Credit Constraints, Risk Sharing, and Household Welfare: The Case of Indonesia

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ABSTRACT

This thesis studies household welfare and financial markets and in particular empirically examines access to finance, human capital, saving and risk sharing group formation using Indonesian households as a case study. Inefficient financial markets in developing countries lead to inefficient resource allocation, economic inequality, and high transaction costs. Households who are marginalised from financial systems find themselves unable to access financial services and smooth their consumption.

The first thing to consider is how credit constraint exists and how to identify it. Credit constraints may arise from market mechanisms: demand for loans and loan supply. In order to assess credit constraints, I use Direct Elicitation Methodology (DEM) and then examine the gathered information and other household characteristics using multinomial logit model. Using Access to Finance (A2F) survey, I find that Indonesian households are likely to experience supply-side rather than demand-side constraints. I also find that financial literacy plays vital role in accessing services from formal financial institution. Moreover by elaborating several types of constraints, the welfare loss is estimated: the constrained households due to risk-related reasons experience loss in terms of annual income between Rp. 16 millions and Rp. 19 millions.

In the second empirical study, I investigate the impacts of earnings risk on schooling and saving. I borrow Basu and Ghosh's model (2001) to develop a theoretical framework of two-period model, which depicts the relationship between earnings risk, schooling and saving. Using the Indonesia Family Life Survey (IFLS) data set, the decision to enter schooling is motivated by earnings risk which is measured by occupational earnings risk and earnings range or the variability between maximum and

minimum earnings level across the IFLS wave. This study finds that education decrease variability over future income. Given the results that the pure risk effect is more dominant than utility smoothing effect, it can be said that to some extent saving is inadequate to anticipate the declining of household income due to earnings risk. The results also show that earnings range is close to Basu and Ghosh's predictions.

Another issue related to financial markets is the barrier to insurance for households, which also limits their capability to manage life risk. As a result, alternative risk coping mechanisms emerge to provide these households with different ways of securing insurance arrangements and in particular as risk sharing groups. In this third empirical research, I investigate the risk sharing group formation where the group is characterised by barriers to insurance. I use several tests to examine full risk sharing hypothesis, borrowing-saving hypothesis, limited commitment, moral hazard, and hidden income. Using the IFLS data set, this study provides evidence of the failure of the full risk sharing hypothesis, which is mainly due to limited commitment and moral hazard problem. Furthermore, I show that the endogenous group formation emerges within IFLS households.

Contents

List of Tables

List of Figures

List of Abbreviations

A2F	Access to Finance Survey
BMKG	Agency for Meteorological, Climatological and Geophysics (*Badan Meteorologi, Klimatologi, dan Geofisika*)
BMT	Islamic Saving and Loan Cooperatives (*Baittul Maal wa Tamwil*)
BPR	People Credit Bank (*Bank Perkreditan Rakyat*)
BPS	The Central Agency on Statistics (*Badan Pusat Statistik*)
BRI	Bank Rakyat Indonesia
IFLS	Indonesia Family Life Survey
KUD	Village Unit Cooperative (*Koperasi Unit Desa*)
LDKP	Village Credit Fund Institution (*Lembaga Dana Kredit Pedesaan*)
LKD, or LPD	Village Credit Institution (*Lembaga Kredit Desa* or *Lembaga Perkreditan Desa*)
Rosca	Rotating savings and credit association (*arisan*)
Rp	Indonesian currency unit (rupiah, or IDR)
SBI	Bank Indonesia Certificates (*Sertifikat Bank Indonesia*)
Susenas	National Socioeconomic Survey (*Survei Sosial Ekonomi Nasional*)

Declaration

The work in this thesis is based on research carried out at the School of Economics, Finance and Business, Durham University, England. No part of this thesis has been submitted elsewhere for any other degree or qualification and it is all my own work unless referenced to the contrary in the text.

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for Wina, Zaydan and Nabhan

رَبَّنَا هَبْ لَنَا مِنْ أَزْوَاجِنَا وَذُرِّيَّاتِنَا قُرَّةَ أَعْيُنٍ وَاجْعَلْنَا لِلْمُتَّقِينَ إِمَامًا

Our Lord! Grant unto us wives and offspring
who will be the comfort of our eyes and
give us (the grace) to lead the righteous
(Quran 25: 74)

Chapter 1

Introduction

1.1 Background of the Study and Motivation

Indonesia is a country with a long tradition of collective action when dealing with social and economic issues. These collective actions are performed by households or individuals within a community or group. The main reason why such actions exist is because reliable financial systems are few or missing: this is particularly true, across the country, for insurance or social protection.

The policy of the Indonesian insurance system in the modern period can be traced back to the colonial era. During the Dutch colonial period in Indonesia, the administrator did not provide or create effective financial institutions; nor were insurance mechanisms developed that provided adequate support for its citizens (see de Jonge, 2004). There was a discrimination in laws and policies for the Dutch and the indigenous people: social security was provided only for the Dutch. There was a change in the early of 1900's when the Dutch government enacted the Ethical Policy which was intended to increase social welfare (*volkswelvaart*) and to promote the discussion of welfare politics. The main concern was the decreasing welfare of indigenous people which was due to the discrimination of the colonial economic policy. In terms of insurance systems, the Dutch administration initiated welfare funds in particular regions. The results however were not as effective as expected and the benefits were mostly taken by the people who managed the funds. As a result of the Ethical Policy, there was an improvement in institutional development and social welfare between 1901

and 1941. This development was disrupted in 1941 by the Japanese occupation (see Vickers, 2005).

A few years after Independence, the Indonesian government started the economic development of the country and it has since experienced different stages of economic growth and downturn. However, there was no significant change in terms of the social security system. Until 2004, social security was only provided to civil servants, police and army officers, and people who work in the formal sector. This leaves two thirds of the people in the Indonesian working force without any social security system (see Hermanto et al., 2009). With the small penetration of formal insurance services, the issue has become important and cannot be neglected since most of the Indonesian population are not protected. In 2004, the Indonesian parliament passed Law Number 40/2004 regarding National Social Security System (*Undang Undang Sistem Jaminan Sosial Nasional Nomor 40/2004*), which ensures the social protection for all Indonesian citizens. However, the implementation is still far from effective and the problems still remain due to mostly institutional problems.

Another related and important issue is the access to finance particularly in terms of credit or loans. The Dutch administration supported pawnshops and cooperatives which were essentially financial systems imported from Europe. The cooperatives were mostly established by indigenous people and served as the basis of economic activities (see Vickers, 2005). This was seen as an essential feature to build a national character based on the principle of "mutual help" (*gotong royong*). This principle was considered an ideal value of Indonesian culture and tradition. Under this principle, many Indonesians believed that the cooperatives would enable to support economic development and national independence.

The Dutch administration also established some banks which were nationalised by the Indonesian government after independence. A question still remains concerning the coverage of financial systems which are dominated by banking services. A study by World Bank (2009) shows that around half of Indonesians are financially excluded and the financial services are excessively concentrated in a few of big cities. This study also show that many Indonesians still rely on informal institutions which are closely associated to their community.

The role of community has become increasingly important particularly after the 1997 Asian financial crisis. There was a significant change in the political and governance systems. This leads to changes to social and economic policies and particularly the growth of decentralisation policies where community development became a cen-

tral part in many policy objectives and their implementation. The idea behind this was to give people more autonomy over and responsibility for their economic development.

Beard (2007) documented household and community contributions in economic development in Indonesia. She concludes that household participation in economic development is determined by three aspects which are interdependent. First, the household participation is affected by the local organisational context which comprises its unique structure with social, political and economic systems. The local organisations matter because they determine the role of civic participation in economic development. In Indonesia, the civic organisations can be divided into two types. The first type includes community organisations which are dependent on the participation of households who live in that area. The second type is non-governmental organisations (NGOs) which operate across the country without having any attachment to specific communities.

Second, the participation is determined by the capacity for collective action within a community. This capacity includes efficient allocation of households' resources in terms of goods and services through a community development process. Many of community activities are decided based on consensus or mutual agreement.

The third aspect is the presence of social capital which is defined as a set of economic benefit which is derived from collective actions within a community. The concept of social capital can be divided into two concepts: networks and trust. As a part of community, households gain social and economic benefits from the networks. And within this community, households are able to conduct reciprocal exchange because of mutual trust.

A classic literature on collective actions can be found in Geertz (1962) where he studied social structure and patterns of saving behaviour in some communities in Indonesia. The structures are known as rotating savings and credit associations or Roscas, can be found across Indonesia in similar fashion and arrangement. Roscas can be regarded as a community-based insurance or social security. Most of these associations are conducted in the short-term and repetitive period. Roscas that are sustained over longer periods are able to accumulate assets and moreover evolve into more institutionalised entities. In many economic literature, this mechanism is known as risk sharing. Such arrangements in Indonesia are based on the moral economy which is rooted deeply in culture and tradition (see Ravallion and Dearden, 1988). Similar ar-

rangements can be also found in credit cooperatives, informal credit, and agricultural contracts, where they develop into informal financial institutions.

As the economy grows toward a modern structure, the role of informal institutions usually diminishes and is replaced by modern and more formal financial institutions. As the financial markets develop, access to finance theoretically should be accessible to the people. In the case of Indonesia, the informal institutions have not declined as modern institutions develop but continue to expand as people still need their accessibility and flexibility. A structured and systematic study of risk sharing and its related issues can make an important contribution to research and policy.

1.2 Research Objectives

Access to financial markets and services is considered as an important feature that supports economic growth and development while at the same time also reducing poverty and promoting economic equality. Limited access to financial institutions in many developing countries impedes economic growth and economic inequality. However, factors that shape development in these countries are significantly different, historically and culturally, from the advanced Western countries where many economic theories were developed.

In developed countries, formal financial markets and institutions serve a significant portion of the population. However, in developing and less developed countries things are other way around. Dysfunctional financial markets have impacts on inefficient resource allocation, low economic growth, and greater inequality. Morduch (1995) describes two common observations that usually exist in developing countries. The first observation is the non existence of various markets. If the markets do exist, they usually do not work efficiently. Secondly, market failures will constitute a set of behavioural and institutional responses. Credit markets, which usually play a main role in finance, is limited due to several constraints. Akerlof (1970) points out that credit markets in underdeveloped countries are characterised by asymmetric information. The problem rests on how to manage an "agency system". A paradox, which usually happens, is that moneylenders can lend and charge higher interest rate than formal financial institutions because they can easily enforce the contract, or have better knowledge of borrowers' characters.

Furthermore, insurance markets in developing countries face different types of barriers making them inaccessible for households, particularly those on low income.

When insurance markets are limited or non existence mutual assistance between family and friends would take place in order to form risk sharing groups. This mutual assistance is beneficial for households. However, this mutual group is not always efficient whenever moral hazards and asymmetric information problems emerge. Moreover, limited commitment and hidden income may be significant features that are embedded in this group formation.

Risk sharing networks with their related issues and in particular group formation, is a very important question since it is related to the impact of economic policies. Such policies include decentralisation, financial intermediation, human capital and social security. How groups form and are organised to conduct risk sharing arrangements also matters.

This study focuses on credit constraints, household welfare, and risk sharing group formation with Indonesian households as a case study. The first question is how credit constraints can be identified and to what extent the constraints affect household welfare. This also includes the characteristics that may affect households' access to finance markets.

The second question is related to saving and education. This study departs from a long standing view of return to education as human capital investment where this provides incentives for individuals to undertake education. The focus here is to assess the impact of earnings risk to education and saving.

The third is related to the type of barriers to insurance that exist in Indonesia. If these barriers exist, then the third question is how the risk sharing group can be formed. When constraints prevail and self-insurance is inadequate, informal insurance becomes important for households. These conditions may become the main reason for households to form risk sharing coalitions within informal networks.

1.3 Research Contributions

In a broad sense, this study enriches the existing literature of household welfare with regard to risk management at the micro level. Specifically, it has three substantive contributions in the field of financial development with Indonesian households as a case study.

The first contribution would be in explaining why some households have limitations in accessing financial services. The implications of limited access to finance cannot be neglected. By classifying and estimating different regimes of credit constraint,

this study offers an approach to estimate the impact of credit constraint based welfare loss calculations.

The second contribution is related to households as production agents. This study contributes to the field of human capital by explaining the relationship between earnings risk and education and then examines the implication to household saving in the Indonesian context. This study provides policy insight into the incentives of human capital investment.

The final contribution is in explaining the barriers to insurance for households and how risk sharing group formation may exist between households. As explained in the previous section, this study contributes to the empirical literature about community risk sharing in Indonesia. In terms of policy implications, the study provides empirical insights into understanding household financial behaviour and the group formation which is beneficial to community development and the local economy. Government's social and economic policies which are based on community developments such as social insurance, community assistances, and other fiscal interventions, can benefit from this study. This may help to provide a better framework for extending social protection and benefits to the communities.

1.4 Structure of the Thesis

The structure of the thesis is as follows. Chapter 2 presents existing literature which focus on four aspects: household welfare, consumption, financial access and risk sharing. This literature provides motivation for the subsequent chapters.

Chapter 3 is a summary of financial development in Indonesia drawn from the two main dataset used in this study. The first data set is the Indonesia Family Life Survey (IFLS), a longitudinal study of Indonesian families conducted by RAND Corporation in 1993, 1997, 2000 and 2007. The IFLS dataset are utilised in Chapter 5 and 6. The second data set is the Access to Finance Survey (A2F), a financial survey of Indonesian households in 2007 by World Bank.

Chapter 4 discusses credit constraint identification using DEM (direct elicitation methodology) which exploits households' opinion toward financial services using A2F dataset. This also includes identifying households' borrowing characteristics. The classification, which is built on the DEM, is then examined in order to estimate welfare loss using several matching models.

Chapter 5 investigates the impact of earnings risk on saving and schooling. Saving is considered a self-insurance or buffer against earnings risk and the decision to save may affect the decision about education. I divide the schooling based on the Mincerian framework: investment in schooling and post-schooling activities in terms of work experience. I motivate the saving function based on the decision of schooling and work which is made in the first period. This saving is then associated with earnings risk which occurs in the second period as a result of decisions made in the previous period.

Chapter 6 investigates different type of barriers to insurance which implies several alternatives of risk sharing models. The testable models include full insurance, borrowing-saving, saving only, moral hazard, limited commitment and endogenous group formation. The empirical analysis can be divided into household and community or village level where the endogenous group formation of risk sharing network is investigated.

Finally, the last chapter concludes with a summary from the study and directions for further research. I discuss several ideas to be considered as future works. These can be subsequent studies related to the topics that are given in this thesis, particularly household economics.

Chapter 2

Literature Review

2.1 Introduction

Households play important roles in the body of knowledge, not only in economics but also in other social sciences. Understanding households as economic agents is not only looking at economic aspect but also institutional and cultural aspects, which shape the household behaviour.

The main focus of this study is on how people can cope and manage their risk and vulnerability, particularly those who are disadvantaged. To understand how households cope their risks, the study investigates risk sharing as a way for households to increase their welfare. This chapter is intended to give a review of related literature mainly in the field of household welfare in emerging countries. Furthermore, it also presents several issues which are related to financial markets in developing countries.

The structure of this chapter is divided into four important aspects. Section 2.2 discusses households as economic agents and its role in the economy with related issues in household surveys. Section 2.3 provides a review of literature on consumption, mainly the common framework used in economic research. Section 2.4 outlines financial development in developing countries with regards to current issues on household economy. Section 2.5 discusses household risk management with more emphasis on risk sharing. Section 2.6 concludes.

2.2 Households as Economic Agents

As a starting point, household and its economy should be clearly defined and observed in well manner. The measurement of household economy has become increasingly important where the households are not only as consumption agents, but also as production agents.

2.2.1 Defining Household

The common way to observe and measure household economic behaviour is by conducting surveys. An ideal of household data set for economists is a long period of longitudinal or panel which includes a number of consumer characteristics and behaviour such as consumption, savings, income, expenditure, and health. This also means that the same households are retained within respective periods. However, this kind of survey will consume a lot of time and efforts.

Household definition varies between surveys and across countries. Along with the globalisation and the changes in economic structure, the definition departs from just merely traditional concept of household.

A household can be defined as a group consisting a small number of people that usually live in the same dwelling, get together and share resources to achieve the common goals or objectives. Other definition may include that these people share consumption in one kitchen or "cooking-pot". These definitions may vary in terms of different countries with different cultures and identities. Many developing countries such as India, Indonesia, and China, households are usually perceived as nuclear family. While in other countries such as the United States, the United Kingdom, or European countries, people who live within a household may not always represent or resemble a nuclear family.

The official definition of household can be found in statistical bureau or agency in one specific country. For example, U.S. Census Bureau (2003) simply defines a household as all of the people who occupy a housing unit. The Indonesian Central Agency of Statistics (BPS) classifies households into two categories (BPS, 1999). The first category is regular household which is defined as an individual or a group of individuals living together in part or the whole physical building or dwelling, and sharing and/or using the same kitchen.

The other category is called as special household which includes a group of people living in a dormitory where the whole daily needs are facilitated by an organisation

or institution; people living in a correctional institution, orphanage, prison; and other groups that consist of more than ten people who share their meals.

A general definition of household can be found in United Nations (2007) referring a household as a basic unit of analysis when assessing the economic circumstance in a society, even tough individual data may be separately collected. United Nations also describes a central feature of household which involves a high degree of income and expenditure pooling. Furthermore, based on some statistical definitions, it distinguishes definition between household and family. Household refers to private housing or household dwelling concept where family definition includes not only common dwelling but also ties or relationship based on blood, marriage or adoption.

However, in some countries, using household as a unit of analysis may become difficult. In Africa, households usually comprise of more than one family and person with or without kinship. The family members may also live separately, for example a married young woman may live with her parents while her husband live in another house (see United Nations, 2007).

To summarise, there are three common components that exist across definition of a household. The definition includes residential requirement, shared consumption, and joint production.

2.2.2 Policy Implications and Consequences

Household survey data give direct measures of the social and economic policy effects, particularly when the policy changes take place. The effects can be observed through the changes in prices or the changes in the provision of public services. Therefore, the definition of household is very important particularly for policy implication and consequences.

Beaman and Dillon (2012) argue that the implications significantly influence in assessing household composition, production and poverty measures. They assess different definition types of household in Mali. They found that additional keywords in definition increase household size and change household composition, mainly by joint consumption or production, which lead to different level of household asset and consumption measures. Beaman and Dillon also point out two important and yet conflicting implications. First, the household definition should be consistent in a given population and across populations. Secondly, the definition should be able to identify relevant economic or decision making unit, which may vary based on research question.

However, since markets do not operate efficiently and contracts cannot be enforced by well-defined state, government policy through any kind of institutional arrangement economic activity entails high transaction costs. Then, households utilise informal alternatives and institutions which allow them to fulfil their needs. This is one of the distinctive features in many developing economies. The need to understand the rationalities of these households along with their conditions and context of their environment may serve better policy formulation in order to enhance productivity and promote sustainable growth.

Complexity may arise in calculating household income and assets, which includes for example remittances from other household members abroad. Along with definition problem, these make some difficulties in comparing household survey results, which in turn will affect empirical assessment and analysis. However, the consequences of definition variation within countries and between countries are yet much known in terms of household statistics.

Another debate in household concepts is household headship that refers to household economic provider, primary decision maker, breadwinner, or a person who is designated as the head by other members. The main premise of this is that there exist perceived differences in terms of households lead by women and those by men. To some extent, if a household is headed by a woman then the household becomes more "vulnerable" than others. Budlender (2003) discusses definition use by central statistical agencies in the United States, Australia, and the United Kingdom. She argues that different type of household head definition may cause difficulties particularly when the measures are taken into economic policy making. She proposes broad range of criteria to determine the dominant person within a household which allow flexible definition of household head and determining household vulnerability.

2.2.3 Household Welfare

An interesting debate on household welfare is how to define and measure welfare. Welfare is related to utility concept though not identical concepts. In many household surveys, welfare can be derived from household consumption of goods (see Grootaert, 1983). The core debate of welfare measurement is between income against expenditure approach. According to Grootaert (1983), there are three alternative approaches to measure household welfare. Each approach will be discussed as follows.

2.2.3.1 True Index of Welfare

The first approach is derived from the preference parameters, which are estimated within an integrated model of household consumption and unemployment. This approach is known as true indices of welfare. This approach is based on the premise that welfare is determined by goods, household composition, leisure, and access to public services. When a household maximises welfare subject to budget constraints, the household needs to consider input prices, output prices, time endowment, wealth accumulation and market wage rate. Using simultaneous equations from observable cross-section data, welfare levels can be estimated, calculated, and compared. The results can be also converted into monetary equivalents using a reference price and wage vector.

2.2.3.2 Expenditure Perspective

The second approach is called total household expenditures approach where the measurement depends on the estimation of total household consumption. The approach is based on the assumption that household preference patterns are shown by goods and services purchased by the household which implies many variables in the welfare function such as decision to bear children, health expenditure, leisure choice, and dwelling decision. In this approach, the household consumption function is a one-equation model which welfare is a function of goods and services consumed by the household.

In many cases, expenditure is often seen as consumption. Consumption is simply defined as resources, which are consumed or expended by households. However, expenditure refers to consumption that is based on market transactions. In other words, expenditure is defined as household purchase of specific goods and services.

As a part of core welfare measurement, expenditures usually can be ranked based on their total expenditures with respect to baseline period. The expenditures usually consist of human development dimension for example health, education, nutrition, family planning and dwelling. Therefore, reliable expenditure or consumption data are important to measure welfare and engage in meaningful interpretation.

Expenditure is directly related to current living standards since the periodic flow of expenditure is able to indicate the level of consumption for a given period such as within a month or a full year. For the case in developing countries where informal

workers are common, it is much easier to use this approach to measure household welfare.

2.2.3.3 Full Income Perspective

The third approach is full income concept where based on the premise that full income is a total of monetary income, in-kind, and the imputed value derived from endowments and assets including durables and time. This approach relates a monetary value to leisure based on household behavioural decision to equate the utility of time spent on corresponding household activities.

Income usually refers to earnings from productive activity such as labour supply and transfers from other parties. Some part of income will be saved and accumulated as household assets. Sources of income and assets are considered as main point in welfare causal analysis. Information on income and assets can be used to distinguish.

Income can be separated into two parts: earned and unearned income. Earned income comes from labour salary and wages while unearned income can be derived from the information about the supply of land, capital or other household assets. For example, unearned income in urban area in many developing countries can be observed from rented housing. This information is important to estimate hedonic rent equations, which comprise tenure arrangement, location, physical characteristics of building and utility availability.

One important aspect of households' income is the proportion of cash income where this varies according to socio-economic groups or regions. The change of monetary income to non monetary income overtime can be used to analyse households' lifespan. Household surveys, which contain information about households' income, education, and demographic characteristics, are very useful in analysing the supply side of labour markets. This will also enable to get insight on the dynamics of household welfare analysis.

2.2.3.4 Comparison Between True Index, Expenditure and Income Approach

From a conceptual point of view, the true indices of welfare approach is considered superior than the other approaches due to a complete set of behavioural equations which comprises households' consumption and labour supply. This approach also employes preference order inferences of the observed variables to produce a computable scalar measure of welfare. The last two approaches are much simple without re-

stricting specific assumptions and use monetary value on the observed behavioural variables. Both approaches also require deflation measures with a price index and an adult equivalence scale.

In terms of practical viewpoint, all these approaches may suffer potential bias whenever adequate data are unavailable. True indices and full income approach are sensitive to opportunity set selection. Therefore, correct identification of this set is necessary to prevent imputation, selectivity and self-response biases. Full income and expenditure approaches are used to complement in measuring household welfare. However, income is often significantly different than expenditure or consumption because of saving and borrowing. In the end, these welfare measures give important information about living standards in a particular economy.

The expenditure approach can be used when strong relative prices exist and homogeneous goods are considered. In many studies, the expenditure approach seems to be used because expenditures are relatively accurate and easier to compute (for example see Deaton, 1997; Nguyet and Mangyo, 2010; Thomas and Frankenberg, 2007; Witoelar, 2013; **?**). In the context of permanent income and life cycle models, expenditures can be also used as a proxy for income since they are less influenced by fluctuations. In summary, it can be inferred that expenditure approach has more advantage in terms of practicality and assumptions used in measuring household welfare.

2.3 Consumption

Consumption is a central issue in macroeconomics, which is typically part of a household decision problem. Consumption decisions are closely related to wealth, saving decisions, uncertainty and risk attitude. It also refers to the process of acquiring and utilising goods and services, and to some extent disposing the residuals in the end.

Magrabi et al. (1991) state there are two types of output as result of household consumption. The first is the satisfaction and well-being experienced by household members and the second is the use of productive resources such as labour supply, engagement with higher level of society and public decision making. In this context, consumption is not merely satisfaction, but also developing household capacity for the betterment of households and society in larger scale.

