third question, about risk diversification, only 57.4 percent of the respondents answered correctly, while 25.9 percent refused to answer, and 16.6 percent responded incorrectly. Generally, as shown in Figure 2., about 23 percent of respondents were not able to answer any of the three questions, while only 33 percent of respondents answered all three correctly.

Figure 2.1. Percentage of correct answers for Indonesia



Calculation from Financial Inclusion Insight (2014) dataset

Computation of the composite financial literacy indexes

Using the polychoric PCA-based approach, a composite index of financial literacy can be constructed. The three financial literacy indicators – interest rates, inflation, and risk diversification – are binary variables indicating whether individuals gave a correct answer. Therefore, the financial literacy index is derived as follows:

$$FL_i = \sum_{m=1}^{x} \sum_{d_{m(j-0)}}^{d_{mp}} \gamma_i | d_{mj} . \mathrm{Y}(x_i | d_{mj}) \qquad (2.18)$$

where FL_i represents the financial literacy index of individual i; x represents the indicators capturing financial literacy (e.g., interest rate); $d_{m1\ldots mp}$ is p categories of variable x_i; and $Y(x_i|d_{mp})$ reflects the function of the estimated indicator x_i corresponding to particular d_{mj}.

A concern in the dataset are the missing observations, i.e., when a respondent does not answer a particular question. As pointed out by Van Rooij et al. (2011b), another issue to consider when using the existing financial literacy measure is the possibility that the respondent guesses the answers at random, leading to biased estimates. To overcome this, some studies include a "refuse to answer" option (see Fernandes et al., 2014, Lusardi and Mitchell, 2011b). Some studies, such as Jaroszek and Dick (2014) and OECD-INFE (2016), treat individuals who "refuse to answer" the same as incorrect answers, on the assumption that these respondents are unable to work out the correct answer. This technique comes at a cost, however. Treating a missing answer the same as the wrong response can be misleading, as this response is neither right nor wrong, but rather intentionally ambiguous. In light of this, this empirical chapter follows the common approach, which treats the "refuse to answer" option as a wrong answer, but also employs alternative ways to handle the missing responses as part of the robustness check. To be more specific, in one instance the "refuse to answer" is treated as missing data, and is then skipped in calculating the PCA estimation.

The construction of the polychoric PCA is based on the calculation of eigenvalues and eigenvectors expressing the distribution of data from the dataset. When computing the polychoric PCA, the number of principal components can be set. To select the component to be used as financial literacy index, this study follows the standard approach by choosing the component with the largest variant, or first principal component, and ignoring the rest of the components (see Kaiser, 1970). Results from the first principal component are presented in Appendix C. The eigenvalue for the first extracted components is 2.35, accounting for approximately 79 percent of the variation in the dataset, indicating there is optimal information captured by the first principal component (Table C2.12, Appendix C).

This study also estimates the Kaiser Meyer Olkin (KMO) test to measure how suited the data is to PCA analysis (see Table C2.14 Appendix C). The KMO value is close to 1.0, which indicates that the data is suited to PCA analysis. Bartlett's test assesses equality of variances across variables, and the results of this test show that the null hypothesis of zero correlation is rejected, indicating a significant relationship among financial literacy questions (see Table C2.14 Appendix C). The computed index, obtained from the first principal component, is normalised between 0 and 1, with a higher value indicating a higher financial literacy level. Thus, all things being equal, an individual with a large number of correct answers will be classified higher according to the financial literacy index than an individual with a small number of correct answers.

Classification of individuals into socioeconomic groups

Before undertaking the main empirical analysis, a discussion of the constructed financial literacy index along with relevant socioeconomic characteristics (including poverty) is in order. These descriptive statistics can be helpful, especially in highlighting potential relationships between variables. To analyse the correlation between financial literacy and poverty, the poverty level could be explored as a continuous variable, though the data may be difficult to interpret. For illustrative purposes and for ease of interpretation, the present study employs a common arbitrary cut-off for poverty, classifying the lowest 40 percent of individuals' consumption expenditure as "poor", and the rest as "non-poor". Furthermore, the mean financial literacy index is calculated for each group.

The mean of the financial literacy index for each group is presented in Table 2.4. The index distribution shows that there is a greater fraction of individuals with low financial literacy levels among the poor than among the non-poor, corroborating a priori expectations and previous studies. Also, the financial literacy index reveals no significant differences between males and females in Indonesia, consistent with Morgan and Trinh (2017). In line with Brown and Graf (2013), the results indicate

that single respondents have lower levels of financial literacy. In contrast to earlier findings such as Potrich et al. (2015), Table 2.4 shows that the average financial literacy index score among young respondents is higher compared to other age levels, whereas the 55–64 age group shows a significantly lower financial literacy index score. There are several possible explanations for this. First, as Indonesia is a developing country, this could be related to education level, suggesting that the older group has had less education than the younger. Second, there is a possibility that the younger generation has been affected by the massive expansion of financial institutions over the last decade, making them likely to have received more information about financial concepts. Third, this could be due to the impact of financial education initiatives targeted at the younger generation.

Table 2.4. The average financial literacy index across demographics

Characteristics	Observation	Average financial literacy index
Whole sample	6000	0.56
Poverty		
Poor	2425	0.49
Non-poor	3574	0.60
Gender		
Male	3493	0.58
Female	2367	0.55
Marital status		
Single	1001	0.36
Non-single	4999	0.54
Age		
Age 15 -24 years	919	0.62
Age 25 - 34 years	1290	0.61
Age 35 - 44 years	1408	0.59
Age 45 - 54 years	1103	0.53
Age 55 - 64 years	1280	0.44
Education		
No school	259	0.24
Primary school	2584	0.48
Junior High School	2776	0.64
Senior High School	372	0.70
University	9	0.77
Location		
Urban	3160	0.62
Rural	2840	0.49
Occupation		
Professional occupation	1081	0.64
Non-professional occupation	4919	0.54

Non-single includes married, divorced, separated, widowed and living together

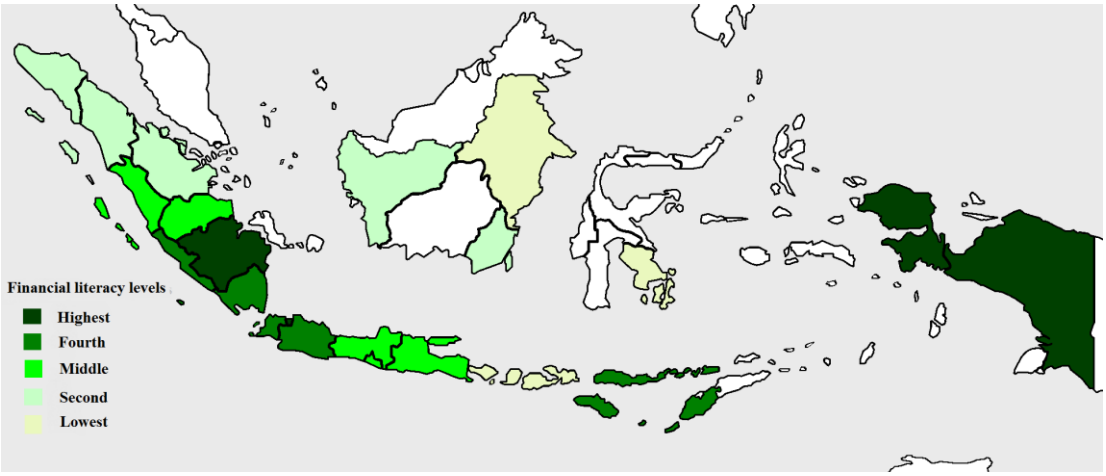
As expected, the results suggest that individuals with a higher level of education have a higher financial literacy index score. For example, individuals with no education have a lower financial literacy index score than university graduates, by 24 percentage points. This is in line with existing studies such as Santoso et al. (2016) and Bucher-Koenen and Lusardi (2011). Similar to ANZ (2008), there seems to be evidence that occupational status is linked to financial literacy level. In Indonesia, individuals with professional occupations have substantially higher financial literacy index scores than non-professional occupation groups (including students and unemployed groups). Also, the urban populace in Indonesia has a higher financial literacy index score than their rural counterparts.

Next, the regional picture of financial literacy in Indonesia is presented. These regional disparities are evident in Figure 2.2. There appears to be evidence that financial literacy is relatively higher on Java Island, with Jakarta, the capital city of Indonesia, leading with the highest financial literacy index score of 0.81. Unsurprisingly, the results also show that financial literacy index scores are relatively higher in the areas around Jakarta. The regional disparities in financial literacy levels conform to inequalities in regional macroeconomic conditions, as the most deprived regions, which also have lower level financial literacy scores, are located outside Java[5].

This finding is echoed by Klapper et al. (2013) who show that financial literacy among people living near Moscow is relatively higher compared to other regions of Russia. In the same vein, Beckmann (2013a), studying Romania, finds that the poorest regions in the northeast of the country are likely to have lower financial literacy levels compared to the highly developed region of the southeast.

[5] Details regarding the average financial literacy index for each province are provided in Appendix D, Figure D2.8

Figure 2.2. Financial literacy at the provincial level



Source: own construction based on FII dataset. The figure shows the average financial literacy index in 24 provinces of the country using polychoric PCA, where the option "refuse to answer" is scored as incorrect.

Overall, these summary data indicate that financial literacy levels differ among individuals with different socioeconomic characteristics. The average financial literacy index is relatively higher for non-single, highly educated individuals, the younger generations, those living in urban areas, and those having a professional job. More importantly, the descriptive statistics show that the average financial literacy index score is significantly lower among the poor.

Using this data, the correlation matrix of the central measured variable is estimated (see Appendix A, Table A2.10). The sign of the correlation table is consistent with the study's hypothesis that increased financial literacy is likely to reduce poverty. However, the descriptive statistics and the correlation matrix only allow us to investigate correlations, and tell us very little regarding the crucial role of financial literacy in reducing poverty without controlling for socio-economic and certain financial factors. The impact of financial literacy on poverty may also suffer from endogeneity, as previously discussed. Therefore, in the next section, a proper econometric model is developed to estimate the actual relationship between financial literacy and poverty, especially by controlling for associated factors and taking into account the issue of endogeneity.

2.5.Empirical results

Having explained the study's methodologies, this section presents its findings. It first presents the results of the OLS regressions. This is followed by a variety of robustness checks.

2.5.1. Econometric results

Table 2.5 displays the results obtained using OLS regressions. The financial literacy variable is the composite index based on the polychoric PCA, in which the 'do not know' option is considered an incorrect answer. The results are reported as a hierarchical regression by including other control variables. Several model specifications are used to ensure that the results remain robust to specification changes and are thus not driven by the choice of specifications. Seven model specifications are used in all, the first being a simple model that includes only financial literacy. The next model controls for gender, marital status, and family size (column 2). This is followed by the specifications that control for age, education, income-earning members, settlement size, type of job, financial shock, bank account, and regional dummies (columns 3-7).

Starting with the baseline model column (1), in which financial literacy is the only explanatory variable, it is clear that its estimated coefficient is positive and highly significant. In column (2), the estimate coefficients of financial literacy still remain positive and highly significant after controlling for gender, marital status, and family size. In columns (3) – (6), further control variables are included, it can be seen that the estimates remain highly statistically significant. The full specification, column (7), includes all the covariates in addition to financial literacy. Once again, the results remain unchanged.

All in all, these OLS results suggest that financial literacy exerts a positive and statistically significant impact on consumption expenditure. In other words, the

results suggest that financial literacy reduces poverty in Indonesia. These results confirm earlier findings by Van Rooij et al. (2012), Fort et al. (2016), Dinkova et al. (2016) and Behrman et al. (2012).

An interesting result that emerges from Table 2.5 is that once education is controlled for, the magnitude of the coefficient of financial literacy decreases by about 45 percentage points. This suggests that education and financial literacy are somehow strongly linked. It is also worth noting that the size of the estimated coefficients of financial literacy are consistently higher than those of education, which may indicate that while education is important in reducing poverty, financial literacy plays a more prominent role in the context of Indonesia.

Moreover, it is observed that some variables that might be considered to confound the association between financial literacy and poverty, such as occupation, financial shock, and bank account, do not affect the statistical significance of financial literacy and the coefficient estimate of financial literacy remains positively significant. It should also be noted that unobservable factors such as parents' education, level of confidence in financial skills and time-preference may still affect the results, and this essay is unable to capture such variables due to data unavailability. However, Behrman et al. (2010) found that parents' education level had no substantial effect in the link between financial literacy and household wealth. Also, Van Rooij et al. (2011b), who studied the relationship between financial literacy and household wealth in the Netherlands, maintain that confidence level in finance and time-preference do not affect the level of wealth, and controlling these variables changes the estimate of the coefficient of financial literacy only slightly.

Table 2.5. OLS regressions: Effect of financial literacy on poverty

Variables	Dependent variable: Log of consumption expenditure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	0.266***	0.258***	0.119***	0.101***	0.100***	0.098***	0.087***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Male		0.127***	0.120***	0.125***	0.111***	0.112***	0.105***
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Single		-0.096**	-0.141**	-0.142**	-0.149**	-0.149**	-0.133**
		(0.023)	(0.031)	(0.030)	(0.030)	(0.030)	(0.030)
Family size		0.031***	0.014**	0.013**	0.008	0.009	0.011*
		(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
Age 25 - 34 years			0.015	0.025	0.032	0.032	0.060
			(0.038)	(0.038)	(0.038)	(0.038)	(0.037)
Age 35 - 44 years			0.129***	0.133***	0.130***	0.130***	0.137***
			(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Age 45 - 54 years			0.152***	0.160***	0.158***	0.158***	0.166***
			(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Age 55 -64 years			0.109***	0.111***	0.103***	0.104***	0.109***
			(0.026)	(0.026)	(0.026)	(0.026)	(0.025)
Education			0.071***	0.062***	0.059***	0.058***	0.044***
			(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Urban				0.163***	0.163***	0.159***	0.142***
				(0.017)	(0.017)	(0.017)	(0.017)
Occupation					0.081***	0.079***	0.038*
					(0.022)	(0.022)	(0.022)
Inc-earning members					0.022**	0.022**	0.019*
					(0.011)	(0.011)	(0.011)
Financial shock						-0.063**	-0.065**
						(0.029)	(0.029)
Bank account							0.237***
							(0.022)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.03	0.04	0.14	0.15	0.16	0.16	0.17
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively.

Generally speaking, the results from the controls are in line with the findings of most existing studies. Males tend to display higher consumption levels, while people who were single, and individuals who experienced financial shock, tend to have lower consumption. People aged 35-54 are better off than other age groups. Respondents living in places with smaller populations tend to be poorer, a trend which apparent in the majority of less developed countries where poverty is more prevalent and severe, notably in rural areas. Consistent with intuition and the existing literature, education appears to be a strong predictor of poverty (Awan et al., 2011, Song, 2012). So is the dummy of income-earning members, indicating that consumption expenditures are higher when more people in the family contribute with their individual incomes. People with a managerial or professional occupation are more likely to have high consumption levels, although the coefficient becomes statistically insignificant when bank account ownership is controlled for.

2.5.2. Robustness checks

Several robustness checks are performed to verify the reliability of the OLS results: (i) an IV approach is implemented due to the potential endogeneity of the financial literacy variable, (ii) PSM technique is used to reduce bias in treatment effect estimates from observational studies, and (iii) alternative measures of financial literacy are used. As discussed earlier, the "refuse to answer" response has been treated differently in different parts of the literature. In the results reported in Table 2.5, this response was treated as an incorrect answer. In the next exercise, these responses are classified as missing observations and thus skipped in the computation of the financial literacy index. Finally, an alternative measure of poverty is adopted, using the Poverty Probability Index (PPI), and OLS, IV, and PSM results are presented.

2.5.2.1. Instrumental Variable (IV) estimates

The baseline OLS estimates indicate a strong impact of financial literacy on poverty. However, findings from the OLS estimates should be interpreted with caution. As previously discussed, financial literacy can be endogenous with respect to reverse causality (i.e., those with higher levels of wealth could improve their financial literacy), measurement error and omitted variable bias (Lusardi and Mitchell, 2014, Fort et al., 2016, Stolper, 2018).

Thus, tackling endogeneity is important. To conduct IV estimations, the present essay uses three sets of instruments. The first instrument is a mean distance to the nearest financial institutions (taken from the FII database). This is inspired by studies that employ distance-related variables as an instrument. For instance, Ky et al. (2016), in the digital finance literature, use as an instrument the distance between a household and the nearest mobile money provider to estimate the impact of mobile money on savings behaviour. Redding and Venables (2004) adopt the distance to centre areas as an instrument for market access. Similarly, Alcaraz et al. (2012) use distance to a railroad route as an instrument for remittance. It is argued that people living nearer a bank (or financial institution) have better exposure to financial information, making them more aware of financial products and more familiar with financial matters. The distance is thus correlated with a person's financial literacy, but as it is largely beyond the respondent's control, it is thereby exogenous to their actions and economic outcomes.

Following the existing literature (see Lachance, 2014, Christiansen et al., 2007, Sekita, 2013, and Klapper et al., 2013) the second and third instruments are, respectively, the ratio of the number of university students to the total number of households in the region, and the ratio of financial workers to the total number of households at the regional level (taken from the Indonesia Database for Policy and Economic Research, World Bank Group). The use of the two regional-level factors as instruments is motivated by the idea that people can improve their financial literacy by social interaction and learning from peers. Exogenous to the respondent, these regional-level factors are assumed to fulfil the requirement for instruments in

that they affect people's financial knowledge through mechanisms like peer learning, but do not directly affect an individual's welfare.

The results from the second-stage regression are reported in Table 2.6 using the distance to the nearest bank branch, the university student's ratio, and the ratio of financial workers as instruments. The models are estimated for the same sample used in the baseline estimates. The dependent variable is consumption expenditure, and the set of control variables is similar to that used in the OLS regression, plus the presence of the instruments. The results indicate that financial literacy has a positive impact on individual consumption, and the effect is robust when controlling for endogeneity. The impact of financial literacy is even stronger than what was found in the OLS. This is in line with existing studies employing the IV method in studying financial literacy, irrespective of the instrument's selection. Lusardi and Mitchell (2014) and Fort et al. (2016) maintain that the actual effect of financial literacy tends to be underestimated, though the greater magnitude of the IV coefficient may be related to either a substantial response from those influenced by the instruments or due to the impact of measurement error. Moreover, it is also important to note that the sign effect of the control variables are relatively similar to those obtained from OLS. This shows that, in general, the effect of the other variables on poverty is not captured by the level of financial literacy.

Although the focus of this thesis is on the impact of financial literacy on poverty, it can be noted that the coefficient of age switches sign. Similar issue was also raised by Reiss (2016). One explanation could be that the loss of efficiency is due to instrumenting which may affect the instrumented variable results. Saying this, however, looking at the magnitude of each age group, the results of the IV implies that younger population experience lower level of consumption expenditure irrespective of the sign switch. Moreover, the results obtained using the PPI (as poverty measure) show consistent results whether using OLS or IV. In light of this, one could argue that the finding that lower age group experience lower consumption expenditure is robust.

Table 2.6. Instrumental variable regressions: Effect of financial literacy

Variables	Dependent variable: Log of consumption expenditure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	2.241***	2.354***	2.356***	2.345***	2.390***	2.339***	2.326***
	(0.232)	(0.250)	(0.287)	(0.316)	(0.314)	(0.296)	(0.296)
Male		0.100***	0.081***	0.082***	0.073**	0.073**	0.069**
		(0.028)	(0.028)	(0.028)	(0.029)	(0.029)	(0.029)
Single		-0.272**	-0.149***	-0.149***	-0.155***	-0.155***	-0.147***
		(0.042)	(0.049)	(0.049)	(0.050)	(0.049)	(0.049)
Family size		-0.004	0.003	0.003	-0.001	-0.001	0.000
		(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)
Age 25 - 34 years			-0.232***	-0.230***	-0.230***	-0.224***	-0.208***
			(0.068)	(0.070)	(0.070)	(0.069)	(0.070)
Age 35 - 44 years			-0.122**	-0.121**	-0.126**	-0.120**	-0.116**
			(0.055)	(0.057)	(0.057)	(0.055)	(0.055)
Age 45 - 54 years			-0.067	-0.066	-0.070	-0.065	-0.060
			(0.051)	(0.053)	(0.054)	(0.052)	(0.052)
Age 55 -64 years			-0.016	-0.016	-0.022	-0.020	-0.016
			(0.046)	(0.046)	(0.047)	(0.046)	(0.046)
Education			0.004	0.004	0.000	0.002	-0.006
			(0.010)	(0.010)	(0.010)	(0.009)	(0.009)
Urban				0.009	0.006	0.013	0.005
				(0.036)	(0.036)	(0.035)	(0.034)
Occupation					0.044	0.047	0.025
					(0.039)	(0.039)	(0.039)
Inc-earning members					0.019	0.019	0.017
					(0.018)	(0.018)	(0.018)
Financial shock						0.066	0.065
						(0.055)	(0.055)
Bank account							0.126***
							(0.040)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F statistics	46	31	32	27	27	30	30
Hansen J p-value	0.44	0.44	0.59	0.58	0.71	0.67	0.64
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively. The financial literacy index has been instrumented, indicating the distance to the nearest bank branch, university student's ratio, and financial worker's ratio.

Furthermore, the test statistics suggest that IV estimators do not suffer from instrument relevance and instrument exogeneity issues. The F statistics are considerably high and clearly above 10, the value required for strong instruments (Staiger and Stock, 1994). The overidentification test is performed to check the instrument exogeneity assumption. The p-value of the Hansen test shows that the instruments are indeed exogenous in every model specification. As a variant of IV procedure, this study also reports findings based on the use of alternative instruments for financial literacy. Instead of using all three instruments together, estimations are made by employing several combinations of instruments. As shown in Appendix F, Table F2.17 - Table F2.19, this modification had little impact on the estimates of the financial literacy effect, no matter which instruments are retained.

2.5.2.2.Propensity Score Matching (PSM) estimates

The results obtained by OLS estimators are substantially similar to IV estimates. However, OLS regression analysis may not always sufficiently address selection bias (Heckman et al., 1997). This study then employs the propensity score matching method as an additional benchmark against the OLS regression results, as it can both address the issue of selection bias and does not require a valid instrument like the IV method. Under the propensity score matching technique, financially literate and illiterate groups are matched based on their socio-economic characteristics. This exercise enables us to match financially literate individuals with similar financially illiterate individuals, corresponding to their unique characteristics such as age, education, occupation, etc.

The matching method requires the distributional coverage of propensity scores to be balanced between the treated (financially literate) and untreated groups (financially illiterate), in the sense that similar propensity scores are based on the same observed control variables or overlap assumption. Thus, before discussing the results, it is important to check whether the overlap assumption has been met. The distribution of the propensity scores of the treated and untreated groups is plotted in Figure G2.5, Appendix G, where 1354 individuals are classified as treated and

4646 individuals are untreated. The upper half of the graph is the propensity score distribution for the treated group, while the bottom half captures the untreated group. All the observations are on the common support, and there are no individuals that the model fails to match.

Table G2.20, Appendix G, reports a comparison of the standardized mean differences before and after matching, which indicates that matching on the propensity score significantly minimises imbalances in the distributions of the control variables for every individual. The standardised biases are substantially large for several variables before matching, and become small after matching (for some variables, they approach zero). For instance, education level and location (urban) biases are 61.8% and 37.1% before matching and only 2% and -0.7% after matching. The balancing property is satisfied when controls such as gender, marital status, family size, education, income-earning members, occupation, age, location, financial shock, ownership of bank account and regional dummy are included. Figure G2.6, in Appendix G, indicates that variances on conditional probabilities of the treatment declining after matching because the propensity score distributions of financially literate and illiterate groups overlap. Overall, these tests indicate that the overlap assumption is met and the matching is of good quality.

Finally, the propensity score is estimated via a probit model. Two different matching estimators, nearest-neighbour matching and kernel-based matching, are used to test the robustness of the findings. The nearest-neighbour matching can be computed with or without replacement (with replacement means an untreated individual can be employed more than once as a match). As discussed by Caliendo and Kopeinig (2008), nearest-neighbour matching with replacement increases the average quality of matching estimation and reduces potential biases. Therefore, the present study explores both the nearest two and nearest five neighbours. For robustness, this study also re-estimates the specification to allow more flexibility in the link between financial literacy and poverty. Thus, the specification is extended by including a variable regional dummy in the second specification.

As expected, the nearest-neighbour matching and kernel-based estimators all lead to similar results, confirming the finding from the regressional analysis that financial literacy has a positive and significant impact on consumption expenditure. These methods estimated that the effect of financial literacy on consumption expenditure would range between 5 and 7 percentage points (see Table 2.7 column 1 and 2). In other words, financially literate individuals have higher consumption than a comparable financially illiterate individual with similar propensity score (estimated by individual characteristics), suggesting the significant role of financial literacy in reducing poverty.

Table 2.7. Propensity Score Matching

	Average Treatment Effect (ATE)	
	Dependent variable: consumption expenditure	
	(1)	(2)
Nearest-neighbour (2)	0.073***	0.058***
	(0.028)	(0.028)
Nearest-neighbour (5)	0.050***	0.075***
	(0.025)	(0.025)
Kernel-based matching	0.071***	0.077***
	(0.023)	(0.024)
Regional dummy	No	Yes
Basic control	Yes	Yes

Notes: regional dummy is included in Specification 2. Figures in parentheses are standard errors. Regressors not reported: gender, marital status, family size, education, income-earning members, occupation, age, location, financial shock, and ownership of bank account. *, ** and *** represent statistical significance at 10%, 5% and 1%, respectively.

2.5.2.3. Financial literacy indexes

As explained in section 2.4.2.3, the financial literacy index is constructed by treating individuals who select "refuse to answer" as if they had answered incorrectly. However, assuming the missing answer/"refuse to answer" is the same as an incorrect response may be problematic, as this response is neither right nor wrong, but rather intentionally ambiguous. In this section, model (2.1) is re-

estimated with alternative financial literacy indexes in which the dependent variable remains the consumption expenditure. In this case, following Kiers (1997), and Wold and Lyttkens (1969), "refuse to answer" responses are treated as missing data and are skipped in the polychoric PCA estimation.

The estimation starts by estimating model (2.1) using OLS. The estimates show that results in all model specifications remain quantitatively the same. These are presented in Table H2.21, Appendix H. However, while the sign and magnitude of the coefficient on the consumption expenditure are preserved, it is only statistically significant at the 10 percent level in some specifications. As this estimation treats the "refuse to answer" response as a missing answer, the loss of degrees of freedom is thus considerable and, as predicted, turns into substantially larger standard errors and a lower level of significance. In spite of this, their estimated signs and magnitudes still give us some amount of confidence in the baseline results.

The IV results are summarised by Table H2.22 (Appendix H). As can be seen, the results remain quantitatively similar to the previous results, although in some specifications, the Hansen J statistic does not have the power to identify problematic candidate instruments.

2.5.2.4. Alternative measure of poverty

This robustness check employs an alternative poverty measure, namely the Poverty Probability Index (PPI). Table I2.23, Appendix I, shows the OLS estimation results, which are consistent with the results in which consumption expenditure is used as a proxy for poverty. Indeed, the results suggest that increases in financial literacy are associated with decreases in PPI, indicating that financial literacy reduces the probability of being poor. An additional possible test of robustness is to use an alternative poverty measure, PPI, in applying the IV and PSM methods. When the IV method is used, this study again finds the same pattern in the coefficient estimates. Consistent with the results using consumption expenditure as a proxy for poverty, the impact of financial literacy is even stronger than that

derived from OLS when the dependent variable is PPI (see Table I2.24, Appendix I).

Estimates from the PSM method are reported, shown in Table I2.25, Appendix I. The results confirm the pattern in earlier findings, where compared with the financially illiterate group, financially literate individuals are likely to avoid poverty. Results obtained from the nearest-neighbour matching estimator indicate that financial literacy decreases poverty level by approximately 1.7 percentage points (see Table I2.25, Appendix I). The effect is also statistically significant at conventional levels of confidence under the Kernel-based method, in which financial literacy reduces the level of poverty by around 2.4 percentage points.

All in all, the results remain relatively similar throughout the robustness checks. Findings from both baseline and alternative methods support the idea that financial literacy is associated with poverty level, and the effect remains significant across different poverty measures and financial literacy indexes.

2.6. Concluding remarks

The aim of this essay is to test the relationship between financial literacy and poverty. To begin, the literature on financial literacy is reviewed. Although there have been few empirical studies about its relationship to poverty, the relevant literature indicates that financial literacy is critical to avoiding poverty. Having reviewed the most relevant literature, the most common methods of measuring financial literacy are discussed. Further, several gaps in the literature on financial literacy are highlighted. To date, most studies have focused on developed countries, and the majority of them examine the relationship between financial literacy and various financial behaviours. Few efforts have been made to unravel its impact on welfare indicators further down the impact chain, in particular, individual consumption and poverty. Second, the findings in the existing literature are not sufficient to draw any reliable conclusions about financial literacy impacts, especially as related to the problem of endogeneity. Third, the literature does not

adequately address the problems that arise from the measurement of financial literacy.

The present essay attempted to fill these gaps. It analyses dataset from developing country (which is infrequently used in the literature) using two measures of poverty: consumption expenditure and the Poverty Probability Index (PPI). Further, this study uses a model to capture the conditional effects of financial literacy on poverty which is estimated by employing two robust estimation techniques, taking into account the problem of endogeneity: Instrumental Variable (IV) and Propensity Score Matching (PSM). In addition, one of the main contributions of this essay is the construction of a more reliable financial literacy index. The standard PCA technique, which has been widely used in the existing literature to construct an index of financial literacy, is not wholly appropriate, as discussed earlier. This is because the evidence grounded in conventional PCA is believed to be biased when using non-continuous data (Kolenikov and Angeles, 2005). A modification of the PCA method, called the polychoric PCA, enhances the PCA performance with binary data, thereby reducing potential biases. Hence, the study modifies composite financial literacy indexes using the polychoric PCA to accommodate the binary nature of the underlying variables.

In the main analysis, in which consumption expenditure is selected as a proxy for poverty, the results reveal that financial literacy is positively associated with consumption expenditure. This result further supports the idea that financial literacy reduces the levels of poverty. The findings, as highlighted above, are consistent with the theoretical predictions of the significant role of financial literacy (Dinkova et al., 2016, Behrman et al., 2012, Van Rooij et al., 2011b, Fort et al., 2016). The effect is robust to varying model specifications and estimation methods, as well as to the use of different poverty measures. For robustness, this study also uses alternative financial literacy index in that “refuse to answer” responses are treated as missing data and are skipped in the polychoric PCA estimation. Results from this approach also favour the existence of a significant impact of financial literacy on poverty.

Overall, this essay offers empirical insights into the role of financial literacy in helping people improve their economic wellbeing and reducing poverty in a developing country context. As a side note, the present study is indeed uncovered how financial literacy translates into reduced poverty, and what the transmission channels between these two variables are. This issue will be further investigated in the next chapter.

Appendices to chapter two

Appendix A

Table A2.8. Variable description

Variable	Variable Description
Consumption expenditure	Monthly per capita expenditure on basic needs. *Units*: log
Poverty Probability Index	Index (0-100) of poverty. *Units*: 0 = not poor and 100 = extremely poor
Financial literacy index	Composite financial literacy index. *Units*: 0 = low financial literacy score and 1 = high financial literacy score
Gender	Takes a value of 1 if male, 0 otherwise. *Units*: dummy variable
Marital status	Takes a value of 1 if single, 0 otherwise. *Units*: dummy variable
Family size	The number of family members. *Units*: numbers
Income-earning members	The numbers of family members earn income. *Units*: numbers
Occupation	Takes a value of 1 if holding job by qualification level, 0 otherwise. *Units*: dummy variable
Age 15 -24	Takes a value of 1 if aged 15 -24. *Units*: dummy variable
Age 25 - 34	Takes a value of 1 if aged 25 - 34. *Units*: dummy variable
Age 35 - 44	Takes a value of 1 if aged 35 -44. *Units*: dummy variable
Age 45 - 54	Takes a value of 1 if aged 45 -54. *Units*: dummy variable
Age 55+	Takes a value of 1 if aged 55 and over. *Units*: dummy variable
Education	Years of schooling of the respondent: *Units*: years
Urban	Takes a value of 1 if living in urban areas, 0 otherwise. Units: dummy variable
Financial shock	Takes a value of 1 the household experienced financial shocks in the past year, 0 otherwise. *Units*: dummy variables
Bank account ownership	Takes a value of 1 if respondents hold a bank account, 0 otherwise. *Units*: dummy variable

Table A2.9. Summary statistics

Variable	Mean	Min	Max
Log of consumption expenditure	13.43	11.7	16.31
The Poverty Probability Index	56.89	8	100
Financial literacy index	0.56	0	1
Gender	0.39	0	1
Marital status	0.17	0	1
Family size	0.28	0	1
Income-earning members	0.35	0	1
Occupation	0.18	0	1
Age 25 - 34	0.22	0	1
Age 35 - 44	0.23	0	1
Age 45 - 54	0.21	0	1
Age 55+	0.18	0	1
Education	4.85	0	13
Urban	0.52	0	1
Financial shock	0.08	0	1
Bank account ownership	0.21	0	1

Table A2.10. Correlation matrix of the main measured variables

Variables	**(CON)**	**(PPI)**	**(FL)**	**(B1)**	**(B2)**	**(B3)**
Log of consumption expenditure **(CON)**	1					
Poverty Probability Index **(PPI)**	0.291	1				
Financial Literacy **(FL)**	0.146	0.17	1			
Binary indicator for interest rate **(B1)**	0.132	0.154	0.765	1		
Binary indicator for inflation **(B2)**	0.116	0.102	0.783	0.374	1	
Binary indicator for risk diversification **(B3)**	0.101	0.15	0.832	0.473	0.485	1

Appendix B

Figure B2.3 Financial literacy questions

Question 1: Imagine you have 10,000 Rupiah in your savings account. Your account is earning 2% interest every year. How much money will you have on your account in 5 years if you do not withdraw anything during that period?

Question 2: Imagine you have 10,000 Rupiah worth of investment, which earns you 3% interest every year. The inflation is 3.5% a year. How much total money will you have in 2 years?

Question 3: Imagine you took a loan of 10,000 Rupiah and you have to pay a fee of 2% each month until you fully repay it. How much total money will have to repay in 1 full year (12 months)?