The first issue of consumption with respect to household welfare is the determinants of household consumption patterns. The second issue is consumption smoothing or how households are able to find stable path of their consumption. The path is

highly related to the concept of time, which is also another dimension of household welfare. The relevant issue here is how consumption and income fluctuate in short time and over the lifespan in order to find the stable path of consumption.

2.3.1 The Determinants of Household Consumption

Household consumption behaviour is influenced by a set of relevant factors such as income, household characteristics, food and non food consumption (see Magrabi et al., 1991). In many cases, multivariate analysis is utilised to estimate different factors that determine household consumption pattern. The most common method is to measure arc elasticity e which is computed as the percentage change of consumption expenditure level $(C_1 - C_2)$ and the percentage change of income levels $(Y_1 - Y_2)$ as follows

$$e = \frac{C_1 - C_2}{C_1 + C_2} \Big/ \frac{Y_1 - Y_2}{Y_1 + Y_2}.$$

Using household data on income and consumption, the arc elasticity, e, can be also empirically derived as follows

$$e = \phi \frac{\bar{Y}}{\bar{C}}$$

where $\bar{Y}$ and $\bar{C}$ denote actual values of average income and consumption respectively and ϕ denotes the regression slope of the term $(C_1 - C_2)/(Y_1 - Y_2)$.

However, this method does not accurately explain the relationship between consumption and other household characteristics that is not linear such as age. The other limitation include the type of income and household life cycle. The complexity also arises when the structure of data is longitudinal or panel which usually contain effects from previous periods.

2.3.2 Permanent Income and Life Cycle Hypothesis

The welfare approach that emerged in economic discussions in 1940s and 1950s mainly focus on the permanent income ideas. The phenomenon of "regression toward the mean" idea has also played a significant contribution to this field (see Mayer, 1972). The well-known study of stable path in consumption is proposed by Brumberg and Modigliani (1954), followed by Friedman (1957) and Ando and Modigliani (1963). These works are also known as approach to wealth theory and collectively provide foundations for the "modern consumption theory".

The theories which are proposed by Ando and Modigliani (1963) and Brumberg and Modigliani (1954) in explaining consumption behaviour are collectively known as life cycle models. Assuming the markets are perfect, life cycle models predict that households consume their expected income at all point of their life. When income is low, households tend to borrow against their future income. They prefer to save more when their income is high in particular during their productive working years. During the retirement, they will consume their accumulated assets and savings. Therefore, the consumption profile over their live stage would be relatively flat.

The main idea of life cycle hypothesis lies on the link between a lifetime budget constraint and consumption at various life cycle periods. The slope of the budget constraint is given by $-(1+R)$ where R denotes the real interest rate which households lend and borrow. The slope indicates the trade-off between consumption at date t and $t+1$. The present value of human wealth or lifetime earnings determines the position of the budget constraint. In terms of utility optimisation problem, this can be written as

$$A = F_0 + \sum_{t=0}^{T} \frac{Y_t}{(1+R)^t} \tag{2.1}$$

where A is the initial wealth includes both financial and human wealth, F_0 denotes financial wealth, and Y_t denotes the expected value of human wealth for each date t.

Friedman (1957) discusses the household problem in more general terms. He argues that the households' decision making toward their consumption pattern is significantly determined by changes in their "normal" level of expected income (or permanent income) than the deviations or fluctuations from "normal" level of income (or transitory income), which are caused by business cycle, life cycle, or other factors.

Friedman also uses the similar terms to distinguish consumption where permanent consumption is defined as part of consumption which is expected and steady and transitory consumption is defined as irregular household expenditure or spending. The permanent consumption will be proportional to permanent income, and a fraction of average lifetime income that will be spent by households. The consumption includes planned consumption that depends on permanent income while the unplanned consumption is independent of income.

The main idea of permanent income lies in the estimation of the relationship between consumption and permanent income, which can be written as

$$\sum_{t=0}^{T} \frac{Y^p}{(1+R)^t} = F_0 + \sum_{t=0}^{T} \frac{Y_t}{(1+R)^t} \tag{2.2}$$

where Y^p denotes permanent income. The relationship between life cycle and permanent income can be shown by left-hand side of equation (2.1) and (2.2) where $Y^p = rA$ where $1/(1+R)^t$ converges to $1/r$. This implies that for permanent income hypothesis, consumption is determined by permanent income while for life cycle hypothesis, consumption is determined by wealth. Therefore, these theories are often referred as permanent income/life cycle hypothesis (or PIH/LCH).

Critics on these theories are mainly based on the assumptions and empirical tests particularly for various countries. Early life cycle theorists generally assume that households consume over their lifespan, not for example sharing consumption to others or distributing it to the heirs. Secondly, this theory assumes that consumption over time is independent to the level of income. The permanent income theory itself is similar to life cycle theory. The main characteristic which distinguishes these theories lies on the exposition of the theory. For example, the exposition can be in terms of utility function specification and explicit use of financial term, which is frequently mentioned as non human capital. Since this theory places more emphasis on permanent income, then it is inadequate to address household welfare issue.

2.3.3 Neoclassical Consumption

The key idea of the Neoclassical approach to consumption is households' ability to decide their consumption that involves two periods: present and future. The income can be earned in the present time and the future as well as the consumption. However they have to decide to consume today or in the future. This means that they have to find time path to smooth their consumption.

Let U denote household utility and the optimisation problem for this household can be written as

$$\max_{\{c\}} \; U = U(c_t) + \beta U(c_{t+1}) \tag{2.3}$$

subject to

$$c_t + \frac{c_{t+1}}{1+R} = A \tag{2.4}$$

where c_t and c_{t+1} denote consumption at date t and $t+1$ respectively, β denotes the discount factor, and R denotes the real interest rate. A denotes household's total wealth that includes financial wealth F_t and human wealth $y_t + (y_{t+1})/(1+R)$.

By solving (2.3) and (2.4), the optimal condition can be written as follows:

$$U'(c_t) = \beta(1+R)U'(c_{t+1}). \tag{2.5}$$

Equation (2.5) is called as the consumption Euler equation which implies that the household is indifferent between consumption today and consumption in the future. Since the Euler equation is written in terms of consumption growth, it gives insight into how interest rates are closely related to growth rates.

This Neoclassical consumption model has several implications on households' decision making on savings and consumption. According to this model, consumption is proportional to total wealth which is partially determined by the present value of household income. As the marginal utility is diminishing, households must receive positive interest rate so that their consumption is not constant. Other implications include tax role on consumption, access to borrowing facility and savings related to consumption smoothing.

2.4 Access to Finance in Developing Countries

Households have to face with various constraints when they have to make economic decisions. Constraints on consumption can be classified into labour, income, wealth, price and environmental constraint (see Magrabi et al., 1991). Most of these factors are highly associated with financial markets. In terms of income, households receive their income in the forms of earnings, interest, rent, pension, dividend through financial system, which correlated highly with financial policy such as savings rate and interest rates. Financial institutions also facilitate households to accumulate their wealth through financial assets, which increase their consumption during their lifespan.

Many consumption theories such as permanent income and life cycle hypothesis heavily rely on the households' ability to access financial markets where borrowing and lending activities exist to facilitate consumption smoothing. The existence of financial markets and institutions in an economy is also necessary to reduce and lessen the effects of asymmetric information and transaction costs. Therefore, households and other economic agents have benefitted from using financial services by channeling funds for productive activities. Further, this will boost economic growth, lessen poverty and improve income equality.

There is a difference between developed countries and the rest of world mainly developing countries in terms of income and consumption. Moreover, it is important to define developing countries. Since welfare is also closely related to household income, it is much easier to classify countries based on national income. According to World

Bank (2012), developing countries include low- and middle-income economies. For year 2010, low- and middle-income countries are those with a gross national income (GNI) per capita of $1,005 or less and of more than $1,005 but less than $12,276 respectively.

In order to improve household welfare and income equality, access to finance is very essential for households. Access to finance, which is also referred as financial inclusion, can be interpreted as the accessibility and utilisation of financial resources in economy by households and other economic agents in the absence of price and non-price barriers. The fact is the access to finance varies across countries where most obstacles to finance access can be found in developing countries. It is necessary to gain an adequate understanding about social, economic and financial environments which will help to gain deeper comprehension on household welfare. This section aims is to provide an understanding about social and economic features that characterise many developing countries with regard to financial development.

2.4.1 Inefficient Financial and Labour Markets

Nowadays, the number of financial services through private sector such as microfinance institutions is increasing. Microcredit markets, which are served by this kind of institution, are growing in many developing countries. This shows that there is demand of financial market for poor people. For example in India and Bangladesh, credits or loans are given mainly to women and micro entrepreneurs who work on joint liability between group members. Fernando (2007) argues that there are five aspects that are demanded by households on access and services from the financial markets: (1) safe and convenient deposit facilities, (2) credit with lower transaction costs and at reasonable prices for different product needs, (3) payment and money transfer, (4) microinsurance products, and (5) financial literacy services for low-income people.

Ljungqvist (1993) argues that the underdevelopment in low income and developing countries is also characterised by a low ratio of physical capital stock, a low level of gross domestic product, a high ratio of unskilled labour, a high return on human capital, and large wage discrepancy between unskilled and skilled labour. The last three aspects are related to labour market. Since households have no or small surplus from their labour income, people get involved in a trade or exchange to market their farming or home production surplus. However, this occurs at irregular periods and in a small scale.

Households also make investment in various types, which often constitute low capital, for example livestock breeding or self establishment of house for dwelling. These investments may include no or small amount of monetary expenditure which may sometimes be ignored in some economic surveys which may in turn ignored by some policy makers and economists in dealing with poverty reduction.

Furthermore, the problem faced by households in developing countries mainly related in three problems: poor health and education, social exclusion, and insecurity. Health and education are important factors that pin down the opportunity of employment, which in turn related to labour wage and income determination. Ranis et al. (2000) find that human development which include expenditures on public health and education have a significant relationship with economic growth.

Households may also experience social exclusion. Social exclusion can be defined to those people who have disadvantage in accessing social institutions and relations, which detach them from normal participation in the society or community. Akerlof and Kranton (2000) argue that social exclusion is close to poverty. The difference is that social exclusion focuses on the relational issues, while poverty is related to distributional problems. Social exclusion can take place in two forms: access to labour market, and opportunity for social services and participation. Moreover, social exclusion affects a person's identity which in turn alter the economic outcome. This implies that households who are socially excluded may not be able to easily interact with other households, particularly activities which are related to monetary or financial transactions.

2.4.2 Financial Contracting

In credit markets, Stiglitz and Weiss (1981) initiate credit rationing analysis in general equilibrium framework. Rationing in a simple understanding is a condition where price mechanism does not prevail to drive the supply and demand equilibrium. In many developing countries, informal financial institutions engage in financial contracting with mostly low-income households due to comparative advantage in terms of monitoring and enforcement capacity. The monitoring is known as peer monitoring where it exploits information between individuals or households. Since it is based on well-informed group interactions, contracts can be enforced between group members where any breaches in contracts may results in social pressures or sanctions.

Furthermore, a study by Townsend and Urzua (2009) show the relationship between contract theory and financial intermediation through econometric policy eval-

uation, particularly alleviation of credit constraints based on occupational choice and risk allocation. This paper shows how contract theory can be analysed empirically under different economic models. They argue that economic researchers and decision makers need to make a clear understanding on the role of unobserved heterogeneity and underlying assumptions on individual endogenous decisions. Because various economic models available are related to financial and economic policy, a careful selection and meticulous interpretation on the models would result to better economic policy formulation.

2.4.3 Transaction Costs

Whenever households enter financial contracts, transaction costs such as exchanging goods and services, information costs, and contract enforcement, incur. However, the transaction cost as an approach goes beyond costs. Transaction cost framework puts more emphasis on the role of institutions in complex and long-term relationship arrangement which focuses on three dimensions: asset specificity, uncertainty and frequency (see Steer and Sen, 2010). This approach is widely used to analyse the theory of production and firm behaviour, yet there is a few attention on household behaviour.

Pollak (1985) argues that there are two implications when this approach is used to analyse households and families. First, the transaction cost approach elucidates activities conducted by households given their incentives to perform efforts and monitoring issue. Second, it clarifies allocation and distribution of resources within and between households when they enter binding contract with institutions.

There are two competing view with regard to high transaction costs in financial markets (see Henley and Boomgaard, 2009). The first view argues that informal financial arrangement mostly from moneylenders provides efficient financial services. The high interest rate is a result due to high uncertainty and transaction costs for small loans for poor households. This explains why some microfinance institutions are able to succeed because they are not constrained by their access to capital compare to formal financial institutions.

On the contrary, a high interest rate is an implication of the fact that informal financial providers behave under “monopolistic competition”. The advantage is due to trusted borrower history, well-informed and exclusive transactions. Therefore under these conditions, these institutions are able to charge high interest rates to households.

In doing financial transactions, households may engage in two different types of contracts, which have different implications. Short-term contracts may be beneficial in a short period but may put households in a hazardous state. In this context, short-term contracts refer to contracts with short duration which also require frequent renegotiation (see Pollak, 1985). It is difficult for households to accumulate capital under this contract and therefore discourage investment in specific capital.

Renewing the contracts or writing long-term contracts can solve such problem. However, contract renewal may also give other problems such as negotiation and monitoring. Complete long-term contracts may also be costly since it is impossible to write under perfect information. Having these difficulties, the incomplete contracts arise, transaction costs become very essential feature to write these contracts and influence household decisions on savings and investment (see Levine, 1997).

In summary, transaction costs as a part of market frictions can bring difficulties for households to smooth their consumption. Furthermore, this will impede financial markets and intermediaries particularly formal institutions, which in turn affect capital accumulation and technological innovation.

2.4.4 Savings and Liquidity Constraints

Levine (1997) defines liquidity as the ease and speed where households or any economic agents are able to convert their assets into purchasing power at specific price. However, due to asymmetric information and transaction costs, households may find these factors restrain their liquidity and therefore amplify the liquidity risk. By offering a contract, financial institutions ideally facilitate households to reduce the liquidity problems.

In developing countries, this condition is also followed by low opportunity of good saving instruments (Besley, 1995). This facility is restricted because of price fluctuations in many basic foods and commodities, which implies that the price has become a source of risk. In economic terms, this will make monetary savings difficult. As a result, the holding of household assets has become an alternative for saving instruments.

Another possible explanation of low level of savings is the social issue such as family and social obligation, which makes savings in formal institutions unattractive. However, it cannot be said that savings are no longer important. Savings are still able to provide limited protection for potential risk events.

2.5 Household and Risk Management

Each and every household have different ways to protect themselves against risk and uncertainty in their life. However, this is heavily affected by various social and economic characteristics. Besley (1995) argues that the main difference between people in rich and developing countries is the importance of risk for their daily lives which is characterised by limited access to credit and insurance market, weak law enforcement, and poor physical infrastructure.

2.5.1 Definition and Sources of Risk

Risk and uncertainty have always been substantial parts of human life. One choice made by an economic agent comes with uncertainty of consequences in the future and every consequence has its own risk. Knight (1921) distinguishes the term "risk" and "uncertainty". Risk can be defined as a quantifiable uncertainty measure, while uncertainty is difficult to be quantified by any means. Moreover, risk is defined as a state of uncertainty where the occurrence of relevant events may give undesired or unexpected loss. Uncertainty is characterized by limited knowledge of an economic agent to these events and its outcomes.

Risk in terms of economics is usually related to negative shocks or losses. For households, the large risk may come in the form of consumption shocks or fluctuations, which is caused by declining income or other household variables such as the health of family member. Households as economic agents are often assumed to have perfect foresight of future consumption by conducting transactions with others. Under different assumptions of markets, negative shocks may not necessarily become welfare losses if they can find ways to smooth consumption.

In many developing countries, risk and uncertainty emerges from social and economic environment such as natural hazards, price fluctuation, unstable political environment and conflicts. Changes in government policies such as market liberalisation and privatisation may also generates problems and increase vulnerability. Households also have specific or idiosyncratic risks for example family illness, death, and crop loss for agriculture households. These risks may lead to declining household welfare. Based on Holden et al. (1991), Ellis (1998), and Banerjee and Duflo (2007), the sources of risk for household can be classified into:

1. *Commodity price risk*. This risk includes any changes in commodity prices and market, which affect household consumption and production activities for exam-

ple agricultural inputs and labour costs. Price variability of inputs influences agricultural households to produce adequate farming outputs, which tend to increase the cost of production. In many cases, some households may not produce at all. In consumption, price variability of staple foods such as rice, corn, and soybean, affects the consumption pattern in particular to fulfil adequate amount of nutrition for household members.

2. *Disaster risk*. This risk comprises natural events or causes such floods, earthquakes, and other natural hazards that affect household production, housing or dwelling, and environmental damage. Households in stricken areas may find it difficult to recover fully and become more vulnerable and have a higher probability of being poor in the future.

3. *Climate risk*. This risk is related to changing in global climate particularly global warming which leads to uncertainty of production or farming schedule. Climate change effects in many developing countries take place in terms of declining crops due to unirrigated yields. The most important agricultural products such as wheat, rice, and soybeans suffer from the increasing in price level, which in turn induce food insecurity, and high level of meat consumption. For households, the negative impacts of such events can be found in the health aspect and well-being of family members particularly children.

4. *Income risk*. This risk can be defined as a deviation of income flow from expected future income path. In this context, income consists of all revenue received by households, which includes earnings from labour service, gain from investment and asset sales. The source of income risk is mainly from the labour market. For each occupational type, it has it own idiosyncratic risk called as earnings risk. The extreme case of income risk is unemployment risk which refers to a condition where a person is not able to find a job, or loses the current job. Household circumstances may worsen if the one who is unemployed is the head of household. The cause may not be only come from individual workers such as incompatible skills and requirement, but also from external factors such as economic recession and business shut downs.

5. *Death risk*. This risk can be defined as the loss of one or more family members which often associated with high costs. The worst case is that the one who dies is the head of the household or the breadwinner. If this happens, the way of

family living will be affected. In many developing and less developed countries where many workers are not protected by insurance and social security, losing important family members leads to higher level of household vulnerability. The family is not only coping with grief and depression, but also have to cope with losing the main source of income for the family.

6. *Health risk*. This risk can be defined as a condition where one or more family members suffer from critical illness which may lead to an increase in family health expenditure. Similar to death risk, the worst thing happens when the head of household or the breadwinner is ill and unable to work. Another case would be if one or more family members have disability or critical illness, which incur huge amount of health costs. In summary, health risk is associated with low level of household productivity, which leads to lower level of household welfare.

7. *Social risk*. This risk is related to social relationships and networks. In times when hardship emerges, households may need and seek for assistances or supports from their relatives and friends through different mechanisms such structured group, society or village association or workplace community. One well-known example for this is Rosca (rotating savings and credit association) where a group of individuals agrees to save and borrow between members for defined periods. However, in recent years many of these networks and groups have been broke down due to economic development, which affect less social cohesiveness between individuals or households.

8. *Political risk*. This risk includes the changes in government policies and political conditions. In some countries, this comprises armed conflicts that lead to political instability. Changes in government regime are usually followed by changes of government policies. Along with political disability, changes in policies have significant effects on households' asset allocation and welfare.

9. *Financial risk*. This risk related to the changes in economic conditions and financial markets which influence households' decision on savings, credit, insurance, and retirement. Households need to access financial institutions to help mitigate large and detrimental shocks. In developed countries, the problems largely arise because households have huge debts in financial systems, which lead to insolvency and defaults. However, in less developed economy where

access to finance is limited, many households turn to informal moneylenders where usually charge higher interest rates than formal financial institutions.

2.5.2 Risk Management

Households' inability to manage risks may lead to vulnerability. Siegel and Alwang (1999) argue that household vulnerability to various risk exposure has vicious cycle. With inadequate access to finance, households in particular the have-nots find themselves in limited asset base which lead to inefficient allocation of assets. If this happens then the assets would yield low returns and therefore influence their consumptions, savings and investment and finally a decrease in their asset base.

Risk management process includes identifying, measuring, estimating and mitigating risk exposure. Risk management in household level can be defined as a set of mechanisms utilised by households to manage anticipated and unanticipated losses due to related uncertainty and risks. These mechanisms affect household welfare through income and consumption channel. Since households' inability to access formal financial institutions and services, formal risk management tools such as insurance products and formal credits, have become costly and unattainable for such households.

Another arrangement that may be available is social risk management. Social risk management comprises policies and programs intended to help poor or nearly poor people (see Holzmann and Jørgensen, 2001). In many countries, social risk management is closely related to poverty alleviation programs, which vary according to the nature of risks, household responses, and social implications. The risk management includes intervention to labor market, social safety nets, and social insurance. However, in many cases social security or protection is limited or even not available for them. Therefore, households rely on informal insurance mechanisms such as social networks and kinship to cope and mitigate such idiosyncratic risks.

Table 2.1 provides four approaches that are commonly used by households as a response to risks and uncertainty. The first approach is called as risk mitigation, which refers to the use of formal financial instruments as risk mitigation tools. In other words, households try to mitigate the risks to other parties. In this approach, financial institutions both formal and informal play vital role in providing products and services to households mainly for consumption smoothing.

The second approach is risk reduction where households try to lessen the level of frequency or severity of unpredicted events usually by optimising efforts or physical

activities such as new technology adoption and migration. In this approach, financial institutions may not have important role for household.

The third approach is called risk coping where households tend to spontaneously respond to the risk events. Household may not aware of unexpected risk. The problem may become worse if they do not enough "buffer" to anticipate against huge loss.

The last approach is called risk sharing which can be defined as sharing the burden of loss with other parties or individuals. This can be also sharing the benefits if the arrangement includes some productive activities.

Some strategy of household risk management may fall into more than one approach. For example, private transfers within family, which can be classified as risk sharing within a household or intrahousehold risk sharing. Another example is Roscas that can be classified as informal insurance between households in a community or village. This can be classified as risk mitigation if it includes credits or loans.

2.5.3 Risk Sharing

As a human being, one individual lives and interacts with other people as family, friends, co-workers, or relatives. Whenever access to finance is none or limited and household risk is inevitable, mutual assistance between households, friends and other people cannot be neglected. This assistance can be formed in different level from family or friends to village level. The simple risk sharing may take place within a family. That is why Fafchamps (2011) called households as the first port of call for risk sharing.

Risk sharing as a financial arrangement can lower transaction costs and therefore facilitates greater specialisation. It can be also defined as a set of transfer between households who have direct relationships in the social networks in all states of the world (see Ambrus et al., 2014). Since it lies beyond formal financial institutions, it is often classified as non-market arrangements or mechanisms. Early development of risk sharing arrangement can be found in sharecropping or agricultural contracting (see Besley, 1995; Stiglitz, 1974). Risk sharing works on the premise of mutuality principle which is defined as an efficient allocation of risk that requires only aggregate risk be borne by its members and all idiosyncratic risk is mitigated by mutual insurance between members (see Lengwiler, 2004). This principle is based on the Borch's rule (1962) which states that risk sharing exists when the ratio of marginal utilities of income is constant across all dates and states of the world.

Table 2.1
Existing Literature on Household Risk Management

Risk mitigation is defined as households' efforts to transfer the risk to other entities mainly formal and informal financial institutions. Risk reduction is defined as households' actions that can decrease or lessen the likelihood of risk occurrence. Risk coping takes place when households try to accept and bear the risk and will act accordingly after the risk event occurs. Risk sharing can be defined as *ex-ante* efforts by households to share the risk by doing arrangement with other households or entities.

Approach	Strategy	Related research
Risk mitigation		
Asset management	– Portfolio adjustment	Campbell (2006), Betermier et al. (2012).
	– Hold financial and/or non financial assets	Udry (1995), Lusardi (1998) Guariglia (2001), Benito and Saleheen (2013), Deidda (2014).
Credit	– Formal and informal credit contracts	Besley and Coate (1995), Kochar (1997), Ghosh et al. (2001).
	– Credit associations and savings clubs	Okten and Osili (2004), Steer and Sen (2010), Karlan and Zinman (2008).
Insurance	– Formal and informal insurance	Udry (1994), Besley and Coate (1995), LeMay-Boucher (2012).
Risk reduction	– Investment for physical asset protection	Glewwe (1991), Rosenzweig and Wolpin (1993), Dercon (1998), Campbell (2006).
	– New technology adoption	Arrau et al. (1995), Banerjee and Duflo (2007).
	– Permanent migration	Halliday (2006).
Risk coping	– Asset liquidation	Morduch (1995), Skoufias (1995), Ellis (1998).
	– Self-production and under-employed asset utilisation	Dercon (1998), Gertler and Gruber (2002).
	– Remittances, charity, and transfers	Fafchamps and Lund (2003), Crayen et al. (2013), Arezki and Brückner (2012).
	– Illegal activities	Feige (1990).
Risk sharing	– Intrahousehold and extended family	Altonji et al. (1992), Hayashi et al. (1996), Cox and Fafchamps (2007), Witoelar (2013).
	– Informal insurance between households	Hayashi et al. (1996), Barr et al. (2012), Fafchamps and Lund (2003), Ambrus et al. (2014).
	– Community insurance pooling	Coate and Ravallion (1993), Townsend (1994), Ranis et al. (2000), Grootaert and Narayan (2004), Ligon et al. (2002), Okten and Osili (2004).