Source: FII survey dataset

Appendix C

The Construction of Financial Literacy Index

Table C2.11. Correlation between financial literacy questions

Variable	Interest rate	Inflation	Risk diversification
Interest rate	1		
Inflation	0.6189	1	
Risk diversification	0.7006	0.7174	1

Table C2.12. Polychoric Principal Component Analysis

Component	Eigenvalues	Proportion explained	Cum. explained
1	2.359	0.786	0.786
2	0.382	0.127	0.914
3	0.259	0.086	1.000

Table C2.13. A scree plot graphs the amount of variation explained by each component

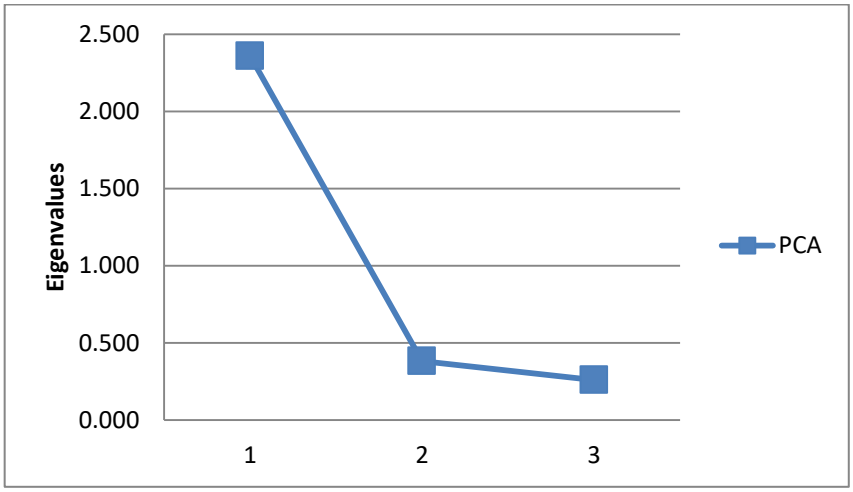
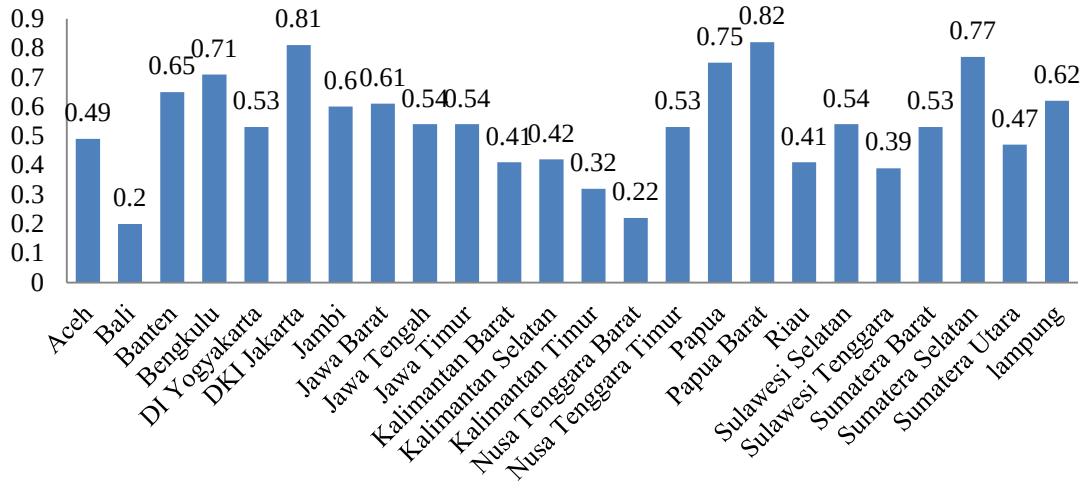


Table C2.14. KMO and Bartlett's test

Bartlett's test of sphericity	
Chi-square	3346.448
Degrees of freedom	3
p-value	0.00
KMO	0.723

Appendix D

Figure D2.4. The average financial literacy index in Indonesia: Provincial level



Source: own construction based on FII dataset

Appendix E

Table E2.15. PPI Scorecard for Indonesia

Indicator		Response	Points
1. How many household members are there?		A. Six or more	0
		B. Five	5
		C. Four	11
		D. Three	18
		E. Two	24
		F. One	37
2. Do all household members ages 6 to 18 go to school?		A. No members ages 6 to 18	0
		B. No	0
		C. Yes	2
3. What is the highest level of education that the female head/spouse has completed?	A. None		0
	B. Grade school (incl. disabled, Islamic, or non-formal		3
	C. Junior-high school (incl. disabled, Islamic, or non-formal)		4
	D. No female head/spouse		4
	E. Vocational school (high-school level)		4
	F. High school (incl. disabled, Islamic, or non-formal)		6
	G. Diploma (one-year or higher), or higher		18
4. What was the employment status of the male head/spouse in the past week in his main job?	A. No male head/spouse		0
	B. Not working, or unpaid worker		0
	C. Self-employed		1
	D. Business owner with only temporary or unpaid workers		3
	E. Wage or salary employee		3
	F. Business owner with some permanent or paid workers		6
5. What is the main material of the floor?		A. Earth or bamboo	0
		B. Others	5
6. What type of toilet arrangement does the household have?		A. None, or latrine	0
		B. Non-flush to a septic	1
		C. Flush	4
7. What is the main cooking fuel?	A. Firewood, charcoal, or coal		0
	B. Gas/LPG, kerosene, electricity, others, or does not cook		5
8. Does the household have a gas cylinder of 12kg or more?		A. No	0
		B. Yes	6
9. Does the household have a refrigerator or freezer?		A. No	0
		B. Yes	8
10. Does the household have a motorcycle, scooter, or motorized boat?		A. No	0
		B. Yes	9

Table E2.16. PPI Scores: The Probability of being Poor

PPI Score	100% National (%)	$1.25 2005 PPP (%)	$2.50 2005 PPP (%)	USAID 'Extreme' (%)
95-100	66.3	74.2	99.6	49.8
90-94	60	68.9	99	38.4
85-89	48.4	57.7	98.3	28.3
80-84	34.1	45.5	96.5	18
75-79	25.2	35.3	95.2	12.6
70-74	17.3	24.7	91.5	7.3
65-69	10.3	16.2	87.7	4
60-64	5.8	9.4	79.7	1.9
55-59	3.2	5.3	68.4	1.1
50-54	1.4	2.6	54.7	0.5
45-49	0.6	1.3	40.1	0.1
40-44	0.2	0.5	26.9	0
35-39	0.1	0.1	17.6	0
30-34	0	0.1	9.1	0
25-29	0	0	6.9	0
20-24	0	0	3.7	0
15-19	0	0	0.2	0
10-14	0	0	0	0
5-9	0	0	0	0
0-4	0	0	0	0

Source: FII survey dataset

Appendix F

Table F2.17 Instrumental variable regressions: Effect of financial literacy

(Instruments: the ratio of financial workers and university students)

Variables	Dependent variable: Log of consumption expenditure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	2.244***	2.352***	2.358***	2.345***	2.390***	2.339***	2.326***
	(0.234)	(0.251)	(0.288)	(0.316)	(0.314)	(0.296)	(0.296)
Male		0.100***	0.081***	0.082***	0.073**	0.073**	0.069**
		(0.028)	(0.028)	(0.028)	(0.029)	(0.029)	(0.029)
Single		-0.272***	-0.149***	-0.149***	-0.155***	-0.155***	-0.147***
		(0.042)	(0.049)	(0.049)	(0.050)	(0.049)	(0.049)
Family size		-0.004	0.003	0.003	-0.001	-0.001	0.000
		(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)
Age 25 - 34 years			-0.232***	-0.230***	-0.230***	-0.224***	-0.208***
			(0.068)	(0.070)	(0.070)	(0.069)	(0.070)
Age 35 - 44 years			-0.122**	-0.121**	-0.126**	-0.120**	-0.116**
			(0.055)	(0.057)	(0.057)	(0.055)	(0.055)
Age 45 - 54 years			-0.067	-0.066	-0.070	-0.065	-0.060
			(0.051)	(0.053)	(0.054)	(0.052)	(0.052)
Age 55 -64 years			-0.017	-0.016	-0.022	-0.020	-0.016
			(0.046)	(0.046)	(0.047)	(0.046)	(0.046)
Education			0.004	0.004	0.000	0.002	-0.006
			(0.010)	(0.010)	(0.010)	(0.009)	(0.009)
Urban				0.009	0.006	0.014	0.005
				(0.036)	(0.036)	(0.035)	(0.034)
Qualification					0.044	0.047	0.025
					(0.039)	(0.039)	(0.039)
Inc-earning members					0.019	0.019	0.017
					(0.018)	(0.018)	(0.018)
Financial shock						0.066	0.065
						(0.055)	(0.055)
Bank account							0.126***
							(0.040)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F statistics	67	61	48	39	41	45	45
Hansen J p-value	0.2	0.2	0.3	0.3	0.41	0.38	0.35
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively. The financial literacy index has been instrumented indicating university student's ratio, and financial worker's ratio.

Table F2.18. Instrumental variable regressions: Effect of financial literacy

(Instruments: the distance to the nearest bank branch and the ratio of financial workers)

Variables	Dependent variable: Log of consumption expenditure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	1.713***	1.805***	1.919***	1.838***	2.009***	1.962***	1.920***
	(0.409)	(0.434)	(0.449)	(0.502)	(0.500)	(0.462)	(0.462)
Male		0.107***	0.089***	0.092***	0.080***	0.080***	0.075***
		(0.024)	(0.026)	(0.026)	(0.027)	(0.027)	(0.026)
Single		-0.226***	-0.148***	-0.148***	-0.154***	-0.154***	-0.144***
		(0.047)	(0.044)	(0.042)	(0.045)	(0.044)	(0.044)
Family size		0.005	0.005	0.005	0.001	0.001	0.002
		(0.010)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
Age 25 - 34 years			-0.184**	-0.172**	-0.187**	-0.181**	-0.159**
			(0.073)	(0.078)	(0.079)	(0.076)	(0.077)
Age 35 - 44 years			-0.073	-0.063	-0.084	-0.078	-0.070
			(0.064)	(0.069)	(0.070)	(0.066)	(0.066)
Age 45 - 54 years			-0.024	-0.015	-0.032	-0.027	-0.019
			(0.058)	(0.062)	(0.064)	(0.060)	(0.061)
Age 55 -64 years			0.008	0.013	-0.001	0.001	0.006
			(0.045)	(0.047)	(0.048)	(0.046)	(0.046)
Education			0.017	0.017	0.010	0.012	0.003
			(0.014)	(0.014)	(0.014)	(0.013)	(0.011)
Urban				0.044	0.032	0.038	0.030
				(0.042)	(0.043)	(0.039)	(0.038)
Qualification					0.050	0.052	0.027
					(0.036)	(0.035)	(0.034)
Inc-earning members					0.019	0.020	0.018
					(0.017)	(0.016)	(0.016)
Financial shock						0.044	0.041
						(0.054)	(0.053)
Bank account							0.146***
							(0.040)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F statistics	15	14	14	11	12	14	14
Hansen J p-value	0.72	0.6	0.9	0.89	0.89	0.89	0.91
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively. The financial literacy index has been instrumented indicating the distance to the nearest bank branch and the ratio of financial workers.

Table F2.19 Instrumental variable regressions: Effect of financial literacy

(Instrument: the distance to the nearest bank branch and the ratio of university students)

Variables	Dependent variable: Log of consumption expenditure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	1.472***	1.568***	1.721***	1.588**	1.826***	1.783***	1.726***
	(0.542)	(0.571)	(0.568)	(0.641)	(0.642)	(0.589)	(0.589)
Male		0.110***	0.092***	0.097***	0.083***	0.083***	0.079***
		(0.023)	(0.025)	(0.026)	(0.027)	(0.026)	(0.026)
Single		-0.206***	-0.147***	-0.147***	-0.154***	-0.154***	-0.143***
		(0.055)	(0.041)	(0.040)	(0.042)	(0.042)	(0.041)
Family size		0.009	0.006	0.007	0.001	0.001	0.003
		(0.012)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
Age 25 - 34 years			-0.162**	-0.144	-0.166*	-0.160*	-0.136
			(0.081)	(0.088)	(0.090)	(0.085)	(0.087)
Age 35 - 44 years			-0.051	-0.035	-0.063	-0.058	-0.048
			(0.074)	(0.081)	(0.082)	(0.077)	(0.077)
Age 45 - 54 years			-0.005	0.010	-0.014	-0.010	0.000
			(0.066)	(0.073)	(0.074)	(0.070)	(0.070)
Age 55 -64 years			0.019	0.027	0.009	0.011	0.017
			(0.048)	(0.050)	(0.051)	(0.049)	(0.049)
Education			0.023	0.023	0.015	0.016	0.008
			(0.018)	(0.017)	(0.017)	(0.016)	(0.014)
Urban				0.061	0.045	0.050	0.042
				(0.050)	(0.050)	(0.045)	(0.043)
Qualification					0.053	0.055	0.028
					(0.034)	(0.033)	(0.032)
Inc-earning members					0.020	0.020	0.018
					(0.016)	(0.015)	(0.015)
Financial shock						0.034	0.030
						(0.056)	(0.055)
Bank account							0.156***
							(0.043)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F statistics	8	7	8	6	7	8	8
Hansen J p-value	0.55	0.44	0.82	0.87	0.89	0.89	0.91
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively. The financial literacy index has been instrumented indicating the distance to the nearest bank branch and the ratio of university students

Appendix G

Figure G2.5. The distribution of propensity scores of the treated (financially literate and untreated (financially illiterate)

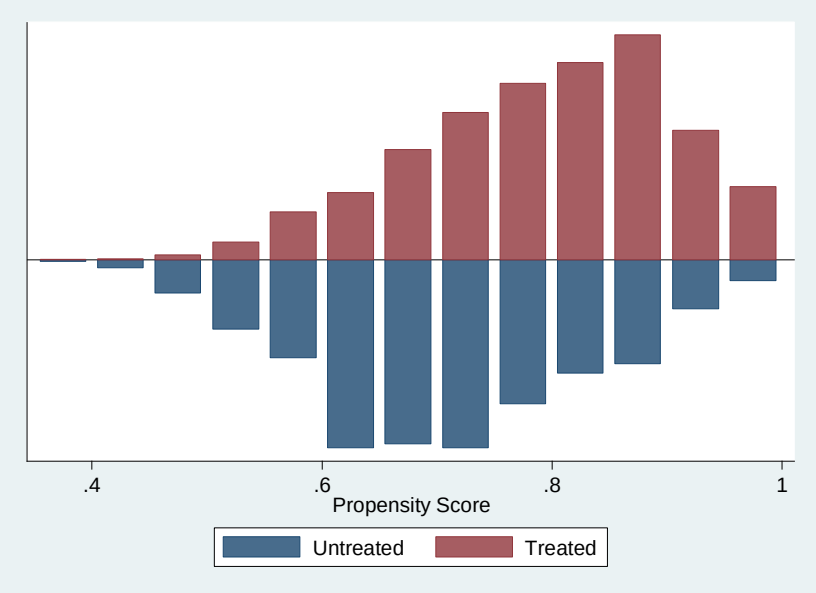
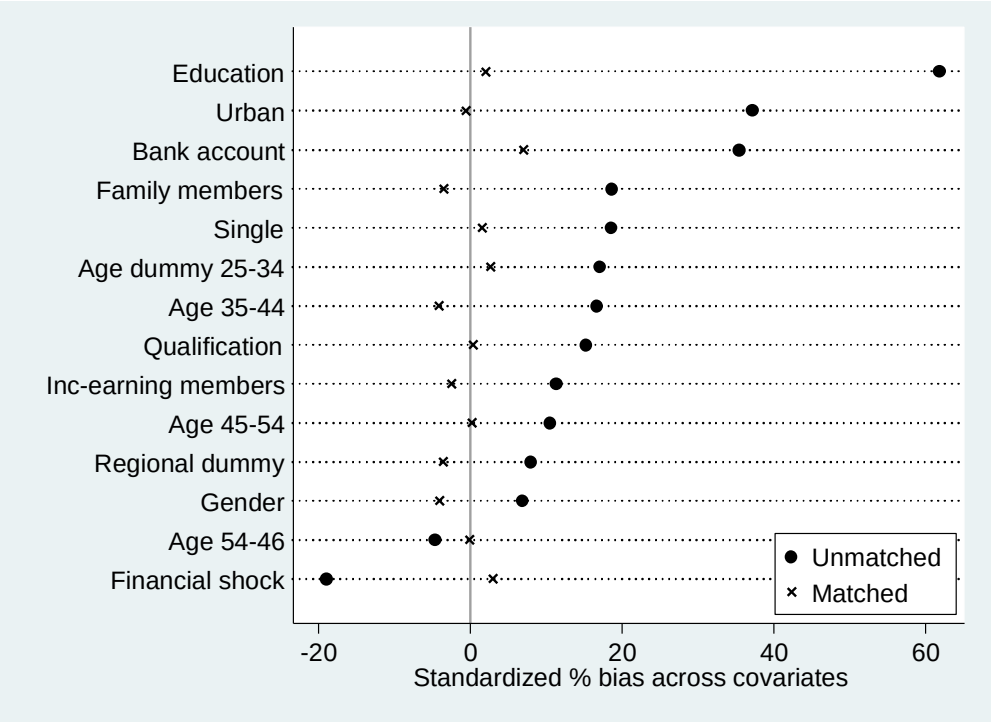


Table G2.20. Differences between treatment and control before and after matching

Variable	Before matching			After Matching		
	Mean		% bias	Mean		% bias
	Treated	Control		Treated	Control	
Observations	4646	1354		4646	1354	
Male	0.402	0.369	6.9	0.402	0.422	-4.1
Single	0.182	0.116	18.5	0.182	0.176	1.5
Family size	3.799	3.488	18.7	3.799	3.859	-3.6
Age 25-34	0.166	0.108	17.1	0.166	0.157	2.6
Age 35-44	0.230	0.164	16.6	0.230	0.246	-4.2
Age 45-54	0.245	0.201	10.5	0.245	0.244	0.2
Age 54-64	0.180	0.198	-4.7	0.180	0.180	-0.1
Education	5.206	3.640	61.8	5.206	5.155	2
Urban	0.568	0.386	37.1	0.568	0.571	-0.7
Occupation	0.193	0.137	15.2	0.193	0.192	0.3
Inc-earning members	1.413	1.318	11.3	1.413	1.434	-2.6
Financial shock	0.072	0.129	-19	0.072	0.063	2.9
Bank account	0.249	0.114	35.4	0.249	0.222	7
Regional dummy	0.669	0.631	7.9	0.669	0.686	-3.6

Notes: the table reports the balancing properties of variable estimated in the propensity score matching when using two nearest-neighbour matching.

Figure G2.6. Percent bias before and after matching



Notes: the above figure is based on the two nearest-neighbour matching.

Appendix H

Table H2.21. OLS regression: alternative financial literacy index

Variables	Dependent variable: Log of consumption expenditure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	0.100***	0.108***	0.054*	0.043*	0.043*	0.043*	0.035
	(0.033)	(0.032)	(0.031)	(0.031)	(0.031)	(0.031)	(0.030)
Male		0.132***	0.123***	0.127***	0.113***	0.115***	0.107***
		(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Single		-0.077***	-0.141***	-0.142***	-0.150***	-0.149***	-0.133***
		(0.023)	(0.031)	(0.030)	(0.030)	(0.030)	(0.030)
Family size		0.036***	0.015***	0.014**	0.009	0.009	0.011*
		(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
Age 25 - 34 years			0.027	0.036	0.042	0.042	0.070*
			(0.038)	(0.038)	(0.038)	(0.038)	(0.037)
Age 35 - 44 years			0.141***	0.144***	0.141***	0.141***	0.147***
			(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Age 45 - 54 years			0.163***	0.169***	0.167***	0.168***	0.174***
			(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Age 55 -64 years			0.115***	0.116***	0.109***	0.109***	0.114***
			(0.026)	(0.026)	(0.026)	(0.026)	(0.025)
Education			0.075***	0.065***	0.061***	0.061***	0.046***
			(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Urban				0.169***	0.169***	0.165***	0.147***
				(0.017)	(0.017)	(0.017)	(0.017)
Qualification					0.082***	0.080***	0.038*
					(0.022)	(0.022)	(0.022)
Inc-earning members						0.023**	0.022**
					(0.011)	(0.011)	(0.011)
Financial shock						-0.068**	-0.070**
						(0.029)	(0.029)
Bank account							0.240***
							(0.022)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.02	0.03	0.13	0.15	0.15	0.16	0.17
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively. Log of consumption expenditure is taken as the dependent variable. Financial literacy index is calculated using a polychoric PCA. *Refuse to answer* responses are treated as missing data and are skipped in the polychoric PCA estimation.

Table H2.22. Instrumental variable regression: alternative financial literacy index

Variables	Dependent variable: Log of consumption expenditure						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	3.360***	3.384***	2.976***	2.722***	2.792***	2.837***	2.821***
	(0.385)	(0.386)	(0.362)	(0.352)	(0.360)	(0.361)	(0.357)
Male		0.159***	0.145***	0.146***	0.140***	0.141***	0.134***
		(0.028)	(0.026)	(0.025)	(0.025)	(0.026)	(0.025)
Single		-0.152***	-0.172***	-0.170***	-0.182***	-0.183***	-0.169***
		(0.038)	(0.045)	(0.043)	(0.043)	(0.044)	(0.044)
Family size		0.040***	0.024***	0.022***	0.013	0.013	0.015*
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Age 25 - 34 years			-0.025	-0.015	-0.004	-0.005	0.018
			(0.054)	(0.052)	(0.052)	(0.053)	(0.053)
Age 35 - 44 years			0.093**	0.098**	0.100**	0.099**	0.104***
			(0.041)	(0.039)	(0.039)	(0.040)	(0.039)
Age 45 - 54 years			0.111***	0.120***	0.126***	0.125***	0.131***
			(0.039)	(0.037)	(0.038)	(0.038)	(0.038)
Age 55 -64 years			0.091**	0.094**	0.090**	0.090**	0.094**
			(0.039)	(0.037)	(0.037)	(0.038)	(0.038)
Education			0.061***	0.055***	0.052***	0.052***	0.039***
			(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Urban				0.121***	0.120***	0.116***	0.101***
				(0.026)	(0.026)	(0.027)	(0.026)
Occupation					0.039	0.036	0.001
					(0.035)	(0.036)	(0.036)
Inc-earning members						0.047***	0.047***
					(0.016)	(0.016)	(0.016)
Financial shock						-0.058	-0.059
						(0.046)	(0.046)
Bank account							0.197***
							(0.035)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F statistics	45	44	41	39	39	38	38
Hansen J p-value	0.39	0.43	0.10	0.05	0.02	0.02	0.02
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively. The financial literacy index has been instrumented, indicating the distance to the nearest bank branch, university student's ratio, and financial worker's ratio.. Financial literacy index is calculated using a polychoric PCA. *Refuse to answer* responses are treated as missing data and are skipped in the polychoric PCA estimation.

Appendix I

Table I2.23. OLS regression with alternative poverty measure

Variables	Dependent variable: Poverty Probability Index						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	-6.191***	-7.575***	-3.020***	-2.427***	-2.390***	-2.210***	-1.982***
	(0.468)	(0.430)	(0.375)	(0.366)	(0.365)	(0.360)	(0.356)
Male		-0.305	0.120	-0.052	0.192	0.081	0.242
		(0.337)	(0.285)	(0.277)	(0.282)	(0.279)	(0.274)
Single		0.940**	4.227***	4.250***	4.537***	4.529***	4.193***
		(0.444)	(0.529)	(0.513)	(0.514)	(0.510)	(0.506)
Family size		3.622***	4.042***	4.069***	4.302***	4.259***	4.215***
		(0.107)	(0.103)	(0.102)	(0.114)	(0.112)	(0.111)
Age 25 - 34 years			-0.377	-0.728	-1.025*	-1.004	-1.608***
			(0.630)	(0.611)	(0.613)	(0.612)	(0.609)
Age 35 - 44 years			-0.015	-0.146	-0.197	-0.201	-0.345
			(0.449)	(0.436)	(0.437)	(0.433)	(0.424)
Age 45 - 54 years			-1.006**	-1.257***	-1.398***	-1.455***	-1.616***
			(0.434)	(0.421)	(0.428)	(0.424)	(0.417)
Age 55 -64 years			-0.758*	-0.825*	-0.706*	-0.721*	-0.833**
			(0.440)	(0.427)	(0.427)	(0.423)	(0.415)
Education			-2.666***	-2.360***	-2.280***	-2.250***	-1.938***
			(0.056)	(0.058)	(0.059)	(0.059)	(0.064)
Urban				-5.480***	-5.483***	-5.149***	-4.789***
				(0.288)	(0.287)	(0.286)	(0.283)
Qualification					-1.348***	-1.165***	-0.279
					(0.370)	(0.369)	(0.363)
Inc-earning members					-1.125***	-1.101***	-1.037***
					(0.202)	(0.200)	(0.197)
Financial shock						5.693***	5.735***
						(0.481)	(0.474)
Bank account							-5.014***
							(0.367)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.03	0.21	0.47	0.49	0.49	0.5	0.52
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively. The financial literacy variable is the composite index based on the polychoric PCA with the 'do not know' option assumed as an incorrect answer.

Table I2.24. IV regression with alternative poverty measure

Variables	Dependent variable: Poverty Probability Index						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial literacy	-10.572***	-19.090***	-10.976***	-2.116	-4.789	-8.431***	-7.890***
	(3.417)	(3.428)	(3.139)	(3.242)	(3.166)	(3.060)	(3.017)
Male		-0.153	0.257	-0.058	0.232	0.191	0.337
		(0.360)	(0.301)	(0.283)	(0.287)	(0.290)	(0.284)
Single		1.904***	4.256***	4.249***	4.543***	4.545***	4.228***
		(0.554)	(0.544)	(0.513)	(0.514)	(0.517)	(0.512)
Family size		3.819***	4.080***	4.067***	4.311***	4.287***	4.244***
		(0.123)	(0.105)	(0.101)	(0.114)	(0.114)	(0.112)
Age 25 - 34 years			0.500	-0.763	-0.751	-0.296	-0.901
			(0.739)	(0.721)	(0.720)	(0.720)	(0.724)
Age 35 - 44 years			0.877	-0.181	0.072	0.495	0.323
			(0.586)	(0.577)	(0.569)	(0.563)	(0.558)
Age 45 - 54 years			-0.227	-1.288**	-1.160**	-0.835	-1.019*
			(0.547)	(0.542)	(0.539)	(0.534)	(0.530)
Age 55 -64 years			-0.313	-0.843*	-0.574	-0.379	-0.502
			(0.486)	(0.466)	(0.463)	(0.462)	(0.456)
Education			-2.426***	-2.368***	-2.219***	-2.093***	-1.808***
			(0.112)	(0.103)	(0.100)	(0.098)	(0.092)
Urban				-5.501***	-5.319***	-4.746***	-4.427***
				(0.365)	(0.360)	(0.352)	(0.342)
Occupation					-1.309***	-1.075***	-0.245
					(0.376)	(0.383)	(0.374)
Inc-earning members					-1.121***	-1.093***	-1.033***
					(0.202)	(0.203)	(0.200)
Financial shock						5.335***	5.393***
						(0.517)	(0.509)
Bank account							-4.723***
							(0.408)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F statistics	46	31	32	27	27	30	30
Hansen J p-value	0.00	0.00	0.02	0.31	0.81	0.96	0.91
Observations	6000	6000	6000	6000	6000	6000	6000

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively. The financial literacy variable is the composite index based on the polychoric PCA with the 'do not know' option assumed as an incorrect answer. The financial literacy index has been instrumented, indicating the distance to the nearest bank branch, university student's ratio, and financial worker's ratio.

Table I2.25. Propensity Score Matching

	Average Treatment Effect (ATE)	
	Dependent variable: PPI	
	(1)	(2)
Nearest-neighbour (2)	-1.742***	-1.765***
	(0.631)	(0.632)
Nearest-neighbour (5)	-1.736***	-1.781***
	(0.561)	(0.025)
Kernel-based matching	-2.345***	-2.437***
	(0.509)	(0.508)
Regional dummy	No	Yes

Notes: regional dummy is included in specification II. Figures in parentheses are standard errors. Regressors not reported: gender, marital status, family size, education, income-earning members, occupation, age, location, financial shock, and ownership of bank account. *, ** and *** represent statistical significance at 10%, 5% and 1%, respectively.

ESSAY TWO

CHAPTER THREE

FINANCIAL LITERACY AND POVERTY: TRANSMISSION MECHANISM

"Financial inclusion matters not only because it promotes growth, but because it helps ensure prosperity is widely shared. Access to financial services plays a critical role in lifting people out of poverty."

Sri Mulyani Indrawati (2015)

3.1. Introduction

The first essay explored the link between financial literacy and poverty. The results reveal that financial literacy reduces poverty. This finding is consistent with the theoretical predictions of the significance of financial literacy (e.g., Van Rooij et al., 2011b, Fort et al., 2016). As briefly mentioned in the first essay (see section 2.2.3.3), financial literacy may contribute to poverty alleviation in various ways. It could help people complete various economic transactions (e.g., Calvet et al., 2007, Shih and Ke, 2014), facilitate the use of financial services such as credit, retirement plans, insurance, and the stock market (e.g., Van Rooij et al., 2011a, Brown and Graf, 2013, Dalkilic and Kirkbesoglu, 2015), improve savings and investment (e.g., Babiarz and Robb, 2014, Abebe et al., 2015), and help people avoid over-indebtedness (e.g., French and McKillop, 2016, Gathergood, 2012). Financial literacy is also linked to self-employment (Ćumurović and Hyll, 2017) and the use of professional financial advice (e.g., Calcagno and Monticone, 2015, Stolper, 2018).

That said, very little is known for certain about the actual channels through which financial literacy affects poverty. With regard to this, it is worth mentioning that

few studies have attempted to identify the precise channels of influence from financial literacy to poverty. Previous studies have mainly focused on either the impact of financial literacy on these intermediate variables (the first part of the causality chain) or the impact of the intermediate variables on poverty (the second part of the chain).

In light of this, this essay aims to contribute to the literature by investigating the financial literacy and poverty transmission mechanism by considering the simultaneous effect of the three main channels, namely the saving channel, the financial services usage channel and the over-indebtedness channel. Although studies have identified numerous potential channels through which financial literacy affects poverty, these three are considered to be the most impactful (e.g., Lusardi and Mitchell, 2014, Lusardi, 2008b, Gathergood, 2012, Grohmann et al., 2018), especially in the context of developing countries.

To achieve this, a simultaneous equation technique, following Tavares and Wacziarg (2001), Lorentzen et al. (2008), Lanati and Thiele (2018), and Bjørnskov (2012), is adapted. This approach allows the incorporation of potential channels linking financial literacy and poverty and provides estimates of the impact of the related intermediate variables as a full system of equations, taking into account the potential endogeneity issue. To the best of our knowledge, this is one of the first studies that has attempted to explore the transmission mechanisms from financial literacy to poverty using a sophisticated method logical approach.

The rest of the essay is structured as follows. Section 3.2 reviews the key elements of the related literature. Section 3.3 discusses the econometrics method and the data used. Section 3.4 discusses the empirical results, and concluding remarks are presented in Section 3.5.

3.2. Literature review

This part of the study is divided into two main sub-sections. The first provides in more detail the theoretical considerations regarding the process through which financial literacy may reduce poverty level. The second reviews the existing empirical studies that have investigated the links between financial literacy, the channels, and poverty.

3.2.1. Theoretical considerations

The literature implicitly points to several potential transmission mechanisms by which financial literature can impact individuals' economic welfare. It is widely recognised that savings are crucial, playing both protective (such as through smoothing consumption) and promotional (like using savings for investment) roles in poverty reduction (see Deaton, 1989, Chowa, 2006, Friedman, 2018, Rutherford, 2000, Collins et al., 2009, Evans and Jovanovic, 1989, Woller, 2002, Lokshin and Yemtsov, 2004). Providing the poor with access to financial services also helps them accumulate various assets that can reduce their deprivation (see Park and Mercado, 2015, Khaki and Sangmi, 2017, Demirgüç-Kunt et al., 2008, Bae et al., 2012, Coulibaly and Yogo, 2016). While credit and loans have become increasingly accessible, there is a danger of over-indebtedness, which will have negative effects on people's economic wellbeing (see Dearden et al., 2010, Daley-Harris and Zimmerman, 2009, Berthoud and Kempson, 1992). Arguably, people with different levels of financial literacy may behave differently when handling financial services, savings, and debt, and this behaviour impacts their economic welfare. This section reviews each of these three channels linking financial literacy and poverty.

3.2.1.1. Saving channel

The link in the causal chain from financial literacy to poverty via savings can be scrutinised via two points: savings as an instrument for poverty reduction, and the impact of financial literacy on personal savings.

Savings as an instrument for poverty reduction

There are two main reasons why saving has become so important to ensuring the livelihoods of the poor. First, savings are a crucial protection during unanticipated financial shocks and negative financial events such as job loss, death, marriage, and emergencies (see Deaton, 1989, Chowa, 2006). Saving is crucial to the process of balancing current financial conditions with projected consumption. This concept is often called consumption smoothing, understood as the practice of managing spending so that people still have a certain amount of disposable income when faced with reduced real income (see Friedman, 2018). When suffering financial shock, savings can help to smooth consumption by allowing for alternative coping strategies, such as reducing consumption of goods (Lokshin and Yemtsov, 2004), selling cattle in a proportional way (Kinsey et al., 1998), or mortgaging remaining assets (Mazumdar et al., 2014). Thus, savings may enhance an individual's capacity to avoid the risks and adverse effects of financial shock and thus diminish vulnerability to poverty (Klasen et al., 2015).

Second, it is a widely held view that savings play a significant part in the mechanisms of poverty reduction through the promotion of financial wealth. Savings allow individuals to make substantial investments in education, asset-building, retirement plans, health care, or choosing nutrient-rich food (see Collins et al., 2010, Rutherford, 2000). For long-term purposes, these investment opportunities can benefit people by allowing them to reach financial goals and to afford purchases in the future, conditions which substantially increase an individual's likelihood to avoid both child poverty and intergenerational poverty. Also, studies have consistently shown that when individuals save money gradually, they have more opportunities to invest in income-generating activities. According

to Hartarska and Nadolnyak (2007), savings-led microfinance has a better effect on economic activity. In this respect, the cost of microfinance activities run by internal savings is lower than the cost of taking out credit. Thus, even though financial institutions might only make credit accessible to large businesses, internal savings accumulation offers an opportunity to stimulate microfinance growth (Evans and Jovanovic, 1989). This view is supported by Abebe et al. (2015), who point out that despite the fact that many small enterprises lack the capacity to obtain credit from financial institutions, saving is the first step in building a relationship with banking institutions.

Although savings can help reduce poverty, the effect should be interpreted with caution. The importance of savings, especially as a tool for poverty alleviation, is somewhat complicated to explain. The primary concern is the assumption that the poor cannot save since they typically prioritise short-term expenditures and daily needs (Ben-Galim and Lanning, 2010). Indeed, poor people often find it difficult to save money due to a lack of economic resources. Low-income individuals must spend all their income to cover basic needs, leaving only a tiny margin for savings. However, as argued by Rutherford (2000), even though they find it hard to save, the poor still want to save, can save and do save money. For example, many housewives still save small amounts of cash while their spouses fail to save some primary income (see Matin et al., 2002). This habit depends on institutional factors, the poor's willingness to save, and the ability to analyse their primary financial instruments. According to Ashley (1983), the poor are just like wealthy people, in the sense that they can still save money, if only on a small scale.

Impact of financial literacy on personal savings

There is abundant theoretical and empirical literature exploring differences in saving behaviour across individuals. Saving behaviour is assumed to be driven by numerous factors, including limited access to financial services (Prina, 2015, Han and Sherraden, 2009), lack of motivation (Dupas and Robinson, 2013, Furnham, 1985), or other externalities such as cultural factors (Furnham, 1985, Fuchs-Schundeln et al., 2017). Furthermore, the existing literature has tried to identify the

best way to reduce barriers to saving. One of the plausible initiatives is to increase financial literacy. Along this line, a significant and growing body of literature indicates the role of financial literacy in increasing savings (Bernheim and Garrett, 2003, Babiarz and Robb, 2014, Lusardi, 2008b). Lusardi and Mitchell (2011a) and Van Rooij et al. (2012) provide a conceptual framework in which individuals with better financial literacy display characteristics of savers and planners. This view is supported by Moore (2003) and Braunstein and Welch (2002), who argue that financial literacy is critical to determining whether a person is willing to save money for the sake of investment and long-term goals. With financial literacy, at least, people can calculate their financial projections gradually and use them effectively to improve living standards.

Furthermore, policymakers have proposed financial education as an effective strategy for increasing financial literacy. In this regard, financial education is vital to introducing financial concepts that can affect an individual's saving behaviour, especially with respect to self-confidence, risk tolerance, and interpersonal skills. Financial education also helps communities manage their surplus and develop best practices in their financial decision-making processes, so that they can maximise their assets to generate more income, or prepare financially for retirement (see Lusardi, 2019, Faboyede et al., 2015, Clark and d'Ambrosio, 2001, Hastings et al., 2013b).

3.2.1.2. Financial services usage channel

There are two points of view from which the usage of finance can be considered a channel through which financial literacy works to alleviate poverty. First, financial services are key to tackling poverty. Second, limited financial literacy serves as a barrier to the use of financial services and financial service effectiveness. These points of view are briefly discussed below.

Financial services for poverty reduction

Financial services usage means the use of a wide range of financial products and services (see Demirgüç-Kunt et al., 2008). There are certain benefits associated with the use of financial services. First, financial services are designed to encourage communities to store larger sums of cash in financial institutions rather than keeping them at home. Indeed, the majority of low-income households use traditional methods of saving, such as keeping cash under the mattress, mortgaging goods and storing livestock, all of which are riskier than a formal institutional savings mechanisms (Collins et al., 2009, Karlan et al., 2010, Dupas and Robinson, 2013). As argued by Rutherford (2000) and Collins et al. (2009), managing money is much more difficult when it is stashed around the house than when it is kept in a bank. The absence of a savings account can lead to various financial problems. For example, when individuals hold money in cash, it can be difficult for them to refuse to lend it to others. This is often apparent in the cases of individuals with family members who are addicted to alcohol or gambling, or who are under obligation to moneylenders. In this respect, formal financial institutions usually offer safer and more profitable products to accumulate individual wealth, rather than storing it as cash. Financial institutions are widely believed to help individuals by offering transparency and honesty, more convenient means of making financial transactions, as well as tools for taking out credit and making payments.

Second, a strong causal relationship exists between the use of financial services and asset accumulation. Use of financial services helps to empower individuals, to integrate societies into the economy, to facilitate the exchange of goods and services, and to provide protection against economic shocks. Financial services usage brings unbankable people into the network of financial institutions so that they can take advantage of the kinds of financial services that bankable people do (Menon, 2019). A wide range of financial products, such as savings, credit, insurance, securities, and pension funds, keeps them connected to economic opportunities that may help low-income groups build up the assets necessary for them to escape poverty (see Fletschner and Kenney, 2014, Morduch and Haley, 2002, Imai and Azam, 2012, Banerjee et al., 2015, Hermes and Lensink, 2011,

Johnson and Rogaly, 1997, Van Rooij et al., 2011a). Not only that, financial services also allow migrant workers to send money to their families, suggesting the potential impacts of remittances on poverty reduction (Adams, 2006, Chimhowu et al., 2005). In addition, if a low-income individual has a bank account, the government can distribute cash benefits directly to the account (see Masino and Niño-Zarazúa, 2019). This saves recipients, who are mostly poor, the hassle of making long trips to distant government offices. Thus, many social benefits in support of poverty reduction could be achieved with some additional sophistication in the financial sector.

Limited financial literacy as a barrier to the usage of financial services and financial service effectiveness

Nowadays, financial services such as loans and savings products have been made increasingly accessible to the poor, in particular through the provisions of microfinance. However, improved accessibility does not automatically translate into increased usage of financial services by the poor. There is a substantial argument that low financial literacy is one of the demand-side barriers for people not using (or uptaking) financial services, even when these are made accessible to them (see Chaulagain, 2015, Cole et al., 2011, Simpson and Buckland, 2009, Atkinson and Messy, 2013, Chakrabarty, 2012, and Grandolini, 2015). Chakrabarty (2012), and Grandolini (2015), for example, argue that apart from factors such as cultural issues, income level, identification documents, and consumer protection issues, financial literacy is one of the key challenges in the promotion of financial services for the poor. In addition, Atkinson and Messy (2013) outline a number of barriers to financial access, including limited awareness of the various financial products available, lack of collateral, low individual trust towards financial institutions, and limited financial knowledge.

Financial literacy can provide people with a better understanding of formal financial products and thus reassure them so that they can avoid non-formal financial products (Braunstein and Welch, 2002). In contrast, lack of financial

skills may serve as a barrier for people in taking up financial services like loans, due to the fear of the potential lenders that they will be unable to make good use of the loans (Dupas et al., 2012, Omoro and Omwange, 2013). This view is also supported by Cole et al. (2011), who reveal that one effective strategy for improving demand for financial services is to increase an individual's financial literacy. When people are not aware of or comfortable with particular financial services, they will simply not use them.

In addition to reducing barriers to the usage of financial services, the existing literature suggests that financial literacy affects the outcomes of using financial products. Thus, it is not only engaging in a particular financial behaviour/practice that is important, but also the soundness of the decisions made when using financial services and products. According to Bongomin et al. (2018), financial literacy leads to smart financial decisions, especially when assessing and using the products and services offered by formal financial institutions. When people take out a loan to invest in income-generating activities, financial literacy helps them make financially responsible decisions.

In the same vein, Nawaz (2015) maintains that microfinance can be a useful tool in empowering women in the fight against poverty. However, this mechanism only works when it is combined with sufficient financial literacy. She demonstrates that financial literacy is, in fact, more important than access to a loan and that people must be more familiar with financial concepts so that they can take advantage of all that microfinance has to offer. Similarly, Karlan et al. (2010) argue that many small entrepreneurs, particularly in developing countries, are financially illiterate, something that comes to cost them when they make poor financial decisions. Financial services usage is crucial in stimulating savings accumulation, at least in part, but limited knowledge of financial concepts can hinder the overall effectiveness of financial services.

Lastly, it is also worth mentioning that the number of formal financial institutions and financial products offered has increased dramatically in recent years. According to Peachey and Roe (2004), competition among banks has expanded

significantly because of market liberalisation. Such improvements mean people are joining a more complicated financial system, underlining the need for the financial knowledge to ensure that people can use various types of financial products from reliable sources, at competitive cost, with full control and flexibility.

3.2.1.3. Over-indebtedness channel

The next link in the causal chain from financial literacy to poverty is the financial literacy – over-indebtedness – poverty channel. While it is most likely that financial literacy reduces the probability of being over-indebted, poverty levels is influenced by how people keep their debt at a sustainable level. These assumptions will be explained below.

Over-indebtedness as poverty determinant

Haas (2006) defines over-indebtedness as a condition in which income is exceeded by the amount of interest to be paid over the long term. For Fondeville et al. (2010), over-indebtedness is a situation in which an individual's resources are insufficient to meet financial commitments without reducing their basic living standards. Meanwhile, Oxera (2004) defines over-indebtedness as a condition where there is an arrear of debt that exceeds an individual's specific financial ability, putting them at structural risk.

In his explanation of over-indebtedness, Scurlock (2007) argues that communities are currently living in an era of easy credit. The financial system has become incredibly complex and sophisticated. People are formally encouraged by the government as well as by financial institutions to take advantage of credit markets. Consequently, the market for auto loans is increasing notably, along with loans for housing, medical expenses, and education. These types of credit are also available to those in lower-income communities, and are usually accompanied by a long-term repayment mechanism. From the borrower's perspective, credit can be critical, and even the best solution, especially during times of income insecurity.

However, as highlighted by Mashigo (2006), many financial institutions do not carefully consider the ability of the borrowers to repay the loan. On the other hand, borrowers oftentimes do not choose appropriate loan products, or they may take out the loan for inappropriate reasons (Shu and Oney, 2014, Barua and Sane, 2014, Nawai and Shariff, 2012, Rani et al., 2017). As a result, many debtors are in arrears. This means that, although credit markets have been made available to everyone, problems of credit management are leading to over-indebtedness, which can cause negative impacts on individual well-being. Thus, instead of improving standards of living and reducing poverty, poor credit management may increase the likelihood of being poor (Dearden et al., 2010, Hartfree and Collard, 2014, Bridges and Disney, 2004, French and McKillop, 2014, Ntsalaze, 2017).

In general, over-indebtedness is believed to be linked to poverty primarily because it reduces disposable income (Daley-Harris and Zimmerman, 2009). Dearden et al. (2010) maintain that its effect may extend to losing access to loans, and increased cost of living. More broadly, the theoretical literature indicates that over-indebtedness may cause social exclusion. Struggling to meet debt payments tends to have a significant impact on mental health, as well as on the borrower's confidence (Blázquez Cuesta and Budría, 2015, Östergren and Canivet, 2017). It can also affect their ability to develop networking skills that are important for career opportunities, potentially worsening their situation through unemployment or lack of a promising career (Dearden et al., 2010). Jobs and regular income, however, are crucial to escaping poverty.

It is worth stressing that the negative impact of over-indebtedness is usually higher for the poor (Rutherford, 2000, Collins et al., 2010). Indeed, low-income individuals are relatively vulnerable to changes in circumstances and financial shocks. Consequently, most poor people end up in some kind of credit scheme and find it challenging to keep up with repayment arrangements. This is because the money they earn has to be allocated between repaying their debt and meeting their basic needs. Under these conditions, they must make the right financial decisions, such as managing their expenditures and/or reducing their monthly budget. Unfortunately, many poor people are not able to make the best choices and prefer

to cut essential investments, which make them worse-off over the long run. Unlike wealthy families that are able to cut back on their secondary needs, the impact of over-indebtedness on the poor is more devastating because it pushes them to spending cuts for primary necessities like food, clothes and even education. When low-income individuals find it difficult to pay their debts, it is harder for them to rise economically (Berthoud and Kempson, 1992).

Improving financial literacy prevents over-indebtedness

One cause of over-indebtedness is a lack of financial literacy. In the literature, financial literacy has at least two major implications for debt performance. First, many scholars hold the view that limited financial literacy, such as the inability of a person to perform a simple financial calculation or understand issues related to interest rates, is strongly correlated with the probability of getting a preferential loan rate, loan delinquency, and loan defaults. (see Duca and Kumar, 2014, Disney and Gathergood, 2013, Gathergood, 2012). It is also thought that financially literate individuals tend to take only necessary loans, thus reducing the likelihood of pursuing risky investments (Aren and Aydemir, 2015).

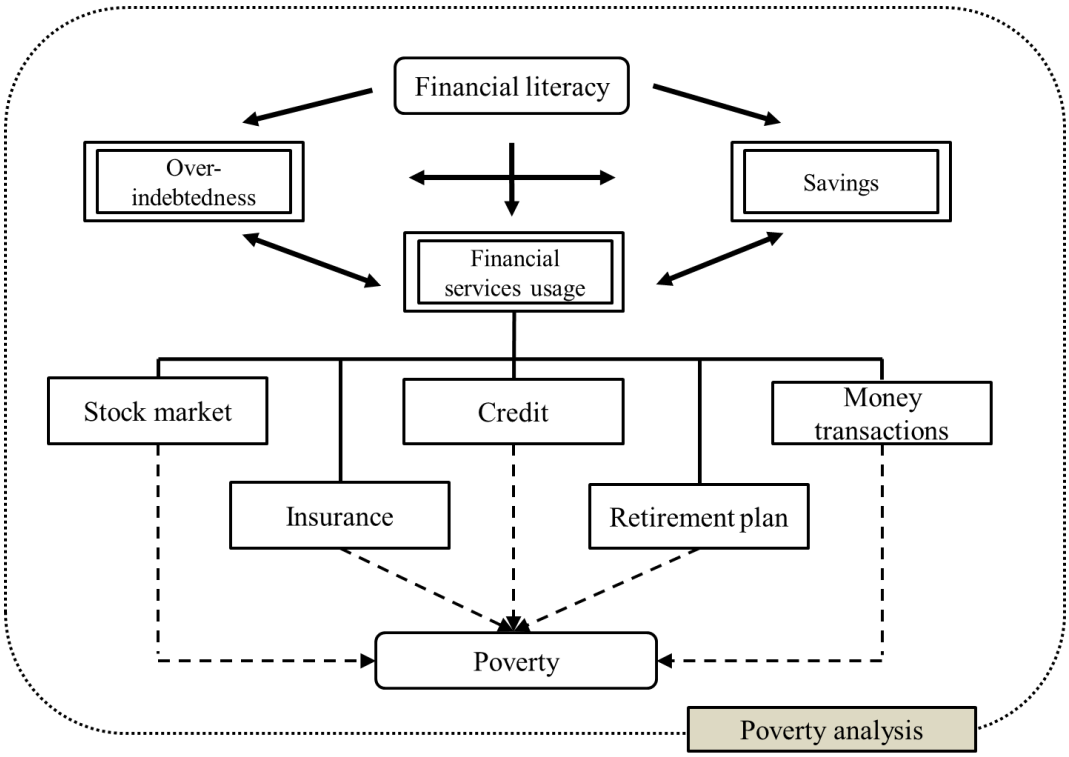
On the other hand, financially illiterate individuals are likely to be trapped in unfavourable, costly investments and end up with a high dependence on credit (Gathergood, 2012). This view is also supported by Brown and Graf (2012), who maintain that those who are unable to identify financial products and perform financial calculations are likely to make inappropriate financial decisions. Along this line, Smits and Günther (2017) and Barua and Sane (2014) provide an in-depth analysis of the role of financial literacy in facilitating micro-lending programmes. According to the authors, financially illiterate borrowers are likely to take on loans that are greater than their income. They conclude that assessing basic finance and numeracy skills before granting a loan may reduce the number of borrowers defaulting on loan repayments.

Second, financial literacy is understood to protect individuals against informal middlemen who are reputed to be exploitative, particularly when people cannot

repay their debts on time. As suggested by Chau et al. (2009) and Gohou (2011), exploitative middlemen are one of the leading factors explaining poverty in many developing countries. They usually lend money under disadvantageous conditions, such as higher interest rates. There are compelling cases in many developing countries where people who borrow money from middlemen must sacrifice land or property if they cannot afford to repay. This can certainly make the poor more vulnerable and trap them in a vicious cycle of poverty.

A summary of the transmission channels through which financial literacy affects poverty, which has been the subject of the above discussion, is illustrated in Figure 3.1. In general, existing theoretical arguments point to links between financial literacy and several channels that influence poverty. There are at least three crucial channels associated with the significance of financial literacy, including the savings channel, the financial services usage channel, and the over-indebtedness channel.

Figure 3.1. Financial literacy and poverty: transmission mechanism



Source: Author

Financial literacy can be thought to mobilise individual savings and link them to wealth accumulation. The ability to calculate financial matters facilitates the use of financial institutions to boost personal welfare, particularly through credit, securities, insurance, retirement plans, as well as efficient and effective transactions. Insofar as it enables effective risk evaluation with regard to debt, financial literacy helps to avoid the probability of being over-indebted and helps to prevent poverty.

3.2.2. Empirical literature

This section of the essay first provides an overview of empirical studies investigating the impacts of financial literacy on poverty via the savings channel. Next, it reviews existing studies that investigate the financial literacy - financial services usage - poverty causal chain, and looks at the empirical evidence revealing how over-indebtedness increases the risk of poverty. This is followed by a summary of the existing studies that investigate the role of financial literacy in avoiding over-indebtedness.

3.2.2.1. Savings channel

Past studies suggest that higher levels of financial literacy are associated with higher saving rates (e.g., Jappelli and Padula, 2013, Babiarz and Robb, 2014, Beckmann, 2013a), and that savings has a large and significant impact on poverty reduction (e.g., Kapoor, 2007, Dupas and Robinson, 2013, Shepherd et al., 2015, Kwai and Urassa, 2015, Souksavanth, 2013, Ivanic, 2019, Brown et al., 2017, Steinert et al., 2017).

With respect to the impact of financial literacy on savings, Babiarz and Robb (2014), for example, investigate whether financial literacy improves the likelihood of saving money for emergency purposes. The authors found that, on average, each correct answer to one of the financial literacy questions will result in a 2.4 percent increase in the likelihood of having an emergency fund to cover three months of

personal expenditure. A relatively similar conclusion is drawn by Beckmann (2013a), who investigates how financial literacy affects household savings. The author discovered that financial literacy has a positive and significant impact on savings. Financially literate individuals tend to save via more than one saving instrument. These individuals are also more likely to join retirement plan programmes. These findings are partially consistent with Murendo and Mutsonziwa (2017), who conclude that financial literacy has a significant impact on both formal and informal savings for people living in urban and rural areas. They suggest that introducing financial literacy programmes, especially for women and individuals living in rural areas, is critical to enhancing saving behaviours.

In studying the relationship between financial literacy and personal savings, some studies have attempted to sketch the significance of financial education in improving people's saving behaviour. Indeed, there is evidence that people who participate in a programme designed to improve financial literacy show higher propensity to save (Bernheim and Garrett, 2003, Bernheim et al., 2001, Supanantaroek et al., 2017, Calderone et al., 2018, Gustafsson and Omark, 2015, Karlan et al., 2015, Birkenmaier et al., 2013). Karlan et al. (2015), for example, examined the impact of a financial education programme on saving behaviour using a randomised control trial approach. They found that financial education programmes have substantial impacts on saving habits. Financial education is also found to be the primary determinant of other social and economic outcomes, including spending patterns, levels of confidence, and academic performance. Similar results are also obtained by Bernheim and Garrett (2003), who investigate the impact of financial education programmes on financial decision-making skills, using OLS estimates. They found that the number of workers who participate in voluntary savings plans increases significantly after attending a retirement seminar. The results are robust for the estimation of longitudinal patterns and the selection of estimation methods.

Furthermore, a considerable amount of literature has been published in an attempt to understand the impacts of saving on poverty. In India, for instance, Kapoor (2007) found that the poor want to save, but they do not have adequate financial

services to convert their small savings into lump sums. They also discovered a considerable gap between the inflow of income and the outflow of expenditure, dependant on the harvest season. In the face of income uncertainty, saving is the only sustainable and reliable way of raising larger sums of cash. This finding is also supported by Dupas and Robinson (2013), who performed a field experiment in Kenya. They investigate to what extent limited access to formal savings accounts hinders business growth in rural areas. The authors establish that, even though withdrawal fees are the most frequent transactions, there is evidence that some members of formal financial institutions save more money, which in turn improves both their productive investments and their personal expenditures.

In the same vein, Shepherd et al. (2015) investigated why some individuals succeed in escaping poverty while others veer far off track. They found that individuals manage to escape from poverty because of their saving practices. Their savings allow them to accomplish some of their primary goals in life, such as buying enough building materials to build a proper house to accommodate the family members. Similar findings are reported in Kwai and Urassa (2015), who examined the effect of saving on poverty in Tanzania. Their results show that saving habits play an important role in increasing the living standards of smallholder farmers. By choosing to save, individuals accumulate more income than can be obtained from income-generating activities, leading them to escape poverty. In the same vein, Souksavanth (2013) investigated the characteristics of household savings in Laos. Using OLS technique, the author concludes that most of the rural households are likely to save money at home, in cash and/or using informal community financial institutions, also known as village savings groups. They also found that several socio-economic factors, such as family size, gender, and type of job, significantly affect savings levels. More importantly, their findings reveal that the accumulation of savings has a substantial effect on living standards. Explicitly, it is associated with significant improvements in health status, agricultural production, investments, and income level.

Using datasets covering a broad cross-section of countries, Ivanic (2019) examined the effect of household savings on poverty reduction using household survey data

from fourteen emerging countries. The author found that household savings significantly affect extreme poverty, particularly for those who depend on the selling of assets as a coping strategy. They also shows that increasing savings leads to substantial improvement in overall income. This finding is corroborated by Brown et al. (2017), who examined the impact of savings on future financial hardships using household level panel data from the British Household Panel Survey and Understanding Society. Employing a flexible Bayesian approach with correlated random effects, the authors found evidence that saving on a regular basis helps individuals to avoid financial trouble. They emphasise that there is a need for financial literacy programmes to address relatively low levels of savings as a means of reducing vulnerability and poverty.

In an attempt to substantiate the impact of savings on poverty, Steinert et al. (2017) performed a systematic review using meta-analysis in the context of Sub-Saharan Africa. The authors conclude that saving programmes are associated with increased consumption expenditures and incomes, higher returns on income-generating activities, and enhanced capacity to avoid food insecurity, all of which lead to a drop in poverty level. They also report that low-income individuals are actually able to save money. Thus, opening more access to formal savings accounts may lead to both increased saving capacity and reduced poverty levels.

3.2.2.2. Financial services usage channel

The existing empirical evidence supports the view that higher levels of financial literacy are associated with the use of financial services (e.g., Cole et al., 2011, Zia, 2009, Carpena et al., 2011). The decision to use financial services subsequently affects individual wealth accumulation and contributes to a reduction in poverty.

Drawing on the link between financial literacy and financial services usage, Cole et al. (2011) investigated why the demand for formal financial services in emerging markets is relatively low. Using Indonesia and India as case studies and employing a field experiment, they found that the limited demand for financial services is related to the unaffordable cost of financial services for low-income individuals.

The authors also conclude that financial education has a significant impact on financial services usage. However, this effect is present only for those respondents with low education and without an economic background.

In the same vein, Fund (2013) investigated the link between financial literacy and the probability of being financially excluded or "underbanked". The author demonstrates that an individual's knowledge and understanding of financial systems has an impact on the level of public participation using financial products. Similarly, Carpena et al. (2011) conducted research in several emerging countries and found that financial literacy has become an important determinant of public participation in the banking sector. The authors carried out a financial exercise in randomised field experiments and find evidence that respondents who participate in financial training are likely to join formal financial institutions, particularly those with low levels of financial knowledge and lower educational levels. The results of this study are also supported by Wachira and Kihiu (2012). Using a multinomial logit approach to investigate the impact of financial literacy on the use of finance in Kenya, the authors conclude that the likelihood of a financially illiterate individual becoming excluded from the financial system is relatively high compared to a financially literate individual. Their results are consistent with the view that financial education is strongly and positively correlated with public participation in formal financial institutions.

In his study *Valuing Financial Literacy: Evidence from Indonesia,* Zia (2009) empirically analysed the relationship between financial literacy and demand for financial services, as well as how financial literacy contributes to the use of formal savings, loans and insurance products. Using a randomised experimental approach, he found evidence that the level of financial literacy is relatively low among uneducated people, the less wealthy, and those who are not interested in financial issues. This study also demonstrates that financial education programmes have a positive impact on financially illiterate people, as well as on respondents with limited educational background. Both groups are shown to be interested in opening a bank account following participation in the workshop. However, the impacts ranged only from 12 percent to 5 percent for uneducated and financially illiterate

respondents, respectively. Overall, the study shows very little correlation between financial literacy and financial access. The author concludes that reducing the cost of financial services is an appropriate way to improve public access to banking institutions as an alternative to the massive implementation of financial education programmes.

Thus, it is clear that financial literacy is associated with demand for, and use of, financial services. As previously summarised in Figure 3.1, it is largely accepted that financial services are a key to lower poverty, especially when it becomes possible for people to access credit, insurance and retirement plans (Imai and Azam, 2012, Fletschner and Kenney, 2014, Van Rooij et al., 2011b). What is more, an individual's participation in the stock market, which is part of financial services usage, can greatly increase household net worth (Van Rooij et al., 2012). Hence, the level of financial literacy is associated with lower levels of poverty with respect to the use of financial services.

3.2.2.3. Over-indebtedness channel

In recent years, there have been an increasing number of studies on the detrimental effect of household debt on the poverty level. For instance, Winckler (2014) examined the impact of over-indebtedness, particularly on low-income individuals. Using three different measures of over-indebtedness; (i) feeling the debt is a heavy burden, (ii) being in repayment arrears, and (iii) credit arrangements (capturing the number of active credit and high levels of debt ratio), he found a strong correlation between the risk of over-indebtedness, low income, and financial exclusion. Although financial exclusion and high levels of debt do not directly cause poverty, being over-indebted makes living more challenging, primarily because of the reduction in disposable income. This finding is confirmed further by Fatoki (2015), who shows that over-indebtedness could have negative consequences at both the micro and macroeconomic levels. At the micro-level, over-indebtedness may lead to lost opportunities to take out new loans when necessary. Over-indebtedness also increases an individual's vulnerability because of its impacts on work productivity, physical and mental health, etc. More importantly, over-indebtedness can cause a

reduction in savings. This, in turn, can create negative consequences at the macro level, particularly on the financial markets. A lower level of savings reflects a weakness in consumption, and can hinder the economic growth of the country.

Investigating the impact of over-indebtedness on multidimensional poverty using a Generalized Additive Model (GAM) and microdata, Ntsalaze (2017) found that poverty levels worsen with over-indebtedness in South Africa. Thus, although credit contributes positively to improving living standards through income-generating business activity, being in too much debt can have a harmful effect on household welfare.

In addition, Mwathi and Kubasu (2017) propose a piece of evidence linking financial literacy and debt management using a survey research design in the context of Kenya. The empirical analysis highlights how individual financial decisions depend on financial literacy, which then affects an individual's financial security and standard of living. It is observed that financially literate respondents are likely to borrow money within reasonable limits, depending on their income capacity. They are also more likely to seek financial advice and weigh their own financial decisions carefully to avoid the debt trap. The authors also conclude that those who have received training on how to manage debt tend to have a better performance in debt repayment. Along the same lines, Lusardi and Scheresberg (2013) explain why financially illiterate communities are likely to engage with costly credit products in the United States. Shortcomings in both financial knowledge and numeracy skills are found to be the main reasons people become over-indebted. The impact of these two factors is statistically robust by controlling for other factors such as education, income, age, and other socioeconomic factors that may affect an individual's likelihood of being over-indebted. The results are consistent with French and McKillop (2014), who show a significant role for financial literacy in determining consumer debt and household wealth, especially among members of credit unions. The impact is found to be relatively larger among low-income individuals.

In the same vein, Lusardi and Tufano (2015) investigated the relationship between debt literacy, financial experiences, and the risk of over-indebtedness in the United States. Debt literacy is constructed based on questions covering fundamental concepts of debt and knowledge of finance, while a subjective assessment based on individuals' perceptions of their level of debt is used as a measure of over-indebtedness. They report that financially illiterate communities pay out-of-proportion fees and finance costs compared to financially literate individuals. The effect remains significant after controlling for socioeconomic factors such as income, wealth status, and family background.

To investigate whether financial literacy has the potential to reduce over-indebtedness, Agarwal et al. (2010) performed financial literacy experiments in the United States. Interestingly, they find that financial literacy training significantly reduces the number of defaults among borrowers. The effect is even more significant for those who have low credit repayment ability due to limited income. The authors conclude that financial education programmes can help people to optimise credit markets and to exercise debt management, which is consistent with the findings of DeLaune et al. (2010), and Paxton et al. (2000) in the contexts of the United States and Burkina Faso, respectively.

To sum up, it is therefore likely that crucial connections exist between financial literacy, the channels, and poverty. Little attention has been paid, however, to the transmission mechanisms from financial literacy to poverty. As summarised in Table 3.1, most existing studies either look at the impact of financial literacy on the channel variables or examine the impact of the channels on poverty. However, there are two studies that are closely related to this essay. One study by Van Rooij et al. (2011b) looks at the transmission mechanisms via which financial literacy improves individual wealth in the Netherlands. Using OLS and IV regression strategies, the authors highlight the role of the stock market and retirement planning as financial literacy transmission channels. The results show that financial literacy increases individual opportunities to participate in the stock market, which indirectly helps to build up assets, generate additional income, and improve the standard of living. Financial literacy is also assumed to increase public

participation in retirement programmes. This could be due to the fact that financially literate people know how to achieve long-term goals and carefully manage their spending and savings. A recent study by Fort et al. (2016) discussed the transmission mechanisms that may drive the positive impacts of financial literacy in Italy. Three possible transmission channels of financial literacy are empirically examined in this study, namely, portfolio composition, retirement plan, and saving behaviour. Based on data from the Bank of Italy, the results suggest that there is no significant impact running from financial literacy to economic welfare via retirement planning and saving behaviours. However, there seems to be evidence that financial literacy would lead to improved portfolio management, which may explain the decisive role of financial literacy on individual wealth.

The present chapter differs from these two studies in the following ways: first, this essay discusses financial literacy transmission mechanisms with a special focus on developing countries, specifically Indonesia, while the above research uses a convenience sample from the developed countries of the Netherlands and Italy. The substantial impacts of financial literacy demonstrated in the context of rich countries may not always translate to developing countries because of their different characteristics and economic development. Second, certain channels in these two studies, such as stock market and portfolio management, are highly reliant on the context. Those channels may be pertinent in a developed country setting but are less relevant in developing countries with smaller stock exchanges and lack of access to advanced financial markets. In the present essay, somewhat more general channels (savings, financial services usage, and over-indebtedness) are studied to investigate the importance of financial literacy in achieving poverty reduction.

Third, the related variables – financial literacy, poverty, and the channels – are not jointly determined as a system of equations in the previous studies. For instance, Fort et al. (2016) employ a single equation approach with OLS and IV estimations and do not describe the complete route of each channel underlying an observed relationship between financial literacy and economic welfare. Using simultaneous equation technique, the present essay not only identifies the fundamental channels

in the chain but also allows us to estimate the magnitude of the particular channels, taking into account the existence of all channels in the model. In addition, with a single equation approach, caution must be applied because the findings may not have consistent estimates of the parameters, as is possible with simultaneous equation technique, which employs the covariance among the disturbances (see Greene, 2000). This, in turn, provides a comprehensive analysis able to come closer to the actual impact of financial literacy as a key to poverty reduction.

Table 3.1. Summary of included empirical evidence on financial literacy, channels, and poverty

Relationships		Research Study	Key findings
Effect of financial literacy on the channels	Saving	Schreiner and Sherradan, 2007; Bernheim and Garrett, 2003; Babiarz and Robb, 2013	Nexus between financial literacy and saving
	Over-indebtedness	Lusardi and Tufano, 2011; Brown and Graf, 2013; French and Mc Killop, 2014; Wolfe-Hayes, 2010; Paxton et al., 2000; DeLaune et al., 2010	The connection between financial literacy and over-indebtedness
	Financial services usage	Wachira, 2012; Carpena et al., 2011; Fund, 2013; Zia 2009; Grohmann et al. 2018	Financial literacy promotes financial services usage
Effect of the channels on poverty	Saving	Kapoor 2007; Dupas and Robinson 2009) Shepherd et al. 2015; Kwai and Urassa 2015; Souksavanth, 2013; Ivanic 2019; Brown et al. 2017; Steinert et al. 2017	The positive effect of saving on welfare
	Over-indebtedness	Winckler 2014; Ntsalaze 2017; Fatoki 2015	The relationship between over-indebtedness and poverty
	Financial services usage	Dupas and Robinson, 2013; Imai and Azam 2012; Imai et al. 2010;, Mosley 2001; Khandker 2005; Lopatta et al. 2017; Ferdousi 2015; Swain and Wallentin 2009 Rajasekhar 2002; Beck et al. 2007; Inoue 2019; Bakari et al. 2019; Zeller and Sharma 1998; Park and Mercado 2015; Fadun 2014	Financial services usage reduces poverty
The transmission mechanism of financial literacy		Van Rooij et al. 2011b; Fort et al. 2016	Financial literacy affects welfare through a series of channels

3.3. Methodology and data discussion

In this section, a detailed description of the econometric examination of the financial literacy transmission mechanism is provided. It begins by describing the model specification. This is followed by an explanation of the simultaneous equations framework. Then, the data used in the empirical analysis is discussed.

3.3.1. Model specification

Most existing empirical studies analyse the total link between financial literacy and poverty, by estimating an econometric model of the form:

$$Pov_i = \beta_0 + \beta_1 FL_i + \beta'_{2i} X_i + \varepsilon \quad (3.1)$$

where *POV* is poverty, *FL* represents the financial literacy index, *X* denotes a vector of control variables like gender, marital status, age, education, family size, occupation, etc., *i* represents individuals and ε is the error term. Taken together, *FL* and *X* reflect the vector of independent variables used in the model.

The above model is relatively similar to the model adopted by a number of empirical studies like Van Rooij et al. (2012), Behrman et al. (2012), Fort et al. (2012), and Dinkova et al. (2016). The current study extends it further by examining the channels through which financial literacy are transmitted to poverty. For this purpose, the standard formulation to modelling and estimating the potential transmission mechanism is to decompose the total effect into the direct and indirect effect as

$$\frac{dY}{dX} = \frac{\partial Y}{\partial X} + \sum_{ind} \left(\frac{\partial Y}{\partial C} \frac{\partial C}{\partial X}\right) \quad (3.2)$$

where *C* represents the channels, and the overall effect of variable *X* on *Y*, $\frac{dY}{dX}$, can be decomposed into the direct effect, $\frac{\partial Y}{\partial X}$, and the indirect effect, $\sum_{ind} \left(\frac{\partial Y}{\partial C} \frac{\partial C}{\partial X}\right)$. Specifically, for this study, the above equation can be rewritten as

$$\frac{dpoverty}{dfinancial\ literacy} = \frac{\partial poverty}{\partial financial\ literacy} + \sum_{ch} \left(\frac{\partial poverty}{\partial channels} \frac{\partial channels}{\partial financial\ literacy} \right) \quad (3.3)$$

where $\partial channels$ denotes the three financial literacy-poverty channels: saving, financial services usage, and over-indebtedness.

As discussed in MacKinnon et al. (2002), Lockwood and MacKinnon (1998), and Preacher and Hayes (2008), there are two designs for a testing hypothesis about transmission mechanism model like (3.2). First, investigators estimate one mediator in the model, or the single-mediation approach. Second, the estimation that involves several channels in one model, also known as the multiple-mediation approach. Figure 3.2 and Figure 3.3 compare the single-mediation and the multiple-mediation approaches. Figure 3.2 shows how financial literacy affects poverty via a single channel variable called *X*. In this context, the indirect effect of financial literacy on poverty via *X* is quantified as a and b (ab). The overall effect of financial literacy on poverty (c) can be quantified as the sum of the direct (c') and indirect effects *(ab)* which equals to $c = c' + ab$.

Figure 3.2. Illustration of the single-mediation model

Figure 3.2a. Indirect and direct effect of financial literacy on poverty

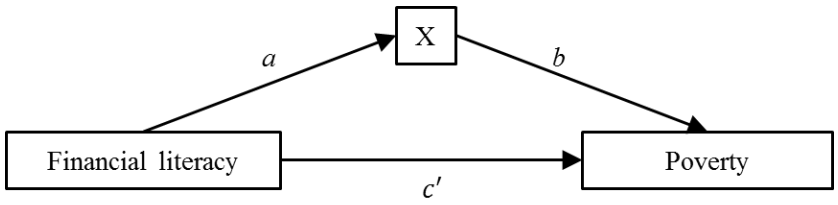


Figure 3.2b. Total effect of financial literacy on poverty

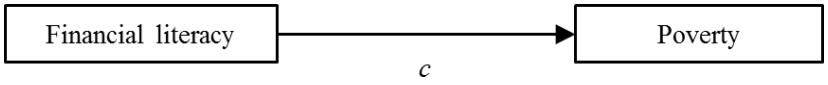


Figure 3.3 shows the multiple-mediation approach in that the indirect effect of financial literacy on poverty can be expressed as the product of the two paths connecting financial literacy to poverty via a number of channels. For instance, the indirect effect of financial literacy on poverty through saving, financial services

usage and over-indebtedness are denoted as a_1b_1, a_2b_2, and a_3b_3, respectively. Further, the total indirect effect of financial literacy on poverty can be quantified as the sum of each indirect effect from all the channels, $\sum_i(a_ib_i)$, and the total effect can be estimated as $c = c' + \sum_i(a_ib_i)$

Figure 3.3. Illustration of the multiple-mediation model

Figure 3.3a. Indirect and direct effect of financial literacy on poverty

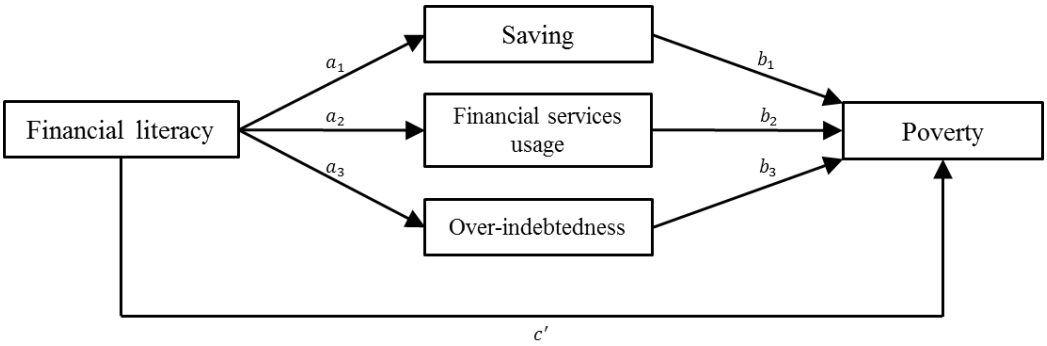
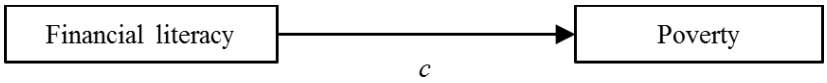


Figure 3.3b. Total effect of financial literacy on poverty



Furthermore, several methods have been proposed in the existing literature in examining the potential transmission mechanism, and most of them focus on the simple mediation term. For example, the best-known one is the causal steps strategy developed by Baron and Kenny (1986), which estimates the paths of the model in Figure 3.2. Specifically related to this study, an indirect effect exists when several criteria are met: first, variable *X* is a channel if financial literacy significantly accounts for variability in *X*. Second, variable *X* significantly influence variability in poverty when controlling for financial literacy. Third, the regression coefficient of financial literacy on poverty decreases significantly when *X* is included along with financial literacy as a predictor of poverty. In regard to Figure 3.2, this technique basically requires significant effects in paths *a*,*b* and c' and the coefficient effect of c' must be smaller than *c*.