When risk sharing arrangement exists, insurance and credit becomes strongly related. Within this arrangement, credit is functioning as a substitute to insurance where a household is able to borrow for consumption smoothing. Moreover, the distinction becomes really unclear when households who serve as lenders are willing to lend for those who need loans whenever unexpected events arise. And more importantly, the transactions between households within this arrangement are becoming

increasingly complicated when the contracts are incomplete which is usually followed by enforcement problems.

There are two advantages of using risk sharing groups or networks over formal or market-based financial institutions. The first advantage is known as peer monitoring (see Stiglitz, 1990). Individuals who live in the same area such as villages or communities and have known each other for quite long time usually form risk sharing arrangement. Since members are well informed about other members in the group, it is difficult for those who want to shirk such arrangement. Given moral hazard and adverse selection issues, any shirking in contractual agreement would usually have results in social actions against such individuals.

The second advantage is contract enforcement which is related to peer monitoring. The individuals will be punished whenever they do not honour a stipulated obligation despite the contracts are not written or violated. The sanctions may not only be monetary but also social pressure due to the household immobility and repetitive arrangements.

Risk sharing is considered as a crucial component of household welfare and economic growth. In order to understand risk sharing in developing countries, Besley (1995) classifies risk sharing methodology into deductive and inductive approaches. He also argues that there is a trade-off between them.

An inductive approach starts with empirical observations and then continued by developing a theoretical model, which explain the risk sharing rule. Such approach can be found for example in Stiglitz (1974) on agricultural arrangement, Udry (1994) on informal credit markets in Nigeria, and Fafchamps and Lund (2003) on rural households in the Philippines. The critic to inductive approach is that it tends to focus on the reality of limited information and the imperfections of government and markets, but theoretically lack of explanation about inefficient institutions and externalities. The end results are often inefficient risk sharing.

Inspired by mechanism design, a deductive approach starts with establishing individual's preferences and production technologies within a group with a set of feasible outcomes given a set of informational and enforcement constraints. The theoretical allocations are derived and then compared to the real world observation. The theoretical approach is proposed by Harris and Townsend (1981) with empirical application mostly related to Townsend's works on India and Thailand. This approach offers the possibility of deriving institutions' optimal conditions from the underlying preferences and technologies as a response to an economic condition. The critic to this approach

is that it does not have adequate theory to explain why the second-best planning application can solved in the design problem and how it should correspond to the real world. In many studies, these methodologies have become complementary.

In terms of empirical approach, there are three type of risk sharing tests, which usually applied to micro level data of income and consumption or expenditure. Based on mutuality principle, the first type of risk sharing test is examining the change of consumption dispersion. This test can be found for example in Townsend (1994). The risk sharing is examined by controlling for aggregate shocks where individual consumption should not depend on idiosyncratic or individual shocks. Efficient risk sharing exists if idiosyncratic risk is not significantly related to consumption given aggregate shock. Similar test can be found in Attanasio and Davis (1996) where they investigate co-movement between income and consumption using the U.S. household data.

Using the same principle, the second type of risk sharing test is known as Euler equation test proposed by Cochrane (1991). The marginal utility of current consumption and the expected marginal utility of future consumption is derived from Euler equation given information available at present time. The efficient risk sharing exists if the ratio of marginal utility between current and future consumption should be independent to individual shocks in current date.

To see how the second type can be derived, suppose a closed economy with N households that have an intertemporal utility for household i can be written as follows:

$$EU = \sum_{t=0}^{\infty} \beta^t \sum_{s=1}^{\mathscr{S}} \pi_t^s U\left(c_{it}^s\right) \tag{2.6}$$

where β is a (common) discount factor, π_t^s is probability of state s that occur at date t, and c_{it}^s is household i's consumption at date t and the presence of state s. Households are assumed to live infinitely. Problem faced by a social planner is a maximisation problem with weighted sum of households' utilities can be written as follows:

$$\max \sum_i \varpi_i \sum_{t=0}^{\infty} \beta^t \sum_{\tau=1}^{\mathscr{S}} \pi_t^s U\left(c_{it}^s\right) \tag{2.7}$$

where ϖ_i indicates the Pareto weights that can be determined by the relative wealth of household at the beginning. These weights are utility aggregating devices and describe the importance of each household's utility to aggregate household utilities.

Equation (2.7) indicates the utility of household without any insurance. This also generates the Pareto-optimal allocations by introducing constraints into the problem, at each date and in each state:

$$\begin{aligned} F^s_{i,t+1} &= (1+R)F^s_{it} + y^s_{it} - c^s_{it} \\ F^s_{i,t+1} &\geq 0, F_{it} \text{ is given} \end{aligned} \tag{2.8}$$

where R is the real interest rate, y^s_{it} is household i's income, and F^s_{it} is household i's financial assets. All variables are at date t and state s. These constraints imply that household's current consumption is limited by the proceeds of their income and wealth.

Households are also able to borrow which the debt cannot exceed their assets and income. The liquidity constraint is indicated by $F^s_{i,t+1} \geq 0$ which restrict households from consuming their current proceeds from supplying their labour service in the next period.

Following Zeldes (1989) and Matsumoto (2006), the first-order condition combined with liquidity constraints is:

$$U'\left(c^s_{it}\right) = E_t\left[U'\left(c^s_{i,t+1}\right)(1+R)\beta\right] + \tilde{\mu}_{st} \tag{2.9}$$

where $\tilde{\mu}_{st}$ denotes the Lagrange multiplier associated with liquidity constraints for household i and $U'\left(c^s_{it}\right)$ denotes the marginal utility of household consumption. The expectations are assumed to be rational. An increase in $\tilde{\mu}$ indicates an increase in the expected utility with respect to current constraint by one unit.

The term $\tilde{\mu}$ in (2.9) can be interpreted as an indicator for negative welfare effect if liquidity constraints exist. When a household has a constraint from more borrowing than saving, the term $\tilde{\mu}$ shows a positive sign. Therefore, when $\tilde{\mu}$ is equal to zero, then there is no borrowing constraint. This implies that current consumption will be lower than it would have been without such constraints. The term $\tilde{\mu}'^s_{it}$ is normalised by

$$\frac{\tilde{\mu}_i}{E_t\left[(1+R)\beta U'\left(c^s_{it}\right)\right]}.$$

Equation (2.9) is rewritten as

$$(1+R)\beta E_t\left(\frac{U'\left(c^s_{i,t+1}\right)}{U'\left(c^s_{it}\right)}\right)\left(1+\tilde{\mu}'^s_{it}\right) = 1. \tag{2.10}$$

Using rational expectations, equation (2.10) implies

$$(1+R)\beta E_t\left(\frac{U'\left(c^s_{i,t+1}\right)}{U'\left(c^s_{it}\right)}\right)\left(1+\tilde{\mu}^{\prime s}_{it}\right)=1+\epsilon_{i,t+1} \tag{2.11}$$

where $\epsilon_{i,t+1}$ is an expectational error which has zero mean and is uncorrelated with the information available at date t. Assuming constant relative risk aversion (CRRA) with positive common risk

$$U(c)=\frac{c^{1-\gamma}}{1-\gamma}\exp(\theta x_{it}),$$

the equation (2.11) becomes

$$(1+R)\beta\left(\frac{c^s_{i,t+1}}{c^s_{it}}\right)^{-\gamma}\exp\left(\theta\left(x_{i,t+1}-x_{it}\right)\right)\left(1+\tilde{\mu}^{\prime s}_{it}\right)=1+\epsilon_{it} \tag{2.12}$$

where θx_{it} is the taste shifter as a function of household characteristics.

The consumption equation is derived from equation (2.12) by taking log differences on both sides and aggregation over households, which can be written as follows:

$$\begin{aligned}\Delta\ln c_{i,t+1}=&\frac{1}{N}\sum_i\Delta\ln c_{i,t+1}+\frac{1}{\gamma}\theta\left(\Delta x_{i,t+1}-\frac{1}{N}\sum_i\Delta x_{i,t+1}\right)\\&+\frac{1}{\gamma}\left[\ln(1+R)+\ln\beta+\ln\left(1+\tilde{\mu}'_{it}\right)+\ln\left(1+\epsilon_{i,t+1}\right)\right]\end{aligned} \tag{2.13}$$

The common terms, $\frac{1}{N}\sum_i\Delta\ln c_{i,t+1}$ and $\frac{1}{N}\sum_i\Delta x_{i,t+1}$ can be replaced by community-time dummy (α_{t+1}). The discount factor and interest rate are assumed to be a function of a vector of time invariant characteristics (fixed effect), z_i.

Since $\ln\left(1+\epsilon_{i,t+1}\right)$ does not have zero mean, the expectation error term becomes $\ln\left(1+\epsilon_{i,t+1}\right)\approx\epsilon_{i,t+1}-\frac{1}{2}\epsilon^2_{i,t+1}$ by applying a second order Taylor expansion. Therefore, (2.13) can be written:

$$\Delta\ln c_{i,t+1}=\alpha_{t+1}+\phi\Delta x_{i,t+1}+\varphi z_i+\frac{1}{\gamma}\ln\left(1+\tilde{\mu}'_{it}\right)+\varepsilon_{i,t+1} \tag{2.14}$$

where $\phi=\frac{1}{\gamma}\theta$, $\varphi=\frac{1}{\gamma}$ and $\varepsilon_{i,t+1}=\frac{1}{\gamma}[-\ln\left(1+\epsilon_{i,t+1}\right)-\frac{1}{2}\sigma^2_{e,i,t+1}]$. The term $\tilde{\mu}'_{it}$ is renormalised by transforming into $\left(1+\tilde{\mu}'_{it}\right)^{\frac{1}{\gamma}}\equiv 1+\mu_{it}$.

Now, the change in consumption is given by $\Delta\ln c_{it}=\Delta\ln y_{it}$. The actual change in log of consumption falls in a value between Equation (2.14) and Δy_{it}. By introducing

community k, Equation (2.14) becomes:

$$\Delta \ln c_{ik,t+1} = \alpha_{k,t+1} + \psi \Delta \ln y_{ik,t+1} + \phi \Delta x_{ik,t+1} + \varphi z_{hk} + v_{ik,t+1} \tag{2.15}$$

where $v_{i,t+1} \equiv \varepsilon_{i,t+1} + \ln\left(1 + \mu_{it}\right)$.

Under efficient risk sharing hypothesis, equation (2.15) is expected to have unity for coefficient α and zero for coefficient ψ. If the risk sharing is not efficient, then the coefficient ψ should be different from zero. This means that the change of consumption of a household is expected to be equal with the average of households in the community. Furthermore, the residual $v_{i,t+1}$ which contain the Lagrange multiplier and the disturbance term with zero mean, will give inference about the liquidity constraints. However, this model only shows how households may be constrained under the condition of imperfect credit markets.

In summary, it is important to note that such arrangement like risk sharing usually do not have adequate quantitative information. The future challenge of risk sharing study as suggested by Townsend (1995) and Besley (1995) is on the empirical application of risk sharing theory. In other words, the data become really matter to confront predictions derived from risk sharing theory.

2.6 Summary

This chapter lays foundation for this study that involves household welfare mainly in developing economy with regard to financial development and inclusion. In assessing financial inclusion, many studies combine data from existing household surveys and macro economic variables in the absence of comprehensive household financial information. However, there are few studies that classify different type of credit constraints or rationing. Furthermore, the impacts of financial exclusion should be also assessed and estimated with respect to household welfare.

There are four broad categories of risk management instruments that can be use by households: risk mitigation, risk reduction, risk coping and risk sharing. Initially, households always try to protect themselves by creating “buffer” against risk and uncertainty through their savings and asset accumulation. This approach is inadequate due to huge severity or loss from economic or idiosyncratic causes. There is need to investigate how savings and labour supply can play pivotal role in household’s self-insurance.

When access to finance is none or limited and self-insurance is inadequate, households may share their risks between their families or with other households. The main contribution here is to study insurance problems and group formation that arise in risk sharing arrangement and then put it into empirical context for Indonesian households given financial exclusion and inadequate self-insurance.

Chapter 3

Finance and Economic Development in Indonesia: A Household Perspective

3.1 Introduction

Finance plays an important role in economic development in many countries. An early work which emphasises the role of finance by Gurley and Shaw (1955) states that economic changes and development analysis relies heavily on a set of social accounts such as net worth of income, saving, consumption, and wealth accumulation. This role also includes the degree and quantity of financial intermediary within an economy. They argue that economic development is retarded if households and firms are only able to access self-finance and direct finance or direct borrowing from surplus units to deficit units. Therefore, financial intermediaries evolve to provide better access and foster economic welfare and development.

To empirically examine financial intermediaries' roles, adequate data or information is needed, particularly studies which emphasise household financial aspects. Many empirical studies in credit and insurance markets extensively utilise household surveys to examine household financial behaviour (for example see Jappelli, 1990; Mace, 1991; Zeldes, 1989). However, the absence of comprehensive micro data can become obstacles in understanding households' financial behaviour. Demirgüç-Kunt et al. (2008) documented various surveys on finance development and found that the obstacles can be eliminated by combining existing surveys with macro data.

Since my study focuses on Indonesian households, it is necessary to provide relevant information about the Indonesian economy and about households. This chapter aims to provide an overview of the main issues concerning Indonesia's economy and issues relating to household finance with respect to the data set used in the study. In particular, the objective here is to explore and briefly discuss relevant household economic and financial data for the study.

The content is as follows. Section 3.2 provides the highlights of finance development in Indonesia. Section 3.3 describes the Indonesia Family Life Survey (IFLS) data set along with comparison to Indonesian census data and household characteristics. IFLS data is utilised for Chapter 5 and 6. Section 3.4 provides explanation about the Access to Finance (A2F) survey which has more detailed information on financial-related variables which are employed in Chapter 4. Section 3.5 discusses general issues in financial development in Indonesia. The last section summarises.

3.2 Finance and Economic Highlights

A modern stage in Indonesia's financial system emerged in the 1900s during the last stages of the Dutch occupation. Since it was developed by the Dutch, the objective of the system focused mainly on the support of the commercial interests of the colonial government. However, there were some social programs to serve the rural populations. After Indonesian Independence and the end of World War II in 1945, economic development was slow, not started until the 1950's. However, from 1950 until 1966, the financial system was repressed by Sukarno government policies. The policy making was very centralised and the financial system was badly damage. Because of this financial repression, the economy deteriorated resulting in hyperinflation and socio-economic problems that lasted until 1966.

Post 1966, under the Suharto regime, the financial sector began to develop characterised by new financial policies and instruments. Between 1966 and 1972, the financial sector was rapidly developed as a response to the stagnancy and devastation of the previous regime. In this period, however, the development relied heavily on the banking sector while other financial sectors were growing more slowly. In the next decade when the "oil boom" took place, the government pushed financial activity into the fiscal sector and offshore financial institutions. The activity shift was also influenced by an expansion of economic opportunity in the private sector. However, the efforts to promote new financial markets such as capital markets were not effective

in fostering economic growth. By the end of 1982, state-owned or government-owned banks dominated the banking system holding 80% of market share.

In 1983, when the oil price began to fall significantly, the government changed economic policy. The changes included many aspects such as trade policy, government expenditure and planning, and banking. In 1988, the government launched an economic policy package which is considered the most liberal policy yet. The policy removed restrictions on opening new banks: this also enabled foreign banks to enter the Indonesian banking system. The loans grew aggressively which triggered high economic growth in Indonesia. However, many banks retained very low capital reserves which was not in line with good banking practice. In 1991, government issued new policies which focused on strengthening bank supervision, following the serious effects of 1988 policy; problems included foreign exchange frauds, bank scandals, and bankruptcy. In 1992, a new law on banking, insurance and pensions was established, indicating new directions towards a modern financial system. This soon was followed by the Capital Market Law in 1995. During this period, Indonesia was considered as a new emerging economic country whose finance sector played an important role following rapid and aggressive growth between 1984 and 1996. This is depicted in Figure 3.A.1. More importantly, this expansion took place after the oil boom.

In 1997, as the currency crisis started in Thailand, the effect spread out to its neighbouring countries including Indonesia. The value of Indonesia's currency against the U.S. dollar fell sharply from 2,436 as of July 1997 to 16,800 in mid-1998 (see Thomas and Frankenberg, 2007). The problem was due to the fixed exchange rate system adopted by the Indonesia government. However, much of the problem was exacerbated by a huge amount of foreign borrowing by the private sector (see Matsumoto, 2007). The interest rates on one-month SBI (*Sertifikat Bank Indonesia* or Bank Indonesia Certificates) which serves as a benchmark rate rose to 67% in mid 1998, followed by the rise in unemployment rate which was around 15% and the real wage rate fall approximately 40% since the crisis started. However, it was revealed that the banking sector was still very fragile due not only to offshore financing but also because of a fundamentally weak financial system. The financial crises became a macroeconomic crisis where the unemployment rate was very high and was also followed by high inflation rate. During the 1997-98 economic crisis, the deposit rates were higher than lending rates implying difficulty to attract people's money into the financial system as depicted in Figure 3.A.2. During this period, the high level of lending rate shows a reluctance for the financial system to provide an intermediary

function. As the financial sector weakened, interest rates decreased rapidly and the inflation rate soared higher (see right panel of Figure 3.A.2).

There are interesting facts about saving rates in aggregate level for Indonesia since 1960. Figure 3.A.3 provides saving rates for Indonesia with its neighbouring countries; these are emerging economies like Southeast Asian countries, India and China, and developed economies like Japan and South Korea. The saving rates for Indonesia have decreasing trends between 1960 and 2010 while other countries except the Philippines have increasing trends for the same period. Only the Philippines and India have average saving rates lower than Indonesia.

Saving can be considered as one important factor of economic growth. China, for example, has one of the highest levels of saving rate in the world (see Kraay, 2000). Saving can support the economic growth which has an important role in shaping economic transition from an agricultural-based economy to a more market oriented economy like China. At an institutional level, this is backed by the proliferation of bank branches and other financial institutions which give households more motivation to save and accumulate their wealth.

The saving rates for Indonesia increased for the first decade of the Soeharto era due to the "oil boom". Since it was triggered by the oil exports, it was also ended when the oil price declined in the 1980's. During the financial deregulation when the government launched its economic package in 1982, the saving rates were steadily increasing due to financial expansion. As the government launched another economic policy in 1988, the saving rates declined and continued to do so until the Asian financial crisis struck. During the Asian financial crisis, the saving rates for Indonesia were the lowest amongst countries that were heavily affected such as Malaysia, Thailand and South Korea. These countries were able to maintain the steady saving rate to support the economic growth. For Indonesia, however, the saving rates declined to the same level as at the end of "oil boom" era and have never fully recovered.

3.3 Indonesia Family Life Survey (IFLS)

In many developing countries, highly accurate and precise data on households are hard to find. Moreover, the data becomes difficult if sample households are retained from time to time as in the PSID (Panel Study of Income Dynamics) in the United States or the BHPS (British Household Panel Survey) in the United Kingdom. The

Indonesia Family Life Survey, or IFLS, can be considered as one of its kind but it has fewer time observations.

IFLS data are gathered and organised by the RAND Corporation and some Indonesian institutions, from the first wave until the latest. These longitudinal surveys consist of two levels: community and household surveys, where the latter can be decomposed into individual and family samples. There are four waves so far: IFLS1 in 1993 (Frankenberg and Karoly, 1995), IFLS2 in 1997 (Frankenberg and Thomas, 2000), IFLS3 in 2000 (Strauss et al., 2004b), and IFLS4 in 2007 (Strauss et al., 2009).

3.3.1 Survey Methodology

Samples were taken from 13 provinces on the islands of Java, Sumatra, Bali, West Nusa Tenggara, Kalimantan and Sulawesi. These islands represent 83 percent of the population. Figure 3.B.1 presents the selected provinces where the surveys were conducted. The surveys were classified into two levels: community and household surveys. The samples were selected from the Susenas 1993 or 1993 socioeconomic survey which consists of 60,000 households.

The surveys cover 7,224 households for the first wave and maintains around 90 percent of its samples until the latest survey wave in 2007. The latest survey consists of 12,977 samples. The respondents were selected using stratified sampling on province level and random sampling on district level with certain sampling rules such as age, ethnicity and other demographic characteristics.

Various detailed information which describes the circumstances of the family as a whole can be classified into four broad categories: (1) fertility and family planning, (2) infant and child health, (3) employment, migration, and education, and (4) social, economic, and health status of young, adults, and old people.

The interviews were conducted with relevant household members with respect to questionnaire modules on the household's characteristics and conditions. For example, the wife or the female head of the household was selected to give information about household consumption, income, health, and family planning. For other information such as employment, household asset, saving, education and community participation, some members of the household including the head will be asked to give responses.

The community or village data in the IFLS give some advantages, particularly in analysing the social and economic environment where a household lives. For example, a village is considered as a risk sharing unit or network (for example see Fafchamps

and Lund, 2003; Ligon et al., 2002; Townsend, 1994). The problem may arise if a household is directly assigned to a specific village identifier. The official IFLS data release does not indicate the village where a household lives. However, this can be managed by linking IFLS individual and household data with IFLS community data using the specific identifier (commid) making a household can be easily tractable.

The surveys were taken in different economic periods that are quite interesting to study. The first wave was taken in 1993 when Indonesia was in economic boom. In this period, the financial sector was liberated while at the same time economic growth and foreign confidence in the Indonesian economy was high (see Kenward, 1999). The second were taken just before the Asian financial crisis in 1997. There was another survey, called IFLS2+, which was conducted specifically to explore and investigate the impact of the crisis for Indonesians. The IFLS2+ survey was conducted in 1998. The survey is a subsample of IFLS households and the data is not publicly accessible. The third wave was conducted in 2000 when Indonesia was still in economic recovery. The last wave was taken ten years after the crisis. It is interesting to see the impact of various changes on Indonesian households.

Figure 3.B.2 depicts the years when the surveys were conducted. This figure also depicts the Gross Domestic Product (GDP) per capita in terms of U.S. dollar current value shows that the effect of the crisis is drastically decreasing after year 1997. This is also followed by the decreasing GDP per capita in terms of purchasing-power-parity (PPP). Moreover, this indicator does not take account of income inequality, where people with low income suffer more than others as investigated by Frankenberg et al. (2003).

3.3.2 The Definition of Household

As discussed in Chapter 2 about the importance of household definition, IFLS defines a household as a person or group of persons who live together and reside a part of or an entire building and have the same kitchen for eating purpose. Moreover, eating from one kitchen is defined further as the joint arrangement in fulfilling daily necessities (see Frankenberg and Karoly, 1995). From this definition, it can be interpreted that IFLS use the same definition as in BPS (1999) which includes people, physical building and kitchen.

IFLS also defines the head of the household as a person among the people who occupy the building who is responsible to satisfy daily necessities of the households. Alternatively, IFLS defines the head of the household as a person who is assigned

as the head of the household. These definitions are very important particularly in understanding the context of this study.

3.3.3 A Comparison between IFLS 3 and 2000 Census

A household survey can be considered as adequate and reliable if the samples represent an up-to-date population. The census usually serves as a frame for household surveys which give basic information about household members' characteristics. In many countries, the census also provides information about house or dwelling characteristics.

In Indonesia, a census is conducted every ten years since 1980 and the latest was 2010. Before 1980, the census was taken in 1961 and 1971; and 1920 and 1930 during the Dutch occupation. Figure 3.B.3 provide comparison of the two pyramids from different data set based on age and gender. The pyramid in the left panel is calculated from the Indonesian Census and the right panel is calculated from IFLS 2. Both surveys were conducted in year 2000.

The difference between the IFLS and census pyramids is partly because of sampling errors and difference in coverage. This may also occur because the IFLS baseline was taken from Susenas 1993, not from the Indonesian census. In the first wave, the IFLS covered only 13 from 27 provinces (see Table 3.B.1). Since the same households along with their splits are retained in the next waves, the difference may increase.

Based on Figure 3.B.3, the most obvious difference is the composition of males and females under 15 years old where these groups in IFLS classification have different shape proportionally compared to the census for the same age groups. However, the IFLS are partially able to capture the demographic composition of Indonesian population, particularly for working-age and old-age population.

According to Deaton (1997), non-coverage of some of the population characteristics is common in household surveys. This does not mean that statistical inference cannot be made from the household survey data set. The optimal way to utilise the data set is to develop research frameworks, which fit with the available information. In terms of household information, the IFLS can be considered as a comprehensive survey with respect to Indonesian population characteristics.

3.3.4 Data Treatment

Since the data were collected in different years: 1993, 1997, 2000, and 2007, the context of unique economic circumstances cannot be neglected. It is necessary to treat the collected data and information in specific ways so that the interpretation of related information can be conveyed accurately and reflect real economic activity.

3.3.4.1 Constructing Household Income and Consumption

The importance of household finance is pointed out by Campbell (2006) in his presidential address on American Finance Association. He argues that it is difficult to measure household finance due to constraints that cannot be captured by any textbook models, from which two challenges emerge: measurement and modelling. However, it is still possible to measure some aspects of households in terms of acquisition, purchasing, and the use of goods and services.

Since the first survey is based on Susenas samples, (ordinary) households in the IFLS can be defined as an individual or a group of individuals living in a physical dwelling or part of it and usually sharing the same kitchen. Each household in the IFLS is uniquely identified and tracked from the first survey to the latest survey. Some individuals have moved across households between each IFLS respectively.

The first analysis starts from two basic household economic variables: income and consumption, where these variables are flow variables. In constructing the household income, the whole family members' incomes are calculated into one household as a unit of analysis.

The household income can be calculated from four sources of income: (1) household earnings or income which come from supplying their labour, (2) net revenue generated from farm business, (3) net revenue generated from non-farm business, and (4) other sources which may comprise of retirement, scholarship money, insurance money, transfers from other households, and Roscas. Since an household is treated as a unit of analysis, the income calculations include all income generated by household members which are in terms of nominal figures.

These nominal figures are then converted into real figures. The conversion method is explained in Section 3.3.4.3. Here, the samples are divided into two categories based on the location: rural and urban areas. A rural or village area is characterised by low-density population and agricultural-based economy, while an urban area is

characterised by high-density population and non agricultural-based economy. The income figures are summarised in Table 3.B.2.

The latest survey gives more detailed information about household economy than previous surveys. For example, IFLS4 contains information of responses to the key public transfer program in late 2005 and late 2007. This includes for example Raskin (*Beras Miskin* or Rice for the Poor), a subsidised program that gives poor households an access to rice, and government market operations concerning rice and some food distribution to households.

In constructing the consumption aggregate from IFLS data, I follow Witoelar (2009). However, for benchmarking reasons, I transform all necessary data in terms of annual information as necessary. The figures are also converted into per capita measures such as per capita income or per capita expenditure. This can be done by dividing such measures with the number of people living in a household.

3.3.4.2 Constructing Household Income Statements and Balance Sheets

This section describes household balance sheet construction based on the existing IFLS data. Samphantharak and Townsend (2010) provide comprehensive approach in constructing household financial statements from the Townsend Thai Monthly Survey since September 1998 until December 2005. Their survey questionnaires are intended to capture household financial variables on a high frequency basis. Using this kind of data, they are able to construct monthly household financial statements containing, for example, monthly income statements, cash flows and balance sheets. These enable the information users to analyse key household variables such as consumption, investment, and liquidity.

The IFLS are not designed to capture the household financial activities completely. Therefore, the chapter can make a potential contribution to the construction of household financial statements from longitudinal household surveys. Another feature in the IFLS questionnaires is the different types of question concerning household economic activity. For example, more detailed information about household credit or borrowing history is available since IFLS3, while IFLS1 and IFLS2 only give limited information about household credits or loans.

However, household financial statements have some limitations. As stated by Samphantharak and Townsend (2010), there are at least four limitations. Firstly, it only describes household activities in aggregate measures. Therefore, it is not easy

to analyse resource allocation within a household. Secondly, it fails to identify and measure human capital and household intangible assets.

Thirdly, it does not capture some decision-making process that are made arbitrarily: an example would be financial decision making related to household production activity. Finally, similar to corporate financial statements, one may use financial information to analyse different types of household variables such as liquidity and activity ratios. However, this will not be adequate, as one should go further than using financial ratios only.

Constructing household financial statements using IFLS data has some limitations since the IFLS are longitudinal surveys. For example, the beginning value for net wealth and cash equivalent accounts should be based on the previous year's balance. The IFLS data do not contain explicit household information that usually exist in corporate financial statements, such as fixed asset depreciations.

Household financial statements are given in Table 3.B.2 and 3.B.3. The tables show the differences between average households who live in different areas. In terms of average net income, rural households have better conditions than those who live in urban areas in that year. One possible explanation is that many of the urban households are still affected by the effects of the crisis for the past three years. However, based on the saving to gross income ratio and the saving to net income ratio in Table 3.B.4, the urban households' financial circumstances are still better than the rural counterparts.

3.3.4.3 Converting Nominal to Real Values

Following Strauss et al. (2004a) and Witoelar (2009), two set of deflators are used in this study. The first set is called as the temporal deflators using December 2000 or IFLS3 as the base. The second set is called as the spatial deflator using Jakarta (the capital city) as the base. Therefore, the real value of a household expenditure x is calculated as follows:

$$v = \frac{x \times i_{\text{törnq}}}{i_{\text{spt00}}}$$

where $i_{\text{törnq}}$ denotes Törnqvist index and i_{spt00} denotes the spatial index. The temporal deflator is based on Törnqvist index calculated as follows:

$$i_{\text{törnq}} = \prod_{i=1}^{N} \left\{ \frac{p_{it}}{p_{ib}} \right\}^{\left(\frac{1}{2} \frac{p_{ib}q_{ib}}{\sum_{i=1}^{N} p_{ib}q_{ib}} + \frac{1}{2} \frac{p_{it}q_{it}}{\sum_{i=1}^{N} p_{it}q_{it}} \right)} \tag{3.1}$$

where p_{it} and p_{ib} denote the price of good or service i in period t and base period b respectively. q_{it} and q_{ib} refer to the quantity of goods or service i purchased in period t and base period respectively. Since IFLS do not provide adequate information to calculate Törnqvist index, the related information will be taken from Susenas data. Another limitation is that the first wave only is calculated in nominal values since there are no regional deflators before 1997. I use GDP deflator from BPS consumer price index as a proxy only for IFLS1 if necessary.

3.3.5 A Comparison of Rural and Urban Households

There are several reasons why households live in poverty: there may be too many adults who can not find jobs or are poorly paid, too many dependents or children within a household even though this household may earn a relatively high salary or income. In many cases, the family composition has strong correlation with poverty along with employment and dependency rates. There may be a high dependency rate or the ratio of dependent young and old (see Musgrove, 1980). In many Asian and African countries, most poverty occurs in rural areas. However, for the past 40 years the poverty trend has changed and shifted to urban areas: this significantly increases the number of urban poor. This condition could lead the population to a greater vulnerability to poverty and undernutrition (see for example Haddad et al., 1999). Since distinct characteristics between rural and urban households exist, it is useful to compare and analysis households in different areas separately.

Using Susenas data between 1987 and 1996, Asra (1999) finds that migration in Indonesia has affected the decline in observed poverty between urban and rural households. This study emphasises that household location should be taken into account since the inflation rate and cost of living between rural and urban environment is significantly different. In this subsection, I will explore the characteristics of IFLS households with respect to household welfare issue.

3.3.5.1 Demographic Characteristics

One of the most important demographic variables in relation to income and wealth is household size or composition. In their study, Peichl et al. (2012) find that the growth income gap has strong correlation with changes in household structure. This structure significantly influences per capita incomes in terms of structural shifts in household formation.

In the first survey in 1993, a half of urban households consisted of more than four persons in a family while in rural areas, 45% of respondents were in a household with more than four persons. In the next survey, these figures have decreased to 29% of urban and 26% of rural households with more than 4 persons.

Households with three and four persons are relatively stable from the first wave until the last wave of the IFLS survey. Two persons households have increased since the first wave. A significant increase for this category is for urban households, implying large scale movement from rural to urban area in particular between 2000 and 2007: during this period the number of two person households grew by 50%. The figures for household size are given in Table 3.B.5. The age structure of a household may also affect its welfare. Table 3.B.5 provides figures for different age categories based on regions where households live. Children below 5 years old in rural households are relatively stable over four IFLS waves while in urban areas, children under five years old are stable for the first three waves and then rise significantly in the last survey.

Working-age individuals for rural and urban area steadily increased by around 1% between 1993 and 1997. However, during the economic crisis between 1997 and 2000 the proportion of this group increased significantly especially for urban areas. Persons over 65 years old are constantly increasing with the final proportion at 12.3% for urban households and 13.7% for rural households. To summarise, the changing family structure based on age cohort found in urban households, is proportionally higher than rural households. However, rural households have a higher proportion of over 65 year olds.

Another interesting fact is found in the marital status of IFLS households. During the economic crisis, the number of separated and divorced spouses between 1997 and 2000 was higher than any other period between IFLS survey waves. This number is higher for those who live in urban area as well as rural area. It seems that social economic conditions during the economic crisis may have affected household attitudes towards marriage.

The key population characteristics from demographic information are household size and working-age structure particularly of the head of the household. Household size affects per capita expenditure and per capita income in analysing household management and later on risk sharing arrangement. The age of the household head is also important in determining the life cycle of an household.

3.3.5.2 Educational Attainment

Education background is related to improved household welfare through better and well-informed decision making on every aspect of household life. In many developing countries, education is still a big issue along with poverty and malnutrition. In terms of nationwide education policy in Indonesia, each citizen is required to complete 9-year mandatory education, which consists of elementary and junior school education. Further discussions about the Indonesia national education system is given in Chapter 5.

As provided in Table 3.B.5, it can be inferred that most of IFLS households have managed to finish their elementary education. In 1993, the percentage of individuals who have completed mandatory is 42% for urban and 19% for rural. In the last survey in 2007, the education attainment of IFLS households is getting better where 50% of individuals in urban area are able to finish their mandatory education: this shows an improvement in educational attainment for this sector. However, this is not the case for individuals in rural areas where only 30% of individuals completed their mandatory education.

The key characteristic from education information is the last level of education obtained by individuals. This is important to determine the length of education which also implies investment in human capital. Moreover, in order to derive any risk related to labour service, this information is necessary to obtain the estimations of earnings risk.

3.3.5.3 Employment Occupation

Employment is a source of information about various dimensions of labour including wages, working contracts, and the range of employers. This information is necessary to analyse how households earn earnings and other revenues.

Concerning employment questionnaires, there are some differences in each survey wave. IFLS asked about employment type through primary activity in the employment module (see Table 3.B.6). IFLS1 and IFLS2 have different question structures while IFLS3 and IFLS4 have same set of questions. Based on Table 3.B.6, it can be inferred that the number of individuals who are working or helping to earn income is constantly increasing: the rate of change in urban area is 33% and 24% in rural area.

Initially, in the IFLS1 the employment classification is based on employment status such as self-employed, government employee, private employee, and family worker.

Starting from IFLS2, the employment classification is based on industry. There is a decrease in agricultural employment in rural area: it stood at 55% of the rural population in 1997 and 51% in 2007. In urban areas, the employment is dominated by transportation, storage, and communication sectors followed by utility services.

Related to educational characteristics in the previous section, occupational characteristic is also important to determine the degree of earning risk. Some occupation in particular sector or industry may have lower or higher risk than other occupations.

3.3.5.4 Consumption and Income Profiles

Figure 3.B.4 and 3.B.5 depict monthly per capita income and consumption patterns of IFLS households based on household location for 1997 and 2000 respectively. Consumption is indicated by monthly per capita expenditure. The age profile is based on the head of household's age with the respective year of the survey. The main question here is to observe the consumption and income pattern before and after economic crisis.

If the age-profile of household consumption or income have hump-shaped curves, then it can be said the consumption or income is tracking age profiles. All of consumption and income profiles follow this pattern in 1997, except monthly per capita expenditure for urban households (bottom left in Figure 3.B.4). Urban households have higher levels of consumption and income compared to rural households. As predicted by PIH/LCH model, the income is decreasing when age is increasing. The income trends are declining after retirement age.

After the Asian financial crisis in 1997, as predicted the income level for both rural and urban households fell due to macroeconomic shocks as shown in Figure 3.B.5. On the other hands, the consumption levels increase for rural and urban households. However, there is a significant change for rural households as the curve now is more convex than in the previous period. This means that younger households tend to consume more compared to elder households in rural area. For urban households, the consumption pattern is relatively stable after age of 40. Similarly in the previous period, the income patterns decline after retirement age but the income level is lower than before.

In summary, as indicated by Frankenberg et al. (2003), rural households have experienced more decline in their per capita income after the economic crisis. This may affected their well-being. However, at same time consumption increased.

3.3.5.5 Financial Well-being

A set of ratios can be used to assess financial well-being for households, which is useful in understanding financial decision making and planning. Greninger et al. (1996) documented various methods for this purpose along with discussion of standardisation, consensus, and application of financial ratios for households.

In the first wave, 64% of urban households and 89% of rural households live in their own house (see Table 3.B.4). These figures do not change much until the latest wave. The numbers who live in owner-occupied houses or rent a house are much higher in urban areas than in rural areas where only 2% of rural households fall in this category. In terms of percent of household income, rent fee is not a burden, since the majority of households pay less than a half of their income, especially those who live in rural areas. The rent fee in terms of percentage of household income is decreasing around the financial crisis period and then increasing in the last waves. It may imply that during crisis period the rent fee is relatively cheaper than in normal time.

In analysing financial ratios in Table 3.B.4, the mean values are compared to recommended ratios as described in Greninger et al. (1996). First, the liquidity asset to monthly expenditure ratio for average urban households is drastically decreasing after the IFLS1. On average, this ratio is close to the recommended ratio (between 2.46 to 2.70) except for average rural households in the IFLS4. This implies that household capacity to smooth their expenditure using their own liquid asset is quite stable from the first wave until the last wave except for rural households in the IFLS4. For liquid asset to current debt ratio, it is quite surprising because on average the figures are higher than the recommended ratio (between 0.79 to 0.94). It seems that the IFLS households tend to keep their liquid assets and borrow far less than the value of their liquid assets.

Based on the savings to gross income ratios, IFLS households tend to save more as reported in the IFLS1 especially those who live in urban area. However, after the financial crisis the numbers are drastically decreasing especially for those who live in rural area. The financial crises may badly affect those who live in rural areas rather than urban households. When savings are calculated against net income, the figures deteriorated. In IFLS1, the value of this ratio is negative for both household types. IFLS households around this period may consume more than they could earn. This may also be induced by the financial boom during this period that lead to higher

household consumption. The figures continued to fall and then bounced back in mid 2005 as indicated by savings to net income ratio in 2007.

Finally, the IFLS household decision making in terms of asset allocation can be considered inefficient. As suggested by Greninger et al. (1996), the liquid asset to net worth ratio should be between 15% and 20%. The mean values for urban and rural households in 1993 are quite good. However, from IFLS2 until IFLS4 the mean values are lower than recommended values indicating that average IFLS households are financially worse off.

3.4 Access to Finance (A2F) Survey

Financial systems in many developing countries are typically underdeveloped, and often serve mainly large firms and wealthy individuals. As an emerging economy, Indonesia has limited households who can access financial systems. According to Fernando (2007), financial access in Indonesia has a different story compared to other developing countries. In Indonesia, the financial institutions have expanded significantly but households are still facing significant problems in gaining access to finance.

Another problem that arises in developing countries is the maintenance of adequate social security or protection for its citizens. As a way to cope with social security issues and inaccessible financial system in Indonesia, the Indonesian parliament passed a new social security law in 2004 (*Undang Undang Sistem Jaminan Sosial Nasional Nomor 40/2004* or Law Number 40/2004 regarding National Social Security System). This law promises to introduce a new nationwide social security system that provided basic protection including an old-age pension, health insurance, death benefits and worker protection for all Indonesian citizens.

However, there is no significant progress since the enactment of social security law. As of 2013, the current system only provides basic protection for formal workers, both in public and private sectors. Therefore, this exacerbates the problems in informal workers and people in village areas. Based on the latest survey by BPS (2010), the number of informal workers is estimated about 71.4 percent of total productive workers, while number of people who live in villages is estimated at 57 percent of total populations. The dispersion of the population and the limited government budget also add more problems to social security program.

Latest estimation by World Bank (2012) reveals that 8.5% of the Indonesian population above 15 years old who have access to a formal loan from financial institutions

while 42.3% of the population borrow from their family and friends. This number is relatively high on average compared to other East Asia and Pacific countries (27.2%) and lower-middle income economies (11.1%). For insurance, only 0.9% of the Indonesian population personally pay for their own insurance which is very low compared to Asia and Pacific countries (36.8%) and lower-middle income economies (5.1%).

This section provides an explanation of the second data set used in this research. The data set is called the Access to Finance (A2F) survey conducted by the World Bank in 2008, covering 3360 households from 10 provinces (see World Bank, 2009). Compared to the IFLS data set, the A2F survey covers a smaller region and fewer households. However, it provides more detail on household information in terms of financial attitude and behaviour which is very important in examining household risk management. This information is not covered in the IFLS data set. In this study, the A2F data set is utilised to identify credit constraints (see Chapter 4).

3.4.1 Survey Methodology

In terms of survey scale, A2F is a smaller survey than IFLS. The A2F survey comprises two levels of observations: household and individual. The financial characteristics are observed in the household level, while the individual level focus on the socio-economic characteristics. The A2F survey put more emphasis on the head of household, defined as the person who has authority over household financial decision making. Like the IFLS, the A2F sample selection ensures nationwide representation of the Indonesian populations using multi-stage random sampling. The sampling weight is based on the different types of administrative level: province, district or city as sub-province, and village level.

The survey covered four provinces in Java (the main island): Banten, West Java, Central Java, and East Java, and six provinces outside Java: Aceh, Jambi, West Kalimantan, North Sulawesi, West Nusa Tenggara, and Maluku. The final samples include 34 urban villages and 30 rural villages which comprises 3,360 survey households: 1,920 on Java and 1,440 outside Java island. Figure 3.C.1 presents the locations of A2F households. Table 3.C.1 provides the summary of samples taken from each province along with the type of access to finance.

The head of the villages was interviewed in order to get information about financial services at the community level such as telecommunication, mode of transportation to the nearest financial institutions, and other information which are related to access to finance. For household questionnaire modules, almost two third of the total

respondents were the household head. The rest of these respondents were the wife or the female head of the households. From the total respondents who were interviewed, a half of them was a woman. 83% percent of the total respondents are married.

3.4.2 The Definition of Household

Although the survey samples are households, A2F does not explicitly define household in the survey. However, based on the demographic information about individuals living in the household given in the questionnaire, it seems that A2F follows the definition of "unitary" household similar to the definition as given in the IFLS. The information of household composition is based on family relationship with the person who is assigned as the head of the household.

3.4.3 Remittances

Remittances sent by migrants in developed countries to their home countries, which are usually developing or less developed countries, have became trends in the past decades. The remittances can be considered as a means of self-insurance which in many cases have became a substitution for formal and informal insurances, especially when social security become less accessible for households (see Crayen et al., 2013; Morduch, 1995). The A2F put more emphasis on information about remittances than any other module in the survey.

Based on the A2F survey, 241 households have at least one household member working abroad. Most of them are working in Malaysia (41%) and Saudi Arabia (32%). The rest are working in South East Asia, East Asia, Middle East, the United States, and Australia. Around 87% of these individuals have at least once part of their earnings remitted to their family in Indonesia, mostly on special occasions or for special purposes (52%). The average value of remittance is Rp 3.2 millions or approximately USD 353.63 (1 USD = Rp 9,200) with the maximum remittance value is Rp 20 millions or USD 2,173.91. Remittances are also used to meet daily needs.

However, most households who received remittances did not save the money and spent it mainly for consumption purposes. The reason is that they do not know how to save. From this, it can be summarised that most of migrant workers along with their respective family do not have adequate knowledge or information about financial services.

3.4.4 Insurance Knowledge

Insurance is perceived as one of the most complicated financial products by households. Insurance is intended to provide household protection against risks such as death, life, property, liability, third-party liability, and old age. Compared to the IFLS survey, the A2F survey provided more insight on insurance products.

Based on the A2F survey, illness and loss of employment are the first two important risks perceived by the majority of households (63%) that can affect their financial well-being. The third risk is losing their dwelling or place to live according to 17% of the households. Having a perception of these risks does not necessarily mean that this will translate into action.

Table 3.C.2 provides insurance ownership based on the type of product. The majority of households in this survey are not covered by government-sponsored health insurance. For private insurance, it is easy to infer that only a small number of households, that is 9.46%, took up insurance against illness. Moreover, the figure is smaller for rural households (5.46%) if private insurance uptake is divided by region. Around 42% of these households also understand that it is important to have protection for their breadwinner. However, not only is health insurance uptake low, but life insurance uptake is also low.

Households who do not take up insurance give two reasons for this position: the first reason is that they do not have enough money to buy insurance. This is quite contradictory since the majority of households (around 95.75%) think that the premium is not too expensive. This may lead to the second reason for not having insurance: they do not know about any insurance product. Therefore, it can be concluded that a low level of knowledge about insurance products or insurance literacy plays a significant role in explaining this situation. The fact that the benefit of the product may not be realised in the near future was another reason people failed to buy insurance.

3.4.5 Household Financial Literacy

Another feature in the A2F data set is a set of questions on the household financial management and financial literacy. This module also includes information on whether an individual is interested in financial matters. The financial management section briefly assesses the household behaviour towards saving and retirement. The financial literacy section is divided into two sets of questions: basic mathematics and

simple loan calculations. However, these questions must be assessed together to get robust results and a better understanding.

Table 3.C.3 provides the basic mathematics and financial literacy scores. There are significant correlations between these scores across cohorts. This implies that the financial literacy score is correlated with basic mathematical skills. However, the financial literacy scores are lower compared to the mathematics score. This means that although one may understand simple calculation in mathematics, it does not necessarily mean he or she is able to understand simple financial calculation. For example the correlation for older cohorts is higher than any other cohorts but eventually the actual scores are lower than younger cohorts. Those who live in urban areas seem have better knowledge about financial products, as they tend to have higher scores than those who live in rural areas. The figures confirm stylised facts about financial literacy where those who are less educated have lower financial literacy scores.

3.5 Issues in Indonesian Financial Markets

Indonesian financial systems have been heavily dominated by the banking sector since the late 1970s until the present. Despite a huge decline in the number of banks during the economic crisis, the bank networks have increased in terms of branches and the number of ATMs (automated teller machines). However, this development only occurs in big cities, particularly Jakarta which is considered as "over-serviced".

In terms of finance access in the institutional level, the IFLS does not provide much information about financial institutions. The accessibility of financial institutions at village level is given by the distance between village offices and the nearest financial institutions as provided in Table 3.C.4. The village offices are usually located at the centre of the village and more likely accessible by residents on that area. The A2F survey also gives similar information based on the questionnaire for village heads.

The financial development should also be taking account of the demand side. However, data and information on financial development from the demand side perspective is still rare. The IFLS is not intended to specifically address household financial behaviour, while the A2F survey was only conducted once. However, it is important to discuss relevant issues about financial development in Indonesia from the households' point of view, given these existing data.

3.5.1 Weak Market Institutions

The development of financial institutions at village level in Indonesia was considered a success. Chaves and Gonzalez-Vega (1996) studied eight financial institutions in rural areas which were relatively successful in reaching out to large numbers of small individual clients and providing suitable financial services. However, these financial institutions do not exist equally throughout the country.

There are several problems these financial institutions meet when trying to penetrate remote areas. Local financial institutions which have a lower cost of information and monitoring mechanisms may be wealth-constrained or too risk averse. Those who have resources may have no access to information, screening and monitoring mechanisms. In other words, asymmetric information and moral hazard characterise financial institutions' problems in rural and particularly remote areas.

Having no or limited information on probability of defaults, financial institutions have to seek other sources of information such as local government officers and in particular village heads. These people can serve as credit rating agents who determine the creditworthiness of an applicant. However, this method is very subjective and risky. Moreover, the accuracy and reliability of village heads as a source of information may jeopardise the existence of financial institutions.

Regulatory constraints may also make it difficult for financial institutions to provide their services to remote and small customers. The policies launched by government through the Ministry of Finance or Bank Indonesia (the central bank) put more emphasis on people who are mainly located in the cities and less emphasis on rural and remote areas. However, the government has also dedicated BRI, one of the state-owned banks in Indonesia, to focus on small and remote customers and specialise its services for these clients. As the cost of information and monitoring mechanism increases, it has become less viable to penetrate and serve the population which are diverse and demographically dispersed.

When institutions fail to address accessibility issues, informal institutions matter. Such institutions may take various forms of risk sharing arrangement. One typical arrangement, which can be found in many regions in Indonesia, is known as *arisan* or in economics literature, Roscas or rotating savings and credit associations. Different types and mechanisms of *arisan* can be found throughout the country (see Cole and Slade, 1996; Ravallion and Dearden, 1988).

With diverse demographic characteristics, Roscas generally consist of a group of people who usually have weekly gathering and rotate part of the pooled resources in

certain ways using random pot or systematic rotation. People are generally motivated to enter Roscas arrangements in order to cope with unexpected income or consumption shocks. This tradition still continues even though financial institutions exist. Since Roscas constitute a simple approach to conducting financial contracts rather than formal financial institutions, a lot of people, especially those who are credit constrained, prefer to use Roscas particularly for short-term needs. However, despite the importance of Roscas for Indonesian people, the government has never put efforts to regulate this "underground" banking practice.