Another simple mediation-based method that is widely used to investigate transmission mechanism effects focuses, not on the paths in the mediation model but rather, on the interaction between the estimated variable (financial literacy in this context) and the channels. The rationale behind this technique is to compare the total effect and the direct effect. A statistical significance of interaction effects supports the hypothesis for the presence of indirect effect (see MacKinnon et al., 2002, Preacher and Hayes, 2008).

This study employs a multiple-mediation model where multiple channels are estimated simultaneously in the model. This technique is adopted for the following reasons. First, when multiple channels are estimated together in one model, it will eliminate the likelihood of parameter bias due to the problem of omitted variables. On the other hand, if numerous channels are each estimated using a simple-mediation model, these separate models may bias effect estimates (Judd and Kenny, 1981). Second, it provides benefit in which we can determine the extent to which some channels facilitate the effect between the two variables of the study (financial literacy and poverty in the present context). Including several channels in one model allow us to estimate the magnitude of the specific channels taking into account the presence of all channels in the model, thus allowing for a comprehensive analysis (Preacher and Hayes, 2008).

To analyse the transmission channels from financial literacy to poverty, five equations are constructed with the presence of endogenous and exogenous variables in the system. The equations of the system are specified in more detail as follow:

$$lnPov_i = \gamma_1 lnFSU_i + \beta_1 lnSAV_i + \delta_1 lnOV_i + \varepsilon_{i1} \quad (3.4)$$

$$\begin{aligned} lnFSU_i = {} & \alpha_1 lnFL_i + \beta_2 lnSAV_i + \lambda_1 Gen_i + \sigma_1 MS_i + \rho_1 FAM_i + \varphi_1 AGE_i + \\ & \mu_1 EDU_i + \tau_1 IEM_i + \emptyset_1 OC_i + \omega_1 UR_i + \aleph_1 HO_i + \psi_1 BBD_i + \pi_1 FS_i + \\ & \Phi_1 GT_i + \underline{\omega}_1 DIS_i + \subset_1 REG_i + \varepsilon_{i2} \end{aligned} \quad (3.5)$$

$$lnSav_i = \alpha_2 lnFL_i + \gamma_2 lnFSU_i + \delta_2 lnOV_i + \lambda_2 GEN_i + \sigma_2 MS_i + \rho_2 FAM_i + \varphi_2 AGE_i + \mu_2 EDU_i + \tau_2 IEM_i + \emptyset_2 OC_i + \omega_2 UR_i + \aleph_2 HO_i + \psi_2 BBD_i + \pi_2 FS_i + \Phi_2 GT_i + \not\subset_2 REG_i + \varepsilon_{i3} \quad (3.6)$$

$$lnOV_i = \alpha_3 lnFL_i + \beta_3 lnSAV_i + \lambda_3 GEN_i + \sigma_3 MS_i + \rho_3 FAM_i + \varphi_3 AGE_i + \mu_3 EDU_i + \tau_3 IEM_i + \emptyset_3 OC_i + \omega_3 UR_i + \aleph_3 HO_i + \psi_3 BBD_i + \pi_3 FS_i + \text{ø}_1 LA_i + \Phi_3 GT_i + \not\subset_3 REG_i + \varepsilon_{i4} \quad (3.7)$$

$$lnFL_i = \lambda_4 GEN_i + \sigma_4 MS_i + \rho_4 FAM_i + \varphi_4 AGE_i + \mu_4 EDU_i + \tau_4 IEM_i + \emptyset_4 OC_i + \omega_4 UR_i + \text{ɲ}_1 USR_i + \text{ʂ}_1 FW_i + \underline{\omega}_2 DIS_i + \not\subset_4 REG_i + \varepsilon_{i5} \quad (3.8)$$

where POV refers to poverty, FL is financial literacy, SAV reflects saving, OV represents over-indebtedness, FSU is financial services usage, GEN is gender, MS represents marital status, FAM is family size, AGE indicates age, EDU refers to education (years of schooling), IEM is income-earning members, OC stands for occupation, UR reflects urban, HO applies to homeownership, BBD is bank branch density, FS represents financial shock, GT is government transfer, LA is a loan availability, USR is a university's student ratio, FW represent financial worker's ratio, DIS is the distance to the nearest banking institutions, REG denotes regional dummy, i represents individuals and ε is the error term.

Specifically, equation (3.4) is the poverty regression with the three main channels (saving, financial services usage, and over-indebtedness) on the right-hand side of the equation. The channels are included to see the link of each channel on poverty[6]. The next three equations ((3.5), (3.6), and (3.7)) examine the effect of financial literacy on each particular channel. Particularly, equation (3.5) is the financial services usage equation, and equations (3.6) and (3.7) are the savings and over-indebtedness equations respectively. Financial literacy is included in each channel equation and every channel equation also consists of a set of control variables. Lastly, financial literacy equation, (3.8), is added to the system mainly to account

[6] Equation (3.4) presumes that the exogenous variables also affect poverty. As part of robustness check, this study let some of the exogenous variables to appear in the poverty regression. Results are not sensitive to this modification.

for the potential reverse causation between financial literacy, poverty, and the channels[7].

In choosing the sets of exogenous and endogenous variables on the right-hand side of the channels and financial literacy equations, this study relies on the existing empirical literature. Variables such as marital status, family size, gender, age, education, income-earing members, occupation, location, and financial shock and homeownership are found to be highly significant in a wide range of specifications in empirical poverty, savings, financial services usage and over-indebtedness studies (see Engelhardt, 1996, Lersch and Dewilde, 2018, Bartfeld and Collins, 2017, Biyase and Zwane, 2018, Lekobane and Seleka, 2017, Akerele et al., 2012, Achia et al., 2010). Hence, the variables are included as conditional variables, in all of the specifications.

In addition, to determine the financial services usage equation, this study also includes bank branch density to control for the infrastructure of the financial services industry, following Celerier and Matray (2018). Regarding the savings equation, this study controls, among others, bank branch density and government transfer (see Beckmann, 2013b, Deuflhard et al., 2014, Lusardi, 2008b, Ozcan et al., 2003). Turning to the over-indebtedness specification, the study also includes availability of loan services as a control variable. With regards to the financial literacy equation, this essay controls for variables such as family size, age, education, occupation, urban, and bank branch density, following the existing literature on the determinant of financial literacy (see Lusardi and Mitchell, 2011c, Servon and Kaestner, 2008, Chen and Volpe, 1998, Atkinson and Messy, 2012, Brown and Graf, 2013). Several important variables, i.e., the distance to nearest financial institutions, university student's ratio and financial worker's ratio are also included into the financial literacy specification inspired by existing studies like Klapper et al. (2015) and Lachance (2014). Lastly, the regional dummy variable is

[7] As in many financial literacy studies, reverse causality may bring to biased estimates (see Grohmann et al., 2014, Beckmann, 2013, Van Rooij et al., 2012, Jappelli and Padula, 2013, Fort et al., 2016).

included in the channels and the financial literacy specification to capture unobserved regional characteristics

3.3.2. Econometric method

In line with Lorentzen et al. (2008), Lanati and Thiele (2018), Bjørnskov (2012), and Tavares and Wacziarg (2001), the three-stage least squares method is used to estimate the system formed by equations (3.4) - (3.8). In simultaneous equation models, if only exogenous variables appear in the system, the Seemingly Unrelated Regression Estimates (SURE) provide consistent estimates. However, in this study, given that the system contains some endogenous variables that are potentially associated with the disturbance, SURE will lead to inconsistent estimates. As endogenous variables appear on the right-hand-side of equations, then one must combine the system estimation of SURE with the instrumental variables method of Two-Stage Least Square (2SLS) which is known as the Three-Stage Least Square (3SLS)[8].

As discussed in Greene (2012), Davidson and MacKinnon (1993) and Zellner and Theil (1962), under 3SLS approach, a dependent variable will have its standard interpretation as the left-hand side variable in an equation with a related disturbance term. All dependent variables are treated as endogenous to the system with a potential correlation with the disturbance in the system's equation. Further, all other variables which appear in the system are assumed to be exogenous to the system and uncorrelated with the error term. Such exogenous variables are used as instruments for the endogenous variables.

[8] This study also checks the robustness of the main model to the method of estimation by re-estimating the model based on Seemingly Unrelated Regression Estimation (SURE). Under this method, the model is estimated without instrumenting for the endogenous variables. Unsurprisingly, the results indicate that the use of SURE bring to inconsistent estimates. Some of the channel effects of financial literacy on poverty become insignificant and significantly decreased in magnitude. This particular results show the significance of controlling for endogeneity to estimate financial literacy-poverty nexus.

Greene (2012) and Davidson and MacKinnon (1993) present the formulation for a 3SLS estimator. The system can be formulated as follow

$$\begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_M \end{bmatrix} = \begin{bmatrix} Z_1 & 0 & \cdots & 0 \\ 0 & Z_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & Z_M \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_M \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_M \end{bmatrix} \tag{3.9}$$

or more simply

$$Y = Z\beta + \varepsilon \tag{3.10}$$

where Y is the dependent variable, Z reflects both the exogenous and the endogenous right-hand-side variable in the equations. β is the coefficient of variables and ε is the disturbance.

As it is assumed that there will be a correlation among the disturbances of the equations, therefore

$$E(\varepsilon\varepsilon') = \sum \tag{3.11}$$

where the disturbances are further assumed to have an expected value of 0.

The first step of 3SLS is to create instrumented values for the entire endogenous variables. These values can simply be seen as the estimated value resulting from the regression of every endogenous variable on all exogenous variables in the system. This step is similar to the first stage of 2SLS and is important for the reliability of the parameter estimates. Designating the set of all exogenous variables as X so that

$$\hat{z}_i = X(X'X)^{-1}X'z_i \tag{3.12}$$

where $\hat{z}$ consists of the instrumented values for all the regressors. They catch on the values for the exogenous variables and first stage estimates for the endogenous variables.

The second step is to get a reliable estimate for the covariance matrix of the equation disturbances that are grounded on the residuals from a 2SLS estimation of each structural equation. The first two stages of 3SLS are vital to address the bias in the estimated coefficient due to the potential endogeneity problem. The third step is to carry out a Generalized Least Square (GLS) type estimation employing the covariance matrix obtained in the previous step. This step is critical for improving the coefficient of the estimated standards errors through controlling for the association of disturbance across equations. The 3SLS estimates of the system parameter with the estimate of residual $\sum$ placed into the GLS estimating equation can be formulated as

$$\dot{\mathrm{B}} = \left\{\hat{\mathrm{Z}}'\left(\sum^{-1} \otimes I\right)\hat{\mathrm{Z}}\right\}^{-1} \hat{\mathrm{Z}}'\left(\sum^{-1} \otimes I\right)y \qquad (3.13)$$

where $\hat{\mathrm{Z}}$ is the set of instrumental variables for the equations, $\otimes$ represents the Kronecker product, and I is an identity matrix.

To identify a simultaneous equation, there is a need for sufficient information to determine the model's parameters considering the identified functional form (see Theil, 1971, Greene, 2012). There should be at least as many non-collinear exogenous variables in the existing system as there are endogenous right-hand-side variables in the given equation and this condition must be the same for every structural equation in the system (Gujarati, 2004). Such variables are exogenous in the sense that they cannot be seen on the left-hand side of any of the equations. That is to say, they are not identified within the system. The rules of the identification in the system of simultaneous equation are described as follow

M = total of endogenous variables in the model.

m = total of endogenous variables in an identified equation.

K = total of exogenous variables in the model.

k = total of exogenous variables in an identified equation.

$$K - k \geq m - 1$$

Clearly, there is a requirement for identification of the system, and it is important to have various sets of exogenous variables to estimate simultaneous equations. To do so, there are two ways. First, an estimation of a system grounded on a prior theoretical exclusion, which comprises the benchmark model and ensures that the equations are over-identified. Second, as part of a robustness check, the sensitivity of the model is calculated using an empirical specification search, where the data controls the variables that should be present in every equation.

3.3.3. Data

The data used in this essay are gathered from the Financial Inclusion Insight 2014. Poverty is defined, as in the first essay, by consumption expenditure. As part of the robustness check, this study uses the Poverty Probability Index (PPI) as an alternative poverty measure. With respect to the saving channel, two measures are used: saving ratio and individuals' intention to save money. This empirical chapter uses a financial services usage index and finance activity to measure financial services usage. In addition to using the debt ratio, which is a widely used measure to capture over-indebtedness, this essay also uses an alternative measure, namely, cross-borrowing. Details of the savings, financial services usage, and over-indebtedness measures are discussed in the following three sub-sections. Table A3.8, Appendix A, shows the construction and description of the key variables used in the analysis.

Table C3.10 of Appendix C presents the correlation matrix of the variables in the model. The first column of Table C3.10 correlates financial literacy with all the endogenous variables. The signs of these correlations are consistent with the previous literature. The results indicate a positive relationship between financial literacy and both financial services usage and savings, whereas financial literacy is negatively associated with over-indebtedness. Column 2 and 3 report the correlations between various channel variables and poverty, respectively. The signs of the correlations are preserved, with the possible exception of the over-indebtedness variables. Looking at the financial literacy – channels – poverty correlations together, the direction of the channel effects can be predicted. For example, financial literacy is associated with higher levels of savings, and savings tends to reduce poverty levels, implying that financial literacy affects poverty via the savings channel. Nevertheless, it is important to control for other determinants of the endogenous variables, as well as addressing the potential endogeneity bias.

3.3.3.1. Measures of saving

In accordance with, among others, the OECD (2013), Gentry and Hubbard (2004), Kelley and Williamson (1968), Lamarche and Grundiza (2017), and Fuchs-Schundeln et al. (2017), this essay uses the saving ratio as a proxy for saving. It is measured in a standard way by looking at the proportion of unspent income, particularly the proportion of savings to income. The saving ratio is formulated as follows:

$$SR_t = \frac{TS_t}{INC_t} \tag{3.14}$$

where SR reflects savings ratio, TS is the total savings and, INC represents overall income.

The saving ratio represents the ability of individuals to spend money after having fulfilled their major needs, irrespective the nature of what their particular needs are. This measure has certain advantages over other measures of savings, as it pictures

more accurately the aggregate of an individual's disposable income that is not spent, and it closely reflects the probability of individuals experiencing financial hardship. In this sense, the higher the saving ratio, the lower the chance that individuals will have difficulty making ends meet (Lamarche and Grundiza, 2017).

Use of this measure does come with a caveat, however. As discussed in Malapit (2012), Ashraf et al. (2010), and Bound et al. (2001), there is a concern about the validity of self-reported data regarding individuals' assets, as respondents are likely to be reluctant to be frank about their capacity for saving. To address this issue, an alternative measure of saving is used, namely, individuals' intention to save money. This measure is constructed as past deposit frequency, as seen in Moore et al. (2001) and Loibl et al. (2011). Theoretical and empirical studies consider it important to be able to capture individual's saving behaviour (see Loibl et al., 2011, Fisher and Anong, 2012, Moore et al., 2001). In this respect, there is a robust assumption that a regular savings habit would improve asset accumulation (Han and Sherraden, 2009).

3.3.3.2. Measures of financial services usage

Financial services usage has proved to be difficult to measure. Data limitation is the primary constraint, but there are also concerns that persons may be financially excluded for various reasons, such as limited infrastructure, banking products that are inaccessible or inappropriate to their needs, or a unsuccessful application of a financial product (Kempson et al., 2006). Another obstacle in the measurement of financial services usage is identifying the characteristics of the financial institutions in question. Most studies differentiate between formal and informal financial institutions (see Von Pischke, 1998, Oleka and Mgbodile, 2014). Formal financial institutions commonly provide a variety of financial products such as loans, savings, and various payment instruments. These organisations are typically registered in the national banking structure, operate under a standard operating procedure, and are accompanied by access to a national payment system. The characteristics of informal financial institutions are also relatively clear, which is to

say they have no legal basis, and are mostly based on trust between money-lenders and their customers. In addition, there are institutions that are not particularly formal, but are able to act as banks because they already have a reasonably mature system. They may even provide some common banking amenities such as loans, savings, and various microfinance products. This type of financial institution may operate outside the national banking framework or under a governmental banking structure, and can be country-specific.

In an attempt to take these issues into account, this essay uses two measure of financial services usage. First, it uses what has become the standard financial services usage indicator, namely individual ownership of a formal financial account, as suggested by the World Bank (2005). This measure is constructed based on three indicators, including ownership of a bank account, accounts in other financial institutions, and bank accounts on behalf of another person. The second indicator is used to capture formal and semi-formal financial services providers other than banking institutions, whereas the last indicator is included to capture conditions where society uses bank accounts for joint ownership or indirect access (see Kumar, 2005). Then, the polychoric Principal Component Analysis (PCA) technique is adopted to create a financial services usage score by combining the set of indicators. A principal component for financial services usage variable is computed as follows:

$$FSU_i = \partial_1 Y_i^b + \partial_2 Y_i^o + \partial_3 Y_i^{bo} \tag{3.15}$$

Where *FSU* represents financial services usage index, *i* is the individual, and Y_i^b, Y_i^o, Y_i^{bo} reflect ownership of a bank account, other financial institution, and bank accounts on behalf of another person, respectively[9]. A detailed financial services usage index construction using polychoric PCA is given in Appendix C.

[9] For a similar approach, using Principal Component Analysis (PCA) to estimate financial services usage, see Camara and Tuesta (2014).

However, despite the way ownership of a financial account is frequently used as financial services usage measure, a major criticism is the possibility that financial account ownership does not automatically lead to use[10]. Thus, it may be a poor indicator of financial services usage, especially in countries where many people own a financial account but do not actually use banking services. Hence, this essay also uses the second measure of financial services usage, namely finance activity, which represents an individual's overall activity with financial institutions, and is computed as the overall frequency of the use of financial services, according to Barcellos and Zamarro (2019). Thus, the second financial services usage measure takes into account not only having an account in a financial institution, but also the frequency of such use. In this regard, it is assumed that an individual who is more likely to use financial services in their daily lives will have more opportunities to optimise the resources that offer a higher chance of escaping poverty.

3.3.3.3. Measures of over-indebtedness

Following Lau and Leung (2011), Lyons and Yilmazer (2005), Keese and Schmitz (2014), Drentea and Lavrakas (2000), Kim et al. (2016), and Chehade et al. (2017), this study employs a widely accepted measure, debt ratio, as a primary measure of over-indebtedness. The proportion of debt to income is expressed as:

$$DR_t = \frac{TD_t}{INC_t} \tag{3.16}$$

Where DR reflects debt ratio, TD is the total debt and, INC represents overall income.

Debt ratio is usually found to be a good indicator of what it is intended to measure, over-indebtedness, and especially the risk of repayment problems. There is evidence that repayment performance is likely to be significantly worse among

[10] As reported by Klapper (2015), even though the number of financial accounts owned in developing countries has increased over the last few years, most have gone unused.

individuals with high debt ratio (Pytkowska and Spannuth, 2012, Collins, 2008). In this respect, financially literate individuals are able to keep their debt ratio at a manageable level (French and McKillop, 2016, Idris et al., 2018).

As part of the robustness check, following Pytkowska and Spannuth (2012), and Chehade et al. (2017), an alternative measure of over-indebtedness is used, namely cross-borrowing, which is constructed as the number of simultaneous loans from different financial institutions. Although cross-borrowing does not always mean over-indebtedness, empirical evidence points to a strong relationship between cross-borrowing, repayment delays, and over-indebtedness. Past studies indicate that over-indebtedness is likely to occur when individuals borrow money from several different moneylenders simultaneously rather than staying with the same credit provider (see Chehade et al., 2017, Pytkowska and Spannuth, 2012, Schicks, 2013). This essay uses this alternative measure of over-indebtedness for the following reasons: First, the literature suggests that although the definition of over-indebtedness is relatively clear, it is technically challenging to measure (see Berthoud and Kempson, 1992, Bridges and Disney, 2004, Kempson et al., 2004). The indicators used to calculate over-indebtedness always receive criticism, and there is no single measurement that captures all the characteristics of being over-indebted. Thus, employing an alternative measure of over-indebtedness is one way to expand the understanding of being over-indebted, rather than relying on a single measure. Second, past studies support the use of this measure (Chehade et al., 2017, Pytkowska and Spannuth, 2012). Third, using a substitute measure of over-indebtedness may result in further validation of the findings.

3.4. Empirical results

Table 3.2 reports the results from jointly estimating the equations of the system based on the 3SLS technique. The full set of variables included is displayed in Table E3.15 of Appendix E. The second column shows the effects of financial literacy on the three channels in the system of equations. The results support the notion that financial literacy is associated with an increase in the financial services usage index. The sign of financial literacy is positive and significant at the 1

percent level, which is consistent with existing studies (see Chaulagain, 2015, Simpson and Buckland, 2009, Chakrabarty, 2012, Grandolini, 2015, Cole et al., 2011). Furthermore, the results show that the coefficient of financial literacy is positive and significant, implying that, on average, individuals with a high level of financial literacy tend to save more. This result is in line with previous findings by Babiarz and Robb (2014), Beckmann (2013a), and Jappelli and Padula (2013), among others. With respect to over-indebtedness, the results indicate that financial literacy is significantly related to debt ratio. The impact of financial literacy on over-indebtedness is negative (-1.623) and significant at the 1 percent level, which is consistent with previous studies (French and McKillop, 2016, Lusardi and Tufano, 2015, Gathergood, 2012).

Table 3.2. Summary of the channel effects using 3SLS (main model)

Channel variables	Consumption expenditure as a measure of poverty		
	Effect of financial literacy on the channels	Effect of the channels on consumption expenditure	Effect of financial literacy on consumption expenditure
Financial services usage index	49.336**	0.122***	6.009***
	(19.247)	(0.013)	(2.460)
Saving ratio	2.381***	3.602***	18.681***
	(0.699)	(0.987)	(6.136)
Debt ratio	-1.623***	-9.433***	15.307***
	(0.173)	(1.418)	(2.786)
Total effect			39.998***
			(8.148)
Wald test			313.42***
Observations	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Financial services usage index is the composite financial services usage index covering the three indicators: ownership of a bank account, account with other financial institution, and bank accounts on behalf of another person. Saving ratio is the proportion of savings to income. Debt ratio reflects the proportion of debts to income. The second column displays the effect of financial literacy on the various estimated channels. The third column reflects the coefficient of each channel variable in the consumption expenditure equation. The last column shows the multiplication of the two coefficients in the previous two columns. Each coefficient estimate is obtained from separate equations of the respective dependent variable on these particular channels and on a set of explanatory variables whose coefficient estimates are not shown.

The third column of Table 3.2 reports the estimated effect of the channel variables on poverty (consumption expenditure). As can be seen, the estimated coefficient of saving is positive (3.602) and statistically significant at the 1 percent level,

suggesting that individuals with higher levels of savings are more likely to improve their standard of living, which is in line with the findings of Moav and Neeman (2012), Rutherford (2000), and Collins et al. (2009). With regard to the impact of financial services usage index and debt ratio, this study finds that it has the expected association with consumption expenditure. Indeed, the financial services usage index is found to increase consumption expenditure. The estimated coefficient of financial services usage is positive (0.122) and statistically significant at the 1 percent level, consistent with existing studies on the role of financial institutions in improving standards of living and reducing poverty (see Fletschner and Kenney, 2014, Morduch and Haley, 2002, Imai and Azam, 2012). Lastly, as in Winckler (2014), Ntsalaze (2017), and Fatoki (2015), this study reveals a significant association between over-indebtedness and poverty levels. Its coefficient is negative and significant at the 1 percent level, which indicates that high levels of indebtedness are associated with a lower level of consumption expenditure, or higher risk of living in poverty.

The combined effect of financial literacy on consumption expenditure via the estimated channels is presented in the fourth column of Table 3.2. The coefficients are obtained from the multiplication of the coefficient of financial literacy in each channel (column 2) by the coefficient of each channel in the consumption expenditure equations (column 3). As can be seen, the effect is positive (6.009) and statistically significant, suggesting that financial literacy affects financial services usage, and leads to higher levels of consumption expenditure. Moreover, it is shown that financial literacy statistically increases consumption expenditure by improving an individual's saving ratio (18.681) and keeping debt ratio at a manageable level (15.307).

Taken together, the financial services usage index and savings explain approximately 62 percent of the total indirect effect (39.998) of financial literacy on consumption expenditure. The estimates also reveal that financial literacy seems to generate a significant reduction in consumption expenditure of about 38 percent through the debt ratio channel. The Wald test indicates that the sum of each channel effect (themselves the coefficient effects in the poverty, the channels, and

the financial literacy equation) is not simultaneously equal to zero. This means that including those channels and the financial literacy variable lead to a statistically significant improvement in the fit of the model. Table E3.16, in Appendix E, presents the test of order condition for the system of equation 1 to 5. It is apparent that the current system of simultaneous equations has enough information – or sufficient exogenous variation – to estimate the parameters of the model, indicating that there is no identification problem.

In general, the results confirm that saving ratio, financial services usage index, and debt ratio are significantly linked to the effectiveness of financial literacy in reducing poverty levels. The effect of financial literacy on poverty via these channels is robust when controlling for a set of explanatory variables and independent disturbance across the system.

3.4.1. Robustness checks

This study performs three types of robustness tests. First, it analyses the sensitivity of the main findings to a modification of the main model (empirical specification search) and controlling for the effects of education factor. The second robustness check consists in re-estimating the associations using alternative measures for each channel. Lastly, it tests for the possibility that effect is sensitive to poverty measures.

3.4.1.1. Empirical specification search and excluding education from the channel equations

A well-functioning simultaneous equation offers consistent estimates for different specifications. Given that poverty and channel equations may be sensitive to different specifications, the standard method used in the empirical literature related to simultaneous equations is to carry out an empirical specification search strategy. Following Tavares and Wacziarg (2001), the indicators that are not significantly different from zero at 95% level of confidence are excluded from the specifications. As a result, a total of 10 variables are excluded from a total of five

equations. The basic specification now consists of 55 variables, involving both endogenous and exogenous variables. Overall, 85 percent of the variables that are assumed to be key determinants of the outcome variables are still present after the empirical specification search. The set of "empirical specification search" equation is presented in Appendix E, Table E3.17. Each equation has enough information, or sufficient exogenous variation, to estimate the parameters of the model, indicating that the order condition is satisfied, and there is no identification problem.

Table 3.3 shows estimates of each channel against consumption expenditure. In model (1), all of the endogenous and exogenous variables appear on the right-hand side of each equation relying on the existing literature, which is a replication of the results shown in Table 3.2 (main model). In model (2), the insignificant variables are excluded from the first stage 3SLS regression (empirical specification search model). As expected, there is a reduction of exogenous variation to estimate the parameters from a simultaneous equation model, and the magnitude of the association is somewhat reduced for some of the channels. However, the sign of financial literacy remains unchanged compared to the primary model, suggesting that the selection of system of equations is robust to different specifications and does not affect the overall indirect effect of financial literacy on poverty. The full set of results, including all control variables, can be found in Appendix F, Table F3.18.

Next, the relative impact of education level, which may distort the estimates, is evaluated. For the primary model (model 1), the education variable is included in all channels and financial literacy equations. As financial literacy and education level are predicted to be strongly correlated, it could be problematic to justify the results if it is in doubt whether the effect of financial literacy is statistically independent of the influence of education. In particular, only a small portion of the sample has both a low financial literacy score and high level of education, raising doubt as to the actual impact of financial literacy. By excluding education from the system of equations, the overall effect of financial literacy on poverty is expected to increase, because the financial literacy variable will take on many of the effects formerly attributed to education.

Table 3.3. Sensitivity to the empirical specification search

Channel variables	Consumption expenditure as a measure of poverty		
	Main model	Empirical specification search	Excluding education
	(1)	(2)	(3)
Financial services usage index	6.009***	6.736***	14.427***
	(2.460)	(2.289)	(4.823)
Saving ratio	18.681***	16.757***	8.254***
	(6.136)	(4.145)	(2.617)
Debt ratio	15.307***	14.072***	17.784***
	(2.786)	(2.152)	(3.177)
Total effect	39.998***	37.566***	40.466***
	(8.148)	(5.852)	(7.823)
Wald test	313.42***	488.95***	1229.03***
Observations	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Financial services usage index is the composite financial services usage index covering the three indicators: ownership of a bank account, account with other financial institution, and bank accounts on behalf of another person. Saving ratio is the proportion of savings to income. Debt ratio reflects the proportion of debts to income. The coefficients are obtained from the multiplication of the financial literacy effect in the channel equations by the coefficient of each channel in the poverty equations. Each coefficient estimate is obtained from separate equations of the respective dependent variable on these particular channels and on a set of explanatory variables whose coefficient estimates are not shown.

Model 3 in Table 3.3 shows the alternative set of regressions when the system of equation excludes the education variable. Unsurprisingly, the results remain unchanged following this modification, confirming that the transmission channels do exist between financial literacy and poverty. It is of note that the absolute magnitude of some channels is somewhat changed. Despite the reduction in the absolute magnitude of saving ratio, the magnitude of the association between financial literacy and consumption expenditure via financial services usage and over-indebtedness is now somewhat larger compared to the main model. As expected, this exclusion leads to an increase in the total indirect effect of financial literacy on poverty. All of the signs and magnitudes are consistent and significant at the 1 percent level, improving our confidence in the previous results. The full set of results, including all control variables, is reported in Appendix G, Table G3.19.

3.4.1.2. Alternative channel measurements

In order to test whether the results are sensitive to the different kinds of channel measurements, alternative measures for each channel are used. Finance activity, individuals' intention to save money, and cross-borrowing are used as substitute measures of financial services usage, saving, and over-indebtedness, respectively. The results using these alternative measures are reported in Table 3.4. Interestingly, the same conclusions appear as when using the other channel measures. In most cases, the specifications on these variables are significant at the 1 percent level, and the signs of the channels of finance activity, intention to save, and cross-borrowing are unchanged relative to the main model. The sign of financial literacy's effect on an individual's intention to save is positive (5.743) and significant at the 1 percent level, which is consistent with the previous findings. Table 3.4 also shows that financial literacy is negatively correlated to cross-borrowing (-3.169), suggesting the crucial role of financial literacy in avoiding over-indebtedness. The effect of financial literacy on finance activity is positive (3.824), albeit statistically insignificant.

Regarding the effect of the channel variables on consumption expenditure, most of the signs of the estimated parameters are similar to the results reported in the main model (Table 3.2). In particular, there is evidence that an effect of financial literacy works through finance activity and intention to save. The effects are positive and statistically significant at the 1 percent level, as in the main model (Table 3.2). However, while the sign of the coefficient on cross-borrowing is preserved (-0.709), it is not statistically significant. In general, although some of the effects are not as significant as those in Table 3.2, the estimated signs and magnitudes of the overall results remain unchanged and support the previous findings. The full set of results, including all control variables, can be found in Appendix H, Table H3.20.

Table 3.4. Sensitivity to channel measure

Channel variables	Consumption expenditure as a measure of poverty		
	Effect of financial literacy on the channels	Effect of the channels on consumption expenditure	Effect of financial literacy on consumption expenditure
Finance activity	3.824	0.592***	2.264
	(3.135)	(0.092)	(1.915)
Intention to save	5.743***	2.307***	13.247***
	(0.841)	(0.368)	(2.432)
Cross-borrowing	-3.169***	-0.709	2.245
	(0.824)	(0.871)	(2.725)
Total effect			17.757***
			(4.226)
Wald test			398.97***
Observations	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Finance activity is the total number of individuals using financial services. Intention to save reflects the total number of individuals depositing money. Cross-borrowing is the number of simultaneous loans from different financial institutions. The second column displays the effect of financial literacy on the various estimated channels. The third column reflects the coefficient of each channel variable in the consumption expenditure equation. The last column shows the multiplication of the two coefficients in the previous two columns. Each coefficient estimate is obtained from separate equations of the respective dependent variable on these particular channels and on a set of explanatory variables whose coefficient estimates are not shown.

3.4.1.3. Alternative measures of poverty

Turning to the alternative proxy for poverty, the Poverty Probability Index (PPI) as suggested by some earlier studies, such as Desiere et al. (2015), Schreiner (2012), Chakraborty et al. (2016), Stark et al. (2015), Jalil and Azam (2014), Karlan and Thuysbaert (2016), Polk and Johnson (2012), is adopted. The findings, as shown in Table 3.5 column 2, highlight that both the magnitudes and the statistical significance of the channels parallel those of the main model (Table 3.2), with the exception of financial literacy and financial services usage relationship, which turn out to be insignificant. The results show that individuals with high levels of financial literacy experience both higher levels of savings and higher chances of avoiding over-indebtedness.

Column 3 of the table shows that savings, financial services usage, and the debt ratio are still robustly related to poverty. The effect of saving ratio on poverty level is negative (-5.555) and significant at the 1 percent level, suggesting the crucial

role of savings in reducing poverty, consistent with the main results. As for the variable of financial services usage, its impact is negative (-0.675) and significant at the 1 percent level, which confirms that public participation in financial institutions helps to reduce the probability of being poor. Finally, the effect of debt ratio remains significant at the 1 percent level (22.242), where a higher level of over-indebtedness increases an individual's level of poverty. The full set of results, including all control variables, is reported in, Table I3.21, Appendix I.

Table 3.5. Sensitivity to poverty measure

Channel variables	Poverty Probability Index (PPI) as a measure of poverty		
	Effect of financial literacy on the channels	Effect of the channels on PPI	Effect of financial literacy on poverty
Financial services usage index	24.184	-0.675***	-16.320*
	(18.092)	(0.033)	(12.251)
Saving ratio	1.105**	-5.555**	-13.226**
	(0.535)	(2.484)	(7.523)
Debt ratio	-0.713***	22.242***	-15.866***
	(0.220)	(4.115)	(5.646)
Total effect			-45.413***
			(18.399)
Wald test			753.86***
Observations	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Financial services usage index is the composite financial services usage index covering the three indicators: ownership of a bank account, account with other financial institution, and bank accounts on behalf of another person. Saving ratio is the proportion of savings to income. Debt ratio reflects the proportion of debts to income. The second column displays the effect of financial literacy on the various estimated channels. The third column reflects the coefficient of each channel variable in the PPI equation. The last column shows the multiplication of the two coefficients in the previous two columns. Each coefficient estimate is obtained from separate equations of the respective dependent variable on these particular channels and on a set of explanatory variables whose coefficient estimates are not shown.

The above analysis is repeated using the alternative measures of savings, financial services usage, and over-indebtedness, and with PPI as a poverty measure (see Table 3.6). Comparing the coefficients on saving ratio, financial services usage, and debt ratio in the previous findings, this study finds evidence that the overall results are consistent with the main model, as shown in Table 3.2. For example, the effect of financial literacy on individuals' intention to save money is positive

(3.792) and significant at the 1 percent level, whereas this saving behaviour is found to have a negative (-1.777) and significant impact on the PPI.

Similarly, the effect of financial literacy on finance activity is also positive (8.621) and significant at the 1 percent level, which in turn leads to a lower PPI. Further, there is also evidence that the effect of financial literacy on cross-borrowing is negative (-2.291) and significant at the 1 percent level. In other words, individuals with high levels of financial literacy are likely to avoid borrowing money from several different money lenders simultaneously. Again, compared with the previous findings, the results indicate a strong correlation between over-indebtedness and poverty level (see Table I3.22 for full set of results).