3.5.2 Lack of Contract Enforcement

As mention in the previous chapter, the role of design and enforcement is inevitable in the establishment and development of economic and financial institutions. Like in many developing countries, since barriers to formal financial services are relatively high, many Indonesian households face legally incomplete contract. This means that "unverifiable information" exist in the contracts. Ideally, judicial and mediatory institutions should be able to fill the gaps related to contracts and take remedial measures.

The issue of formal contract enforceability gives less incentive to financial institutions to serve a broader scope of customers. In order to overcome constraints such as agency problems, many financial institutions rely on endorsement or references from village heads or other local government officers, as they perceive that these officers may have informational advantage over the management of these borrowers or potential customers. These officers also play a significant role as contract enforcers if there are repayment problems.

3.5.3 Inadequate Access to Formal Credits

Since 1970s, Indonesian government has initiated credit schemes for small-scale business to stimulate business activities. The schemes can be classified into two broad groups: farm and non farm activities. These credit schemes are mostly operated by BRI with the assistance from central ministries, local government agencies and institutions. Many studies conclude that where BRI plays a pivotal role in credit channeling it is a success story. Moreover, BRI is considered as one of the largest and most successful micro-finance institutions in the world (see Kristiansen, 2006).

However, the success story of credit channeling does not mean households have adequate access to financial institutions across the country. The diverse characteris-

tics along with geographic location have become challenges for financial institutions wanting to expand their financial services. The high level of demand for financial services does not necessarily meet the supply from formal financial institutions.

Using random trial experiment data from the A2F survey and Indian data, Cole et al. (2011) can investigate the demand for financial services and financial literacy. They find that financial literacy education does not increase the probability of accessing bank services even though the demand is quite high. This suggests that financial deepening is not yet there to reach people who are excluded from financial markets.

Besides Roscas, households also use other informal financial arrangements such as moneylenders, trade credit, village savings, pawning (*gadai*), and also other sources of loan such as friends, relatives, storekeepers, and employers. Farmers often conduct forward selling of their crop which know as *ijon*. The impact of *ijon*, however, is costly to farmers as the selling price is lower than the market price.

3.5.4 Inadequate Formal Insurance Providers

Agricultural and commodity trade is characterised by high uncertainty and have many kind of risk exposures. The source of risks can be in the forms of climate change and disasters, huge price fluctuations, and inadequate infrastructure for distributions such as road and mode of transportations. It is unlikely to find formal insurance institutions that can give protections for farmers, small traders and companies against such risks. The problem is similar to the conditions in loan or credit markets where the source of information is none or inadequate. It is difficult for formal insurance institutions to provide insurance products whenever actuarial information is less or unreliable.

3.5.5 High Search and Transaction Costs

Indonesian households are not well-informed about financial markets and institutions which include market and economic situations, credibility of financial institutions and products. The government efforts to provide such information to households are still ineffective as indicated by frauds and financial losses suffered by Indonesian households.

As a result from imperfect and asymmetric information, households tend to collect information based on peer or respected people that they may perceive as trustworthy and reliable. Farmers and traders have similar characteristics and tend to gather in-

formation of financial products from their own group and networks without spending more time to check the quality of information. Those who are able to find and access informal services mostly end up with high interest rates. Chaves and Gonzalez-Vega (1996) find that the effective rates of credit services are between 32% and 84%. From the financial institutions' view, providing services to small-scale customers may not be effective because of diseconomies of scale.

Moreover, Kristiansen (2006) argue that costs of interaction, lack of trust and information uncertainty have a significant contribution in explaining high transaction costs in Indonesia. This also explains why households with profitable business in rural area have difficulties in business growth. The result of high transaction costs is market failure and under-utilised economic potentials despite credit growth.

3.6 Summary

This chapter describes two recent surveys, which cover the main information about Indonesian households and particular financial related information. Four waves of IFLS surveys have advantages in the sense that it retains around 92% of its respondents since the initial survey in 1993. However, it gives limited information about household financial behaviour. In comparison to the IFLS, the A2F provides a deeper insight into financial behaviour but in a smaller number of households covered by the survey. Given information from these two surveys, household behaviour related to economic and financial activities can be captured and analysed.

As the economic crisis hit Indonesia in 1997 to 1998, access to financial institutions has become increasingly important. However, the barriers to financial services still exist from both supply and demand side. Since financial institutions fail and penetration is still low, many households tend to use informal institutions or arrangement to cope with risk and uncertainty. The informality and flexibility of these mechanisms which reduce transaction costs are seen as an advantage for many people wishing to cope with risk and uncertainty.

Appendix 3.A Financial Development Indicators

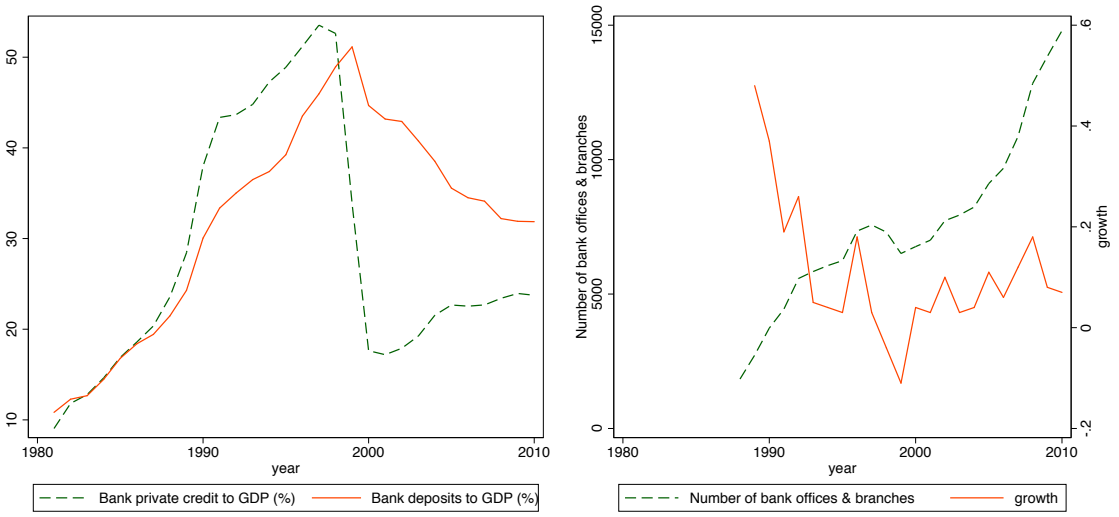

Figure 3.A.1. Financial Sector and Growth in Indonesia, 1981–2010. Bank private credits refer to financial claims provided by commercial banks or similar institutions to private sectors through loans, non equity securities, trade credits, and other receivables. Bank deposits refer to third party funds which are placed in the commercial banks and similar institutions. The number of bank offices and branches in the right panel comprises only commercial banks. *Source:* author's calculations from the Global Financial Development (http://data.worldbank.org/data-catalog/global-financial-development).

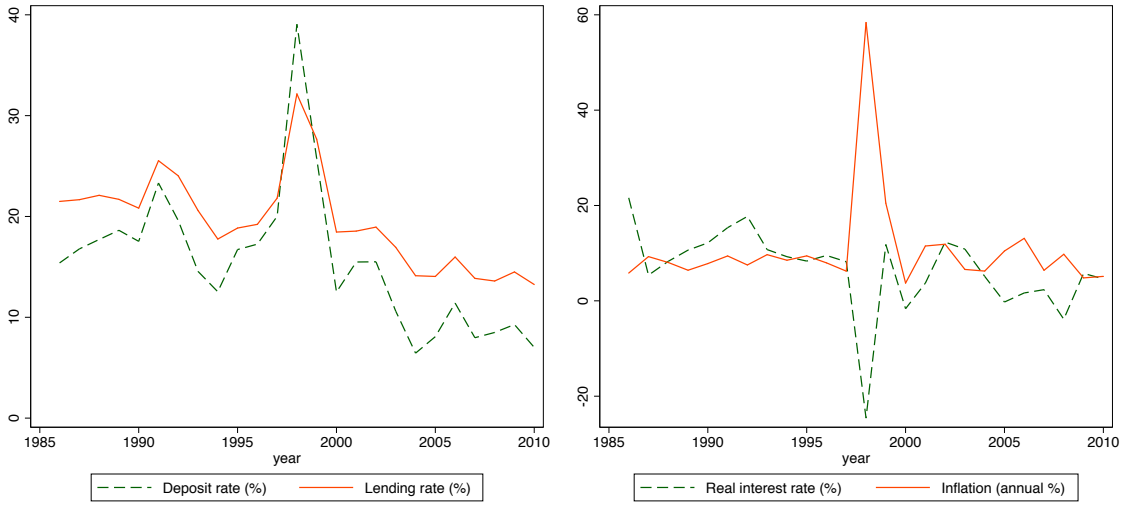

Figure 3.A.2. Interest Rates and Inflation in Indonesia, 1986–2010. The deposit rate is the rate of demand, time, or savings deposits which are paid by commercial banks or similar financial institutions. The lending rate is the average rate of the short- and medium-rate financing paid by private sectors to commercial banks or similar institutions. *Source:* author's calculations from the World Development Indicators (http://data.worldbank.org/data-catalog/world-development-indicators).

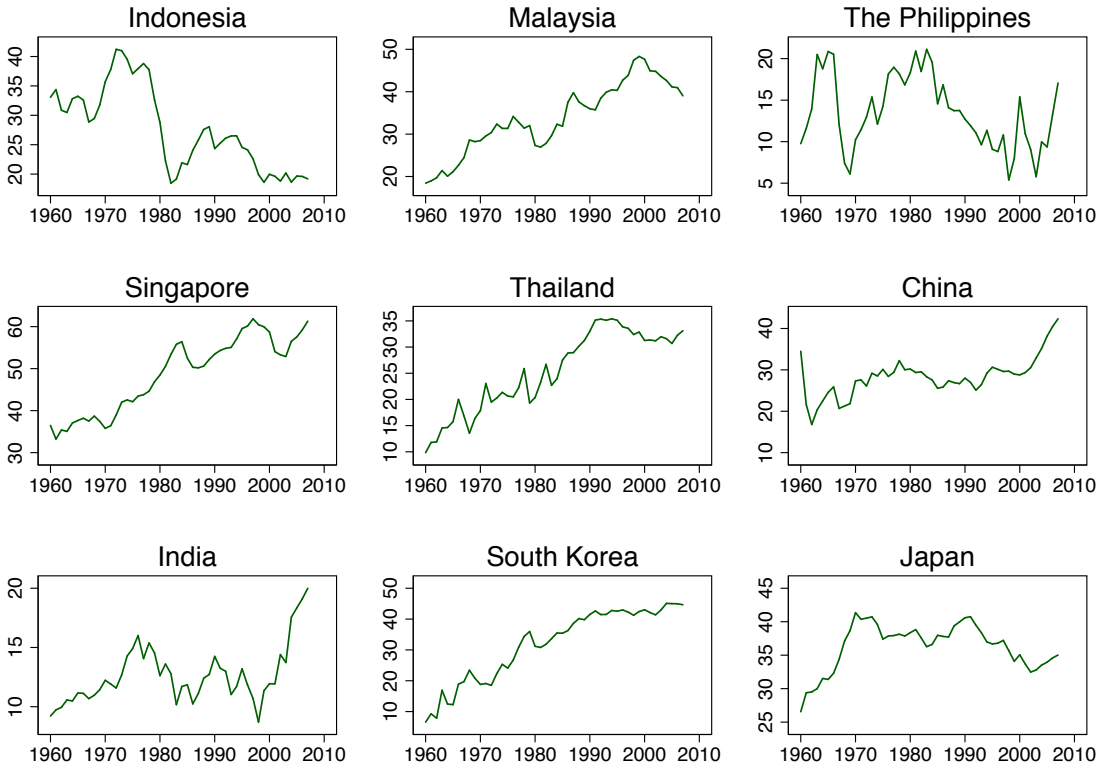

Figure 3.A.3. Saving Rates in Selected Asian Countries. The aggregate saving rate is computed as $100 - kg - kc$ where kc denotes consumption share of real GDP per capita and kg denotes government share of real GDP per capita. *Source:* author's calculations from the Penn World Table 6.3 (Heston et al., 2009).

Appendix 3.B IFLS Household Profiles

Figure 3.B.1. Administrative Map of Indonesia: IFLS Samples. This map is based on the respondent profiles of IFLS1 samples. These were taken from selected Indonesia provinces, which are indicated by orange-shaded area. The number of current administrative provinces is different from the first survey was conducted in 1993. This is due to the formation of new provinces: Bangka-Belitung (formerly a part of South Sumatera), Banten (formerly a part of West Java), Riau Islands (formerly a part of Riau), Gorontalo, North Maluku, and West Papua. The subsequent surveys retained around 90% from the first IFLS survey with additional samples mainly due to household splits. *Source:* author's calculations from the IFLS data set.

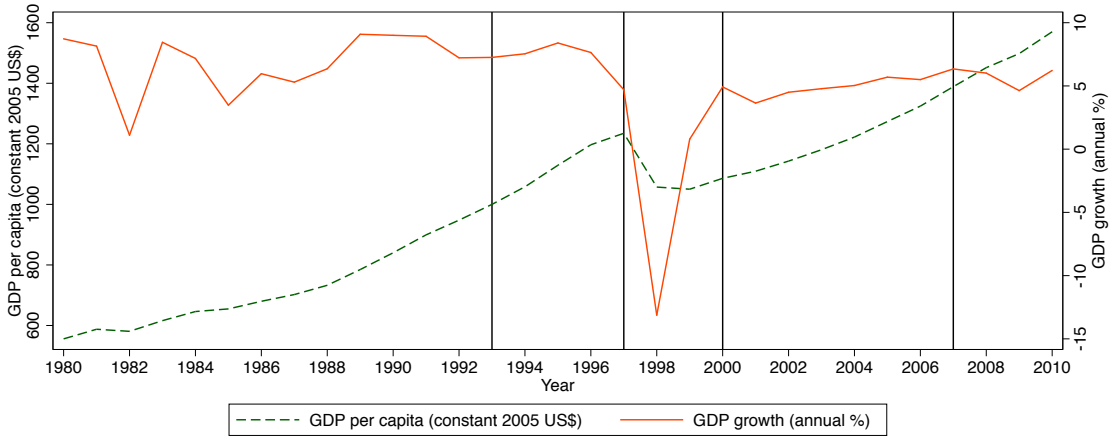

Figure 3.B.2. Indonesia GDP Per Capita and Growth, 1990–2010. The vertical line indicates the time when the surveys were conducted respectively: IFLS1 in 1993, IFLS2 in 1997, IFLS3 in 2000, and IFLS4 in 2007. The period of Asian financial crisis took place between mid of 1997 and 1998. *Source:* author's calculations from the World Development Indicators (http://data.worldbank.org/data-catalog/world-development-indicators).

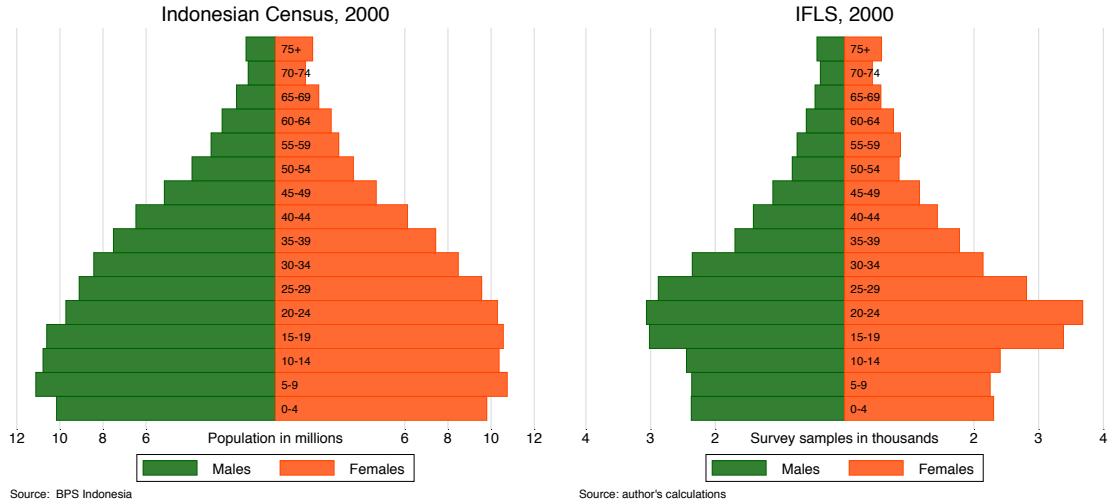

Figure 3.B.3. A Comparison between Indonesian Population and IFLS3. The first panel on left side shows population pyramid based on Indonesian Census 2000 which classified by gender and age. The second panel on the right side shows IFLS samples taken in the same year. Both are classified by gender and age. *Source:* author's calculations from BPS and the IFLS data set.

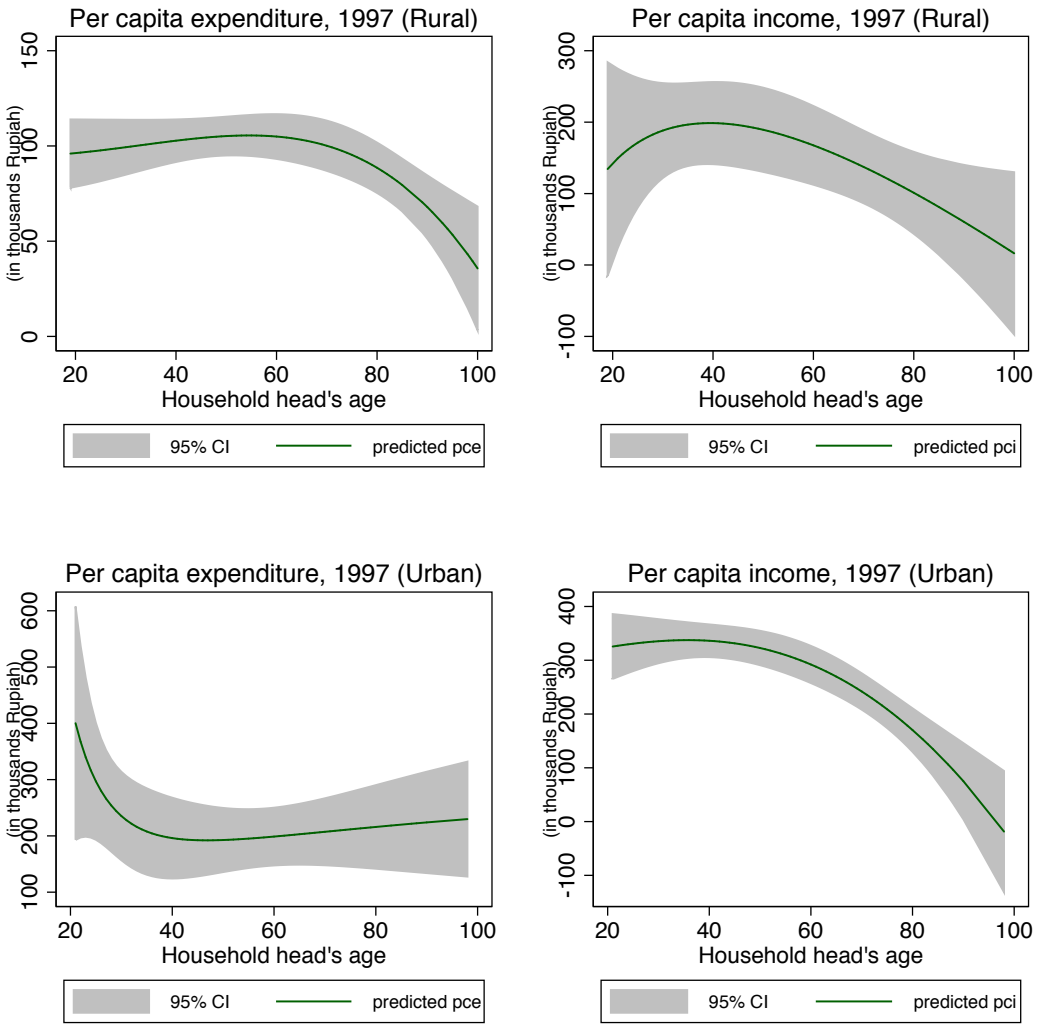

Figure 3.B.4. Income and Expenditure Pattern Based on Cohort, 1997. The figures are fitted values with 95% confidence interval for household head's age against per capita expenditure and per capita income respectively. All variables are in 2000 Indonesian rupiah. *Source*: author's calculations from the IFLS data set.

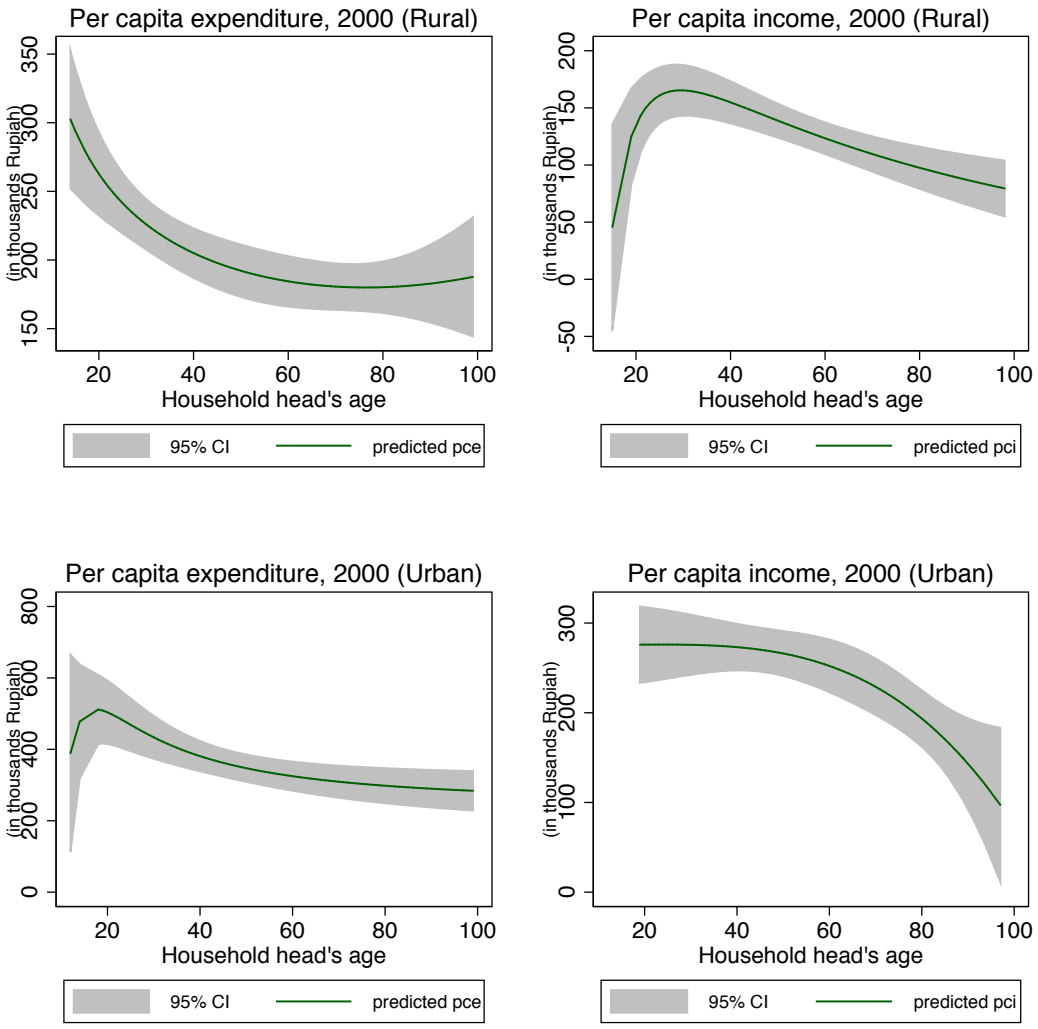

Figure 3.B.5. Income and Expenditure Pattern Based on Cohort, 2000. The figures are fitted values with 95% confidence interval for household head's age against per capita expenditure and per capita income respectively. All variables are in 2000 Indonesian rupiah. *Source*: author's calculations from the IFLS data set.

Table 3.B.1
IFLS Samples Based on Locations

Due to household migration, the figures show different profiles compare to IFLS1 in 1993 as depicted in Figure 3.B.1. Aceh, Riau, Bengkulu, Central Kalimantan, East Kalimantan and Southeast Sulawesi are included due to household migration. Banten is a spin-off from West Java, Bangka-Belitung is a spin-off from South Sumatera, Riau Islands is a spin-off from Riau, and West Sulawesi is a spin-off From South Sulawesi. The figures in parentheses are calculated by using the number of households in that area and province over the total number of households by area. *Source:* author's calculations from the IFLS data set.

Province	IFLS1 (1993)		IFLS2 (1997)		IFLS3 (2000)		IFLS4 (2007)	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Aceh					1 (0.02)		1 (0.01)	
North Sumatera	320 (8.47)	300 (7.59)	300 (8.56)	241 (5.84)	385 (7.66)	306 (5.66)	478 (6.47)	433 (7.04)
West Sumatera	120 (3.17)	240 (6.08)	124 (3.54)	251 (6.08)	162 (3.22)	313 (5.79)	287 (3.89)	340 (5.53)
Riau					39 (0.78)	17 (0.31)	64 (0.87)	36 (0.59)
South Sumatera	160 (4.23)	210 (5.32)	147 (4.19)	225 (5.45)	188 (3.74)	327 (6.04)	198 (2.68)	381 (6.20)
Bengkulu						1 (0.02)		
Lampung	60 (1.59)	240 (6.08)	51 (1.46)	240 (5.81)	75 (1.49)	308 (5.69)	161 (2.18)	360 (5.85)
Bangka Belitung							57 (0.77)	16 (0.26)
Riau Islands							32 (0.43)	1 (0.02)
DKI Jakarta	800 (21.16)		651 (18.57)		853 (16.98)		994 (13.46)	
West Java	620 (16.40)	630 (15.95)	596 (17.00)	662 (16.03)	948 (18.87)	940 (17.38)	1383 (18.72)	779 (12.67)
Central Java	380 (10.05)	540 (13.67)	389 (11.10)	610 (14.77)	541 (10.77)	784 (14.49)	711 (9.63)	905 (14.72)
DI Yogyakarta	320 (8.47)	180 (4.56)	295 (8.42)	190 (4.60)	383 (7.62)	221 (4.09)	552 (7.47)	162 (2.63)
East Java	460 (12.17)	660 (16.71)	434 (12.38)	683 (16.54)	618 (12.30)	885 (16.36)	933 (12.63)	1001 (16.28)
Banten							209 (2.83)	276 (4.49)
Bali	140 (3.70)	210 (5.32)	135 (3.85)	224 (5.43)	204 (4.06)	287 (5.30)	380 (5.14)	255 (4.15)
West Nusa Tenggara	120 (3.17)	300 (7.59)	98 (2.80)	358 (8.67)	173 (3.44)	489 (9.04)	351 (4.75)	486 (7.90)
West Kalimantan								1 (0.02)
Central Kalimantan					5 (0.10)	3 (0.06)	9 (0.12)	3 (0.05)
South Kalimantan	120 (3.17)	210 (5.32)	128 (3.65)	210 (5.09)	170 (3.38)	293 (5.42)	255 (3.45)	364 (5.92)
East Kalimantan					6 (0.12)	1 (0.02)	25 (0.34)	8 (0.13)
North Sulawesi							1 (0.01)	
South Sulawesi	160 (4.23)	230 (5.82)	157 (4.48)	235 (5.69)	274 (5.45)	234 (4.33)	284 (3.85)	336 (5.46)
Southeast Sulawesi						1 (0.02)		
West Sulawesi							21 (0.28)	7 (0.11)
Total	3,780	3,950	3,505	4,129	5,025	5,410	7,386	6,150

Table 3.B.2
IFLS Household Income Profile, 2000

The figures are in thousands and in 2000 Indonesian rupiah, except for the number of observations. *Source:* author's calculations from IFLS data set.

(a) Urban households

	Obs.	Mean	Median	Standard Deviation
Income				
Labour income (earnings/salary)	4,906	8,830	5,400	12,500
Net revenue, farm business	84	2,584	1,130	3,388
Net revenue, non-farm business	783	6,077	2,520	15,800
Other revenues				
Retirement	346	5,731	5,400	3,461
Scholarships	229	960	300	2,499
Insurance money	66	2,077	600	4,834
Transfers	44	1,872	200	2,897
Roscas	658	623	275	1,143
Total income	4,906	10,500	6,400	15,800
Expenditures				
Food consumption	4,906	7,138	5,545	6,207
Freq. Purchased items	4,906	2,394	1,146	4,169
Non freq. Purchased items	4,906	2,160	766	5,752
Housing	4,906	2,393	900	10,900
Education	4,906	1,096	335	2,290
Total expenditures	4,906	15,387	10,300	19,000
Net income (deficit)	4,906	−4,877	−3,448	18,600

(b) Rural households

	Obs.	Mean	Median	Standard Deviation
Income				
Labour income (earnings/salary)	5,323	5,151	2,850	9,272
Net revenue, farm business	283	1,368	670	2,221
Net revenue, non-farm business	601	3,885	180	16,400
Other revenues				
Retirement	118	5,262	540	3,498
Scholarships	142	3,479	150	37,800
Insurance money	19	1,770	300	4,720
Transfers	33	1,391	245	2,571
Roscas	592	516	1,575	1,038
Total income	5,323	5,979	3,190	13,000
Expenditures				
Food consumption	5,323	5,208	4,207	4,494
Freq. Purchased items	5,323	1,005	502	2,044
Non freq. Purchased items	5,323	1,236	480	3,705
Housing	5,323	976	480	5,399
Education	5,323	458	125	1,196
Total expenditures	5,323	9,039	6,725	9,891
Net income (deficit)	5,323	−3,062	−2,848	13,600

Table 3.B.3
IFLS Household Balance Sheets Profile, 2000

The figures are in thousands and in 2000 Indonesian rupiah, except for the number of observations. *Source:* author's calculations from the IFLS data set.

(a) Urban households

	Obs.	Mean	Median	Standard Deviation
Assets				
Savings/CDs/stocks	1,620	6,202	1,000	26,100
Receivables	613	5,596	700	26,600
Appliances	4,080	2,452	1,300	5,234
Jewelry	2,950	1,692	500	5,679
Furniture and utensils	4,532	1,951	900	43,579
Livestock/poultry/fishpond	85	1,480	200	8,170
Vehicles	2,401	11,800	2,660	36,500
House occupied	3,004	50,900	22,000	87,200
Other house/building	712	51,800	25,000	92,600
Non-agricultural land	768	30,300	10,000	60,200
Other assets	1,780	6,751	200	2,637
Total Assets	5,025	55,800	16,200	12,700
Total liability	879	2,710	480	17,500
Net worth	5,025	55,300	16,000	126,000
Total liability and net worth	5,025	55,800	16,200	12,700

(b) Rural households

	Obs.	Mean	Median	Standard Deviation
Assets				
Savings/CDs/stocks	940	2,420	400	9,220
Receivables	561	3,114	500	15,900
Appliances	3,699	1,092	450	2,567
Jewelry	2,984	921	300	7,572
Furniture and utensils	5,089	967	500	1,945
Livestock/poultry/fishpond	244	563	100	1,136
Vehicles	2,011	3,901	250	12,500
House occupied	4,467	14,700	8,000	24,700
Other house/building	367	22,800	10,000	46,800
Non-agricultural land	921	10,900	4,500	28,500
Other assets	1,935	388	185	1,638
Total Assets	5,410	20,100	88,876	41,500
Total liability	674	2,557	500	6,461
Net worth	5,410	19,800	8,680	41,100
Total liability and net worth	5,410	20,100	88,876	41,500

Table 3.B.4
Profile of IFLS Households: Financial Well-being

In financial ratios, the first column is the number of households reported their assets and debt respectively. Liquid assets consist of saving/deposit certificate, receivables, and jewellery. Savings include saving/deposit certificate. Net worth is calculated by deducting current debt from total household assets. Gross income is all household income including salary, farm, and non-farm revenue. Net income is gross income minus household expenditures. *Source:* author's calculations from the IFLS data set.

	IFLS1 (1993)		IFLS2 (1997)		IFLS3 (2000)		IFLS4 (2007)	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Homeownership								
Self-own	2,205	3,388	2,365	3,633	3,107	4,526	4,963	9,079
Occupying	628	354	643	413	894	616	1,579	841
Rented/contracted	593	42	468	68	931	191	1,301	161
Others	4	2	4	3	3	1	19	7
Monthly rent as percent of household income								
< 10%	129	14	152	25	319	72	203	25
10% to 25%	92	4	145	13	275	40	321	30
25% to 50%	53	5	53	5	110	15	170	24
> 50%	135	8	44	5	83	11	405	26
Financial ratios								
Liquid asset/monthly expenditure	414	230	724	538	2448	2753	2967	2688
Mean	42.43	3.18	4.46	2.84	3.25	2.26	2.32	1.77
Standard deviation	372.56	8.21	15.05	4.97	10.71	7.49	5.05	3.91
Liquid asset/current debt	169	106	279	226	610	468	586	387
Mean	22.18	9.00	10.43	7.61	19.86	7.91	4.56	2.53
Standard deviation	126.93	23.94	47.20	17.25	100.23	22.44	20.54	6.47
Savings/gross income	414	230	726	538	1138	827	1207	709
Mean	57.00	23.71	23.27	0.35	1.53	0.64	1.73	0.21
Standard deviation	378.76	88.88	580.80	1.64	30.94	5.36	45.42	0.49
Savings/net income	414	230	724	538	1138	827	1194	700
Mean	−40.72	−2.42	0.09	0.62	0.74	−0.06	0.32	0.25
Standard deviation	747.74	12.50	17.85	5.58	23.45	4.84	3.96	0.79
Liquid asset/net worth	169	106	284	231	611	471	589	387
Mean	3.01	0.14	0.07	0.05	0.08	0.13	−0.04	0.06
Standard deviation	52.51	0.34	0.17	0.08	0.16	2.17	3.23	0.27

Table 3.B.5
Profile of IFLS Households: Demography

The figures are calculated in percentage for each category based on household location, except for average age. It only includes those who are living within the households when the survey was being conducted. Age 6 to 17 implies the age for primary and secondary education. Age 18 to 64 implies working age. Above 64 years old implies retirement age. The majority of household dwelling is occupied by more than five people. *Source:* author's calculations from the IFLS data set.

	IFLS1 (1993)		IFLS2 (1997)		IFLS3 (2000)		IFLS4 (2007)	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Household size								
1 person	7.42%	4.99%	7.63%	7.70%	10.63%	6.10%	12.67%	11.61%
2 persons	7.89%	11.46%	10.67%	13.89%	11.02%	13.86%	21.19%	21.44%
3 persons	15.16%	19.09%	14.10%	16.67%	18.43%	21.46%	18.24%	21.42%
4 persons	19.50%	19.98%	19.51%	20.28%	19.28%	20.15%	19.18%	19.61%
5 or more	50.03%	44.48%	48.09%	41.46%	40.64%	38.43%	28.73%	25.91%
Age cohorts								
Under 5	11.71%	14.40%	10.65%	12.70%	10.83%	12.13%	14.69%	14.44%
6 to 17	29.04%	29.96%	26.97%	29.39%	22.53%	25.96%	20.87%	23.44%
18 to 64	50.08%	44.73%	51.09%	45.22%	56.68%	49.78%	52.11%	48.37%
Above 64	9.17%	10.91%	11.30%	12.70%	9.96%	12.13%	12.33%	13.74%
Average age	26.35	26.42	28.95	28.16	28.78	28.46	30.78	30.14
Marital status (>15 years old)								
Single	31.25%	18.36%	31.19%	19.06%	31.84%	18.78%	23.54%	17.80%
Married	59.48%	70.57%	58.73%	69.49%	59.03%	71.07%	65.71%	70.77%
Separated	0.52%	0.50%	0.61%	0.50%	0.77%	0.51%	0.52%	0.46%
Divorced	2.00%	2.35%	1.85%	2.13%	1.90%	2.29%	1.93%	2.06%
Widowed	6.75%	8.22%	7.63%	8.82%	6.46%	7.35%	8.29%	8.91%
Religion								
Islam	85.30%	86.49%	87.65%	87.86%	86.94%	89.72%	88.69%	88.78%
Protestant	5.44%	5.41%	4.94%	4.72%	5.17%	4.11%	4.30%	4.64%
Catholic	3.09%	1.28%	2.59%	1.17%	2.51%	1.07%	2.19%	1.31%
Hindu	2.86%	5.82%	2.68%	5.83%	3.88%	4.96%	4.08%	5.10%
Budha	2.63%	0.05%	2.06%	0.06%	1.41%	0.09%	0.66%	0.13%
Other	0.67%	0.95%	0.08%	0.36%	0.08%	0.05%	0.08%	0.04%
Highest education attainment								
No/not yet in school	19.13%	31.82%	16.89%	28.31%	13.33%	22.07%	17.98%	23.32%
Elementary	39.64%	50.50%	36.80%	49.86%	32.22%	47.87%	30.35%	44.71%
Junior high	15.74%	10.06%	17.53%	12.24%	16.44%	14.58%	15.19%	14.96%
High school	19.14%	6.49%	21.02%	8.09%	24.89%	11.27%	23.85%	11.96%
University	4.02%	0.48%	4.68%	0.69%	6.50%	1.23%	6.76%	1.79%
Other	0.41%	0.26%	0.29%	0.15%	0.81%	0.58%	0.75%	0.75%
Islamic school			0.01%	0.02%	0.26%	0.39%	0.18%	0.38%
Vocational/college	1.92%	0.39%	2.72%	0.63%	3.89%	1.06%	3.68%	1.14%
Kindergarten			0.06%	0.03%	1.68%	0.94%	1.27%	0.99%

Table 3.B.6
Profile of IFLS Households: Employment

The question about last week primary activity is only included for IFLS3 and IFLS4. For IFLS3 and IFLS4, unemployment figure is taken from "Stay at home/unemployed" optional answer for a question about last week primary activity. The unemployed person is then classified based on working age definition from this option. For employment by industry, if a person has more than a single job, then the primary occupation is selected. Agriculture includes forestry, fishing, and hunting. Utility services include electricity, gas, and water. Wholesale includes retail, restaurants, and hotel. Transportation includes storage and communication. Financial services include finance, insurance, real estate, and business services. In IFLS1, public welfare sector is used instead of social welfare sector. *Source:* author's calculations from the IFLS data set.

	IFLS1 (1993)		IFLS2 (1997)		IFLS3 (2000)		IFLS4 (2007)	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Primary activity								
Working/helping to earn income	35.56%	39.06%	38.51%	39.00%	40.54%	42.41%	47.32%	50.00%
Unemployed			35.28%	29.10%	7.71%	7.60%	5.47%	5.01%
Job searching	2.93%	1.81%			1.23%	0.80%	0.82%	0.51%
Attending school	25.15%	19.01%			22.99%	21.00%	20.83%	20.58%
Housekeeping	15.07%	13.76%			13.92%	12.98%	17.35%	16.86%
Retired	0.93%	0.20%			1.34%	0.68%	3.32%	2.55%
Sick/disabled					0.36%	0.59%	0.50%	0.67%
Other	20.35%	26.16%	26.22%	31.90%	2.92%	2.09%	1.85%	0.87%
Stay at home					8.98%	11.85%	2.54%	2.94%
Employment status								
Self-employed	12.86%	21.96%	35.02%	50.81%	20.56%	24.29%	17.35%	17.96%
Self-employed (with workers)	8.20%	12.62%			13.68%	22.12%	14.02%	25.02%
Government workers	17.96%	6.54%	12.13%	5.24%	9.35%	4.30%	9.10%	4.92%
Private employee	56.76%	41.12%	48.30%	26.15%	48.17%	27.76%	41.01%	17.56%
Family worker	3.99%	16.82%	4.55%	17.81%	8.22%	21.52%	8.46%	23.06%
Others	0.22%	0.93%			0.02%		10.06%	11.50%
Employment by industry								
Agriculture	8.60%	53.62%	11.80%	54.95%	11.66%	54.05%	10.78%	51.42%
Mining and quarrying	0.68%	1.77%	0.15%	0.08%	0.20%	0.09%	0.16%	0.10%
Manufacturing	14.18%	11.23%	0.34%	0.72%	0.31%	0.74%	0.37%	0.86%
Utility	1.31%	0.59%	18.20%	10.03%	18.13%	10.37%	15.94%	10.65%
Construction	6.15%	5.39%	0.54%	0.12%	0.49%	0.15%	0.41%	0.18%
Wholesale	23.12%	7.98%	5.30%	3.23%	5.33%	3.40%	5.87%	3.37%
Transportation	5.07%	5.17%	29.79%	16.48%	29.07%	16.29%	31.91%	17.72%
Financial services	6.83%	2.29%	4.84%	2.87%	5.03%	3.00%	4.16%	2.54%
Social services	24.43%	7.98%	1.25%	0.14%	1.31%	0.15%	1.45%	0.21%
Others	9.62%	3.99%	27.79%	11.37%	28.47%	11.77%	28.94%	12.96%

Appendix 3.C A2F Household Profiles

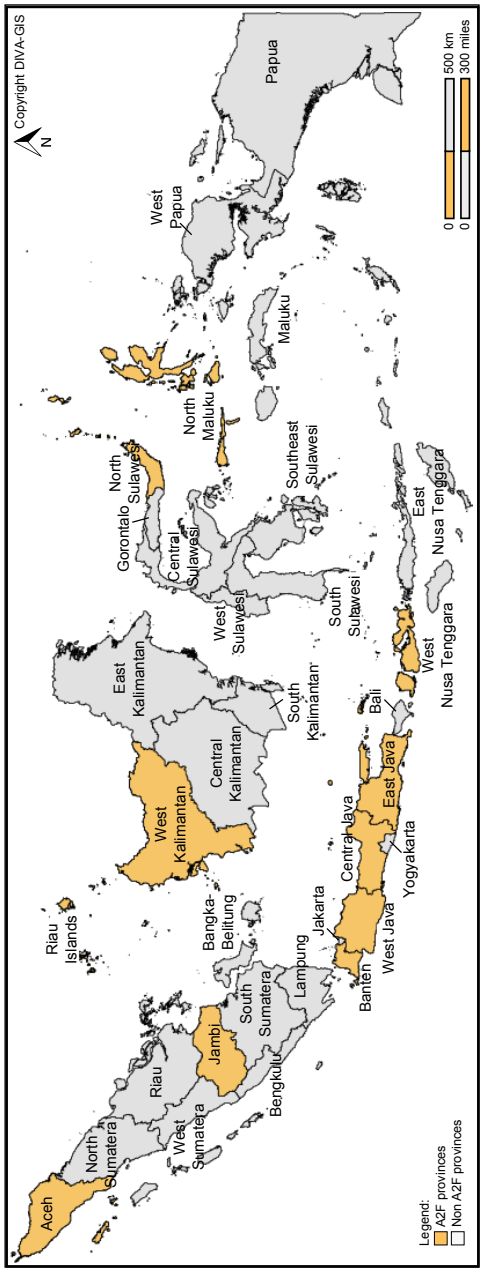

Figure 3.C.1. Administrative Map of Indonesia: A2F Samples. This map is based on the respondent profiles of A2F samples. For respondents from outside Java islands, the selected provinces are different to IFLS samples. *Source:* author's calculations from the A2F data set.

Table 3.C.1
Household Samples Based on Access to Finance and Geographic Base

The provinces located in Java island are West Java, Central Java, East Java, and Banten. The non-Java provinces are Aceh, Jambi, West Nusa Tenggara, West Kalimantan, North Sulawesi, and North Maluku. The number in parentheses denotes the proportion of households in that category for each province respectively, except for Column (6) which shows the number of samples for each province respectively. *Source:* author's calculations from A2F data set.

Province	(1) Borrowing households	(2) Non borrowing households	(3) Borrow from formal only	(4) Borrow from informal only	(5) Borrow from both	(6) Total
Aceh	184 (6.63%)	56 (9.61%)	37 (11.78%)	91 (5.90%)	56 (6.09%)	240 (7.14%)
Jambi	216 (7.78%)	24 (4.12%)	14 (4.46%)	139 (9.01%)	63 (6.85%)	240 (7.14%)
West Java	515 (18.55%)	85 (14.58%)	46 (14.65%)	310 (20.09%)	159 (17.28%)	600 (17.86%)
Central Java	405 (14.58%)	75 (12.86%)	45 (14.33%)	194 (12.57%)	166 (18.04%)	480 (14.29%)
East Java	629 (22.65%)	91 (15.61%)	83 (26.43%)	295 (19.12%)	251 (27.28%)	720 (21.43%)
Banten	112 (4.03%)	8 (1.37%)	1 (0.32%)	96 (6.22%)	15 (1.63%)	120 (3.57%)
West Nusa Tenggara	187 (6.73%)	53 (9.09%)	11 (3.50%)	123 (7.97%)	53 (5.76%)	240 (7.14%)
West Kalimantan	163 (5.87%)	77 (13.21%)	13 (4.14%)	131 (8.49%)	19 (2.07%)	240 (7.14%)
North Sulawesi	188 (6.77%)	52 (8.92%)	25 (7.96%)	84 (5.44%)	79 (8.59%)	240 (7.14%)
North Maluku	178 (6.41%)	62 (10.63%)	39 (12.42%)	80 (5.18%)	59 (6.41%)	240 (7.14%)
	2777	583	314	1543	920	3360

Table 3.C.2
Insurance Ownership Based on Product Type

Public health insurance is defined as medical insurance provided by government or through PT. Askes Indonesia (government-owned health insurance company). Private health insurance is defined as commercial medical insurance provided by a private company. Education insurance is basically saving for children's education and will be disbursed in particular date when a child enters certain level of education. Travel insurance is defined as benefit that will be received if the holder suffers loss during business or personal trip. Accident insurance is defined as benefit that will be paid to the holder or his/her beneficiaries if the holder suffers from accident. Home insurance is defined as protection for dwelling house. Life insurance is defined as a lump sum payment to the beneficiaries due to the insurance policy holder's death. *Source:* author's calculations from the A2F data set (World Bank, 2009).

	Urban		Rural		Total	
	Obs.	Percentage	Obs.	Percentage	Obs.	Percentage
Public health insurance	568	41.16	589	29.75	1,157	34.44
Private health insurance	218	15.80	100	5.05	318	9.46
Home insurance	32	2.32	13	0.66	45	1.34
Education insurance	119	8.62	51	2.58	170	5.06
Vehicle/asset insurance	265	19.20	199	10.05	464	13.81
Travel/accident insurance	466	33.77	347	17.53	813	24.2
Life insurance	181	13.12	108	5.45	289	8.6

Table 3.C.3
Financial Literacy and Mathematics Scores

The scores for financial literacy and basic mathematical skill are between 0 and 1 where 1 is the maximum score. The questions to measure financial literacy consist of interest compounding, numeracy, inflation, and diversification. The questions with regard to mathematical score consist of basic mathematics such as simple algebra and arithmetic. Coefficients significant at the 1% are denoted by *. *Source:* author's calculations from the A2F data set (World Bank, 2009).

Cohort	Obs.	Financial literacy		Mathematics		Pairwise correlation
		Mean	Std. dev.	Mean	Std. dev.	
Rural						
15 – 24	185	0.453	0.248	0.767	0.229	0.394*
25 – 34	488	0.475	0.267	0.752	0.223	0.364*
35 – 44	436	0.487	0.264	0.774	0.221	0.389*
45 – 54	370	0.459	0.281	0.752	0.242	0.423*
55 – 64	220	0.365	0.281	0.678	0.272	0.495*
Above 64	181	0.269	0.281	0.590	0.309	0.529*
Overall	1980	0.442	0.277	0.736	0.247	0.449*
Urban						
15 – 24	91	0.516	0.252	0.864	0.152	0.331*
25 – 34	331	0.581	0.261	0.853	0.184	0.338*
35 – 44	412	0.579	0.258	0.856	0.170	0.275*
45 – 54	270	0.577	0.277	0.850	0.181	0.484*
55 – 64	171	0.557	0.256	0.861	0.191	0.275*
Above 64	105	0.493	0.307	0.807	0.244	0.551*
Overall	1380	0.566	0.267	0.852	0.183	0.389*

Table 3.C.4
Average Distance to Nearest Financial Institutions

The distance was measured from the head of village office in kilometres. The Islamic Microfinance was not asked in IFLS 2 and IFLS 3. The Village Credit Fund Institution was eliminated from IFLS 4 survey. *Source:* author's calculations from the IFLS data set.

	IFLS2		IFLS3		IFLS4	
	Urban	Rural	Urban	Rural	Urban	Rural
Bank BRI	1.982	7.599	1.885	8.084	2.389	8.790
People Credit Bank (BPR)	4.300	11.403	3.576	7.759	3.124	12.519
Village Credit Institution (LKD)	2.000	4.750	2.250	n.a.	3.042	5.667
Village Credit Fund Inst. (LKDP)	2.500	11.000	n.a.	3.000		
Village Unit Cooperative (KUD)	2.609	5.183	2.321	4.237	3.609	6.679
Other formal cooperative	2.000	5.500	1.333	9.950	2.518	5.950
Private bank	4.123	13.948	2.746	21.649	3.473	17.875
Islamic Saving and Loan Cooperatives (BMT)					2.594	10.568

Chapter 4

Credit Constraint Identification and Household Welfare

4.1 Introduction

Credit or loans are essential for household economies in various ways. Households use them whenever consumption smoothing is needed to cope with income changes or health shocks. They can also support home business and investment, particularly for financing working capital. Credit can be very flexible for households if they hold credit cards which serve as a tool for household money management or for revolving credit lines. This means credit is available up to certain levels for households who have this kind of facility. However, many households may find it extremely difficult to gain credit access. In these cases, the difficulty in accessing credit or financial markets may impedes household welfare.