Table 3.6. Sensitivity to poverty measure

Channel variables	Poverty Probability Index (PPI) as a measure of poverty		
	Effect of financial literacy on the channels	Effect of the channels on PPI	Effect of financial literacy on poverty
Finance activity	8.621***	-4.812***	-41.481***
	(2.402)	(0.262)	(11.953)
Intention to save	3.792***	-1.777*	-6.735*
	(0.854)	(1.056)	(3.995)
Cross-borrowing	-2.291***	20.209***	-46.307***
	(0.808)	(2.462)	(16.418)
Total effect			-94.524***
			(16.502)
Wald test			1087.69
Observations	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Finance activity is the total number of individuals using financial services. Intention to save reflects the total number of individuals depositing money. Cross-borrowing is the number of simultaneous loans from different financial institutions. The second column displays the effect of financial literacy on the various estimated channels. The third column reflects the coefficient of each channel variable in the PPI equation. The last column shows the multiplication of the two coefficients in the previous two columns. Each coefficient estimate is obtained from separate equations of the respective dependent variable on these particular channels and on a set of explanatory variables whose coefficient estimates are not shown.

3.4.2. Summary comparison

Table 3.7 provides a comparison of the regression estimates across different measures of savings, financial services usage, over-indebtedness, and poverty. Model 1 in the table reports regression estimates using consumption expenditure as a measure of poverty. As can be seen, the coefficients for the three measures of channels are statistically significant and suggest that financial literacy affects consumption expenditure through financial services usage, saving ratio, and debt ratio.

Table 3.7. Summary of the channel effects using 3SLS

Channel variables	Comparison Table	
	Consumption expenditure as a measure of poverty	Poverty Probability Index as a measure of poverty
	(1)	(2)
Financial services usage index	(+)*	(-)*
Saving ratio	(+)*	(-)*
Debt ratio	(+)*	(-)*
Total effect	(+)*	(-)*
Finance activity	(+)	(-)*
Intention to save	(+)*	(-)*
Cross-borrowing	(+)	(-)*
Total effect	(+)*	(-)*

Note: * is statistical significant

As shown in column 2 of Table 3.7, using an alternative poverty measure (PPI) does not cause significant changes in the estimates of channels, since the effects of financial literacy through the channels remain statistically significant. The results suggest that financial literacy significantly lowers poverty level (PPI) by improving savings, using financial services, and avoiding over-indebtedness. Table 3.7 also shows a comparison of the regression estimates using finance activity, intention to save and cross-borrowing as measures of the channels. The results remain similar and consistent with the research hypotheses across two measures of poverty, and

the coefficients in regressions with these alternative indicators remain significant, except for the indirect effect of finance activity and cross-borrowing in model 1.

Taken together, this study confirms that the impact of financial literacy on poverty seems to work primarily through the savings channel, financial services usage channel, and over-indebtedness channel. The use of different specifications and some alternative measures of the channels and poverty do not affect the basic results of this study, which confirm that the system as a whole delivers sensible results.

3.5. Concluding remarks

Previous studies have indicated that financial literacy has an impact on poverty. However, most studies, like Engelbrecht (2008), Faboyede et al. (2015), Refera et al. (2016), and Behrman et al. (2012), have not treated the significance of financial literacy in much detail, particularly when explaining the transmission mechanisms through which financial literacy affects poverty. Understanding the channels through which financial literacy affects poverty would help policymakers decide which aspects that are influenced by financial literacy initiatives and which do not. Most important, it could provide insight into whether improving financial literacy skills has significant economic consequences; this is useful because, despite the theoretical progress in modelling the effects of financial literacy, we still know relatively little about a route through which improving financial literacy skills can reduce poverty.

Using a simultaneous equation approach, this essay investigates three channels whereby financial literacy may affect poverty: savings, financial services usage, and over-indebtedness. The results obtain here reveal that financial literacy potentially reduces poverty in the context of Indonesia. Moreover, the results indicate the transmission channels through which financial literacy affects poverty. The results show that financial services usage is a critical channel, since the effect of financial literacy on financial services usage is positive and significant, in line with the existing literature (e.g., Fund, 2013, Wachira and Kihiu, 2012, Simpson

and Buckland, 2009). As in Fletschner and Kenney (2014), Morduch and Haley (2002), Imai and Azam (2012), the results suggests that the usage of financial services improves an individual's well-being.

Further, this empirical study finds a positive and strong relationship between financial literacy and savings, which in turn lowers poverty levels. In this sense, the findings are consistent with the theoretical literature on financial literacy, savings, and poverty (e.g., Bernheim and Garrett, 2003, Babiarz and Robb, 2014, Sherraden, 2017, Jappelli and Padula, 2013, Rutherford, 2000). Lastly, this study is also able to support previous research such as Lusardi and Tufano (2015), Brown and Graf (2013), French and McKillop (2014), Dearden et al. (2010), Berthoud and Kempson (1992), which found that financial illiteracy is associated with increased risk of over-indebtedness, and that over-indebtedness can lead to systemic vulnerabilities and higher poverty levels, as in Ntsalaze (2017).

Summing up all channel effects, financial literacy is found to be negatively associated with poverty. The main results obtained using a simultaneous equation approach remain robust to a set of sensitivity analyses in which this study considers various specifications, as well to as alternative measures of the channels and of poverty.

Appendices to chapter three

Appendix A

Table A3.8. Variable description

Variable	Variable Description
Consumption expenditure	Monthly per capita expenditure on basic needs. *Units*: percent points
Poverty Probability Index	Index (0-100) of poverty. *Units*: 0 = not poor and 100 = extremely poor
Financial services usage Index	Composite financial services usage index based on polychoric PCA. Index (0-100) of financial services usage. *Units*: 0 = low levels of financial services usage and 100 = high levels of financial services usage
Saving Ratio	The proportion of savings to income. *Units*: percent points
Debt Ratio	The proportion of debts to income. *Units*: percent points
Finance activity	The total number of individuals uses financial services in the past 60 days. *Units*: high numbers signify more frequent financial services usage.
Intention to save	The total number of individuals depositing money in the past 60 days. *Units*: high numbers signify greater intention to save money
Cross-borrowing	The number of simultaneous loans from different financial institutions. *Units*: high numbers signify greater chance of being over-indebted.
Financial literacy	Composite financial literacy index based on polychoric PCA. *Units*: 0 = low financial literacy score and 1 = high financial literacy score
Gender	Takes a value of 1 if male, 0 otherwise. *Units*: dummy variable
Marital status	Takes a value of 1 if single, 0 otherwise. *Units*: dummy variable
Family size	The number of family members. *Units*: numbers
Age	Respondent's age. *Units*: years
Education	Years of schooling of the respondent: *Units*: years
Income-earning members	The numbers of family members earn income. *Units*: numbers
Occupation	Takes a value of 1 if holding job by qualification level, 0 otherwise. Units: dummy variable
Urban	Takes a value of 1 if living in urban area, 0 otherwise. *Units*: dummy variable
Financial shock	Takes a value of 1 the household experienced financial shocks in the past year, 0 otherwise. *Units*: dummy variables
Government transfer	Takes a value of 1 if received social care, 0 otherwise. *Units*: dummy variable
Homeownership	Takes a value of 1 if own a house, 0 otherwise. Units: dummy variable
Bank branch density	The ratio of local bank branch (per 1000 households). *Units*: percent points
University student's ratio	The ratio of university students in the region (per 1000 households). *Units*: percent points
Financial worker's ratio	The ratio of financial workers in the region (per 1000 households). *Units*: percent points
Distance	Mean distance to nearest financial institutions. *Units*: km
Loan availability	Takes a value of 1 if respondents claim that there are no loan services close to where they live, 0 otherwise. *Units*: dummy variable

Note: most of the variables are collected from the Financial Inclusion Insight (FII) database except bank branch density, university student's ratio, and financial workers ratio that are taken from the Indonesia Database for Policy and Economic Research, World Bank Group.

Appendix B

Table B3.9 Summary statistics

Variable	Mean	Min	Max
Consumption expenditure	5.61	0	100
Poverty Probability Index	56.89	8	100
Financial services usage index	51.1	0	100
Saving Ratio	0.15	0	33
Debt Ratio	0.09	0	27
Finance activity	1.37	0	51
Intention to save	0.86	0	42
Cross-borrowing	0.26	0	5
Financial literacy	56	0	1
Gender	0.39	0	1
Marital status	0.17	0	1
Family size	3.73	0	16
Age	41.21	15	98
Education	4.85	1	14
Income-earning members	1.39	0	7
Occupation	0.18	0	1
Urban	0.53	0	1
Financial shock	0.08	0	1
Government transfer	0.04	0	1
Homeownership	0.78	0	1
Bank branch density	6.06	0	23
University student’s ratio	0.04	0	0.13
Financial worker’s ratio	166.16	2	648
Distance	3.04	1	6
Loan availability	0.03	0	1

Appendix C

Table C3.10 Correlation matrix for the main variables

	FL	CE	PPI	SR	FUI	DR	IS	FA	CB
Financial Literacy (FL)	1								
Consumption Expenditure (CE)	0.117	1							
Poverty Probability Index (PPI)	-0.17	-0.25	1						
Saving Ratio (SR)	0.027	0.039	-0.051	1					
Financial services usage Index (FUI)	0.104	0.174	-0.293	0.134	1				
Debt Ratio (DR)	-0.023	0.028	-0.006	0.172	0.04	1			
Intention to Save (IS)	0.11	0.165	-0.142	0.181	0.248	0.022	1		
Finance Activity (FA)	0.135	0.263	-0.351	0.145	0.479	0.014	0.267	1	
Cross Borrowing (CB)	0.012	0.024	-0.056	0.101	0.198	0.206	0.124	0.102	1

Appendix D

The construction of financial services usage index

Table D3.11 Correlation between financial services usage questions

Variable	Bank account	Other formal f. institution account	Indirect account
Bank account	1		
Other financial institution account	0.073	1	
Indirect account	-0.145	0.053	1

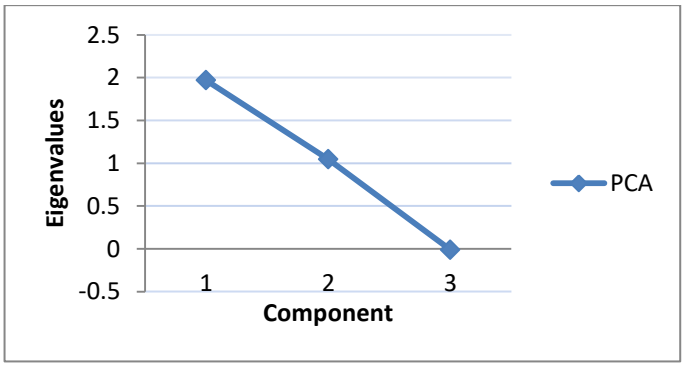
Table D3.12 Polychoric Principal Component Analysis

Component	Eigenvalues	Proportion explained	Cum. explained
1	1.967	0.655	0.655
2	1.045	0.348	1.004
3	-0.012	-0.004	1

Table D3.13 Scoring coefficient for Polychoric PCA

Variable	Coeff. 1	Coeff. 2	Coeff. 3
Bank account	0.954	0.190	0.933
Other financial institution account	0.013	1.635	-0.347
Indirect account	-1.351	0.291	1.321

Table D3.14. A scree plot graphs the amount of variation explained by each component



Appendix E

Table E3.15. System estimates for the base specification

Variables	Consumption Expenditure	Financial services usage	Saving	Over-indebtedness	Financial literacy
Financial services usage	0.122***		0.041***		
	(0.013)		(0.012)		
Saving	3.602***	-82.584***		1.134***	
	(0.987)	(19.617)		(0.188)	
Over-indebtedness	-9.433***		-1.641*		
	(1.418)		(0.860)		
Financial literacy		49.336**	5.187***	-1.623***	
		(19.247)	(0.789)	(0.173)	
Male		6.116***	-0.005	-0.077***	0.052***
		(1.708)	(0.038)	(0.021)	(0.017)
Single		-20.903***	0.307**	0.105***	-0.149***
		(3.226)	(0.123)	(0.037)	(0.049)
Family size		-2.540***	-0.043***	0.012*	-0.005
		(0.659)	(0.016)	(0.007)	(0.005)
Age		0.047	0.009***	-0.003***	-0.003***
		(0.069)	(0.002)	(0.001)	(0.001)
Education		3.227***	-0.224***	0.006	0.058***
		(0.477)	(0.054)	(0.007)	(0.012)
Income-earning members		7.568***	0.097***	-0.050***	0.030**
		(1.734)	(0.033)	(0.018)	(0.012)
Occupation		2.409	-0.515***	0.104***	0.070**
		(2.074)	(0.112)	(0.025)	(0.032)
Urban		7.228***	-0.277***	-0.014	0.107***
		(1.706)	(0.079)	(0.023)	(0.021)
Financial shock		27.372***	0.661***	-0.303***	
		(7.238)	(0.124)	(0.062)	
Homeowner		-1.900	-0.154***	0.064***	
		(1.393)	(0.031)	(0.020)	
Bank branch density		-0.494***	-0.005		
		(0.136)	(0.003)		
Loans availability				-0.161**	
				(0.068)	
Government transfer		7.142**	0.634***		
		(2.880)	(0.183)		
Financial worker's ratio					0.001***
					(0.000)
University student's ratio					-3.586***
					(0.833)
Distance					0.084**
					(0.033)
Regional dummy	Yes	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Financial services usage reflects an index ranged from 0-100 which calculated based on the three questions capturing the ownership of a bank account, account on behalf of another person, as well as the ownership of financial account. Saving refers to saving ratio while over-indebtedness indicates debt ratio.

Table E3.16 Test of order condition

	Variables	Equations				
		(1)	(2)	(3)	(4)	(5)
		Poverty	Financial services usage	Saving	Over-indebtedness	Financial literacy
Endogenous variable	Poverty					
	Financial services usage	δ_1^1			δ_1^4	
	Saving	δ_2^1	δ_1^2		δ_2^4	
	Over-indebtedness	δ_3^1		δ_1^3		
	Financial literacy		δ_2^2	δ_2^3	δ_3^4	
Exogenous variable	Male		γ_1^2	γ_1^3	γ_1^4	γ_1^5
	Single		γ_2^2	γ_2^3	γ_2^4	γ_2^5
	Family-size		γ_3^2	γ_3^3	γ_3^4	γ_3^5
	Age		γ_4^2	γ_4^3	γ_4^4	γ_4^5
	Education		γ_5^2	γ_5^3	γ_5^4	γ_5^5
	Inc-earning members		γ_6^2	γ_6^3	γ_6^4	γ_6^5
	Occupation		γ_7^2	γ_7^3	γ_7^4	γ_7^5
	Urban		γ_8^2	γ_8^3	γ_8^4	γ_8^5
	Financial shock		γ_9^2	γ_9^3	γ_9^4	
	Homeownership		γ_{10}^2	γ_{10}^3	γ_{10}^4	
	Bank branch density		γ_{11}^2	γ_{11}^3		
	Loans availability				γ_{11}^4	
	Government transfer		γ_{12}^2	γ_{12}^3		
	Financial worker's ratio					γ_9^5
	University student's ratio					γ_{10}^5
	Distance					γ_{11}^5
	Reginal dummy	γ_1^1	γ_{13}^2	γ_{13}^3	γ_{12}^4	γ_{12}^5
Order condition for identification K-k ≥ m-1 where K=17		17-1 ≥ 3-1	17-13 ≥ 2-1	17-13 ≥ 2-1	17-12 ≥ 3-1	17-12 ≥ 0-1

Table E3.17.Test of order condition: Empirical specification search

	Variables	Equations				
		(1)	(2)	(3)	(4)	(5)
		Poverty	Financial services usage	Saving	Over-indebtedness	Financial literacy
Endogenous variable	Poverty					
	Financial services usage	δ_1^1			δ_1^4	
	Saving	δ_2^1	δ_1^2		δ_2^4	
	Over-indebtedness			δ_1^3		
	Financial literacy		δ_2^2	δ_2^3	δ_3^4	
Exogenous variable	Male		γ_1^2		γ_1^4	γ_1^5
	Single		γ_2^2	γ_1^3	γ_2^4	γ_2^5
	Family-size		γ_3^2	γ_2^3	γ_3^4	
	Age			γ_3^3	γ_4^4	γ_3^5
	Education		γ_4^2	γ_4^3		γ_4^5
	Inc-earning members		γ_5^2	γ_5^3	γ_5^4	γ_5^5
	Occupation			γ_6^3	γ_6^4	γ_6^5
	Urban		γ_6^2	γ_7^3		γ_7^5
	Financial shock		γ_7^2	γ_8^3	γ_7^4	
	Homeownership			γ_9^3	γ_8^4	
	Bank branch density		γ_8^2			
	Loans availability				γ_9^4	
	Government transfer		γ_9^2	γ_{10}^3		
	Financial worker's ratio					γ_8^5
	University student's ratio					γ_9^5
	Distance					γ_{10}^5
	Reginal dummy	γ_1^1		γ_{11}^3	γ_{10}^4	γ_{11}^5
Order condition for identification K-k ≥ m-1 where K=17		17-1 ≥ 3-1	17-9 ≥ 2-1	17-11 ≥ 2-1	17-10 ≥ 3-1	17-11 ≥ 3-1

Appendix F

Table F3.18. System estimates: Empirical specification search

Variables	Consumption expenditure	Financial services usage	Saving	Over-indebtedness	Financial literacy
Financial services usage	0.116***		0.034***		
	(0.012)		(0.007)		
Saving	4.268***	-98.184***		1.136***	
	(0.921)	(23.487)		(0.131)	
Over-indebtedness	-9.740***		-0.538		
	(1.426)		(0.437)		
Financial literacy		58.187***	3.927***	-1.445***	
		(18.887)	(0.433)	(0.121)	
Male		7.021***	0.252***		0.044***
		(2.463)	(0.079)		(0.014)
Single		-23.309***	-0.019*	-0.067***	-0.117***
		(4.356)	(0.010)	(0.016)	(0.041)
Family size		-2.512***	0.007***	0.105***	-0.003***
		(0.888)	(0.001)	(0.028)	(0.000)
Age		3.374***	-0.164***	0.012**	0.048***
		(0.720)	(0.033)	(0.006)	(0.010)
Education		8.515***	0.055***	-0.003***	0.024***
		(2.222)	(0.021)	(0.001)	(0.009)
Income-earning members		8.699***	-0.428***	-0.048***	0.048*
		(2.701)	(0.068)	(0.015)	(0.027)
Occupation			-0.225***	0.090***	0.093***
			(0.050)	(0.023)	(0.019)
Urban					
Financial shock		32.426***	0.490***	-0.285***	
		(8.764)	(0.073)	(0.052)	
Homeownership			-0.119***	0.061***	
			(0.026)	(0.019)	
Bank branch density		-0.503***	0.383***		
		(0.145)	(0.098)		
Loans availability				-0.106***	
				(0.026)	
Government transfer		5.168			
		(5.334)			
Financial worker's ratio					0.001***
					(0.000)
University student's ratio					-4.299***
					(0.751)
Distance					0.048*
					(0.027)
Regional dummy	Yes	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Financial services usage reflects an index ranged from 0-100 which calculated based on the three questions capturing the ownership of a bank account, account on behalf of another person, as well as the ownership of financial account. Saving refers to saving ratio while over-indebtedness indicates debt ratio.

Appendix G

Table G3.19. System estimates: Excluding education

Variables	Consumption expenditure	Financial services usage	Saving	Over-indebtedness	Financial literacy
Financial services usage	0.131***		0.000		
	(0.014)		(0.004)		
Saving	3.688***	-128.000***		0.978***	
	(1.018)	(40.775)		(0.213)	
Over-indebtedness	-9.840***		0.136		
	(1.478)		(0.282)		
Financial literacy		110.287***	2.238***	-1.807***	
		(33.991)	(0.361)	(0.180)	
Male		8.812**	0.053*	-0.061***	0.039**
		(3.516)	(0.028)	(0.023)	(0.016)
Single		-24.758***	-0.106**	0.080**	-0.082**
		(6.432)	(0.052)	(0.039)	(0.039)
Family size		-3.667***	-0.026***	0.009	-0.006
		(1.297)	(0.010)	(0.008)	(0.005)
Age		0.059	0.006***	-0.005***	-0.005***
		(0.148)	(0.002)	(0.001)	(0.001)
Income-earning members		11.430***	0.068***	-0.034*	0.037***
		(3.616)	(0.018)	(0.021)	(0.013)
Occupation		2.700	-0.177**	0.134***	0.107***
		(3.973)	(0.079)	(0.029)	(0.040)
Urban		11.659***	-0.076	0.036	0.144***
		(4.466)	(0.066)	(0.035)	(0.029)
Financial shock		42.777***	0.385***	-0.272***	
		(14.381)	(0.066)	(0.067)	
Homeownership		-4.094	-0.062**	0.058***	
		(2.880)	(0.028)	(0.022)	
Bank branch density		-0.720***	-0.003*		
		(0.250)	(0.002)		
Loans availability				0.005	
				(0.025)	
Government transfer		10.185*	0.216**		
		(5.206)	(0.087)		
Financial worker's ratio					0.001***
					(0.000)
University student's ratio					-3.432***
					(0.849)
Distance					0.075**
					(0.038)
Regional dummy	Yes	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Financial services usage reflects an index ranged from 0-100 which calculated based on the three questions capturing the ownership of a bank account, account on behalf of another person, as well as the ownership of financial account. Saving refers to saving ratio while over-indebtedness indicates debt ratio.

Appendix H

Table H3.20. System estimates: Sensitivity to channel measure

Variables	Consumption expenditure	Financial services usage	Saving	Over-indebtedness	Financial literacy
Finance activity	0.592***		-0.002		
	(0.092)		(0.286)		
Intention to save	2.307***	-1.126		0.635***	
	(0.368)	(0.940)		(0.238)	
Cross-borrowing	-0.709		1.285***		
	(0.871)		(0.496)		
Financial literacy		3.824	5.743***	-3.169***	
		(3.135)	(0.841)	(0.824)	
Male		0.104	0.049	0.006	0.007
		(0.108)	(0.059)	(0.033)	(0.017)
Single		-1.116***	0.012	-0.080	-0.073
		(0.218)	(0.289)	(0.062)	(0.053)
Family size		-0.083**	-0.008	0.017	0.002
		(0.037)	(0.029)	(0.011)	(0.006)
Age		0.017*	0.014***	-0.008***	-0.003***
		(0.009)	(0.003)	(0.003)	(0.001)
Education		0.495***	-0.069	0.033***	0.030
		(0.035)	(0.156)	(0.010)	(0.024)
Income-earning members		0.171	0.024	-0.032	0.007
		(0.122)	(0.049)	(0.033)	(0.013)
Occupation		1.253***	-0.279	0.175***	0.078
		(0.155)	(0.425)	(0.047)	(0.098)
Urban		0.722***	-0.052	0.023	0.057**
		(0.182)	(0.205)	(0.049)	(0.024)
Financial shock		0.286	0.130	-0.056	
		(0.282)	(0.101)	(0.072)	
Homeownership		0.448**	0.050	-0.067	
		(0.187)	(0.128)	(0.051)	
Bank branch density		0.007	-0.001		
		(0.006)	(0.004)		
Loans availability				0.212	
				(0.155)	
Government transfer		-0.246	-0.115		
		(0.269)	(0.151)		
Financial worker's ratio					0.000
					(0.000)
University student's ratio					-1.064
					(1.988)
Distance					0.058
					(0.054)
Regional dummy	Yes	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Finance activity is the total number of individuals uses financial services. Intention to save reflects the total number of individuals depositing money. Cross-borrowing is the number of simultaneous loans from different financial institutions.

Appendix I

Table I3.21. System estimates: Sensitivity to poverty measure

Variables	PPI	Financial services usage	Saving	Over-indebtedness	Financial literacy
Financial services usage	-0.675***		0.004		
	(0.033)		(0.011)		
Saving	-5.555**	-55.798***		0.658***	
	(2.484)	(17.153)		(0.228)	
Over-indebtedness	22.242***		-0.115		
	(4.115)		(0.765)		
Financial literacy		24.184	2.381***	-0.713***	
		(18.092)	(0.699)	(0.220)	
Male		3.320**	-0.015	-0.013	0.060***
		(1.600)	(0.039)	(0.027)	(0.020)
Single		-15.850***	0.026	0.012	-0.232**
		(2.950)	(0.114)	(0.046)	(0.093)
Family size		-5.634***	-0.229***	0.091***	-0.062
		(0.602)	(0.016)	(0.009)	(0.039)
Age		-0.027	0.002	-0.001	-0.004***
		(0.068)	(0.002)	(0.001)	(0.001)
Education		3.472***	-0.036	-0.011	0.085***
		(0.467)	(0.048)	(0.009)	(0.027)
Income-earning members		6.158***	0.113***	-0.027	0.061**
		(1.550)	(0.031)	(0.023)	(0.028)
Occupation		1.252	-0.317***	0.131***	0.076**
		(1.982)	(0.103)	(0.031)	(0.038)
Urban		8.286***	0.055	-0.055*	0.174***
		(1.654)	(0.074)	(0.029)	(0.058)
Financial shock		13.989**	0.203*	-0.047	
		(6.305)	(0.111)	(0.079)	
Homeownership		-1.414	-0.116***	0.068***	
		(1.205)	(0.032)	(0.026)	
Bank branch density		-0.375***	-0.005*		
		(0.127)	(0.003)		
Loans availability				-0.147**	
				(0.068)	
Government transfer		5.817**	0.311*		
		(2.837)	(0.161)		
Financial worker's ratio					0.001***
					(0.000)
University student's ratio					-4.076***
					(0.877)
Distance					0.073**
					(0.034)
Regional dummy	Yes	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Financial services usage reflects an index ranged from 0-100 which calculated based on the three questions capturing the ownership of a bank account, account on behalf of another person, as well as the ownership of financial account. Saving refers to saving ratio while over-indebtedness indicates debt ratio.

Table I3.22. System estimates: Sensitivity to poverty measure

Variables	PPI	Financial services usage	Saving	Over-indebtedness	Financial literacy
Finance activity	-4.812***		-0.022		
	(0.262)		(0.248)		
Intention to save	-1.777*	-3.302***		0.572**	
	(1.056)	(0.722)		(0.236)	
Cross-borrowing	20.209***		1.300***		
	(2.462)		(0.420)		
Financial literacy		8.621***	3.792***	-2.291***	
		(2.402)	(0.854)	(0.808)	
Male		-0.181**	-0.076	0.042	0.020
		(0.089)	(0.068)	(0.033)	(0.014)
Single		-1.976***	-0.142	-0.012	-0.055
		(0.183)	(0.257)	(0.062)	(0.041)
Family size		-0.564***	-0.207***	0.102***	0.030**
		(0.030)	(0.029)	(0.011)	(0.014)
Age		0.022***	0.007**	-0.005*	-0.002**
		(0.007)	(0.003)	(0.002)	(0.001)
Education		0.574***	-0.008	0.016	0.032*
		(0.032)	(0.136)	(0.010)	(0.018)
Income-earning members		0.558***	0.125**	-0.063*	-0.013
		(0.095)	(0.050)	(0.033)	(0.013)
Occupation		0.664***	-0.359	0.222***	0.135*
		(0.131)	(0.374)	(0.047)	(0.073)
Urban		1.511***	0.203	-0.070	0.019
		(0.147)	(0.184)	(0.050)	(0.028)
Financial shock		0.249	-0.052	0.023	
		(0.225)	(0.117)	(0.078)	
Homeownership		0.862***	0.112	-0.058	
		(0.152)	(0.118)	(0.051)	
Bank branch density		0.002	-0.002		
		(0.006)	(0.005)		
Loans availability				0.110	
				(0.131)	
Government transfer		0.508**	0.071		
		(0.238)	(0.153)		
Financial worker's ratio					0.000
					(0.000)
University student's ratio					-0.733
					(1.276)
Distance					0.012
					(0.039)
Regional dummy	Yes	Yes	Yes	Yes	Yes
Observations	6000	6000	6000	6000	6000

Notes: Standard errors in parentheses, p < 0.1:* p < 0.05:** p < 0.01:***. Finance activity is the total number of individuals uses financial services. Intention to save reflects the total number of individuals depositing money. Cross-borrowing is the number of simultaneous loans from different financial institutions.

ESSAY THREE

CHAPTER FOUR

MONEY ATTITUDE, FINANCIAL LITERACY AND POVERTY

"Never Spend Your Money Before You Have It."
Thomas Jefferson (1822)

4.1. Introduction

A considerable amount of literature has studied the potential impact of financial literacy, *a person's understanding of financial concepts*, on poverty reduction (Engelbrecht, 2014, Jacob et al., 2000, Bell and Lerman, 2005, Behrman et al., 2012, Van Rooij et al., 2012). The empirical evidence appears to support the assumption that people with different levels of financial literacy may behave differently with respect to financial practices, which in turn may help them avoid financial problems. Financial literacy is found to help prevent a wide variety of financial difficulties, such as overindebtedness (e.g., French and McKillop, 2016, Gathergood, 2012, Disney and Gathergood, 2013), food insecurity (Millimet et al., 2018, Carman and Zamarro, 2016), and money shortage, corresponding to its role in increasing individual savings (e.g., Babiarz and Robb, 2014, Beckmann, 2013a, Jappelli and Padula, 2013).

It is likely, therefore, that financial literacy improves the ability to anticipate financial difficulties and thereby reduce poverty. However, it is more challenging to know to what extent this effect is related to people's attitude towards money. In real life, financial decisions are a complex process. They do not depend only on the ability to understand financial matters; people also need good judgment and healthy attitudes towards money. In other words, even though some individuals may have sufficient knowledge of finance, they may nevertheless struggle to make

appropriate financial decisions. Therefore, in addition to financial literacy, money attitude may also be a crucial influence on our daily financial decisions.

Indeed, money attitude has attracted the attention of many scholars in the field of consumer behaviour (e.g., Khare, 2016, Durvasula and Lysonski, 2010, Lea et al., 1995). However, few studies have been able to draw on any systematic research about whether and how attitudes toward money are associated with poverty. Therefore, it is crucial to seek a comprehensive understanding of the relationship between money attitude and poverty. More importantly, an empirical study of this issue could provide a theoretical background for financial education initiatives that will help policymakers accelerate poverty alleviation.

The study offers some important contribution to literature. First, this essay deals with two central issues: the impacts of money attitude on poverty, and the joint effects of money attitude and financial literacy on poverty. Thus, in addition to examining the direct effect of money attitude on poverty, this study also tests whether the effect of money attitude is conditional upon the level of financial literacy. By doing so, this essay provides an exciting opportunity to advance our knowledge of the complex relationship between money attitude, financial literacy, and poverty.

Second, to explore the interlink, this study employs a logistic regression model, in which the individual and interactive effects of money attitude and financial literacy on the risk of financial struggle are evaluated. In this essay, an attempt is also made to provide a sensitivity analysis using the average treatment effect estimation to address the potential endogeneity issue. A handful of existing studies have looked at the correlation between money attitude and financial struggle, but failed to address the potential endogeneity bias (e.g., Von Stumm et al., 2013, Lim et al., 2003, Dowling et al., 2009b, Loibl et al., 2017, Gundersen and Garasky, 2012).

Several money attitude dimensions that have been verified as determinants of poverty are considered in this essay. These include compulsive spending (Moav and Neeman, 2012, Tatzel, 2014), self-efficacy (Farrell et al., 2016, Lim et al.,

2014), and budget plan (Ogori and Adebayo, 2013, Tang, 1992, Collins et al., 2010). The effect of these attitudes toward money on economic outcomes have been studied, measured and investigated from a variety of perspectives (e.g., Bauer and Mitev, 2012, Von Stumm et al., 2013, Lim et al., 2003, Dowling et al., 2009a, Gundersen and Garasky, 2012, Loibl et al., 2017, Moav and Neeman, 2012). In order to analyse the impact of money attitude on poverty, a variety of financial struggle indicators are included in the model specifications as dependent variables. Although poverty and financial struggles are distinct conditions, they are strongly correlated on an intuitive level in the sense that financial struggles may affect an individual's income-generating ability and level of poverty.

The rest of the chapter is organised as follows. A review of the literature explaining the concepts of money attitude and the link between money attitude and poverty is discussed in section 4.2. This is followed by the methodology and the data in section 4.3. The results of the empirical exercise are presented and discussed in section 4.4. Finally, the chapter's summary and conclusions are presented in section 4.5.

4.2.Literature Review

This part of the study is divided into two main sections. The first section reviews the relevant theoretical background regarding money attitude. A brief explanation of the definition of money attitude is provided, followed by a review of the relationship between money attitude and poverty, in order to help conceptualise the impact of money attitude on poverty. The second section presents a summary of the empirical literature.

4.2.1. Theoretical literature

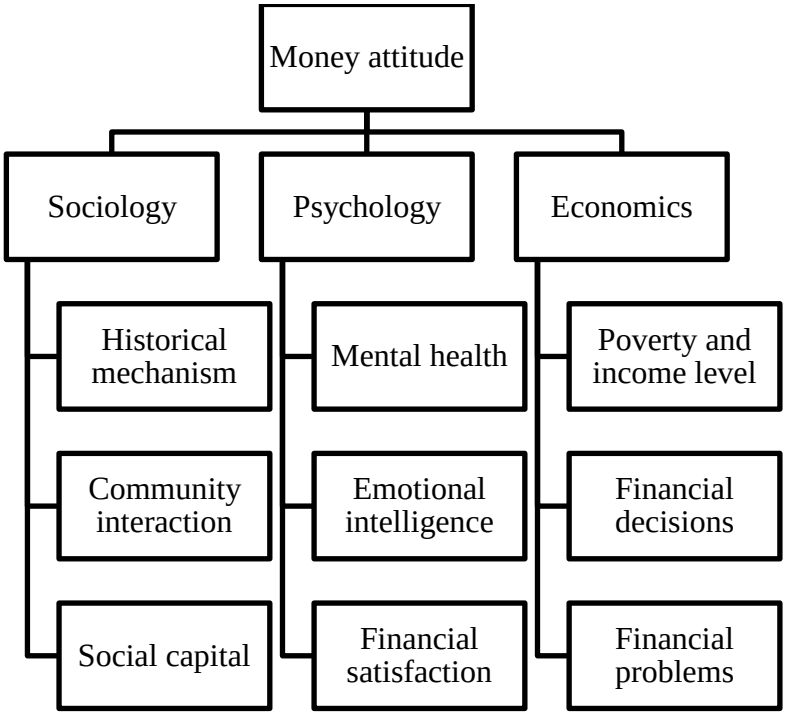
4.2.1.1. Definition of concepts

A number of terms have been used to describe people's basic perceptions concerning money, including *money management, financial management, financial attitude, financial behaviour*, and/or *money belief* (see Hira, 1997, Matul, 2009, Sayinzoga et al., 2016, Rodrigues et al., 2016, Finn et al., 1994, Bowen et al., 1997). However, money attitude is the term most widely used to capture a set of behaviour and decisions that vary depending on individual needs, personality, and priorities (see Argyle and Furnham, 2013, Carruthers, 2010, Tang, 1992, Simmel, 2004, Furnham, 1984).

Money attitude is a complex and multidimensional concept. As summarised in Figure 4.1, there are three primary domains of social science that examine the individual's attitude towards money: sociology, psychology, and economics. Sociologists usually describe money attitude as the effect of an extended historical mechanism and interactions within the community (Carruthers and Ariovich, 2010, Tatarko and Schmidt, 2012), gender (Prince, 1993) and socio-demographic factors (Simkiv, 2013). In this regard, there is a reciprocity affiliation between attitude towards money and society, because humans construct their social identity in part through social activities and community networks. In communities, money attitude might depend on the degree of trust, tolerance, culture, and social capital. For instance, societies with strong social capital and high levels of trust are more likely to participate in informal financial institutions and less likely to invest in the stock market or use other formal financial services (Tatarko and Schmidt, 2012, Knack and Keefer, 1997)[11].

[11] Several studies have pointed out that historical and social aspects are determinative with respect to money attitude (see Zelizer, 1997; Healy and Cote, 2001; Carruthers, 2010). Healy and Cote (2001), for instance, analyse the pattern of money attitude among migrant populations and conclude that an individual's money attitude is strongly related to social circumstances where they come from rather than the socioeconomic situation in which they live.