From a macroeconomic perspective, credit or financial markets are important to an economy: they affect economic growth and equality as well as investment and technology choices. Well-developed credit markets are crucial for conducting financial transactions through different credit channels. However, credit markets are not properly established in developing countries (see for example Deaton, 1992).

A study by the World Bank (2009) shows that only fifty percent of Indonesia's population have adequate access to financial services. The rest is considered as unbankable with the majority living in rural areas and working in the informal sector.

This study shows how banks and other financial services are heavily concentrated in urban area, particularly in Jakarta which is regarded as "over-serviced". In rural areas, the granularity of customers matters. Four financial institutions providing financial access in rural area are: government-owned commercial bank (BRI or *Bank Rakyat Indonesia*), government-owned pawnshop (*Perum Pegadaian*), people credit banks (BPR or *bank perkreditan rakyat*), and various types of formal and informal microfinance institutions. These institutions serve different segments and have different regulations. The first three are formal financial institutions, which have formal regulations of their operational system. The latter is dominant compared to others in terms of the number of people participating in different ways.

Furthermore, Ghosh et al. (2001) describe important features that characterised informal credit and financial institutions in developing countries. The features are: (1) contracts are unlikely to be written in advance when credit agreements emerge, (2) highly segmented credit markets with repetitive lending and long term relationships, (3) higher interest rates compared to average interest rates in formal institutions, (4) closely related with other markets for example labour, agricultural, and land markets, and (5) a large amount of credit rationing or the inability to borrow according to household needs.

The main question here is how to identify and measure accessibility of credit markets for households. Most research usually uses one of two approaches in estimating credit constraints based on participation in credit markets: "indirect" and "direct" methods. The "indirect" method tries to assess conditions when the credit supply cannot match the demand for credit. This method has many difficulties in terms of distinguishing supply from demand equations. The other method is based on the survey data on credit information, particularly on credit applications and related conditions that emerge from these processes. Using this method, the researchers directly ask the households about their credit rationing.

This chapter investigates credit constraints in Indonesian households mainly by identifying and classifying the constraints using DEM (direct elicitation methodology). This is important in order to understand the household problem of accessing formal financial institutions. Furthermore, the welfare loss is estimated for those who have difficulties in accessing credit markets. This study focuses on formal financial institutions since these institutions provide several advantages to households such as low interest rates for loans and consumer protection. The number of formal financial institutions has increased significantly for the past 30 years. However, due

to informational disadvantage and transaction costs, the formal financial services are limited to mainly in urban areas. Some households are still reluctant to fully access and use formal financial services. Moreover, they may end up by getting loans from informal financial institutions which are often more expensive than formal financial institutions.

The rest of the chapter is organised as follows. Section 4.2 describes various methods used in empirical measurements of credit constraints. Section 4.3 discusses methodology and empirical strategy by utilising A2F survey data. Section 4.4 gives the empirical findings and discussions. Section 4.5 provides concluding remarks.

4.2 Related Literature

An individual or household is said to have access to finance if he or she can use formal or informal financial services in the right form and at reasonable prices whenever he or she needs it. This definition can be considered as full access to finance. One may have partial or limited access due to different dimensions for example the scope of products, institutional, quantity, price, gender, and age. Access to finance means an economic opportunity for those who have the access since they are able to take advantage from financial markets to improve their welfare.

Fernando (2007) argues a root cause of the supply side constraints is the conventional view the potential market holds of those on lower incomes. This view focuses on two interrelated ideas with regard to these particular people. The first is the potential profit of the low end of financial markets. The second is the financial services through governmental programmes and social-oriented institutions. In many developing countries, conducting transactions with formal financial institutions is often perceived as a complicated procedure carrying high transaction costs, and may even be intimidating, especially for women and those who have low financial literacy. Binswanger and Sillers (1983) also find that risk aversion may affect different types of small-scale potential creditors: it prevents them applying for a loan especially when collateral is required.

Credit constraints are different to liquidity constraints. If the former exists, they can consume more than their income but are limited by the borrowing constraints. Liquidity constraints are considered as a condition of imperfect credit markets where a financial intermediary does not prevail or is less effective than it should be. In other words, the supply of credit cannot prevail to fulfil demands for credit effectively.

Hayashi (1987) describes the way in which liquidity constraints occur under either one of two following conditions. First, households are rationed, meaning that they face quantity constraints on borrowing. The amount of credit needed is lower than expected. Secondly, they may face the interest rates that are higher than the benchmark (market) interest rate: this is referred to as interest rate differential. However, if credit constraints emerge, households cannot consume more than their income.

Credit constraints limit household welfare and access to financial services to cope with needs and mitigate risks. Jappelli (1990) defines credit constraints as any situations where economic agents report unsatisfied demands for credit or any other borrowings from financial institutions. In this context, financial institutions refuse to grant credit due to the inherent risky conditions of the agents or asymmetric information about the ability of the agents as lenders.

However, a household with no or small debt cannot be assumed as likely to be constrained since the level of credit or debt is a function of credit supply and the household's demand for credit (see Grant, 2007). Boucher et al. (2009) classify credit constraints into two types: (1) *ex ante* and (2) *ex post* credit constraint. The former exists when households are not able to secure loans and are unable to take desired actions and engage in profit maximising investment. The latter exists when they are prevented from borrowing after decisions are made and investment outcomes are realised. The credit constraints would have implications on the household's ability to pool risks across time. As the facility to absorb random shocks in income and consumption decrease, there would be a change in behaviour towards risk. Eswaran and Kotwal (1990) argue unequal ability to access financial market would have an impact on the degree of risk aversion. In other words, the risk aversion can be a reflection of inability to cope with downside income risks.

A starting point would be a condition within credit markets where demand for credit does not meet with the credit supply. Credit rationing can be defined as a situation where the demand for credit exceeds supply at the prevailing interest rate. In other terms, this implies the demand and supply curves may not intersect due to backward-bending supply curves for high levels interest rates (see Freixas and Rochet, 2008). Households or individuals who are in such a situation face what is called credit constraint.

Petrick (2005) documented various empirical methods on credit rationing along with specific strengths or weaknesses. He then classified various studies on credit rationing into six methods: (1) measurement on loan transaction costs, (2) qualitative

information from interviews, (3) qualitative information from interviews using the credit limit approach, (4) spill-over effects with regard to secondary credit sources, (5) economic household modelling, and (6) econometric analysis of dynamic investment decisions. The first four are seen as direct methods in the sense that the inference is made based on direct information from borrowers. The last two can be classified as indirect methods because they analyse the consequences of credit rationing through econometrics techniques, which seek to identify credit constraints by assessing the conditions between supply and demand of credits or loans. The interaction between these two types may exist since indirect methods use some information generated by direct methods.

Credit constraint identification through measurement of credit transaction costs requires collection of specific information about households, in particular the calculation of the effective costs to gather a relevant price variable. These costs may result in negative investments and therefore lead to exclusion of those who are not able to repay nominal interest rests. Moreover, the value of the price variable is difficult to measure because it requires distinguishing different types of costs that are necessary for credit approval, monitoring, and the costs that are due to shirking loan officers or inefficient practices. Schneider (1987) argues that providing a theoretically accurate measurement of transaction costs is difficult whenever the opportunity costs of related transaction activities are not known.

The second method identifies credit constraints from direct questions about credit application and approval using qualitative information from survey data. For instance, households can be classified into four categories according to demand for credits: (1) did not have any demand for credits, (2) had demand for credit but did not apply, (3) applied for credit but was rejected, and (4) received a credit. The last category can be divided into two subcategories: received full or partial credit. Therefore, the first and fourth category is not credit constrained, except for those who received partial credits. The second and third category can be considered as "credit constrained".

However, the categorisation would be different based on respondent's subjective assessment with regard to his circumstances. Using this method, the gathered information provides consistent identification of households with exogenous liquidity. However, this method does not quantify the severity of credit constraints nor credit market efficiency. Another disadvantage of this method is that some information about loan contracts, for example credit size and interest rates will not be used.

Some studies using this approach are for example Jappelli (1990), Kochar (1997), Guirkinger and Boucher (2008), and Boucher et al. (2009).

Boucher et al. (2009) use DEM (direct elicitation methodology) to identify credit constraints between different types of rationing by using multinomial logit. Their study is able to identify four different rationing: quantity, risk, transaction cost, and price. This study focuses on the identification of credit constraint through the borrower's perception of lender credit rules.

The third method, which is called the credit limit approach tries to overcome the limitations of the qualitative nature in the second method by asking respondents the maximum amount of credit willing or able to be taken. This amount is the respondents' credit limit with respect to a particular lender which implies access to credit from different sources (for example see Swaminathan et al., 2010). However, this approach has a limitation since it requires specifying particular item questions on credit limits which are not easy to be understood by respondents.

The next method is constructed on the concept of "spill-over" which simply can be defined as the use of secondary credit sources as a result of unsatisfied demand with respect to the initial source of credit (Besley, 1994). This method needs detailed information from formal and informal financial institutions that are commonly used by respondents. One must be careful to identify both primary and secondary sources of credit since segmentation is very important. However, this measurement may generate an underestimation of credit constraints if some rationed households just accept the constraints on formal loans and do not use the secondary sources of credit.

The last two methods, which are classified as indirect methods, are household modelling and dynamic investment models. Studies that employed this approach, focus on one of two main aspects: the shadow interest rate, or the identification of interdependencies between consumption and production decision making by households. Both approaches are able to estimate the marginal effects of credit and can be used to measure credit rationing or credit market efficiency. This is achieved by comparing estimated effect and market interest rate. However, this approach is more data demanding than any other method described before.

Kochar (1997) employs this approach in identifying credit rationing in different aspects of household borrowing and different sources of credit. Using the 1981-1982 All-India Debt and Investment Survey (AIDIS), Kochar calibrates the models to estimate the probability of demand and access to both formal and informal credit sources and finds that the level of demand for credit is low. Instead of using interest rate

differential, she use reservation cost and finds that the reservation cost is lower for informal credit compared to formal credit which effectively reduces formal credit rationing. However, in many case in developing countries, it may be difficult to find the interest rate differential particularly from the demand-side using micro data.

The dynamic investment models examine credit constraints by identifying violations of a theoretical investment decision model which is based on neoclassical assumptions of perfect and complete capital markets (see Arrow, 1964; Arrow and Debreu, 1954; Debreu, 1959). If imperfect capital markets exist which implies financial-structure-dependent investment, this gives a first test of credit constraints as implied by Hayashi (1987). Early works in this approach are more pragmatic in terms of utilising liquidity variable alone. Later works are more flexible by augmenting a financial variable which is derived from a dynamic decision model. In household modelling, this approach requires various data that sufficient large panel data needed in many cases (for example see Rosenzweig and Wolpin, 1993).

This literature survey has shown that studies on credit constraints or rationing can be developed in various ways. More sophisticated approaches in terms of microeconometric analysis would yield more economic meaning and interpretation of credit constraints; in particular, about those households who are constrained. However, most of these studies focus on rural or agricultural environments. Therefore, this study attempts to contribute by identifying credit constraints and estimating welfare loss for general households with Indonesian households as a case study. Secondly, the contribution of this study also investigates the credit constraints with risk preferences and financial literacy.

4.3 Methodology

A household's decision to borrow depends on the demand for credits and credit supply. Grant (2007) argues that one cannot assume that households with little or no credit are likely to be credit constrained. The observed level of household's credit is a function of household's demand for credit and the credit supply from lenders or financial institutions.

Furthermore, there are three aspects that should be addressed regarding the borrowing behaviour of households. The first aspect is the number of households who are credit constrained. The second is how to distinguish households who are likely to

be constrained and unconstrained. The third is how much welfare loss tis caused by credit constraints.

In observing borrowing behaviour, one must consider asymmetric information that may exist between borrowers and lenders which leads to moral hazard and adverse selection. In the absence of insurance markets, households are called to have notional demand which is defined as a demand for credit in the first-best world when perfect credit markets exist. In the presence of asymmetric information, households' demand for credit can be defined as effective demand.

Following Boucher et al. (2009), the presence of asymmetric information in the credit market may also lead to non-price constraints: quantitative, transaction-cost and risk. Quantitative rationing takes place when a potential borrower has a profitable project or a productive activity but is unable to find a credit supply. This can be considered as supply-side constraints.

The other two rationing categories imply low level of demand for credit compared to quantitative rationing. Transaction-cost rationing occurs when a potential borrower has positive notional demand but does not have effective demand for credits due to transaction costs. Risk rationing occurs when a potential borrower has a profitable project or productive activity but chooses to withdraw due to lower return. The details of each classification will be discussed in the next section.

4.3.1 Data

In understanding the different categories of credit rationing, I use the A2F data set which contains adequate information about Indonesian households' financial behaviour (see World Bank, 2009). This nationwide survey carefully selected households in order to ensure representativeness by using multistage random sampling based on province (first level), district (second level) and village (third level). The final sample comprised of 3,360 household respondents with 1920 households from Java (the main island in Indonesia) and 1,440 from outside Java.

Using DEM method as proposed by Boucher et al. (2009), I classify households according to their status towards the credit market as described in Figure 4.1. The classification between constrained and unconstrained households is based on the credit supply and households' demand for credit. Using DEM approach, the classification can be brought into operational concept in household surveys such as the A2F survey. The difference is that the A2F survey questions tried to capture and identify credit rationing based on the actual experience of the household, while Boucher et al. (2009)

use respondents' opinions or perceptions about the possibility of getting credit from a bank.

4.3.2 Credit Constraint Classifications

Suppose D_h^N denotes household h's notional demand for credit and D_h^E denotes household h's effective demand for credit. Notional demand for credits implies households' demand for credit when first-best world exists or when credit markets are perfect assuming the absence of well-functioning insurance markets.

Effective demand for credit implies demand for credit contracts available in a world with asymmetric information. S_h denote the maximum amount of credit which can be supplied by a lender to household h.

A household can be considered *unconstrained* if he is not affected by asymmetric information. Unconstrained also implies price-rationed, meaning that credit limit levied by lenders will not bind for these households where:

$$D_h^E = D_h^N \leq S_h. \tag{4.1}$$

Unconstrained households can be also divided into two groups: borrowers who have positive effective demands and non-borrowers who have zero effective demand for credits.

The constrained households can be divided into two types: demand-side and supply-side constrained. A household can be considered as supply-side constrained or quantity rationed when a credit limit is binding as follows:

$$D_h^N \geq D_h^E > S_h. \tag{4.2}$$

Equation (4.2) means that household h's notional demand for credit is equal or greater than effective demand for credits, but the credit supply is lower than the effective demand for credit. One important characteristic from supply-side constrained is that the constraint comes from the credit supply in terms of credit limit. The households' effective demand may be lower than notional demand due to asymmetric information. If a household secures less credit than the desired credit then equation (4.2) will hold.

In identifying quantity constrained households in the A2F survey, households classified in this category are mainly rejected applicants. Those who were rejected in their application have positive effective demand for credit; however, they face a zero credit

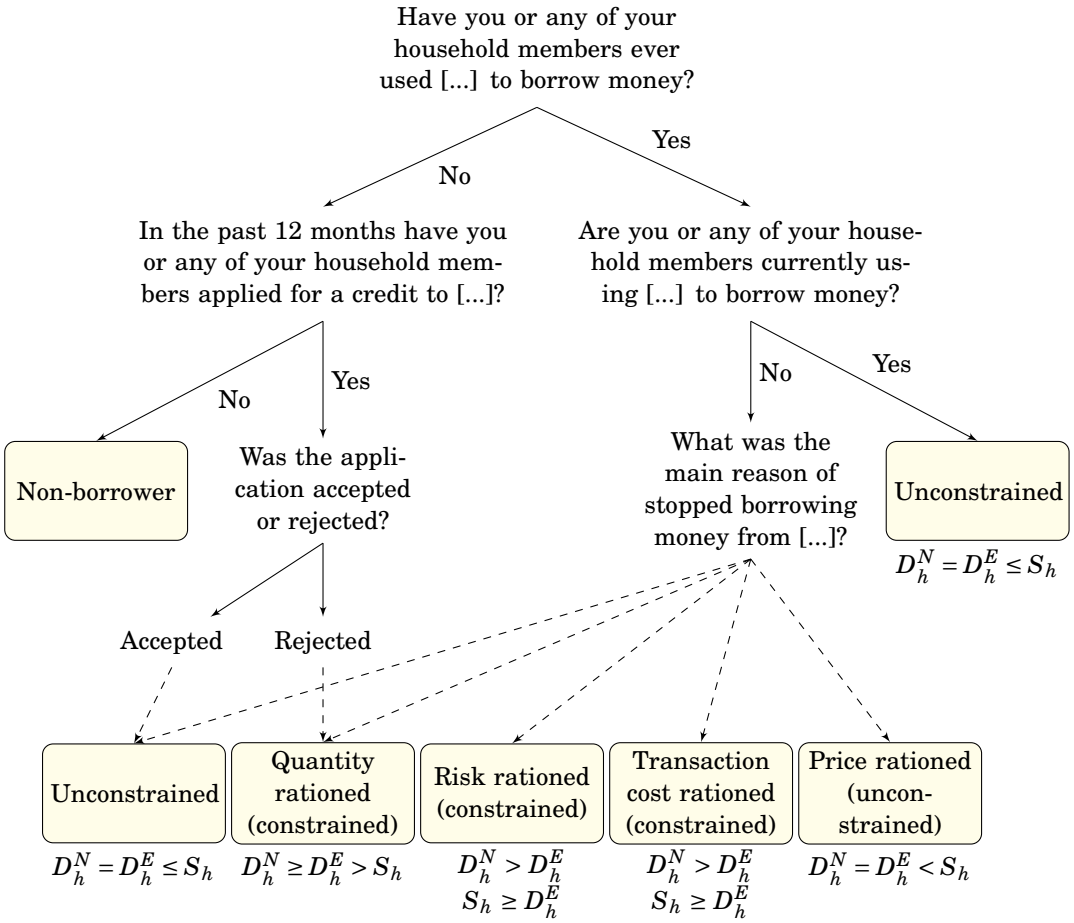

Figure 4.1. Borrowing Classification. The questions are taken from A2F survey module. [...] denotes the type of financial institutions or services which the respondents were able to choose from available options. Only respondents who use formal financial institutions are included in the analysis. This includes formal financial institutions such as government-owned bank, private bank; and micro finance such as cooperatives, Islamic saving and loan cooperative, formal saving by non-governmental organisation. D_h^E denotes household's effective demand for credit, D_h^N denotes household's notional demand for credit, and S_h denotes credit supply. *Source*: author's summary from the A2F data set.

limit from lenders. Boucher et al. (2009) identify two other groups that fall into this category: unsatisfied borrowers and "certainly rejected" applicants. Unsatisfied borrowers currently have credits but are asking for more. In other words, the credit amount for this group is lower than their effective demand for credit. The applicants who are "certain" of loan rejection are those who have positive effective demand and do not apply for a credit. This is caused by past credit history or perceptions of credit limit rules. However, questions with regard to these two types of borrowers are not included in A2F survey.

Households who are demand-side constrained can be expressed as follows:

$$D_h^N > D_h^E \tag{4.3}$$

$$S_h \geq D_h^E \tag{4.4}$$

where the credit limit is not binding. Equation (4.3) implies effective demand is lower than notional demand for credits that exists because of transaction costs or risk sharing rules of first-best contract. Equation (4.4) implies that credit supply limits the effective demand for credits.

In this particular case, the low level of effective demand is due to either risk or transaction costs. To distinguish between risk and transaction-cost rationed, it is necessary to classify households' responses as described in Table 4.1.

The A2F also provided an alternative answer for respondents who wish to provide a specific reason apart from available options by writing down their own reason on the "other" option. The reasons can classified into one classification: risk, transaction cost or price reason. Furthermore, it is important to note that the respondents already had loans from the financial institutions, but then they decided to stop borrowing due to a particular reason.

4.3.3 Empirical Strategy

Identifying credit constraints using the DEM approach is essentially trying to gather information by capturing all relevant variables from borrowers' perceptions. Boucher et al. (2009) address some issues in using the DEM approach. The first issue is the respondents' perception of financial service provider definition. The sources of credit may imply different credit rules that may also influence the decision to apply for credit. This may also help to test sector-specific hypothesis of credit sources. The A2F

Table 4.1
Reasons for Lack of Effective Demand for Credits

The questions are taken from A2F survey module where the respondents are asked what was the main reason they stopped borrowing money from a particular formal financial institution. The respondents should choose one of these options or state a reason of stopped their borrowings (Question E1.3). The elicited responses are then classified into five borrowing classifications. *Source:* author's summary from A2F data set.

Classification	Reasons of stop borrowing
Unconstrained	Do not need to borrow
Price rationed	Prefer to save Interest rate too high
Risk rationed	Worry about the repayment Not enough collateral Decided to use another source of credits Unfavourable credit term Unfavourable repayment schedule Do not have job or business Do not have enough money
Transaction-cost rationed	The bank officers were unfriendly or unhelpful Inconvenient location Institution not existed anymore
Quantity rationed	The bank refused to lend

questionnaire provides options relating to various types of financial institutions so that it would be easy for respondents to give accurate responses.

The second issue is about household versus individual constraint. The A2F survey explicitly describes that the constraints are addressed at household level, which means that this is consistent with a "unitary" household definition. This implies that the household head should be able to identify the effective and notional demand for credit for the entire household. The next issue is using respondents' perceptions of lender supply rules. The questions should be properly designed so that they are understood by respondents.

Since various household characteristics are used to observe credit rationing, the analysis will be conducted within a multivariate environment in particular multinomial logit model. Suppose Y_h is a categorical variable which represents observable credit rationing of household h and takes value $0,1,..,I$. Y^*_{hi} is defined as the unobserved "propensity" of household h fall into credit rationing category i:

$$Y^*_{hi} = \beta^{'} X_h + \varepsilon_{hi} \tag{4.5}$$

where β denotes a vector of parameters with the $i-$th category, X_h denotes a vector of household characteristics, ε_{hi} denotes unobservable component of the household h's propensity to be in the category i, and credit rationing regimes are indexed by i.

The ε_{hi} are independent and identically distributed with Weibull distribution assuming $I+1$. The probability of household h in category i is

$$\Pr(Y_h = i) = \Pr\left(Y_{hi}^* > Y_{hj}^*\right) \qquad \forall i \neq j. \tag{4.6}$$

The objective here is to assess the correlation between the observed rationing category and other factors that may influence credit demand such as risk preferences and financial literacy. Another relevant variable to be considered is the applicant's earnings or income. This gives insight into the borrowing capacity and ability to repay the credits. The annual income is the total of all household members' income comprising earnings or salary, grants or transfers, rent fee, and interest income. Household assets can also be used as the collateral required by the banks. Other variables are discussed as follows.

4.3.3.1 Asset Index

Since the nominal values of asset data are not provided in the A2F survey, I use asset index as proposed by Filmer and Pritchett (2001) as a proxy for collateral. They tested the index using data from India, Indonesia, Pakistan, and Nepal. They also show that this index have reasonable correlation between expenditures and asset variables from the same households. Furthermore, they argue that the asset index can be used a proxy for economic status for a household.

The questions in A2F concerning asset variables are given in two parts or subsections. The first part comprises questions the structure of the building such as main material used for the most part of the house, roof, floor, and electricity. This part also asks about house ownership, rent payment (if the house is rent), and credit installment (if the house is purchased using credit).

The second part of this survey section comprises of assets owned by households. The respondents are asked whether they have a specific asset and then they are asked the quantity of asset owned by them, except for land, which is in terms of square metre. The type of asset comprises 22 components, which are used to construct the asset index. The respondents can specify one asset that is not given in the list. However,

this is not included in the asset index construction because it may not be the same asset type for all households.

Using principal component analysis, the index is constructed from various asset ownership indicators that are aggregated into one variable. The index assumes that the maximum variances and covariances in the asset variables can be used to explain household wealth in the long run. After the principal components are derived and the "scoring factors" are recovered, the index score for each household is calculated. The results of principal component analysis are given in the Appendix 4.C (see Table 4.C.1, 4.C.2 and 4.C.3).