Figure 4.1. Literature Diagram



Source: Author

From a psychological perspective, money is often assumed to play a vital role as a determinant of behaviour that is related to emotional intelligence (Engelberg and Sjöberg, 2006, Shafir and Mullainathan, 2013, Furnham, 1984), materialism (Durvasula and Lysonski, 2010, Khare, 2014), and financial satisfaction (Hanley and Wilhelm, 1992, Wilhelm et al., 1993). Furnham (1984), for example, describes money attitude as a way of control and reflect to a personal reliance on money which causes continuing concern about money. Along this line, Engelberg and Sjöberg (2006), argue that the purpose of money not only reflects the utilitarian community but also acts as an emotional indicator of worth. Therefore, some people hold the belief that money is a symbol of happiness and may think harder about using money to gain wealth and power. Meanwhile, other individuals have a pragmatic mindset about money, considering it merely an economic instrument, and do not worry too much about it (see Gąsiorowska and Hełka, 2012).

Finally, money attitude has been explained by economists as linked to economic features such as income level (Li-Ping Tang et al., 2004), financial planning (Gambetti and Giusberti, 2012, Masuo et al., 2004, Vitell et al., 2007), poverty (Arawiran-Ramirez, 2011) and financial problems (Dowling et al., 2009a, Von Stumm et al., 2013, Matul, 2009, Bauer and Mitev, 2012, Lim et al., 2003). Simmel (2004), for instance, defines money attitude as a way of thinking about money that may affect a person's financial decisions. In the same vein, Shih and Ke (2014) argue that money attitude plays a crucial role in determining an individual's financial decisions, such as whether a person decides to make long-term, high-risk financial choices, or short term, low-risk ones.

It is not possible, however, to distil money attitude into general propositions and theories. As pointed out by Argyle and Furnham (2013), even though economists and psychologists have the same aims in trying to identify and to analyse the way in which money is used, there are substantial differences between economic and psychological perspectives in interpreting individuals' attitude towards money. Economists and sociologists are concerned with explaining how communities, groups, or countries use, save, invest, and spend their money under certain circumstances. From this perspective, money attitude appears to play an essential role in people's financial choices. Having healthy money attitudes will cause people to make better financial decisions, and unhealthy attitudes toward money will result in poor financial management and economic problems. Also, economists have tried to explain money attitude as the rational decisions resulting from financial knowledge and individual understanding.

On the other hand, psychologists have attempted to investigate why and how various groups of individuals with different beliefs spend and use money in different ways, and to describe the reasons that lead to such differences. These scholars consider that anyone can be illogical and self-centred. Hence, nearly all psychologists identify individuals' attitudes towards money using experimental games that permit analysis of the perspectives of individuals or small groups, while economists derive their findings from survey datasets or questionnaire analysis, and

mostly prefer to build models of financial behaviour based on large numbers of respondents.

To draw a clear distinction between the different varieties of money attitude studies, this research will not describe money attitude using emotional factors, mental issues, morality, or psychoanalytics. It will instead examine money attitude as an economic indicator. Following Shockey and Seiling (2004), this study defines money attitude as a set of economic choices and behaviours that differ depending on personal or family needs, capacities, and preferences. Therefore, the research framework is organised to make clear linkages to show how money attitude affects financial struggles, as has been done in past studies such as Von Stumm et al. (2013), Norvilitis et al. (2006), Dowling et al. (2009a), Bauer and Mitev (2012), Lim et al. (2003), Gundersen and Garasky (2012), Loibl et al. (2017), and Moav and Neeman (2012). Some related theories are taken on board to develop instruments through an examination of survey datasets rather than laboratory research.

4.2.1.2. Money attitude and poverty

Generally, money attitude has a significant impact on poverty in that it explains how individuals think about their money and how they react to it. Two important factors influence the extent to which money attitude affects poverty. First, individuals' attitudes regarding spending money significantly predict their savings, debt level and wealth in general (Henchoz et al., 2019, Von Stumm et al., 2013, Moav and Neeman, 2012). Second, scholars maintain that the propensity to do long-term money planning is strongly associated with better economic outcomes (Ameriks et al., 2003, Lynch Jr et al., 2009). A number of money attitude dimensions have been proposed as determinants of poverty in the literature. Nevertheless, this essay identifies three primary attitudes towards money that can affect poverty status. The details of these money attitude dimensions are summarised in the following sub-section.

Compulsive spending

Compulsive spending is a failure of self-control, indicative of thoughtless, excessive spending decisions (Zhang et al., 2017). Black et al. (2001) argue that the greater an individual's level of compulsiveness is, the more of their available income they may spend. A compulsive spender is likely to buy unnecessary things they cannot afford. This type of individual may choose to spend rather than to save (see Watson, 2003, Lunt and Livingstone, 1991, Spinella et al., 2014, Roberts and Sepulveda M, 1999, Williams and Grisham, 2012). In time, this kind of money attitude leads to negative economic consequences. According to Tatzel (2014), attitudes like compulsive spending can increase the probability of having financial trouble. For instance, compulsive spending is associated with greater loan dependence (Bauer and Mitev, 2012), large debts, as well as failure to repay loans (Watson, 2009, Omar et al., 2014).

A further explanation is given by Sen (2014), who maintains that poverty is not merely about a lack of income but also a matter of being deprived of basic abilities. Indeed, while a lack of income may be the main reason for such deprivation, it is not the only factor in determining abilities. These factors may be socioeconomic, including age, gender, regional factors, or family size, or otherwise, such as the ability to control spending. This view is supported by Matul (2009), who maintains that the reason the poor do not save is not because they do not have the capacity to do so, but because they do not see the point[12]. In many cases, the poor actually have sufficient financial capital to deal with unexpected events, but they are not able to utilise them. Many low-income families are not afraid of future uncertainty, and they are therefore more likely not to be ready for an emergency, since they spend money far beyond what is necessary. Thus, their choice to save less can increase the probability of having financial struggles due to a shortage of funds. To

[12] The author finds that approximately 48 per cent of low-income people in the research believe that saving is only for the rich, and 25 per cent do not save because they do not want to wait to reap the benefits of their savings.

some extent, financial decisions are not aggravated by limited resources, but rather by a particular perspective on money.

By drawing on the concept of compulsive spending, Moav and Neeman (2012) have been able to develop a model to explain the puzzling attitude of low-income people who seem to have the capacity to increase their financial well-being, but instead spend a considerable portion of their income on unnecessary things that do not help them escape poverty. The authors construct their model based on an individual's spending, showing the equilibrium point where poor individuals who want to climb the social ladder via asset accumulation begin to exhibit conspicuous consumption and feel like a wealthy person. Moav and Neeman (2012) explain the phenomenon as an effort by the poor to break out of their poverty status. Nevertheless, this attitude towards money eats up a large portion of their income, and because they spend more and save less in the long run, they may ultimately fall back below the poverty line.

This view is supported by Banerjee and Duflo (2007), and Rao (2001) who show that many poor people, especially in developing countries, spend a large fraction of their income on unproductive activities such as festivals. This attitude towards money is perplexing, since many of them spend a smaller share on education, eat less, and report having a medical illness. They also fail to take revenue from income-generating activities, save less, and choose to cut spending on food when faced with financial shock (Banerjee and Duflo, 2007).

Self-efficacy

In general, self-efficacy represents an individual's sense that they are able to complete goals and tasks, and find better solutions to their problems (see Bandura, 1994, Gecas, 1989). In the context of finance, self-efficacy is understood to be an individual's belief in his or her own abilities to achieve a financial objective (Lim et al., 2003). It is considered to be independent of financial literacy notions (Danes and Haberman, 2007). People can be financially literate, with a good understanding of financial concepts, and still have insufficient self-efficacy to make substantial

efforts to exploit their knowledge. For example, an individual may have high levels of financial literacy, but if they lack the self-confidence to spend less and to set aside savings, individual knowledge of finance may have little impact on their financial outcomes (see Tharp, 2018).

Theoretical and empirical studies indicate a positive correlation between self-efficacy and economic outcomes. People with higher levels of self-efficacy are predicted to find solutions when financial problems occur and feel confident that they can handle their finances and sort the problem out. They are likely to frame their financial problem as a challenge instead of a threat. They feel more in control of money and financial activities, and will likely take practical steps to solve the problem (see Bandura, 1994). This kind of confidence in the ability to work out money calculations is crucial to encouraging people to use formal financial products (Mindra and Moya, 2016). As explained by Mewse et al. (2010), individuals with high levels of self-efficacy are more likely to work collaboratively with creditors, helping them get out of debt. This view is supported by Tokunaga (1993), Farrell et al. (2016) and Engelberg (2007), who argue that self-efficacy is crucial in determining the risk of over-indebtedness. Individuals with lower financial self-efficacy – that is, those with a lack of self-belief in managing their financial lives – tend to avoid long-term financial objectives such as saving and investments, and prefer to engage with debt-related products.

A broader perspective has been adopted by Gundersen and Garasky (2012), who argue that individuals with a high level of confidence in their ability to manage their daily financial lives are less likely to experience food insecurity. Their lack of self-confidence in managing money may result in a failure to optimise food consumption with respect to income and prices. The authors also highlight that a practical skill such as performing pricing strategies may help people to increase their emergency fund, particularly while facing financial shock. The inability to anticipate financial shock, however, appears to be a primary determinant of food insecurity.

Budgeting

Past studies indicate that attitudes towards money, including behaviours such as developing a budget strategy and putting a solid budget plan into action, help people to avoid financial struggle (Von Stumm et al., 2013, Tang, 1995, Millimet et al., 2018). For this reason, a budget plan is related to at least two essential life skills: managing risk and building large sums of money (see Collins et al., 2009). With respect to risk, budgeting allows people to administer their spending, especially during times when cash is limited. It helps people avoid running out of cash before their next payday. A budget plan also allows people to make a spending plan. With a budget plan, people have a chance to steer clear of issues before they happen, for example, by avoiding spending money on unnecessary things when the budget has run out. Financial shocks such as crop failure, job loss, and unexpected medical expenses can be managed earlier in a variety of ways, such as by borrowing money from a financial institution, family or money lender, or by selling unproductive assets.

When it comes to the role of the budget plan as a step to building assets, further explanation is given by Rutherford (2000) and Ogori and Adebayo (2013). They argue that making an investment plan and accumulating ample savings requires a balance of expenditure. A budget plan is designed mainly to control financial activities from day to day, making sure that the money goes to meet basic daily needs. For the poor, whose income is relatively unstable, making a budget plan could have a significant impact on their daily lives. Once the budget plan successfully yields large enough cash savings, the poor can purchase vital assets and create business opportunities. In a more specific example, a large fraction of the poor in many developing countries are farmers who are reliant on their crops. During harvest season, the farmers experience an increase in income (see Sibhatu and Qaim, 2017). A budget plan can help them to plan their expenses for subsequent months when they are not making enough income. A household with a budget plan will seek to cover immediate expenses first, while continuing to supplement their income with small business, temporary jobs, or remittances from working family members. These strategies often emerge when they make a regular

budget plan. Millimet et al. (2018) and Dominick et al. (2018) even maintain that a tendency to make a regular budget plan and keep that budget on track significantly reduces the risk of becoming food insecure. The likelihood of being food insecure is lowered by performing a set of daily financial activities. These include reviewing income prior to making large purchases, setting financial goals, and tracking budget and spending.

In view of everything mentioned above, it is clear that there is a substantial correlation between money attitude and poverty, suggesting the necessity of both appropriate attitudes toward money as well as the skill to manage it on a daily basis. When people manage their money effectively, they have a greater chance of avoiding financial problems and escaping poverty. The most important money attitude factors affecting the risk of experiencing financial struggles are compulsive spending, self-efficacy, and budget planning.

4.2.2. Empirical literature

Numerous studies estimate the correlation between money attitude and poverty. The central argument is that money attitude generates a substantial effect on the risk of financial struggles and can affect the results of overall welfare. An important study in this context, by Von Stumm et al. (2013), investigated whether knowledge of finance together with money attitude are significantly correlated with the likelihood of suffering financial troubles. The authors found that financially literate individuals would be likely to be able to avoid adverse financial events such as: i) bankruptcy, ii) missed payments, iii) denial of credit, iv) an unexpected overdrafts, and v) house repossession. In addition, some practical financial activities such as: a) keeping track of a budget plan, b) planning ahead and c) staying informed have considerable roles in avoiding financial troubles. Atkinson et al. (2007) and Leite and Silva (2015) have also suggested that money attitudes are independently associated with socioeconomic status such as education and

economic welfare, while financial literacy is strongly connected with an individual's socio-economic background.

Along the same line, Bauer and Mitev (2012) examined the impact of money attitude on the risk of financial troubles using 1000 individuals' datasets of respondents in Hungary. The study notes that compulsive spending, as a measure of money attitude, is related to: a) high levels of debt, b) an increased dependency on loans and c) a greater chance of getting into financial difficulties. A caveat to the findings is that the magnitude effect of compulsive spending on a financial struggles can be reduced depending entirely on the person's financial situation, especially whether they are actually able to buy compulsively.

Furthermore, Lim et al. (2003) extended the existing money attitude-financial struggle literature by examining the correlation between money attitude, sex, and financial struggles via a logistic regression analysis. Their results indicate that individuals who experience financial troubles are more likely to see money as a source of power, and they are also less likely to budget their money than those who are financially untroubled. The authors also note that women care more about the budgeting process and how money will be spent, while men generally are likely to see money as a symbol of power and tend to spend that money on 'unnecessary' things. A parallel analysis was undertaken by Lea et al. (1995), who examined how money attitude affects the likelihood of experiencing over-indebtedness. Their findings are as follows: i) the authors emphasise that some people seem to cope better than others with financial problems; ii) there is evidence that high levels of debt are caused by dysfunctional economic behaviour. Several attitudes towards money, such as the absence of a budget plan and buying unnecessary often expensive goods determine the prevalence of a person getting themselves into a state of 'over-indebtedness'. In this regard, budgeting or a lack thereof appears to be the most important determining influence when compared to other economic factors. Lastly, the results showed that non-debtors are more likely to have a bank account than debtors; a situation which can help the former cohort to control their spending behaviour.

A similar conclusion is drawn in an important study by Garðarsdóttir and Dittmar (2012), who examined the money attitude and over-indebtedness relationship by using the structural equation modelling approach. Their results indicate a significant correlation between an individual's money attitude and their amount of debt. Specifically, it is demonstrated that people who create a budget plan, who always keep an eye on cash flow, and who always control their spending are very likely to avoid over-indebtedness. Another critical study in this regard is carried out by Dowling et al. (2009a) who analysed the determinants of financial problems among young male Australian workers. The results support their theoretical findings which were that money attitude factors such as: i) budgeting, ii) cash management and iii) financial planning are the leading causes of individuals experiencing financial troubles. In addition, the authors also provide evidence of the significant impacts of other money attitude factors such as: i) materialism, ii) evaluation and iii) anxiety or worry about financial struggles.

In addition, a recent study by Shih and Ke (2014) provided findings to explicitly model the conceptual relationship between a) financial literacy and b) money attitude with financial outcomes. Various logistic regression models that estimated the probability of taking a high-risk financial investment are constructed. Overall, two main conclusions are drawn. First, money attitudes affect individual financial decisions; several money attitude factors such as achievement-esteem and retention-planning would cause high-risk financial decisions. Second, the authors note that financial literacy also predicts financial decisions where the higher the level of financial knowledge, the greater the propensity to make high-risk financial investments or to take high-risk financial decisions.

Some case studies, including Mewse et al. (2010) focus on the substantial role of the self-efficacy dimension of money attitude. They investigated how debtors performed debt management and why they got themselves into financial debt in the first place. Using logistic regression, the research team conclude that self-efficacy is found to be significantly correlated with effective debt management. A high level of self-efficacy can stimulate people to work collaboratively with creditors; a crucial step towards getting out of debt. Empirical evidence offered by Tokunaga

(1993) is consistent with Mewse et al. (2010), which show that identifying an individual's motivation, desire, and ability to spend money is important when determining that individual's financial stability. Money attitude dimensions such as: i) self-efficacy, ii) sensation-seeking, iii) prestige, as well as iv) risk-taking, are strongly associated with the risk of over-indebtedness.

Recognising the importance of money attitude, some studies incorporate the concepts of money attitude into discussions regarding food insecurity (e.g., Gundersen and Garasky, 2012, Millimet et al., 2018, Loibl et al., 2017). The empirical work by Millimet et al. (2018) used observational data focusing on 1,009 low-income households to investigate whether an individual's attitudes towards money is significantly correlated with the probability of being food insecure. A significant theoretical contribution by Millimet et al. (2018) is to control the issue of endogeneity and to provide robust checking with alternative specifications. Using the binary indicator to capture whether or not the respondents experience food insecurity, the results reveal that money attitude plays a critical part in a person's food insecurity status. There is evidence that creating a budget plan, tracking spending, and reviewing their financial situation helps low-income individuals to anticipate future needs and therefore prevent, or at least limit, their levels of food insecurity. Millimet et al. (2015) are consistent with Loibl et al. (2017) and Gundersen and Garasky (2012) who all found that attitudes towards money, such as: i) spending behaviour, ii) budget planning, iii) levels of frugality and iv) financial literacy all either positively or negatively affect the prevalence of food insecurity.

Having discussed the empirical evidence about money attitude, it is important to note that this present essay differs from the existing empirical works in the following ways: first, most studies have conducted empirical works focusing on developed countries. Perhaps, data availability issues hinder researchers in developing countries from obtaining appropriate measurements of the money attitude indicators. Second, to the best of this author's knowledge, none of the previous studies has estimated the joint influential effects of financial literacy and money attitude on the propensity for experiencing financial struggles (see Table

4.1). Existing studies, such as those from Von Stumm et al. (2013), and Shih and Ke (2014), treat each variable as separate determinants of economic outcomes rather than taking into account their interactions. Lastly, the related empirical studies do not take into account the possible endogeneity problem between money attitude and financial struggles; with the one exception of Millimet et al. (2018).

While more data has become available in recent years, this current study discusses the significance of money attitude from a poverty standpoint. Particularly, this chapter contributes to the existing literature by examining possible links between money attitude and poverty based on a sample of 6060 individuals in a developing country context. In this essay, logistic regression is used to provide a clear picture of the correlation. However, this study also involves alternative specifications by using the average treatment effect estimation based on an inverse-probability weighted regression adjustment (IPWRA) and endogenous treatment effect technique in order to establish whether there is an endogeneity issue. What is more, this research aims to fill the gap in the literature by investigating the interactive effect of financial literacy and money attitude on poverty, instead of concentrating only on their individual impacts (see Figure 4.2). This particular type of examination fosters an understanding of how the effect of money attitude changes or alters as the level of financial literacy changes, thereby providing an original contribution to this growing area of research.

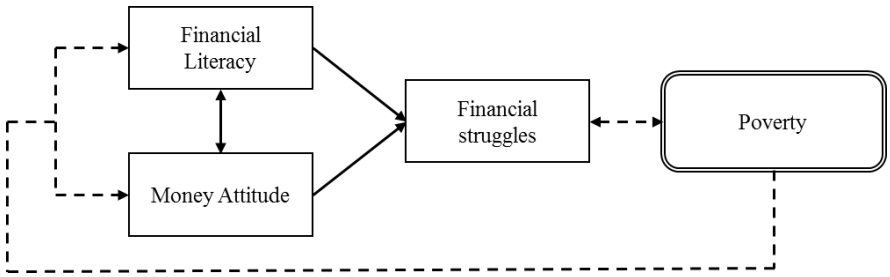
Table 4.1. Empirical evidence on money attitude studies

Research Study	Purpose of the study	Country	Methods used	Key findings
Von Stumm et al. (2013)	To investigate the determinant of experiencing adverse financial events	United Kingdom	Logistic regression	Financial literacy and money attitude are an essential determinant of negative financial experiences
Garðarsdóttir and Dittmar (2012)	To estimate the relationship of money attitude to debt	Iceland	Structural Equation Modelling	A substantial link between money attitude and debt.

Table 4.1. (Continued)

Research Study	Purpose of the study	Country	Methods used	Key findings
Millimet et al. (2018)	To examine the link between financial capability and food security	United States	Regression analysis and IV Probit	Financial capability is a crucial food security determinant
Dowling et al. (2009b)	To evaluate the determinants of financial problems and dissatisfaction	Australia	Multiple regression analysis	Money attitude and financial management are financial problems determinant
Bauer and Mitev (2012)	To examine the effect of money attitude on financial trouble	Hungaria	Structural equation modelling	Compulsive buying affect financial trouble
Shih and Ke (2014)	To examine the determinant of financial decisions	Taiwan	Logistic regression	A significant correlation between money attitude and financial literacy with financial decisions
Gundersen and Garasky (2012)	To investigate the food insecurity determinant	United States	Probit regression	Money attitudes affects food insecurity
Tokunaga (1993)	To investigate the use and abuse of consumer credit	United States	Multivariate Analysis of Variance	A substantial correlation between unsuccessful credit users and lower self- efficacy
Mewse et al. (2010)	To examine factors that can encourage debtors getting out of debt	United Kingdom	Logistic regression	Self-efficacy as a predictor of contact by debtors with creditors
Lim et al. (2003)	To investigate the correlation between money attitude and financial hardship	Singapore	Logistic regression	A significant link between money attitude and financial hardship
Hanley and Wilhelm (1992)	To explore money attitude and self-esteem nexus	United States	Discriminant function analysis	Compulsive spenders use money only to reflect their status and power
Loibl et al. (2017)	To investigate the prevalence of food insecurity	United States	Tobit regression	The propensity to plan for money reduces the chances of children's food insecurity.
Lea et al. (1995)	To examine consumer debt determinant	United Kingdom	Multivariate analysis	Budget plan is a crucial determinant to avoid credit-related problems

Figure 4.2. The relationship of financial literacy, money attitude, financial struggles and poverty



Source: Author

4.3. Methodology and data discussion

This section begins by describing model specifications in the analysis of the money attitude implications. Subsequently, an estimation procedure for investigating the significance of money attitude is presented. Then, the data used in the empirical analysis is provided in the last section.

4.3.1. Model specification

This essay uses cross-sectional survey data to examine the impact of money attitude on financial struggles, as measured by previous studies (e.g., Bauer and Mitev, 2012, Von Stumm et al., 2013, Lim et al., 2003, Dowling et al., 2009a, Gundersen and Garasky, 2012, Loibl et al., 2017). The standard model has the form:

$$FS_i = \beta_0 + \beta_1 MA_{1i} + \beta'_{2i} X_{2i} + \varepsilon_i \quad (4.1)$$

where FS denotes financial struggle status for individual i, MA stands for money attitude, X represents a vector of independent variables, the subscript i reflects individuals and ε is the error term. Specifically, for the baseline model of this study, the above equation can be expressed as:

$$FS_i = \beta_{1j}MA_{ij} + \beta_2 FL_i + \beta_3 GEN_i + \beta_4 MS_i + \beta_5 FAM_i + \beta_6 AGE_i + \beta_7 EDU_i + \beta_8 IEM_i + \beta_9 OC_i + \beta_{10} UR_i + \beta_{11} AI_i + \beta_{12} HH_i + \beta_{13} FS_i + \beta_{14} SN_i + \beta_{15} FC_i + \beta_{16} REG_i + \varepsilon_i \quad (4.2)$$

where the dependent variable is financial struggles (FS), MA is the indicator of money attitude, j = 1, 2, 3 represent the different money attitudes, FL is the indicator of financial literacy, GEN is gender, MS stands for marital status, FAM is family size, AGE indicates age, EDU represents education, IEM is income-earning members; OC stands for occupation, UR reflect urban, AI is additional income, HH reflects head-household, FS represents financial shock; SN is social network, FC denotes financial control, REG is regional dummy, i reflects individuals and ε is the error term.

With respect to model (4.2), the control variables, other than social network, are natural candidates for inclusion in the regression. Social network defined by a dummy variable if respondents can get sufficient funds from the family for emergency purposes, is included in the model as it is thought to be a primary determinant of financial struggles. Along this line, there is a large volume of published studies describing the role of social capital in reducing poverty (e.g., Tabi, 2009, Grootaert, 1999, Islam and Alam, 2018). To further control for unobserved heterogeneity, variables to capture patterns of financial decisions like who controls money is also included in the model. One may argue that people's attitude towards money does not necessarily affect the probability of falling into financial struggle if money is controlled by other people in their households, such as parents, and spouse. Literature indicate that there are potential differences between individual-controlled and join-controlled of finances in terms of spending decisions (see Vogler, 1998, Pahl, 1990).

Furthermore, a number of econometric techniques are used in the existing literature to estimate models like (4.2). Following Von Stumm et al. (2013), Lim et al. (2014) and Shih and Ke (2014), this study uses logistic regression model. To ensure the robustness of the results from the presence of modelling errors and endogeneity

bias, this study also uses the average treatment effect estimation, as suggested by Cattaneo (2010), Wooldridge (2010), Senbet et al. (2017) and Raptou and Papastefanou (2018). These techniques are briefly discussed in the following subsections.

4.3.2. Estimation procedure

4.3.1.1. Logistic regression

The current interest of study is whether an individual suffered financial struggles. Thus, it has the dependent variable that is binary, taking on values of 1 if an individual experienced financial struggles or 0 otherwise. The dependent variable default (y) is computed as

$$Y = \begin{cases} 1, \text{if an individual experienced financial struggle} \\ 0, \text{otherwise} \end{cases} \quad (4.3)$$

Technically, the OLS technique can be employed in this situation. However, the result is not satisfactory as the predicted values of the equation might be lower than 0 or greater than 1, which makes it difficult to justify. In addition, one of the main assumptions under linear regression is the linear correlation between variables, and this assumption is not met when the outcome is binary. Therefore, this study employs logistic regression method which allows us to estimate the models with a binary dependent variable while the explanatory variables can be categorised as either binary or continuous (Cleves and Tossetto, 2001, Pampel, 2000). The logistic regression model has the benefit of being less exaggerated when standard assumptions, especially on the normality of variables, are violated (Hair et al., 2010). It addresses the violation of linear assumption by computing the linear equation in logarithmic terms. Using the maximum likelihood estimation method, the logistic regression model can find the maximum likelihood parameters that are functions of all of the observed outcomes and explanatory variable values.

The functional form of the logistic model adopted can be written as

$$P_i = \frac{1}{1 + e^{-z_i}} \tag{4.4}$$

where P_i is the probability of experiencing financial struggle and

$$Z_i = \beta X + u_i \tag{4.5}$$

Further, the probability that the individuals is not financially struggle can be expressed as

$$1 - P_i = \frac{1}{1 + e^{-z_i}} \tag{4.6}$$

Taking the ratio of equations (4.4) and (4.6), the probability that an individual experiencing financial struggle against the probability that the individual is not financially struggle can be computed as

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \tag{4.7}$$

The expression (on term) $\frac{P_i}{1-P_i}$ is the odds ratio in favour of financial struggle. Then, the functional form of the model can be expressed as

$$L\left(\frac{P_i}{1 - P_i}\right) = Z_i = \beta X_i + u_i \tag{4.8}$$

L is the logit, and the odds ratio is a linear function of variable *X*. A binary logistic regression for the present study can be written as

$$P_i = P(Y_i = 1) = F(\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots \beta_k X_{ki}) \quad (4.9)$$

where P_i stands for the probability of individual *i* to experience financial struggles, F is a cumulative distribution function, $X_{ji}, j = 1, 2, \ldots, k$ is a value of the independent variable X_j for individual *i*, *k* is a number of explanatory variables, β_0 is the intercept and $\beta_j, j = 1, 2, \ldots, k$ reflects the regression coefficient. The beta coefficients (β_0) are computed via the maximum-likelihood method.

In the logistic model, the exponential function of the regression coefficient of each independent variable can be estimated as the odds ratio or the opportunity of the occasion to happen, relying on certain conditions. Odds are measured as the fraction of two likelihoods P_i and $1 - P_i$ which refers to the likelihood ratio of the event to occur or not. For two events *X* and *Z*, the corresponding odds of *X* occurring relative to *Z* happening can be explained as follows:

$$odds\ ratio\ \{X\ vs\ Z\} = \frac{odds\{X\}}{odds\{Z\}} = \frac{P_X/(1 - P_X)}{P_Z/(1 - P_Z)} \quad (4.10)$$

where odds ratio reflects the association among an exposure and an outcome. It indicates the odds that an outcome (e.g., financial struggle) will happen given a particular exposure (e.g., money attitude), compared to the odds of the outcome happening in the absence of that exposure. The odds ratio can be useful in drawing whether such exposure is a crucial determinant for a particular outcome. Thus, an odds ratio greater than 1 reflects exposure linked with higher odds of outcome, the odds ratio less than 1 indicates exposure associated with smaller odds of outcome, and the odds ratio equal to 1 means the absence of effect of exposure on the outcome.

In the context of model (4.2), the present study also conducts analysis whether there is an interactive term of the two variables, financial literacy and money attitude, using the logistic regression method. In order to detect possible

interaction, assuming the equation with two explanatory variables *A* and *B* where the two variables can be binary or continuous variables, the interaction term is estimated between variable *A* and *B* that equal to *AB*. In the linear model, an interaction exists when the impact of variable *A* on the outcome variable *Y*, relies on the value of variable *B* (Fisher, 1992). *B* is assumed to be the moderator of the effect of *A* on *Y*, but the significant interaction *AB* also indicates that the effect of *B* on *Y* is moderated by *A*. The formula of the outcome *Y* is

$$Y = \beta_0 + \beta_1 A + \beta_2 B + \beta_3 AB \tag{4.11}$$

When including two variables, *A* and *B*, and a product term in a logistic regression model, the formula of the logit of *P* can be explained as follow:

$$ln\left(\frac{p}{1-p}\right) = \ln(odds) = \beta_0 + \beta_1 A + \beta_2 B + \beta_3 AB \tag{4.12}$$

Consider a logistic model for the risk of suffering financial struggle with the interaction term between financial literacy and money attitude, the formula can be written as:

$$ln\left(\frac{p}{1-p}\right) = \ln(odds) = \beta_0 + \beta_1 FL + \beta_2 MA + \beta_3 (FL \text{ x } MA) \tag{4.13}$$

where *FL* denotes financial literacy and *MA* represents money attitude.

However, interpreting the effect of the interaction term in the logistic regression model may be challenging. Despite the logistic regression technique provides the concepts of the odds ratio, which makes the results easier to interpret, this easily interpretable metric is not straightforward when there is an interaction between independent variables. The intuition from non-linear regression when the interaction of the covariates is included is not similar to linear models. In particular, with reference to equation (4.11) the expression of $\beta_3 AB$ is not equal to the odds ratio for the interaction term in the non-linear model like equation (4.12). The expression of $\beta_3 AB$ in the non-linear model is the ratio of odds ratios (see

Norton et al., 2004). As a consequence, the sign of $\beta_3 AB$ does not necessarily reflects the sign of the interaction effect. In addition, unlike the interaction effect in linear models, the interaction effect in non-linear model is depending on all the independent variables in the models, even if those variables are not part of the interaction itself, making the results difficult to interpret (Norton et al., 2004, Ai and Norton, 2003). Following Li and Barry (2012), one way to understand a significant interaction in non-linear model is via exploring predicted probabilities of having a certain arttitude towards money across different levels financial literacy. To do so, an adjusted probability of money attitude is estimated in understanding and interpreting interactions where the outcome will be one by setting various values of the financial literacy index.

Finally, this study estimates a number of models explaining financial struggle determinants. In order to check model selection uncertainty in logistic models, the Bayesian Information Criteria (BIC) and the Akaike Information Criteria (AIC) are computed whereby the model with smaller AIC/BIC are favored against the models with a larger value. Regarding the R-squared, there are a number of techniques to estimate an R-squared for logistic regression. But, there is no consensus about which one is best. This study reports the two common measures that are most often reported in the existing literature particularly the one that is developed by Nagelkerke (1991) and McFadden (1974), which also known as pseudo R-squared. Although the two R-squared are different in computation, they both aim to tell if the model fits the data.

4.3.1.2. Average treatment effect

One of the main aspects in observational studies is to adjust the estimated effect for confounding. Traditional approaches, like logistic regression model link outcome to the main independent variable and covariates by a multivariate specification. Another statistical method used in the literature to adjust confounding effect for the model (4.1) is the method of treatment effect. This approach emphasis on the balance of covariates between treatment groups prior to linking treatment to the

outcome. Numerous studies suggest that the treatment effect technique and logistic regression approach are in general bringing to similar results (Shah et al., 2005, Stürmer et al., 2006). However, some studies, like Martens et al. (2008), note that the difference between the methods are systematic and can be significant depending on the number of prognostic factors, the balance of covariates distributions between treatment groups, and the magnitude of the treatment effect. To check if results are robust to the choice of estimation technique, the average treatment effect estimation based on Inverse Propensity Weighting Regression Adjustment (IPWRA) estimator as developed in Cattaneo (2010) is employed.

The IPWRA technique elaborates the potential outcomes framework, or also known as a counterfactual framework. Suppose one's analysing the potential outcome approach to obtain causal treatment effects of individual *i* and what would the outcome (Y_i) be for the same individual when they are exposed to treatment (*T*). The causal treatment effect is reflected by the equation below:

$$P(Y_i = 1) - P(Y_i = 0) \tag{4.14}$$

This equation explains the estimated value of the outcome probability $P(Y_i = 1)$ when an individual i is in the treatment group (T=1) and the value of the outcome probability $P(y_i = 0)$ of the same individual in the control group (T=0). A caveat is that causal inference approach can only observe one of the potential outcomes or one treatment level and never both, known as counterfactual (see Holland, 1986). Given this issue, the standard technique is to use the trick of "missing-data" approach to estimate treatment effects by assuming that the treatment is as good as randomly assigned after controlling for covariates, which is known as conditional independence assumption. The functional forms can be written as:

$$(Y_i = 0) = X_i\beta_1 + \varepsilon_{i0} \tag{4.15}$$

$$(Y_i = 1) = X_i\beta_2 + \varepsilon_{i1} \tag{4.16}$$

$$t = \begin{cases} 1 \; if \; Z_i\alpha + u_i > 0 \\ 0 \; otherwise \end{cases} \tag{4.17}$$

$$(\varepsilon_{ij}|X, Z) = (\varepsilon_{ij}|Z) = (\varepsilon_{ij}|X) = 0 \; for \; j \; \varepsilon \{0,1\} \tag{4.18}$$

where X and Z reflect explanatory variables; α and β are the calculated parameter; u and ε are the error terms that are not correlated with X or Z. The coefficient of X and Z are then used to estimate the Average Treatment Effect (ATE). Under the conditional independence assumption, the potential outcomes are assumed to be independent of the treatment assignment, when sufficient observable explanatory variables are controlled for (see equation (4.18))

Given the above equations, the IPWRA estimator is used to calculate the treatment effects under the conditional independence assumption. This technique extends the conventional treatment effect estimator, specifically by combining two methods: Inverse Propensity Weighting (IPW) and Regression Adjustment (RA). IPW approach uses probability weights to reach parameters of the outcome in order to address the missing-data issue as the consequence of the fact that each individual is observed in only one of the treatment level. Principally, the weighting factor is the inverse of the estimated likelihood of falling into the treatment group multiplied by the sample weight for each observation:

$$\frac{1}{p(x_i)} w_i \; for \; T_i = 1, \text{and } \frac{1}{1 - p(x_i)} w_i \; for \; T_i = 0 \tag{4.19}$$

The rationale behind this approach is to give a greater weight to the non-treatment group whose characteristics are more similar to the treatment group. This process allows us to address the issue of selection bias where the treatment is not randomly assigned in the sample, given the way individuals self-select into the treatment. Further, unlike IPW technique that focusses on addressing self-selection by modelling the treatment, the RA method models the outcomes by using contrasts of averages of treatment-specific predicted outcomes to estimate treatment effects (see Wooldridge, 2010, Cattaneo, 2010).

The IPWRA estimator simultaneously employs both techniques as discussed above, particularly by computing separate estimator: a model to predict treatment status,

and another model to predict outcomes. By doing so, the estimation offers a doubly robust property where results remain consistent even if one of the two models (treatment or outcome) is incorrectly specified (Wooldridge, 2002). To see how IPWRA works in this study, consider a simple model of financial struggle (Y), where money attitude is defined as a binary treatment (T). Employing the set of functional forms as explained above, the outcome equation can be formulated as:

$$Y_i = \beta_1 X_i + \beta_2 T_i + \varepsilon_i \tag{4.20}$$

where Y denotes the outcome which equals to the financial struggle status. X represents the vector of explanatory variables as defined in equation (4.2), ε is the error term and the subscript i reflects individual; and T is the indicator of the treatment variable corresponding to money attitudes as follows.

$$T_i = \begin{cases} 1 \; if \; \gamma_1 Z_i + \varepsilon_i > 0 \\ 0 \; if \; \gamma_1 Z_i + \varepsilon_i \leq 0 \end{cases} \tag{4.21}$$

where T indicates a certain attitudes toward money taking the value of 1 for big spender, higher self-efficacy and budget planner and 0 for non-big spender, lower self-efficacy and non-budget planner. The vectors Z include a set of explanatory variables that might affect money attitude, i.e., gender, marital status family size age, education (years of schooling), income-earning members, occupation, additional income, head-household, financial shock, social network, and parental control. By controlling for all the covariates, the treatment is assumed to be randomly assigned and should not have any feedback from the outcome variable to the treatment.

In this regard, IPWRA estimator employs a three-step strategy to estimate the impacts of money attitude on the risk of financial struggle. First, the treatment model parameters and inverse probability weights are estimated. Second, employing particular inverse probability weights, the estimator fit weighted regression models of the outcome for each treatment group and obtain the treatment-specific predicted outcomes for each individual. Lastly, the estimator

estimates the means of the treatment-specific predicted outcomes and using the difference of these averages to compute the average treatment effects (see Cattaneo, 2010).

Using the average treatment effect estimation, the issue that need to confront is whether the specified models fulfil the two standard assumptions of the potential outcome framework: (i) unconfoundedness (exogeneity of the treatment) and (ii) sufficient overlap (see de Luna and Johansson, 2006, Imbens and Wooldridge, 2009, Pearl, 2009). Regarding the first assumption, the value of financial struggles and money attitude variables may be reliant on the value of other predictors (variables). As a consequence, the significant association can occur among the unobserved factors leading to both the endogenous dependent and independent variables, leading to incorrect regression coefficient and biased estimators.

There is no easy-to-use statistical examination to check whether there are unmeasured confounders which can affect the estimation results. Under randomised experiments, the unconfoundedness assumption is valid, while in observational studies, we cannot guarantee whether the explanatory variables included in equation (4.20) and (4.21) fully explain the treatment and the outcome variables. It is always the case that there are additional relevant variables which are not included in the model specifications. Hence, it is crucial to check the likelihood of this assumption, while it is generally untestable in practice, one should test how sensitive the results are for violating this assumption.

Following the technique developed in Senbet et al. (2017), Shippee et al. (2018), Wooldridge (2010), and Raptou and Papastefanou (2018) this study also employs robust estimators of endogenous treatment effect to overcome the possible endogeneity problem. Endogenous treatment effect estimator extracts experimental-type causal effects from observational data. It offers the advantages of addressing potential endogeneity by letting some remaining unobservable components to affect both the potential outcomes and treatment assignment after controlling on the observable covariates (Wooldridge, 2010). This approach uses a

control function technique by including the residuals from the treatment assignment as a regressor in the model for the potential outcome as the equation below:

$$E(\varepsilon_{ij}|t) \neq 0 \; for \; j \; \varepsilon \{0,1\} \tag{4.22}$$

The equation reflects that the unobservable in the potential-outcome equations are related to treatment status.

Employing the endogenous treatment effect technique, a Wald test can be performed to check the potential of endogeneity bias. A Wald test indicates that the null hypothesis is not rejected at the 5 percent significant level for all the specifications, as presented by the values of Chi² and the related probabilities (see the result in section 4.4). This means that there are no substantial unobservable factors that affect both the money attitudes and the risk of financial struggles. Due to there is no evidence of endogeneity, the IPWRA method is preferred as it provides the correct standard error because of a multistep estimator (see Wooldridge, 2007).

Lastly, an important assumption for the use of the average treatment estimation is the overlap condition, that is, there is a common support in which the probability of an individual being assigned to the treatment group is both nonzero and less than 1. The standard approach to test this assumption is to plot the propensity scores for both the treatment and control groups and look at whether the overlap assumption is violated. Appendix C displays the estimated density of the predicted probabilities of each money attitude indicators. Among the three money attitude indicators, neither plots indicate too much probability mass near 0 or 1, and the two estimated densities have most of their respective masses in regions in which they overlap each other which suggests that there is no evidence of a violation of the overlap assumption.

4.3.2. Data

The data are gathered from the Financial Inclusion Insight (2016). The selection of the survey year is based on the availability of annual observations on money attitude variables[13]. The survey is considered the most comprehensive database, which contains individuals' datasets from a total of 24 provinces in Indonesia. A common view in the existing literature is that having poor money attitudes often results in financial struggles that can lead to poverty (see Caplan, 2014). Furthermore, three variables are employed as the measure of financial struggles: i) over-indebtedness, ii) money shortage, and iii) food insecurity. For the first variable, over-indebtedness is constructed by a variable which takes value 1 when individuals fail to repay debts by the deadline and ask for an extension and 0 otherwise. This measure is now well documented in a number of empirical studies on over-indebtedness (Disney et al., 2008, Oxera, 2004, d'Alessio and Iezzi, 2013). The second variable of 'money shortage' is measured by dummy variables and takes on a value of 1 for experiencing a money shortage and 0 otherwise. This measure is relatively similar to the 'financial problems measure' developed by Fitzsimmons et al. (1993). Lastly, having considered that there are many kinds of financial struggles that can be influenced by money attitude, the present empirical study uses 'food insecurity' as a measure of 'financial struggles'. This study is informed Carman and Zamarro (2016), where the issue of food insecurity is expressed as a dummy variable equal to 1 when an individual experiences food insecurity and 0 otherwise. It is important to note that the use of binary indicators as the measure of financial struggles is not a novelty in the existing literature (see Von Stumm et al., 2013, Lim et al., 2003, Carman and Zamarro, 2016).

When it comes to measuring money attitudes, the first money attitude dimension is the so-called big spender; the behavioural dimension cited by Yamauchi and Templer (1982) and Furnham (1984). This measure closely follows the work of Atkinson et al. (2016) and Tatzel (2014) and is defined as 'a person who spends

[13] Data on money attitude is not available in 2014 data, used for the other essays

more money than they make each month'. This measure fits the type of individual who is predicted to be an impulsive consumer; someone concerned with prestige, materialistic issues, and who is 'loose' with money. For such people, high prices and expensive goods represent encouraging attractions. They are usually less frugal than other consumers, being interested in buying high priced expensive goods for status. As suggested by the existing literature, individuals with big spending behaviour are likely to be increasingly in debt, to experience money shortages and to suffer from food insecurity (e.g., Tatzel, 2014, Watson, 2003, Omar et al., 2014, Spinella et al., 2014).

The second money attitude dimension is a person's level of self-efficacy which arguably reflects a belief in one's own ability as well as a perception of being competent to deal with daily financial decisions. The self-efficacy measure is constructed based on Lim et al. (2003), which designates a value of 1 when individuals claim that they have the skills and knowledge to manage their finances well and 0 otherwise. There is increasing and well-documented evidence that individuals with high levels of self-efficacy are more likely to avoid financial troubles (e.g., Lim et al., 2014, Engelberg, 2007, Farrell et al., 2016). Lastly, this essay uses budget planning and/or a budget plan as a measure of money attitude. This dimension is constructed by a binary variable which provides a value of 1 for budget planning, or an individual who makes a regular budget plan and then sticks to it, and 0 otherwise. As put forward by Tang (1995), individuals who create regular budget strategies and who put a solid budget plan into action have more chance of avoiding financial struggles than spenders who fail to implement such strategies or plans.

Table A4.13 in Appendix A describes the variables included in the model specification and reports the summary statistics. It is shown that about 42 percent of the respondents suffered from over-indebtedness, approximately 24 percent of the sample experienced money shortages, and at least one in ten in the sample had gone without food. Furthermore, around 45 percent of the sample have been categorised as 'big spenders', 53 percent of the sample had high levels of self-efficacy, and 32 percent were recorded as having a budget plan and sticking to it.

A correlation matrix of the main measured variables is provided in Table C4.15, Appendix B. As summarised in Table 4.2, most of the signs in the correlation table are consistent with the study hypothesis. It can be predicted that being a big spender and is strongly positively correlated with over-indebtedness, money shortage, and food insecurity. In addition, the correlation table shows a negative correlation between both self-efficacy and budget planner and the risk of experiencing a financial struggle. Another outcome from this study indicates that financial literacy can help to reduce the probability of having financial problems. However, whether this is simply an object of confounding and endogeneity issue is to be estimated grounding in advanced econometric techniques presented next.

Table 4.2. Money attitude effect: Expected sign

Money attitude variables	Expected sign		
	Over-indebtedness	Money shortage	Food insecurity
Big spender	+	+	+
Self-efficacy	-	-	-
Budget plan	-	-	-

4.4. Empirical results

Having described relevant methodologies, this study will now move on to discuss the findings. This section first presents the results from the logistic regression. It is then followed by findings from the IPWRA estimation. Finally, a comparison of the regression estimates across the two methods of estimation is presented.

4.4.1. Logistic regression estimates

Following the existing studies cited above, such as Von Stumm et al. (2013), Lim et al. (2003), and Carman and Zamarro (2016), the logistic regression technique is used for the estimation of the econometric model. For robustness purposes the results are reported as hierarchical regressions. In total, there are seven models with modifications of a set control variables. Models (1), (2) and (3) are baseline models which simply regress the money attitude variables before adding these variables to the same equation in model (4) along with financial literacy. Further, this study checks the sensitivity of the results by including other control variables (as a group): these are (i) gender, marital status, family size, age and education, (ii) urban, occupation, income-earning members, additional income, head-household, and financial shock, and (iii) social network and financial control.

Table 4.3 reports logistic regression results using over-indebtedness as the dependent variable. Model (1), the baseline model, shows that being a big spender increases the risk of being over-indebted and the estimated coefficient is significant at the 1 percent level, which is consistent with the theoretical literature (Tatzel, 2014, Khare, 2016, Omar et al., 2014, Watson, 2009). Similarly, the coefficient of 'budget plan' is also positive and significant at the 1 percent level. This result is broadly consistent with the past studies about the importance of budgeting (Von Stumm et al., 2013, Lea et al., 1995, Dowling et al., 2009a, Gundersen and Garasky, 2012). In addition, all the estimated models (2, 4, 5, 6, and7) indicate that self-efficacy is significantly associated with a reduced risk of over-indebtedness, which is in line with the work of Mewse et al. (2010), and Farrell et al. (2016). The results obtained by adding other control variables such as in model (4), (5), (6), and (7) indicate that if these variables are added as a group, the sign of money attitude, as well as other control variables, remains consistent.

Table 4.3. Adjusted odds ratio obtained from logistic regression: Over-indebtedness

Variable	Dependent variable: Over-indebted						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Big spender	1.667***			1.498***	1.436***	1.414***	1.412***
	(0.146)			(0.138)	(0.133)	(0.131)	(0.131)
Self-efficacy		0.680***		0.807**	0.832*	0.857*	0.854*
		(0.063)		(0.079)	(0.082)	(0.084)	(0.084)
Budget plan			0.551***	0.614***	0.694***	0.697***	0.697***
			(0.058)	(0.065)	(0.075)	(0.076)	(0.076)
Financial literacy				0.544***	0.643***	0.656***	0.654***
				(0.086)	(0.103)	(0.106)	(0.106)
Male					1.044	1.097	1.115
					(0.096)	(0.140)	(0.150)
Single					0.820	0.813	0.814
					(0.133)	(0.137)	(0.138)
Family size					1.049*	1.068**	1.070**
					(0.030)	(0.034)	(0.034)
Age					1.000	1.000	1.000
					(0.004)	(0.004)	(0.004)
Education					0.846***	0.882***	0.882***
					(0.022)	(0.024)	(0.024)
Urban						0.863	0.861
						(0.085)	(0.085)
Occupation						0.435***	0.435***
						(0.084)	(0.084)
Inc-earning						0.940	0.942
						(0.051)	(0.051)
Add.Income						1.284	1.283
						(0.222)	(0.222)
Head-household						1.027	1.020
						(0.144)	(0.145)
Shock						1.388***	1.389***
						(0.138)	(0.138)
Social network							1.018
							(0.115)
Financial control							1.047
							(0.103)
Regional dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,060	6,060	6,060	6,060	6,060	6,060	6,060
Log-Likelihood	-1914	-1923	-1913	-1888	-1854	-1832	-1831
Chi-square test	41.77	24.93	39.77	91.67	158.2	184.4	184.7
AIC	0.633	0.636	0.632	0.625	0.616	0.610	0.611
BIC	-48926	-48908	-48927	-48951	-48976	-48968	-48951
Pseudo R2	0.0108	0.00613	0.0110	0.0240	0.0417	0.0532	0.0533
Nagelkerke R2	0.00684	0.00391	0.00699	0.0152	0.0262	0.0334	0.0335

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively.

Table 4.4. Adjusted odds ratio obtained from logistic regression: Money shortage

Variable	Dependent variable: Money shortage						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Big spender	1.590***			1.509***	1.441***	1.420***	1.425***
	(0.100)			(0.097)	(0.095)	(0.097)	(0.098)
Self-efficacy		0.792***		0.895	0.949	1.056	1.054
		(0.055)		(0.064)	(0.070)	(0.080)	(0.080)
Budget plan			0.812***	0.882*	1.048	0.998	1.046
			(0.055)	(0.062)	(0.076)	(0.077)	(0.081)
Financial literacy				0.601***	0.737***	0.792**	0.839*
				(0.067)	(0.085)	(0.094)	(0.101)
Male					0.990	0.898	0.932
					(0.067)	(0.084)	(0.091)
Single					1.047	1.123	1.146
					(0.116)	(0.134)	(0.138)
Family size					1.029	1.087***	1.090***
					(0.022)	(0.027)	(0.027)
Age					0.996	0.997	0.997
					(0.003)	(0.003)	(0.003)
Education					0.788***	0.836***	0.842***
					(0.015)	(0.017)	(0.017)
Urban						0.610***	0.599***
						(0.046)	(0.046)
Occupation						0.655***	0.658***
						(0.079)	(0.080)
Inc-earning						0.878***	0.888***
						(0.038)	(0.039)
Add.Income						1.536***	1.547***
						(0.207)	(0.210)
Head-household						1.226**	1.184
						(0.127)	(0.124)
Shock						5.409***	5.302***
						(0.493)	(0.485)
Social network							0.564***
							(0.048)
Financial control							1.115
							(0.083)
Regional dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,060	6,060	6,060	6,060	6,060	6,060	6,060
Log-Likelihood	-3113	-3135	-3136	-3098	-2990	-2719	-2693
Chi-square test	383.5	343.1	342.7	408.1	585.2	916.3	961
AIC	1.028	1.036	1.036	1.024	0.990	0.903	0.895
BIC	-46527	-46483	-46481	-46531	-46704	-47194	-47227
Pseudo R2	0.0594	0.0528	0.0525	0.0640	0.0967	0.179	0.186
Nagelkerke R2	0.0629	0.0561	0.0558	0.0676	0.100	0.177	0.184

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively.

Table 4.5. Adjusted odds ratio obtained from logistic regression: Food insecurity

Variable	Dependent variable: Food insecurity						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Big spender	1.674***			1.515***	1.409***	1.396***	1.400***
	(0.151)			(0.142)	(0.134)	(0.134)	(0.135)
Self-efficacy		0.713***		0.856	0.922	0.982	0.979
		(0.068)		(0.085)	(0.094)	(0.100)	(0.101)
Budget plan			0.510***	0.561***	0.695***	0.675***	0.716***
			(0.056)	(0.063)	(0.080)	(0.080)	(0.085)
Financial literacy				0.478***	0.660**	0.699**	0.756
				(0.078)	(0.111)	(0.118)	(0.129)
Male					0.798**	0.635***	0.658***
					(0.080)	(0.084)	(0.091)
Single					1.331*	1.491**	1.527**
					(0.225)	(0.264)	(0.270)
Family size					1.024	1.092**	1.098***
					(0.034)	(0.039)	(0.039)
Age					1.000	0.998	0.999
					(0.004)	(0.004)	(0.004)
Education					0.726***	0.758***	0.764***
					(0.022)	(0.025)	(0.025)
Urban						0.823*	0.807**
						(0.086)	(0.086)
Occupation						0.543***	0.549***
						(0.116)	(0.117)
Inc-earning						0.899*	0.915
						(0.057)	(0.058)
Add.Income						1.093	1.090
						(0.203)	(0.203)
Head-household						1.633***	1.565***
						(0.228)	(0.221)
Shock						3.147***	3.030***
						(0.403)	(0.390)
Social network							0.486***
							(0.050)
Financial control							1.112
							(0.115)
Regional dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,060	6,060	6,060	6,060	6,060	6,060	6,060
Log-Likelihood	-1819	-1829	-1814	-1788	-1698	-1629	-1605
Chi-square test	117	94.24	116.7	166.2	313.7	415.8	450.6
AIC	0.601	0.605	0.600	0.592	0.564	0.543	0.536
BIC	-49116	-49095	-49124	-49151	-49289	-49373	-49404
Pseudo R2	0.0306	0.0250	0.0329	0.0470	0.0952	0.132	0.144
Nagelkerke R2	0.0188	0.0153	0.0201	0.0287	0.0572	0.0783	0.0856

Notes: constant is included in regressions but not reported. Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively.

Further, Table 4.4 reports the logistic regression estimates of the conditional effect of money attitude, using money shortage as a measure of financial struggle. Consistent with the theoretical literature, there is a substantial correlation between 'big spender' and 'money shortage' where the sign of 'big spender' is significant at the 1 percent level. However, the result is inconclusive regarding the effect of 'self-efficacy' on 'money shortage'. The results show that logistic regression estimates of 'self-efficacy' are not statistically consistent across different specifications. The logistic regression estimates on self-efficacy in model (2) show that the estimated coefficient is statistically significant, whereas it turns to be insignificant in the subsequent specifications when control variables are included, particularly models (4) to (7). A similar pattern appears with the potential effect of a budget plan, where the model without control variables indicates a significant effect of a budget plan on the risk of money shortage. However, the effect is not perfectly significant across the specifications.The fact that weak evidence is found to support the existence of relationship between both both self-efficacy and budget plan and money shortage lead us to interesting findings. This is probably because both self-efficacy and budget plan may have significant impact only if individuals own a certain level of resources. In other words, making budget plan and having self-efficacy well begins with hanging on to what people's have. This situations is so common that such budget, for example, may not work at all whilst most of their income goes out. Thus, if individuals suffer from money shortage, doing a budget and improving self-efficacy are not easy. When money is super tight, people are simply too deprived to budget.

The final step is to trace the effects to food insecurity, as is done in the seven models in Table 4.5. Consistent with the existing literature on money attitude and food insecurity such as Millimet et al. (2018), Carman and Zamarro (2016), Gundersen and Garasky (2012), the big spender effect is statistically significant at the 1 percent level, which shows that being a 'big spender' is associated with an increased risk of food insecurity. In addition, there seems to be evidence that having a budget plan is associated with lowering the risk of food insecurity; an effect that is significant in all cases. The results show that if other control variables are added to the specifications, the signs for 'big spender', 'budget plan' and

'financial literacy' variables remain similar. Conversely, the significance of 'self-efficacy' varies across models, being non-significant in models (4) to (7), thereby casting doubts on its potential impact regarding the prevention of food insecurity.

Apart from the significant impact of money attitude, it is also important to highlight that 'financial literacy' is found to be significantly related to the risk of experiencing a financial struggle. The effect of financial literacy in reducing the risk of being over-indebted is significant at the 1 percent level, which is in line with findings from Von Stumm et al. (2013), French and McKillop (2016) and Gathergood (2012). Also, the results of this current study provide more evidence to support a significant relationship between financial literacy, money shortage, and food insecurity. The result shows that people with a high level of financial literacy are more likely to avoid money shortage and food insecurity than those with lower levels of financial literacy or understanding. Its effect is statistically significant across different models, which is consistent with the financial literacy literature in general (Behrman et al., 2012, Van Rooij et al., 2012, Fort et al., 2016).

Considering a potential interaction between financial literacy and money attitude that may play an essential role in understanding the nature of the money attitude-financial struggle relationship, an adjusted probability of money attitude is estimated in understanding and interpreting interactions. For illustrative purposes, the financial literacy levels are divided into ten quintiles from an extremely low financial literacy score to the highest, whilst keeping other explanatory variables at their mean values. The average marginal effect explains predicted probabilities for values between 1 and 0, or the average change in probabilities when money attitude indicators increase by one unit. The *margins* technique reports the average marginal effect, which can be interpreted within percentage points by multiplying by a 100.

Interestingly, there seems to be evidence to indicate that an interaction effect exists between money attitude and financial literacy. For instance, as presented in Table 4.6, the predicted probabilities (dy/dx) of big spender on the risk of suffering over-indebtedness, money shortage, and food insecurity decrease as the level of financial

literacy increases (see columns 2, 4 and 6). In other words, being a 'big spender' may not substantially increase the risk of having financial struggles if that individual is financially literate. A possible explanation is that individuals with very high levels of financial literacy may have the capacity to maintain an appropriate standard of healthy financial decision making. They may engage in compulsive spending without experiencing serious financial difficulties.

Table 4.6. Predicted probability for different financial literacy levels: Big spender

Financial literacy quintile	Dependent variable: over-indebtedness		Dependent variable: money shortage		Dependent variable: food insecurity	
	dy/dx	std.error	dy/dx	std.error	dy/dx	std.error
1	0.043***	0.013	0.075***	0.016	0.031**	0.012
2	0.040***	0.011	0.068***	0.014	0.030***	0.01
3	0.037***	0.009	0.061***	0.012	0.029***	0.008
4	0.035***	0.008	0.055***	0.01	0.028***	0.007
5	0.032***	0.008	0.048***	0.01	0.027***	0.007
6	0.030***	0.008	0.042***	0.011	0.026***	0.008
7	0.027***	0.01	0.035***	0.013	0.024***	0.009
8	0.025**	0.011	0.029*	0.015	0.023**	0.011
9	0.023*	0.012	0.022*	0.017	0.023*	0.013

Note: dy/dx for factor levels is the discrete change from the base level. Model: logistic regression. Each model includes all the explanatory variables. Robust p-value. $***$ $p < 0.01$, $**$ $p < 0.05$, $*$ $p < 0.1$.

Furthermore, the impact of self-efficacy on over-indebtedness is negative and significant in most quintiles (Table 4.7, column 2). As expected, there appears to be a considerable reduction in the probability of being over-indebted if individuals have a high level of financial literacy. That is to say, individuals with high self-efficacy who then acquire more knowledge regarding financial improvement, have a significant positive effect on reducing their chances of experiencing over-indebtedness. Conversely, no significant impact is observed in all the financial literacy quintiles in the case of self-efficacy and financial literacy interactions using money shortage and food insecurity as measures of financial struggle (Table 4.7, column 4 and 6). Thus, for financially literate individuals, having higher levels of self-efficacy is not statistically associated with the probability of suffering either money shortage or food insecurity.

Table 4.7. Predicted probability for different financial literacy levels: Self-efficacy

Financial literacy quintile	Dependent variable: over-indebtedness		Dependent variable: money shortage		Dependent variable: food insecurity	
	dy/dx	std.error	dy/dx	std.error	dy/dx	std.error
1	-0.018	0.015	-0.024	0.018	-0.019	0.013
2	-0.019	0.012	-0.017	0.015	-0.014	0.011
3	-0.021**	0.01	-0.01	0.013	-0.009	0.009
4	-0.022**	0.009	-0.003	0.011	-0.005	0.008
5	-0.024**	0.009	0.003	0.011	0.001	0.008
6	-0.025**	0.01	0.01	0.012	0.004	0.009
7	-0.026**	0.011	0.016	0.014	0.008	0.01
8	-0.027**	0.013	0.022	0.016	0.011	0.012
9	-0.027**	0.015	0.028	0.019	0.015	0.013

Note: dy/dx for factor levels is the discrete change from the base level. Model: logistic regression. Each model includes all the explanatory variables. Robust p-value. $***$ $p < 0.01$, $**$ $p < 0.05$, $*$ $p < 0.1$.

Turning to the interaction effect between financial literacy and budget planning, Table 4.8. shows that given a certain financial literacy score, there are greater differences in the effect of a budget plan, or the lack of such a plan, towards financial struggles. The results indicate that there exists a negative and significant relationship between budget planning and over-indebtedness across the financial literacy quintiles (Table 4.8, column 2). Interestingly, the effect size of a budget plan decreases as the level of financial literacy increases. This means that when people have a very high level of financial literacy, making a budget plan may not help them to avoid over-indebtedness. One explanation could be that a direct and negative relationship exists between financial literacy and over-indebtedness (see Table 4.3). People with strong financial literacy do a better job in analysing their debt. At this point, the budget plan may have a weak effect as financially literate individuals, as they might not see the need for it to avoid over-indebtedness. This is not because they no longer need it in their life, but because they understand that they already have the capacity to avoid over-indebtedness through the essential knowledge they have regarding finance and associated issues.

Table 4.8. Predicted probability for different financial literacy levels: Budget plan

Financial literacy quintile	Dependent variable: over-indebtedness		Dependent variable: money shortage		Dependent variable: food insecurity	
	dy/dx	std.error	dy/dx	std.error	dy/dx	std.error
1	-0.040***	0.015	0.031	0.02	-0.023	0.015
2	-0.038***	0.012	0.024	0.016	-0.024**	0.012
3	-0.036***	0.01	0.017	0.014	-0.024**	0.01
4	-0.034***	0.009	0.01	0.012	-0.025***	0.008
5	-0.032***	0.008	0.003	0.011	-0.026***	0.008
6	-0.030***	0.008	-0.004	0.012	-0.027***	0.009
7	-0.028***	0.009	-0.011	0.013	-0.028***	0.01
8	-0.027**	0.011	-0.017	0.016	-0.028**	0.011
9	-0.025**	0.012	-0.024	0.018	-0.029**	0.013

Note: dy/dx for factor levels is the discrete change from the base level. Model: logistic regression. Each model includes all the explanatory variables. Robust p-value. $***$ $p < 0.01$, $**$ $p < 0.05$, $*$ $p < 0.1$.

In the case of food insecurity, the results also show that the statistical significance and effect sizes of a budget plan increase as the level of financial literacy increases (Table 4.8 column 6). The relationship confirms that in communities where financial literacy levels are high, making a budget plan and sticking to it may play a more significant role in decreasing the probability of suffering food insecurity. This finding is consistent with the view that individual knowledge on finance may result in a high-quality budget plan involving taking control of spending and optimising the sources available in profitable areas. Nevertheless, as shown in Table 4.8, column 4, it is observed that the effect of the budget plan is not statistically significant across financial literacy quintiles, using money shortage as a measure of financial struggles.

Having identified the predicted probabilities of money attitudes, each probability can be plotted against an individual's financial literacy scores via a margin plot. Overall, Figure D4.3, D4.4, and D4.5 of Appendix D clearly show that significant interaction effects are observed between 'financial literacy' and 'money attitude'. This outcome means that the relationship between money attitude and financial struggles is not simply straightforward, but is also conditional on the level of an individual's financial literacy.

4.4.2. Average treatment effect estimates

The results using the IPWRA method are presented in Table 4.9 through to Table 4.11. Comparing the coefficients of the 'big spender', 'self-efficacy' and 'budget plan' categories, this study has found that the overall results are relatively consistent with the logistic regression findings, providing further confirmation of the importance of money attitude. For example, using over-indebtedness as a 'financial struggle' measure, there is evidence that being a 'big spender' increases the probability of also experiencing over-indebtedness. Considering the results in column 2 of Table 4.9, the estimated ATEs indicate that the average percentage of someone being over-indebted, if all samples are categorised as 'big spenders' would be 2.8 percent higher than the average that would occur if none of the respondents were to be categorised as 'big spenders'. In addition, the estimates for self-efficacy and budget planning are negative and significant at the 1 percent level, suggesting that the average percentage of someone being over-indebted, if all samples have a high level of self-efficacy and make budget plans, would be 2.4 and 2.5 percent respectively. These levels are higher than the average that would occur if all the samples had low levels of self-efficacy, and none of the respondents made budget plans.

Table 4.9. Estimates of money attitude impact on over-indebtedness

Binary treatment variables	Over-indebtedness		
	ATE	Chi^2	Prob > chi^2
Big spender	0.028***	3.68	0.159
	(0.007)		
Self-efficacy	-0.024***	4.19	0.123
	(0.009)		
Budget plan	-0.025***	3.97	0.137
	(0.008)		

Notes: Each coefficient estimate is obtained from separate regression of the respective dependent variable on this particular money attitudes and set of explanatory variables whose coefficient estimates are not shown. The chi^2 and the corresponding probabilities represent the endogeneity test (Ho: treatment and outcome unobservables are not correlated). Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively.

Table 4.10 presents the estimated ATEs when money shortage is used as a proxy for financial struggle. The results also indicate that 'big spender' is associated with an increased risk of money shortage, with the estimated ATEs being positive and significant at the 1 percent level. Being a 'big spender' would increase, on average, the percentage of individuals suffering from a 'money shortage' condition. However, there is no evidence of a significant militating effect from budget planning and self-efficacy on the risk of money shortage; an outcome similar to the results obtained from using logistic regression.

Table 4.11 reports the money attitude impacts on the dimension of food insecurity. In particular, the 'big spender' category seems to be associated with an increase in the risk of experiencing food insecurity. The estimated ATEs indicate that the average percentage of the sample population who are food insecure if all samples are categorised as 'big spenders', would be 2.5 percent higher than the average that would occur if none of them are classified as a 'big spender'. In addition, the results also show that having a budget plan tends to reduce the probability of suffering food insecurity, where the effect is negative and statistically significant at the 5 percent level. However, the result is inconclusive regarding any self-efficacy effect on food insecurity; the estimation is not significant despite the signs of the estimated ATEs being preserved.

Table 4.10. Estimates of money attitude impact on money shortage

Binary treatment variables	Money Shortage		
	ATE	Chi^2	Prob > chi^2
Big spender	0.047***	2.55	0.279
	(0.009)		
Self-efficacy	-0.0040	3.25	0.197
	(0.010)		
Budget plan	0.008	3.32	0.19
	(0.011)		

Notes: Each coefficient estimate is obtained from separate regression of the respective dependent variable on this particular money attitudes and set of explanatory variables whose coefficient estimates are not shown. The chi^2 and the corresponding probabilities represent the endogeneity test (Ho: treatment and outcome unobservables are not correlated). Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively.

Table 4.11. Estimates of money attitude impact on food insecurity

Binary treatment variables	Food Insecurity		
	ATE	Chi²	Prob > chi²
Big spender	0.0253***	2.15	0.341
	(0.00721)		
Self-efficacy	-0.0079	1.73	0.421
	(0.00813)		
Budget plan	-0.0187**	2.21	0.331
	(0.00829)		

Notes: Each coefficient estimate is obtained from separate regression of the respective dependent variable on this particular money attitudes and set of explanatory variables whose coefficient estimates are not shown. The chi² and the corresponding probabilities represent the endogeneity test (Ho: treatment and outcome unobservables are not correlated). Figures in parentheses are robust standard errors; *, ** and *** represent statistical significance at 10%, 5%, and 1%, respectively.

4.4.3. Summary comparison

Table 4.12 provides a comparison of the econometric data across two different methods of estimation. In all models, the related control variables are included because they seem to be a significant factor in most of the results in Table 4.3 through to Table 4.11. In Table 4.12, models (1) and (2) display regression estimates from three different methods of estimation using ‘over-indebtedness’ as a measure of financial struggle. However, models (3) and (4), as well as models (5) and (6), use ‘money shortage’ and ‘food insecurity’ as the dependent variables respectively. In general, the regression estimates when employing a different estimation method indicate a substantial correlation between ‘money attitude’ and ‘financial struggle’. Most of the signs of the estimated variables are preserved and consistent with the existing literature.

However, the magnitude effects of money attitude vary depending on the money attitude dimensions and a measure of financial struggles. The big spender category has become the most important money attitude indicator, as it has a significant effect in all of the models. The effect of the budget plan is found to be statistically significant in most of the models, except the budget plan, where it becomes insignificant once the money shortage is used as a measure of financial struggle. In

addition, despite the significant impact of self-efficacy upon reducing the risk of suffering over-indebtedness, self-efficacy is not statistically related to the risk of money shortage and food insecurity.

Table 4.12. Effect of money attitude on financial struggle: comparison

Variables	Over-indebted		Money shortage		Food insecurity	
	Logistic (odds ratio)	IPWRA (ATE)	Logistic (odds ratio)	IPWRA (ATE)	Logistic (odds ratio)	IPWRA (ATE)
	(1)	(2)	(3)	(4)	(5)	(6)
Big spender	(+)*	(+)*	(+)*	(+)*	(+)*	(+)*
Self-efficacy	(-)*	(-)*	(+)	(-)	(-)	(-)
Budget plan	(-)*	(-)*	(+)	(+)	(-)*	(-)*

Note: * is statistical significant

In general, this study notes that the predicted effect of the three money attitude indicators is fully consistent across different estimators. Thus, even by using different estimations aimed to test any type of error that may occur, the results are robust in the sense that the 'money attitude' variable is statistically associated with the risk of financial struggle; an outcome which is in line with both theoretical and empirical studies.

4.5. Concluding remarks

A considerable amount of literature has been published in an attempt to understand the complex role money plays as part of everyday life. However, the existing studies have been unable to establish a clear relationship between an individual's money attitude and the risk of that person experiencing financial problems. The reason for this inability may be the lack of a theoretical base, data availability, and/or the prevalence of an econometric approach. This essay has developed, as a contemporary option, a conceptual framework for discussing money attitude, financial literacy, and financial struggles.

The study has added some crucial contributions to the existing literature on this subject. The first contribution is to understand the link between money attitude and the likelihood of suffering from financial trouble. The second main contribution is to investigate the conditional effects of money attitude relevant to financial struggle by using financial literacy as a conditioning variable. This study tests the assumption that the link between money attitude and financial struggle is not always straightforward; rather, it depends on a person's financial literacy level. This analysis allows clarification of the varied influences of financial literacy on poverty and to link ensuing discussions to the concept of 'money attitude'.

This essay employs three measures of financial struggle: i) over-indebtedness, ii) money shortage and iii) food insecurity. Also highlighted are three measures of money attitude: i) big spender, ii) self-efficacy, and iii) a budget plan. In addition, two estimation strategies; logistic regression model and average treatment effect estimation, are compared to test whether the results are sensitive to the different empirical approach, specification errors of the econometric models and/or potential endogeneity issue. In line with the literature on money attitude, the results are robust for the altered empirical strategies, which indicate that there is a potential impact of money attitude on the risk of experiencing financial struggle (Von Stumm et al., 2013, Dowling et al., 2009a, Bauer and Mitev, 2012, Lim et al., 2003, Shih and Ke, 2014). Including additional control variables within the equations had no impact on the quantitative results and most effects consistently significant across regressions. The effect of money attitude on financial struggle is also robust with respect to possible endogeneity.

Further, this essay has also investigated whether the impact of money attitude on financial struggle is associated with greater levels of financial literacy. This study hypothesised that financial literacy and money attitudes would synergistically interact, such that those individuals who were categorised as: a) a non-compulsive spender, with b) a high level of self-efficacy and c) a budget planner who was d) financially literate would be associated with a decreased chance of experiencing financial struggles, outside of any independent associations of money attitude and

financial literacy. This study found that interaction is present where the link between money attitude and financial struggle is conditional upon the individual's level of financial literacy and *vice versa*. For individuals whose financial literacy levels are high, being a compulsive spender may play only a minimal role in increasing the probability of experiencing financial struggles. In addition, for individuals with high levels of self-efficacy, adding more financial knowledge increases its effect on the control and reduction of over-indebtedness. What is more, there is also a positive interaction between budget planning and financial literacy which indicates that at a very high level of financial literacy, making a budget plan is likely to reduce the risk of being over-indebted and food insecure. Overall the findings of this essay emphasize the potential impact of money attitude, combined with financial literacy, on poverty levels in the Indonesian context.

Appendices to chapter four

Appendix A

Table A4.13. Variable description

Variable	Variable Description
Over-indebtedness	Takes a value of 1 if failed to repay debt by the deadline and/or ask for an extension, 0 otherwise. *Units*: dummy variable
Money shortage	Takes a value of 1 if experienced a shortage of funds in the last 6 months, 0 otherwise. *Units*: dummy variable
Food insecurity	Takes a value of 1 if ever gone without enough food to eat in the last 6 months, 0 otherwise. *Units*: dummy variable
Big spender	Takes a value of 1 if respondents spend more money than they make each month, 0 otherwise. *Units*: dummy variable
Self-efficacy	Takes a value of 1 if respondents' statement was I could manage my money well, 0 otherwise. *Units*: dummy variable
Budget plan	Takes a value of 1 if respondents make a regular budget plan and stick to it, 0 otherwise. *Units*: dummy variable
Financial literacy	Composite financial literacy index based on polychoric PCA. *Units*: 0 = low financial literacy score and 1 = high financial literacy score
Gender	Takes a value of 1 if male, 0 otherwise. *Units*: dummy variable
Single	Takes a value of 1 if single, 0 otherwise. *Units*: dummy variable
Family size	The number of family members. *Units*: numbers
Age	Respondent's age. *Units*: years
Education	Years of schooling of the respondent: *Units*: years
Urban	Takes a value of 1 if living in urban area, 0 otherwise. *Units*: dummy variable
Occupation	Takes a value of 1 if holding job by qualification level, 0 otherwise. *Units*: dummy variable
Head of household	Takes a value of 1 if the head of household, 0 otherwise. *Units*: dummy variable
Income-earning members	The numbers of family members earn income. *Units*: numbers
Additional income	Takes a value of 1 if hold secondary jobs, 0 otherwise. *Units*: dummy variable
Financial shock	Takes a value of 1 the household experienced financial shocks in the past year, 0 otherwise. *Units*: dummy variables
Social network	Takes a value of 1 if respondents can get sufficient funds from the family for emergency purposes. *Units*: dummy variable
Financial control	Takes a value of 1 if decided how the money will be used by himself. *Units*: dummy variable

Note: All the variables are collected from the Financial Inclusion Insight (FII) dataset.

Appendix B

Table B4.14. Summary statistics

Variable	Mean	Min	Max
Over-indebtedness	0.097	0	1
Money shortage	0.236	0	1
Food insecurity	0.093	0	1
Big spender	0.452	0	1
Self-efficacy	0.528	0	1
Budget plan	0.318	0	1
Financial literacy	0.492	0	1
Gender	0.385	0	1
Single	0.164	0	1
Family size	3.517	1	13
Age	41.661	15	100
Education	4.673	1	12
Urban	0.53	0	1
Occupation	0.154	0	1
Head of household	0.4	0	1
Income-earning members	1.732	0	7
Additional income	0.057	0	1
Financial shock	0.601	0	1
Social network	0.823	0	1
Financial control	0.429	0	1

Appendix C

Table C4.15. Correlation analysis

	OV	MS	FI	BS	SE	BP	FL
Over-indebtedness (OV)	1						
Money Shortage (MS)	0.203	1					
Food Insecurity (FI)	0.190	0.360	1				
Big Spender (BS)	0.076	0.099	0.077	1			
Self-efficacy (SE)	-0.056	-0.056	-0.053	-0.194	1		
Budget Plan (BP)	-0.075	-0.043	-0.082	-0.105	0.143	1	
Financial Literacy (FL)	-0.065	-0.062	-0.069	-0.093	0.072	0.109	1

Correlations based on 6060 respondents

Appendix D

Figure D4.3. Overlap plot of estimated propensity score: Big spender

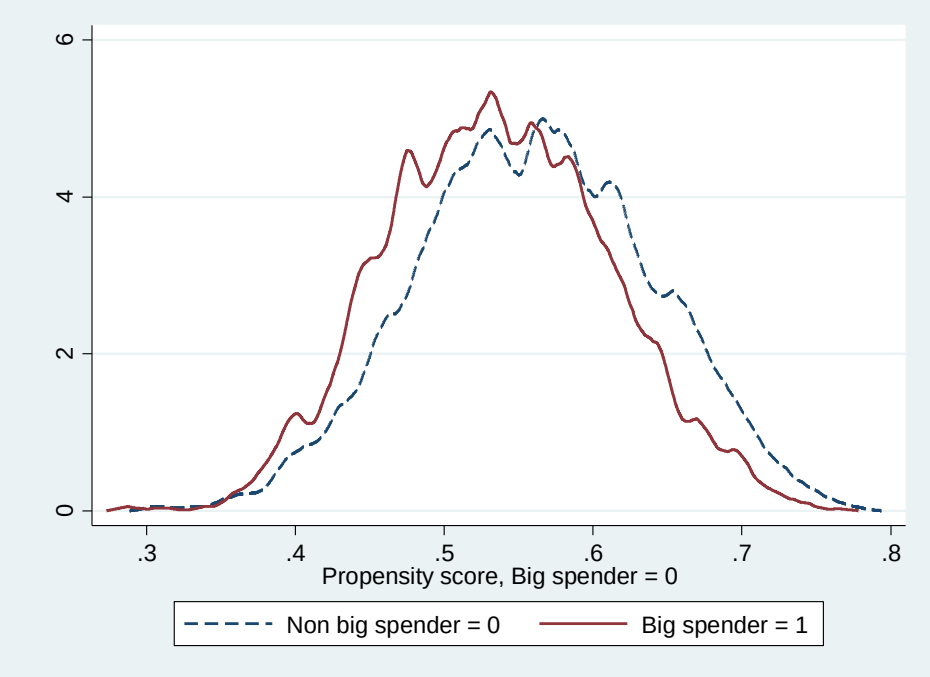


Figure D4.4. Overlap plot of estimated propensity score: Self-efficacy

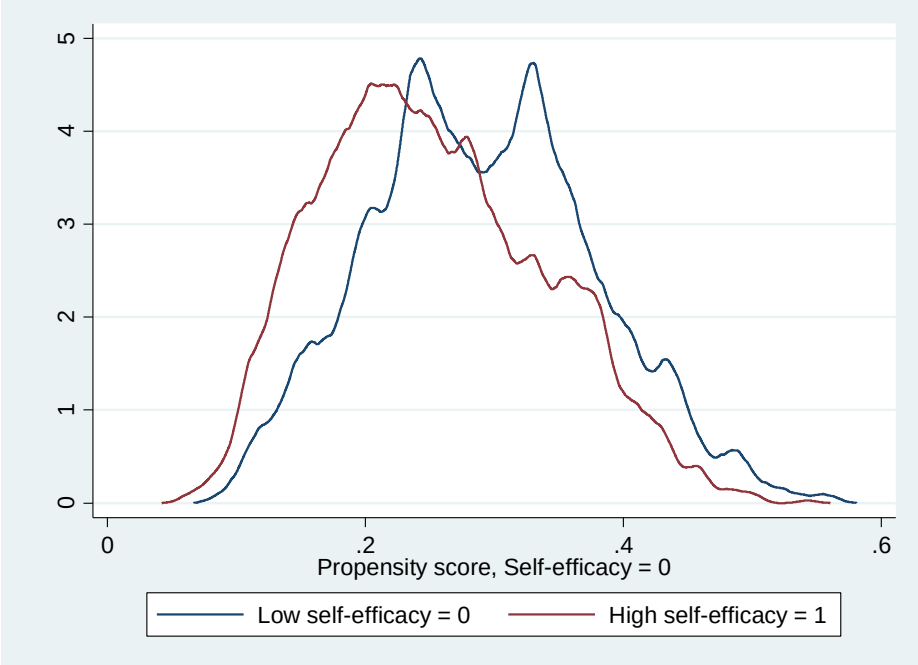
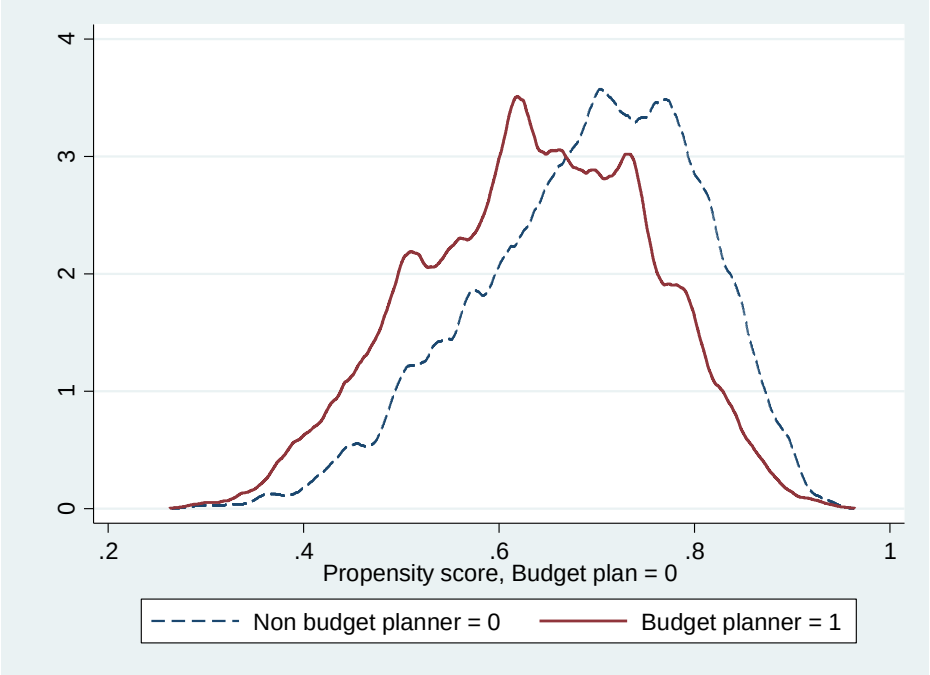


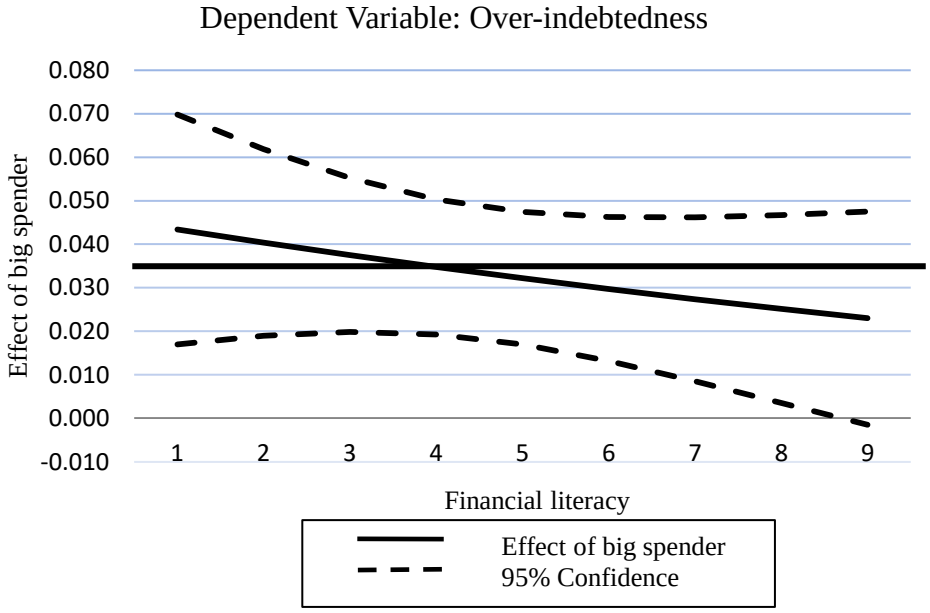
Figure D4.5. Overlap plot of estimated propensity score: Budget plan

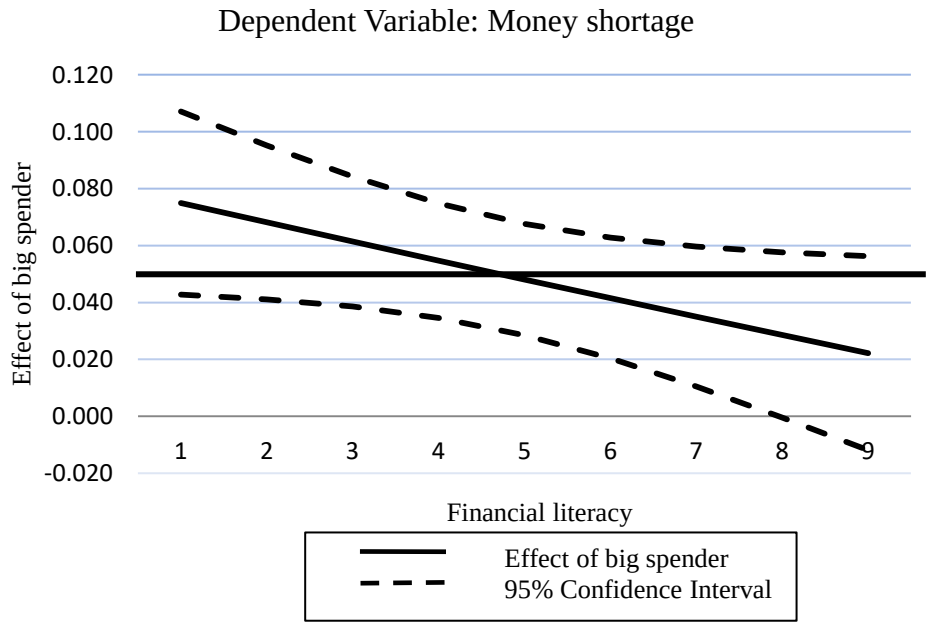


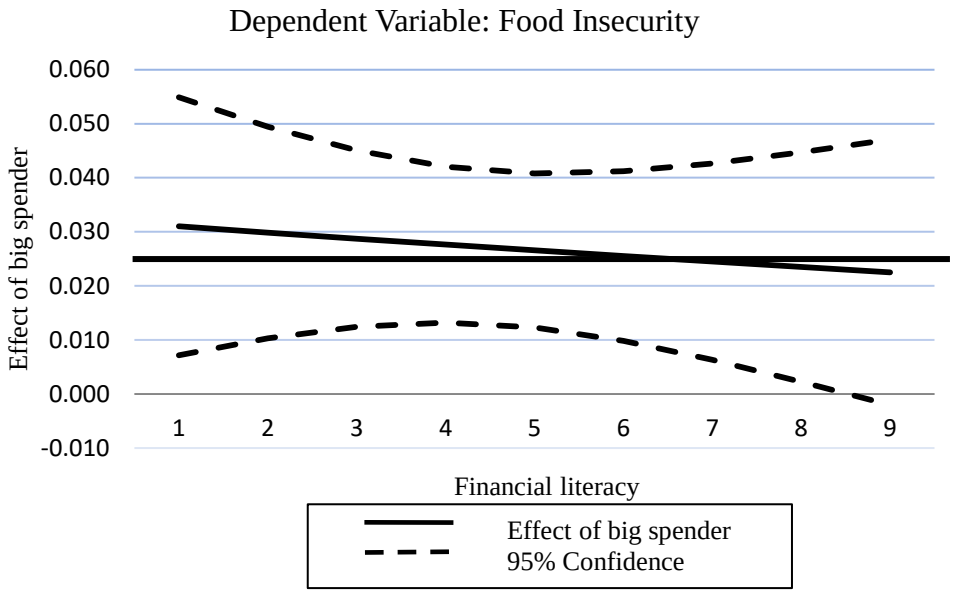
Appendix E

Figure E4.6. Effect of money attitude as financial literacy changes: only significant terms shown

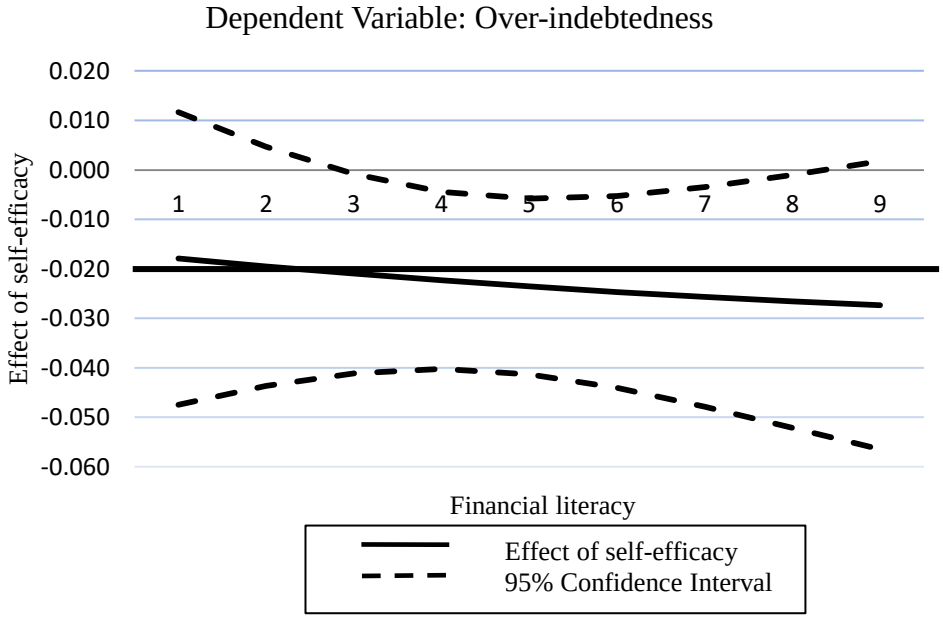
A. Big spender



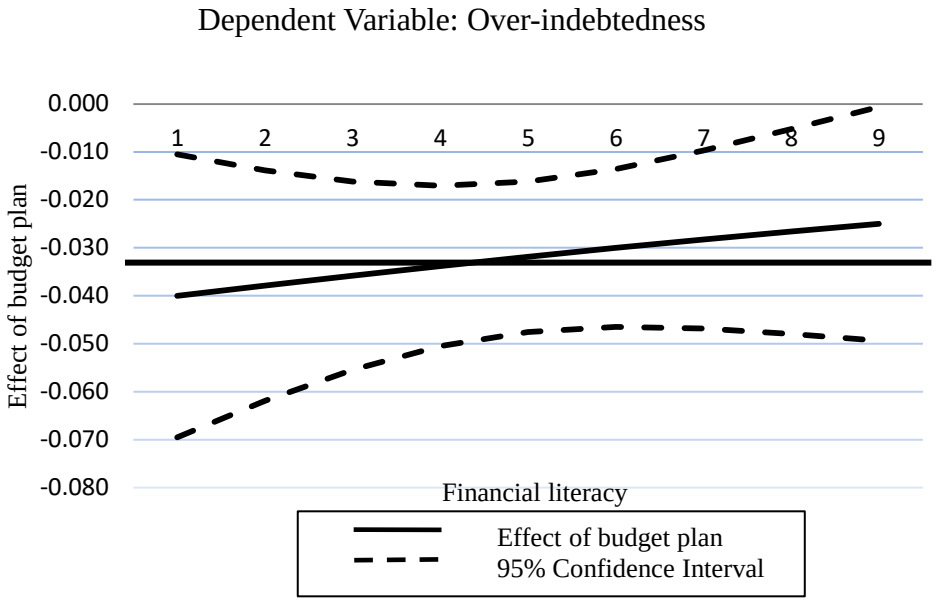


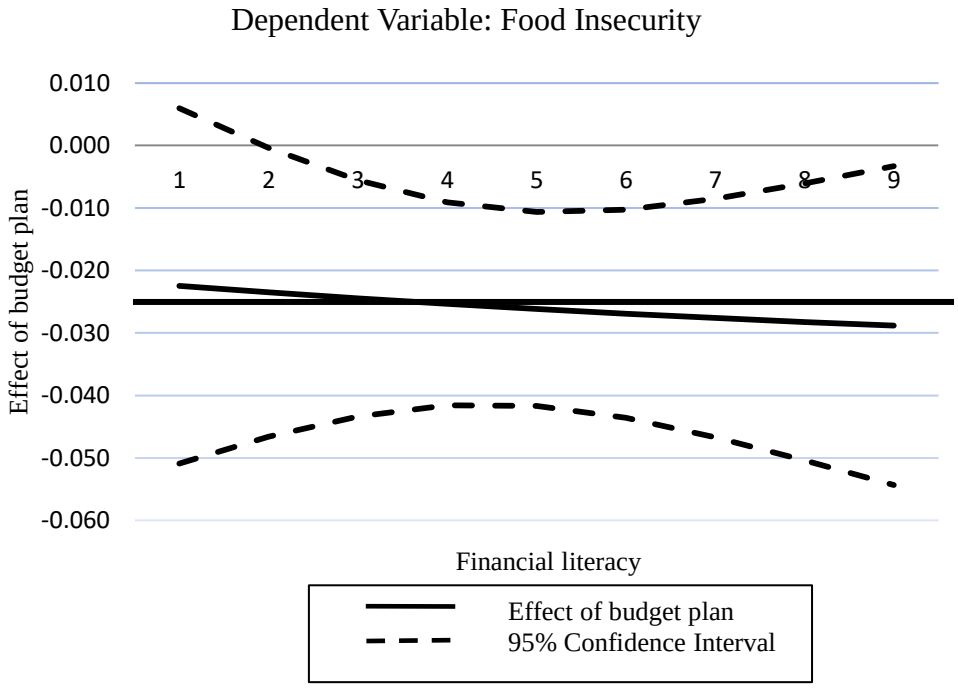


B. Self-efficacy



C. Budget Plan





CHAPTER FIVE

CONCLUSION

"The fundamental cure for poverty is not money but knowledge."
Sir Arthur Lewis (1979)

5.1. Summary of the thesis

The main objective of this thesis is to analyse the impact of financial literacy on poverty, particularly in the context of Indonesia. To address this objective, each empirical chapter has provided a detailed empirical investigation, and each has made a number of important contributions to the current literature on the topic of financial literacy. In general, this thesis is one of the earliest scientific studies of the interlinkage between financial literacy and poverty using advanced econometrics techniques. Most of the pre-existing research on financial literacy has been done in developed countries, or from the perspective of cross-country analysis, and researchers have been limited in their ability to explore this issue not only by a lack of data but also by a seemingly endless debate over terminology and measurement of related variables. This situation has made it very difficult to apply the most appropriate quantitative research methods and to reach generalisations regarding the findings. This thesis extends our knowledge of the critical role of financial literacy in poverty reduction in the context of a developing country, namely Indonesia. Taking advantage of the recent dataset generated by the Financial Inclusion Insight (FII), this thesis contributes to the literature with an extensive theoretical framework, appropriate measurements, and advanced quantitative techniques. In this way, some progress has been achieved in explaining the significance of financial literacy.

This Ph.D. research is presented via three main essays. The first empirical essay examines the interface between financial literacy and poverty. It began by

discussing the theoretical framework regarding the link between financial development, financial inclusion, financial literacy, and poverty. Then, this essay analyses the validity of the prevailing technique for measuring financial literacy. Although the regular measurements recognise the need to use a set of variables to capture financial literacy, their use in practice reveals limitations. This essay contributes to the literature by proposing a more reliable financial literacy index. This thesis's selected technique – polychoric PCA – is superior to existing measurements of financial literacy in its ability to compute non-continuous data, as a proxy for plausible features of financial literacy. In this way, it provides a more robust measure of financial literacy and makes an essential contribution to the existing literature. The main strength of this essay is the use of a mixed-method approach, notably the way the analysis is carried out employing OLS regression and instrumental variable (IV) regression, followed by propensity score matching (PSM).

Estimations using OLS regressions show that the financial literacy effect is positive and significant across all different specifications when extra control variables are added one by one. The results indicate that financially literate individuals are likely to have higher levels of individual wealth. These results remain unchanged even when controlling for the education variable, suggesting that although increasing education levels is crucial, additional impacts are possible by improving the level of financial literacy. These findings are in line with existing studies showing the positive role of financial literacy (e.g., Jappelli and Padula, 2013, Van Rooij et al., 2011b, Carpena et al., 2011, Faboyede et al., 2015, Fort et al., 2016, Behrman et al., 2010). As financial literacy is a potentially endogenous variable, the validity of the impact of financial literacy was further tested for robustness by employing the IV technique. To conduct IV estimations, this essay uses three sets of instruments: the distance to the nearest bank branch, university student's ratio, and financial worker's ratio. The results show that the effect of financial literacy remains significant, similar to what was demonstrated in the OLS regression. Cross-validation was shown using a propensity score matching technique. This technique does not require valid assumptions as does the IV method and can be used to reduce bias in treatment effect estimates from observational studies. As expected,

the results obtained using the PSM technique confirms the finding from the regression analysis that financial literacy affects poverty level. Furthermore, the first empirical essay re-estimates the econometric models using different financial literacy indexes and substitute measures of poverty. The results remain unchanged, suggesting that financial literacy indeed has a significant effect.

The second empirical essay is devoted to discussing the transmission mechanisms between financial literacy and poverty. Using techniques developed by Tavares and Wacziarg (2001) among others, a simultaneous equation approach is employed to estimate the effect of financial literacy on each channel and to measure the influence of each channel on poverty. The key benefit of this approach is its ability to quantify the magnitude of each channel. By adding together the effects of financial literacy on each channel, and the effects of each channel on poverty, the total indirect effect can be measured, and the relative influence of each channel can be compared. The simultaneous equation estimator reveals that a transmission mechanism exists between financial literacy and poverty. Financial literacy improves public participation in formal financial institutions, and an improvement in financial services usage brings a higher level of individual wealth. The significant role of financial literacy in promoting the use of financial services is consistent with the research conducted by Fund (2013), Wachira and Kihiu (2012), Simpson and Buckland (2009). This essay also shows that the effect of financial literacy on savings is significant, and parallels the existing literature (Bernheim and Garrett, 2003, Babiarz and Robb, 2014, Sherraden, 2017, Jappelli and Padula, 2013). The results also suggest a positive effect of saving in reducing poverty, as do most previous studies (Rutherford, 2000, Evans and Jovanovic, 1989). More importantly, this study confirms previous research regarding the significance of financial literacy in avoiding over-indebtedness, which can potentially affect individual wealth (e.g., Lusardi and Tufano, 2015, Brown and Graf, 2013, French and McKillop, 2014, Dearden et al., 2010, Berthoud and Kempson, 1992, Ntsalaze, 2017). The main results, obtained using the 3SLS technique, remain robust to a set of sensitivity analysis, especially by employing various specifications, as well as alternative measures of the channels and of poverty.

Essay three examines the links between both financial literacy and money attitude, and the probability of avoiding financial trouble. The novelty in this empirical chapter is in combining the theoretical discussion of financial literacy and money attitude, aiming to complement the existing literature that mostly assesses financial literacy as a percentage of correct answers on a financial knowledge test, and therefore ignoring individual differences in people's attitudes towards money. This thesis upholds the hypothesis that the probability of having financial struggles is also driven by varying attitudes towards money, not only by financial knowledge. As far as I can tell, relatively little research has been conducted to investigate the joint effect of financial literacy and money attitude on financial outcomes.

Employing a logistic regression model and average treatment effect estimation, findings from the third essay provide some important insights. First, this study shows that money attitudes affect the risk of experiencing financial struggles, as found in earlier studies (Bauer and Mitev, 2012, Von Stumm et al., 2013, Dowling et al., 2009a, Lim et al., 2003). Big spenders and individuals with lower levels of self-efficacy are likely to suffer financial struggles. Positive attitudes towards money, such as regularly creating a budget plan and sticking to it, are a key factor in our everyday lives. Such strategies help individuals to avoid over-indebtedness, money shortages, and food insecurity. The finding regarding the joint factors of financial literacy and money attitude can provide new insight into how financial literacy policies can be developed to reduce poverty, hopefully generating better outcomes for communities seeking to minimize the prevalence of financial struggle, and corroborating the ideas of Barry (2016).

5.2. Policy implications

The results of this thesis have several salient implications for future practices and contribute valuable insights to policymaking. The most obvious result is the fact that financial literacy plays a vital role in poverty reduction. Thus, a key policy lesson from this study is that in addition to national and international and efforts to improve education levels, emphasis should be directed toward enhancing financial literacy in Indonesia.

This suggests that government policy-makers should introduce financial education in the national curriculum. Every schoolchild should now be trained in financial concepts. This is very important because basic knowledge of finance should be taught from as early an age as possible. Financial education has not yet been part of the broader policy agenda in Indonesia, however, with the result that many teenagers leave school lacking the financial knowledge and skills needed to make smart and informed financial choices.

In addition to promoting financial education in the school curriculum, policymakers seeking to improve financial literacy levels should take into account the socio-economic situation of Indonesia, where vulnerable and disadvantaged groups have lower financial literacy than other population groups, as shown in the first essay. Therefore, effective policies must be able to reach these groups. Reaching them can be a challenge, however, both literally (because of geographical isolation) and figuratively: it can be difficult to persuade these groups to participate in financial literacy development programmes, due to scarce resources, lack of cognitive ability, poor understanding of financial markets, and limited access to financial services. This thesis recommends gradual and cautious first steps for establishing a financial education programme. To begin with, conventional efforts to provide financial literacy education merely in big cities need to be rethought, since the majority of the poor are beyond school age and located in rural areas. For example, Indonesia has implemented the "saving movement programme" which delivers financial education to various places such as markets, schools, and workplaces, using a "financial education car" to distribute books and brochures related to financial concepts. However, the programme seems to neglect the fact that a primary target audience, low-income people, are mostly concentrated in rural areas and remain disconnected from the current financial education agenda. In this context, policy initiatives to address this group should feature an integrated approach, delivering financial literacy training directly to communities in rural areas, with close cooperation between the government, financial institutions, and local community organisations. In addition, delivering information through TV programmes, social media, and even direct messaging to mobile phones, could help increase their awareness of the significance of financial literacy. It is also important

to note that, like other groups, the poor need a trusted financial education scheme that is appropriate to them. An alternative approach in promoting financial literacy in rural communities might take into account the collectivist culture that still prevails among the poor.

It is also worth noting that this study finds evidence that advanced age is associated with lower financial literacy. Older citizens are among the population groups with high levels of poverty in Indonesia (see Priebe and Howell, 2014). With an increasingly ageing population, inadequate financial literacy among the elderly has essential policy implications. A unique financial literacy programme that pays attention to the particular needs and preferences of the elderly may be effective in improving their wealth and potentially reducing poverty rates. For example, a financial education programme could be designed to improve their capacity to manage their pension funds, improving pension savings related behaviour as well as disseminating knowledge of how to earn profits via financial providers.

As noted above, the results of the second essay confirm the significant effect of financial services usage as a channel between financial literacy and poverty. When developing the financial services sector, policymakers ought to bear several points in mind. First, financial inclusion policies that address only supply-side barriers cannot guarantee the effective use of financial services in a poverty reduction agenda. This study emphasises that policymakers should address low financial literacy in order to reduce demand-side barriers to the use of financial services. Better financial literacy can improve both demand for financial products and the effectiveness of financial services, measuring success in terms of credit repayment and building small businesses. Second, financial literacy interventions can be implemented to promote the use of financial services. The government could make financial literacy a forceful platform by pressing financial institutions to increase their attention to this area and by shaping policy according to a financial literacy development agenda. Initiatives to improve financial literacy can be delivered as part of credit schemes offered by financial institutions to their members. This initiative not only improves public participation in financial products, reduces the unbanked population, and provides members with tools that can help them achieve

financial success, but it also helps the institutions themselves to have members who are actively involved in productive financial transactions.

Further, the findings of the second essay also suggest a role for financial literacy as a tool to boost savings. This result is encouraging and provides some useful insights. For instance, employers worried about their employees' financial stability could use the findings to justify financial education programme designed to empower them in making appropriate financial decisions and improving saving habits. In the government context, incorporating this result can lead to important policy shifts. For example, where governments implement cash transfer programmes as part of their progressive social protection initiatives, it can be predicted that financially literate participants would benefit most from the programme due to their understanding of the importance of saving money to reach future goals. The study result can also help explain why some groups fail to build wealth or derive other benefits from the programme. More broadly, the results of this study offer insights about the potential effects of adding financial education programmes in support of cash transfer programmes.

As the second essay shows, over-indebtedness is one of the main channels linking financial literacy and poverty. In this era, more and more people are taking out credit to meet everyday costs and/or deal with financial problems. Hence, policymakers should consider ways to offer their citizens alternative solutions. It should be noted that both customers and financial institutions are responsible for the issue of over-indebtedness. Financial institutions should be called upon to offer fair terms and consumer protection, and loans should not exploit customers. More importantly, banks and other lending institutions ought to put financial education programmes in place from the beginning. As previously mentioned, whenever possible, the financial institutions should be encouraged to become involved in the development of the financial education agenda.

The findings of the third essay indicate the importance of money attitude, and offer additional insights of use to policymakers in developing more comprehensive financial education programmes that take this element into account. It is

understandable that changing attitudes can be hard. Low-income people may need even more intensive provision and incentives (alongside mere understanding of financial terms) to break with previous attitudes towards money. Nevertheless, changes in money attitude can be achieved with appropriate information and guidance, for example, by demonstrating the importance of making a budget plan, encouraging them to avoid spending money on unnecessary expenses and providing examples to show them how their income could grow, to increase their level of self-efficacy. In short, financial education should include day-to-day money management, budgeting, credit, and debt management - not merely a class on understanding financial terms. By facilitating people's understanding of the importance of analysing their needs, what they want, and what they can afford, appropriate strategies to avoid financial struggle can be prepared.

Lastly, as relatively little evidence is available in the country about the effectiveness of financial literacy as a tool in the poverty eradication agenda, policymakers should recognise that research on financial literacy is vital to supporting more inclusive growth and improving current financial education initiatives. The government would need to provide support for research on financial literacy. Publication of financial literacy studies can raise public awareness about the significance of financial literacy in modern economies. What is more, research is crucial to the improvement of financial education. A comprehensive evaluation of how financial education initiatives affect financial well-being can lead to better practices in the future.

To sum up, the results of this thesis suggest that policymakers should direct more attention toward the potential of financial literacy to impact poverty in Indonesia when formulating policies.

5.3. Limitation and direction for further research

Although this study represents quite a detailed examination of financial literacy, it is not without its limitations, which provide abundant room for further research. In its investigation of the impact of financial literacy, the analysis is based on cross-sectional data. One main limitation was the lack of reliable data over a longer period. The discussion would be made more interesting by the existence of a longitudinal dataset, leading to a deeper examination of the dynamics and evolution of financial literacy in Indonesia. In addition, a further analysis comparing Indonesia to other developing countries would also be interesting and could bring valuable policy insights.

Furthermore, while the financial literacy index is modelled after similar indices in standard financial literacy research, a more complete assessment is clearly needed in future work. For instance, an individual's knowledge of the stock market, and knowledge about insurance and pensions would be interesting aspects to examine. In the third essay, this thesis attempts to measure the impact of the three main attitudes toward money: big spender, budget plan, and self-efficacy. There is a need for an in-depth analysis that includes other attitudes towards money, such as power, distrust, anxiety, etc. This would prove a difficult task, however, since sufficient data on money attitudes is not available in Indonesia. This issue remains part of the agenda for future study.

Although various techniques have been employed to address the methodological drawbacks of each method of measuring financial literacy, this study is limited by the shortcomings of each method. Hence, future work could include improving upon the methodology around the impact of financial literacy. It would be fascinating if, in the future, this study can be re-examined using other techniques.

With respect to research approach, it is readily apparent that analysing the characteristics of financial lives is very difficult since it involves such complex factors. Future investigations will require a sophisticated approach to support the evidence that financial literacy and money attitude are indeed crucial in changing

financial decisions. Instead of relying on survey data, investigations based upon laboratory and field settings can offer rich insights into the financial lives of the poor, enabling researchers to link their activities to dimensions of financial literacy and money attitude.

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the second period with no saving. In that case, c1 (1)= 1 1+ η-ρ+ β-ρ (1+ rb)-ρ.

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