4.3.3.2 Risk Aversion

In order to capture household's risk preference by the elicitation approach, the A2F provides a set of questions that relate to household perception about risk (A2F Questionnaire Section L). The A2F provides a set of questions that captures household perception of risk. The respondents are asked to play a "game" in which they have a chance to earn a small amount of money. The question is simple, if a respondent is willing to play the game, he or she will draw a marble from a bag of white and black marbles. If he draws a white ball, then he will get Rp 5,000 and 0 for a black marble. If the respondent is not willing to play, then he or she will certainly get Rp 2,000. The other option is to refuse to play. The risk aversion can be defined as follows

$$U(a) \leq \frac{1}{2}U(b) + \frac{1}{2}U(d) \tag{4.7}$$

where a, b and d are the value different expected payoff which are Rp 2,000, Rp 5,000 and 0 respectively. The utility function is assumed to be:

$$U(c) = \frac{c^{1-\gamma}}{1-\gamma} \tag{4.8}$$

where γ is the coefficient of constant relative risk aversion. Equation (4.7) implies that one will choose uncertain payoff if the expected utility of this payoff is equal or higher to the expected utility of certain payoff. In order to get values for the coefficient of constant relative risk aversion, plug (4.8) into (4.7), then solve to get γ. The range of γ is between 0.244 and 2.385. Respondents with higher γ are more risk averse. To understand respondents' attitudes towards credit or financial services, a financial literacy variable is used. The A2F gives five questions about loan mechanisms (A2F

Questionnaire Section K). For example, the question is about interest rate calculation, comparing two different credit schemes, and diversification in farming. The literacy score range is between zero and one where one is the highest score. Furthermore, the level of education may also affect household decision making in applying for a credit. Therefore, the highest attainment level of education of the household head is also taken into account.

4.3.3.3 Financial Literacy

Financial literacy can be defined as a quantitative measure of households' financial decision making (see Attanasio and Weber, 2010). The questions concerning financial literacy in the A2F follow Lusardi and Mitchell (2008, 2014). The questions that are employed to calculate financial literacy score for each household are given in Appendix 4.B.

The questions are designed to capture households' understanding about four basic financial skills and knowledge. These are (1) numeracy and the ability to calculate interest rate compounding, (2) numeracy and the ability to understand the concept of time value of money, (3) understanding of the concept of inflation and (4) understanding the principle of risk diversification.

The correct answer for each question has value of one and otherwise is zero. All answers are divided by four to get overall score. Therefore, the maximum score is one and the minimum score is zero. The questions are designed to be simple, relevant to daily financial decision, concise, and able to distinguish financial knowledge across households.

4.3.4 Welfare Loss Estimations Using Matching Models

In order to measure welfare loss due to credit constraints, I use matching models in particular average treatment models to evaluate the effects of inadequate credit access for households. The matching models overcome selection bias if OLS methods are used to estimate such data.

Average treatment effect (ATE) models are mainly use to evaluate economic policy such as job training (Heckman et al., 1997) and credit policy (Rui and Xi, 2010). Rosenbaum and Rubin (1983) show that matching between treated and control units based on propensity scores is sufficient if conditional independence assumption holds.

This model also assumes counterfactual settings which refer to the fact that one individual household has only one outcome.

In this study, the treated units are households who are likely to be constrained, and the control units are borrowers who are not constrained by credit access or price-constrained households.

Following Rosenbaum and Rubin (1983), the propensity score is defined as the conditional probability of receiving a treatment:

$$p(X) = \Pr(W = 1|X) = E(W|X) \tag{4.9}$$

where $W \in \{0,1\}$ indicates the exposure to the treatment and X is the vector of household characteristics.

If the propensity score for a population of households $p(X_h)$ is known, the average treatment effect on the treated (ATT), in this case to the constrained households, is estimated by:

$$\begin{aligned} \tau &= E\{Y_{1h} - Y_{0h}|W_h = 1\} \\ &= E[E\{Y_{1h} - Y_{0h}|W_h = 1\}] \\ &= E[E\{Y_{1h}|W_h = 1, p(X_h)\} - E\{Y_{0h}|W_h = 0, p(X_h)|W_h = 1\}] \end{aligned} \tag{4.10}$$

where Y_{1h} denotes potential outcome with treatment, and Y_{0h} denotes potential outcome without treatment.

Since the data is not from experimental design, propensity score matching employed in this study is based on the selection of observables. The idea here is to compare the outcome variables of households who are likely to be constrained with those who are not constrained.

There are four methods of matching the units or these households using propensity scores: nearest-neighbour, stratification, radius and kernel. Nearest-neighbour method is a matching of treated units or the constrained households to the control units or unconstrained households with the closest propensity scores. This is usually applied with replacement.

Let C be the set of constrained households as the treated units and U is the set of unconstrained households as the control units. Y_h^C denotes the observed outcome of constrained households and Y_i^U denotes the observed outcome of unconstrained

households. The nearest-neighbour is written as follows:

$$U(h) = \min_i \parallel p_h - p_i \parallel \tag{4.11}$$

where $U(h)$ is the set of unconstrained household characteristics, p_h and p_i is the estimated value of propensity score of household h and household i respectively.

Stratification can be done by dividing the range of propensity score variations in intervals. Within these intervals, treated and control units will have average propensity scores which can be expressed by

$$\tau_q^S = \frac{\sum_{t \in H(q)} Y_h^C}{N_q^C} - \frac{\sum_{t \in H(q)} Y_i^U}{N_q^U}. \tag{4.12}$$

However, some matches may be considered as poor when the nearest neighbour has an extremely different score. This issue can be overcome by implementing the other two matching methods. First by radius matching, constrained households as the treated units are matched only by control units this falls into a predefined neighbourhood of the propensity scores of constrained households. The neighbourhood dimension in this particular case by radius is set in a very small value which may lead to exclusion for some treated units which do not have controls. This can be written as

$$U(h) = \{p_i | \parallel p_h - p_i \parallel < r\}. \tag{4.13}$$

For nearest-neighbour matching in (4.11) and radius matching in (4.13), the estimators can be written as

$$\tau = \frac{1}{N^C} \sum_{c \in C} Y_c^C - \frac{1}{N^C} \sum_{j \in U} w_j Y_j^U \tag{4.14}$$

where N^C is the number of units of constrained households in treated groups and w_j are the weights defined by $w_j = \sum_h w_{hj}$.

By using kernel matching method, all constrained households as treated units are matched with a weighted average of unconstrained households as control units. The weights are set to be inversely proportional between the propensity scores of constrained and unconstrained households.

$$\tau^K = \frac{1}{N^C} \sum_{h \in T} \left\{ Y_h^C - \frac{\sum_{i \in U} Y_i^U R\left(\frac{p_h - p_i}{b_n}\right)}{\sum_{k \in U} R\left(\frac{p_h - p_i}{b_n}\right)} \right\} \tag{4.15}$$

where $R(\cdot)$ is a kernel function and b_n is a bandwidth parameter. The welfare loss can be estimated using the average treatment effects (ATT) between constrained and unconstrained households.

To get empirical results, I employ Stata's `pscore` package for the estimation of various matching models. This package estimates propensity scores and ATT for each matching technique (see Becker and Ichino, 2002).

4.4 Analysis and Discussions

4.4.1 Data Description

In the A2F survey, financial institutions can be divided into formal and informal institutions. Formal institutions are divided into three types: banks, micro finance institutions and pawnshops. Banks in the A2F include government banks, private banks including Islamic banks, and people credit banks (BPR). Microfinance institutions include credit associations or cooperatives, Islamic saving and loan cooperatives (BMT), and formal saving institution by NGOs (non government organisations). Employers, daily banks, community welfare schemes, neighbourhood community, and family or friends are considered as informal sources of credit. This study focuses on formal financial institutions since these institutions ideally should cover many households as possible. Respondents who are in the process of getting loans would not be considered in the samples.

Based on the A2F data set, more than 17% of the total households do not have any access to formal or informal financial institution in terms of credit and 45% of households only use informal sources of credits. If the number of households who use both are added, then 73% of households utilise informal financial services to get a credit. For non-Java provinces, there is around 5% of total respondents in each province who are borrowers. From 3,360 households surveyed, only 8% of total households secured credit from formal financial institutions only, 44% of total households had credit from informal sources only and 26% of total households borrowed from both sources. These facts suggest that banks and other formal institutions are still unable to cover the majority of households despite high growth of financial service expansion after year 2000.

Only households with complete information are used in the analysis. From 3,360 households in A2F, the final samples used are 1,775 households which comprise of

1,050 rural households and 725 urban households. Therefore, the sample rate used in the analysis is 53% of the A2F households. More summary statistics for each credit regime based on the location of the households are given in the Appendix 4.D (see Table 6.B.2 and 6.B.3).

Table 4.1 provides household samples based on their location and credit classification. The majority of urban households do not borrow from formal financial institutions. In urban area, households also have similar characteristics and have higher proportion than urban household counterpart. In many provinces, the proportion of households who do not borrow is on average around ten percent except for rural households in West Nusa Tenggara and West Kalimantan and for urban households in Jambi, West Java and North Sulawesi, which are around twenty percent.

In terms of unconstrained regime, urban households comprise of around twenty percent while rural households comprise of eleven percent. This shows that access to formal financial institutions may likely to occur in urban area. However, the lowest proportion of unconstrained households can be found in Banten province. This is quite interesting because Banten is a Java province, which was a part of West Java province until 2000. As a newly formed province, it seems that formal financial institutions have not well developed in Banten for both rural and urban area since it was separated from West Java province.

Credit constraints due to price-related reason seems occur in a small number of respondents. For non-price reason, risk-related reasons take place more than transaction-cost constraints. Demand-side credit constraints, which are due to price and risk rationing, are likely to incur in urban than rural area. The number of households who are constrained by supply-side or quantity rationing is also higher in urban area than rural area.

In summary, the number of urban households who can access formal financial institutions is higher than rural households. The number of unconstrained households also follows similar pattern where urban households are higher than rural households. However, credit rationing is also likely to incur more for urban households than rural households.

Table 4.2 describes relevant household characteristics which are related to financial market activity. Households use some of their assets as collateral in order to secure credits from financial institutions.

The negative value of the average asset index for non-borrowers implies that these households have a low value of assets. The high value of asset index can be found for

Table 4.1
Credit Constraints Based on Household Location

The respondents is classified based on the location, province and credit rationing category. The location is divided into rural and urban area where the household lives. The provinces located in Java island are West Java, Central Java, East Java, and Banten. The non-Java provinces are Aceh, Jambi, West Nusa Tenggara, West Kalimantan, North Sulawesi, and North Maluku. The figures in parentheses indicate the percentage of households being classified on particular credit regime on that location and province respectively, except for total respondents. The survey did not cover urban area in East Java and West Kalimantan. Column (1) denotes non borrower, (2) unconstrained, (3) price constrained, (4) risk constrained, (5) transaction-cost constrained, and (6) quantity constrained. *Source:* author's calculations from the A2F data set.

Province	(1) Non borrower		(2) Unconstrained		(3) Price		(4) Risk		(5) Transaction-cost		(6) Quantity		Total	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Aceh	78	55	17	25			1	6			15	11	111	97
	(9.3)	(12.1)	(14.7)	(17.4)			(3.2)	(16.2)			(30.0)	(15.5)	(10.6)	(13.4)
Jambi	82	77	12	20		4	8	4		2	10	9	112	116
	(9.8)	(17.0)	(10.3)	(13.9)		(28.6)	(25.8)	(10.8)		(40.0)	(20.0)	(12.7)	(10.7)	(16.0)
West Java	49	111	6	28	1	1	2	11		1		15	58	167
	(5.8)	(24.4)	(5.2)	(19.4)	(20.0)	(7.1)	(6.5)	(29.7)		(20.0)		(21.1)	(5.5)	(23.0)
East Java	69		30				6		1		7		113	
	(8.2)		(25.9)				(19.4)		(12.5)		(14.0)		(10.8)	
Banten	49	53	2	4	1	1	1	1	1		3		57	59
	(5.8)	(11.7)	(1.7)	(2.8)	(20.0)	(7.1)	(3.2)	(2.7)	(12.5)		(6.0)		(5.4)	(8.1)
West Nusa Tenggara	175	17	9	9	1	1	6	1			5	1	196	29
	(20.8)	(3.7)	(7.8)	(6.3)	(20.0)	(7.1)	(19.4)	(2.7)			(10.0)	(1.4)	(18.7)	(4.0)
West Kalimantan	178		11		2		6		4		1		202	
	(21.2)		(9.5)		(40.0)		(19.4)		(50.0)		(2.0)		(19.2)	
North Sulawesi	67	93	16	21		5		11		1	5	16	88	147
	(8.0)	(20.5)	(13.8)	(14.6)		(35.7)		(29.7)		(20.0)	(10.0)	(22.5)	(8.4)	(20.3)
North Maluku	93	48	13	37		2	1	3	2	1	4	19	113	110
	(11.1)	(10.6)	(11.2)	(25.7)		(14.3)	(3.2)	(8.1)	(25.0)	(20.0)	(8.0)	(26.8)	(10.8)	(15.2)
Total	840	454	116	144	5	14	31	37	8	5	50	71	1050	725
	(80.0)	(62.6)	(11.0)	(19.9)	(0.5)	(1.9)	(3.0)	(5.1)	(0.8)	(0.7)	(4.8)	(9.8)		

Table 4.2
Means of Key Variables for Each Ration Category

Only borrowings from and credit applications to formal financial institutions are calculated. Column (1) denotes non borrower, (2) unconstrained, (3) price constrained, (4) risk constrained, (5) transaction-cost constrained, and (6) quantity constrained. Standard deviations are in parantheses. Annual income is standardised. *Source:* author's calculations from A2F data set.

	(1) Non borrower		(2) Unconstrained		(3) Price		(4) Risk		(5) Transaction-cost		(6) Quantity	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Age	40.778	40.015	43.552	39.306	39	44.643	40.838	47.162	41.250	42.400	40.780	43.493
	(14.957)	(13.414)	(11.793)	(12.661)	(12.787)	(13.293)	(12.681)	(1.253)	(13.036)	(16.861)	(13.666)	(12.589)
Asset index	−0.421	0.161	0.430	0.727	0.410	0.814	−0.104	0.562	0.194	0.486	0.369	0.752
	(0.744)	(0.862)	(0.843)	(0.811)	(1.073)	(0.716)	(0.778)	(0.917)	(0.806)	(1.138)	(0.923)	(0.759)
Education	5.662	8.643	9.009	11.604	10	10.929	6.387	9.081	7.750	12.800	9.72	11.380
	(3.846)	(4.134)	(5.107)	(3.863)	(4.637)	(4.287)	(2.974)	(4.192)	(4.773)	(4.549)	(4.638)	(4.261)
Financial literacy	0.391	0.489	0.537	0.589	0.500	0.571	0.476	0.588	0.500	0.600	0.525	0.595
	(0.268)	(0.270)	(0.266)	(0.220)	(0.306)	(0.267)	(0.284)	(0.230)	(0.267)	(0.224)	(0.244)	(0.248)
Income	−0.215	−0.052	0.346	0.506	0.045	0.021	−0.092	0.055	−0.226	2.487	0.149	0.574
	(0.672)	(0.497)	(1.636)	(1.247)	(0.407)	(0.314)	(0.471)	(0.457)	(0.106)	(5.326)	(0.688)	(1.206)
Risk aversion	0.761	0.815	1.001	0.809	0.672	1.314	0.727	1.228	1.047	0.244	0.929	0.817
	(0.917)	(0.947)	(1.028)	(0.947)	(0.957)	(1.111)	(0.910)	(1.082)	(1.108)	(0)	(1.009)	(0.954)
Observation	840	454	116	144	5	14	31	37	8	5	50	71

unconstrained and price rationed households, indicating their ability to fulfil credit requirements from the lenders.

The annual income is standardised from total household income for the past 12 months. Similar to asset index, non-borrowers have a relatively low level of income compared to average households. The quantity constrained households have a relatively high level of average annual income compared to other credit constraint categories.

For risk preference, households who had their credit application rejected are less averse than others. This confirms that the lenders are reluctant to approve the application because quantity rationed households exhibit risk taking behaviour. Households who fall in the transaction-cost rationed category have a relatively high level of risk aversion as well as negative annual income. This may also explain why these households have more aversion given low levels of income.

As expected, households who are non-borrowers tend to have lower financial literacy scores than other households who are borrowers. This implies that financial literacy seems play a vital role in household decision making to apply for a loan. In other words, non-borrowers seem reluctant to apply for a credit loan due to their understanding toward financial products and knowledge. Households who are quantity rationed seem to have a better knowledge of financial information. This may imply they have better understanding toward financial information which motivate them to approach formal financial institutions in order to get a loan. The rest of households in other categories have relatively similar average financial literacy scores between 57% and 60%.

In summary, A2F households have relatively different characteristics when they are classified based on a credit constraint regime. The results provide initial conditions that could confirm the source of constraints still exists in credit markets.

4.4.2 The Impact of Different Credit Constraint Regimes

The use of DEM in defining the type of credit constraints faced by households requires accurate questionnaire design to distinguish each credit constraint regime. Such classifications can be done as the required information given in the A2F questionnaire enable us to do so. After the households are classified into the appropriate regime, the multinomial logit along with the marginal effects can be estimated for each classification simultaneously. The purpose of this analysis is to evaluate the impact of the probability of being observed in each rationing regime where the independent vari-

Table 4.3
Marginal Impact of Regressors on the Probability of Each Credit Constraint Regime and Non-Borrower

Column (1) denotes non-borrower, (2) unconstrained, (3) price constrained, (4) risk constrained, (5) transaction-cost constrained, and (6) quantity constrained. To estimate the marginal effects, the regressors are set to equal to the sample median. The income variables are standardised. The subdistrict (*kecamatan*) dummy is used as control variables. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source:* author's calculations from the A2F data set.

	(1) Non borrower	(2) Unconstrained	(3) Price	(4) Risk	(5) Transaction-cost	(6) Quantity
Age	-0.004^{***}	0.001^{**}	0.000	0.001^{*}	0.000	0.001^{**}
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Asset	-0.077^{***}	0.039^{***}	0.007	−0.013	0.001	0.017^{*}
	(0.016)	(0.010)	(0.005)	(0.009)	(0.004)	(0.007)
Education	-0.015^{***}	0.008^{***}	0.001	−0.000	0.001	0.005^{***}
	(0.003)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Financial literacy	-0.141^{***}	0.058^{*}	0.003	0.047	0.003	0.030
	(0.040)	(0.024)	(0.007)	(0.026)	(0.011)	(0.017)
Annual income	-0.041^{*}	0.030^{**}	−0.007	0.001	0.004	0.012^{*}
	(0.019)	(0.009)	(0.006)	(0.011)	(0.003)	(0.005)
Risk aversion	−0.015	0.004	0.003	0.007	−0.000	0.001
	(0.009)	(0.005)	(0.002)	(0.005)	(0.003)	(0.004)

ables are evaluated at median values. The marginal impact of regressors for each rationing is given in Table 4.3. The post-estimation results for the multinomial logit regressions are given in the Appendix 4.E (see Table 4.E.2).

Starting with quantity rationed regime in Table 4.3 Column (6), the probability of quantity rationed household increases as the asset index increases. This type of rationing would be related to some credit rules that is usually evaluated by lenders. The credit rules are usually related collateral or some assets that could be pledge in order to get credit loans. The possible explanation for this is because potential borrowers are required to pledge some of their worthy assets in order to apply for a credit that may not fulfill the requirement needed to get a credit loan. The household income may also play role in this context. For quantity constrained households, the probability of being classified in this category increases as household income increases. Although the households have certain level of income, this is not adequate to secure a loan from formal financial institutions. If we compare the marginal effect of annual income between quantity constrained households and unconstrained households, the

effect for the latter is lower than the former. From these results, it can be inferred that the credit rule imposed by formal financial institutions can be assessed through the marginal effects.

The other variables that have significant effects for quantity rationed households are the age of respondents and their education level. The effect of age for quantity constrained households is similar to risk constrained households and unconstrained borrowers. For the level of education, the possibility of being quantity rationed increases as the level of education is higher. Financial literacy and risk preference of households seem do not have any effects in determining probability of being classified in this regime. Households in the quantity rationed regime are said to have a binding supply-side constraint.

As mentioned before, non-price rationing can be divided into risk and transaction-cost rationing. However, for the transaction-cost rationed, nothing can be inferred (see Table 4.3 Column (5)). This is due to an inadequate number of sample households for this regime. For the risk rationed household, the age of the respondents is the only variable that has significant and positive effect to the probability of being classified in risk rationed regime. This effect is similar to the same variable as for quantity constrained households and unconstrained households. It seems that experience affects the way households interact with formal financial households. As households get older, they accumulate experience in terms of interacting with these institutions.

Following Boucher et al. (2009), unconstrained households can be divided into price rationing households and unconstrained borrowers. Price rationed households here are those who stop borrowing loans from formal financial institutions due to price-related reasons. For price constrained households, the case is the same as transaction-cost constrained households where the number of sample households may not be adequate to estimate the marginal effects.

For borrowers, the effect on the probability of being unconstrained is increasing as regressors increased with the exception of risk aversion. It can be interpreted that these households have adequate collateral capacity in terms of asset and income would lead to higher probability of being unconstrained borrowers. The possibility of being accepted is because the lenders are able to observe their financial capacity based on the households' asset and income. Again, if we compare the marginal effects of these two variables, the unconstrained households have higher effects than any other households in other regimes. It can be inferred that their asset and income are above certain level, which is imposed by formal financial institutions.

Unconstrained households are also financially literate which implies that they have adequate knowledge in accessing and using loans from lenders. This can be shown given the fact that the effect of financial literacy increases as the probability of being observed in this regime also increases. In other words, those who are well informed about financial knowledge are likely to apply successfully for credit from financial markets. The effect of age for unconstrained borrowers is also increasing significantly. However, it has similar effect with risk constrained and quantity constrained households. The level of last education obtained by the head of the household also has positive effect toward the probability of being classified as unconstrained households. Again, the marginal effect of education level for unconstrained households is the highest among credit constraint classification. This suggests that people who obtained higher level of education may be able to secure loans from formal financial institutions.

As anticipated, the overall impact of explanatory variables to the probability of non-borrowers has significant and negative marginal effects, except for risk aversion. The non-borrowers are defined as households who do not apply for a loan to formal financial institutions. The impacts of asset and income indicate low capability in providing collateral to gain credit. This may suggest that non borrower households have less confidence whenever they have to deal with formal financial institutions especially in terms of applying and securing a loan from these institutions.

The marginal effect of age for non-borrower households is significant and negative. This may imply that younger households tend to be classified as non-borrower. The similar interpretation can be also used to explain the level of education for non-borrower households. Since the marginal effect of education is significantly negative, it can be said that those who have lower level of education may not be able to or have less access to formal financial institutions.

Moreover, the negative impact of financial literacy score indicates that they do not have adequate knowledge of credit with its related information. One interesting fact is that the marginal effect of financial literacy for non borrower households is higher than any effects given by the rest of the variables. This means that financial literacy is very critical component in explaining low level of the accessibility of formal financial institutions in Indonesia. The low level of financial literacy also implies that if borrowers know that the loan is too risky for them, and then they may reluctant to continue using credit and stop borrowing. Another possible explanation is that since they are well-informed about the credit terms, they are able to measure their ability

to face future consequences. Therefore, they feel it would be difficult to fulfil loan requirements.

To conclude, the key point here is each credit constraint regime can be identified and distinguished by using multinomial logit method. Although there are inadequate samples for price and transaction-cost constraint observation, this method is still reliable to distinguish the effect of different credit constraint regime. The results show that there are different characteristics between households given their credit constraint classification. This excludes the age where the effects are quite similar for unconstrained borrowers, quantity rationed and risk rationed households.

4.4.3 Welfare Loss Estimation

The most important question with regard to credit constraint classification is about the impact of inadequate access to financial markets. Therefore, the welfare loss can be used to answer this issue. The method used here is an *ad-hoc* approach using matching models.

After classifying credit regime in the previous section, the constrained households are then matched against unconstrained households who are borrowers. Table 4.4 provides estimation results, the impact of credit constraints on per capita income with different treated units: price, risk, transaction-cost and quantity rationed households. The unconstrained households are used as control in matching methods. It should be noted that the context of this case is only for formal financial institutions based on the A2F data.

The credit constraints have negative impacts on annual income across different regimes with the transaction-cost constrained group as an exception. However, these methods are only able to significantly estimate for risk constrained households. Using a different approach of matching models, it can be shown that the welfare loss range due to risk constraints is between Rp 16 millions to Rp 19 millions which are statistically significant except for the nearest neighbour matching method. The nearest-neighbour method seems to generate lower figures since it takes the nearest unit between propensity scores of constrained and unconstrained households as treated and control units. The impact of risk rationing for households is between these figures, which can be interpreted as a decrease in annual income.

The coefficients for the price constrained indicate welfare loss, which are higher than risk rationing. However, since the coefficients are not statistically significant,

Table 4.4
Estimation Results of Matching Models for Each Regime

The coefficients are in millions Indonesian rupiah. The treated observations are households being constrained in a particular credit rationing regime and the control observations are unconstrained borrowers. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source:* author's calculations from A2F data set.

Matching methods	Price constrained	Risk constrained	Transaction-cost constrained	Quantity constrained
Stratification	−23.6	−16.0***	29.3	−4.23
	(10.0)	(6.18)	(49.3)	(8.74)
Nearest neighbor	−48.1	−19.2	50.6	−8.92
	(4.45)	(6.44)	(36.9)	(6.40))
Radius	−23.6	−19.2***	29.2	−6.67
	(5.57)	(7.98)	(50.5)	(7.31)
Kernel	−24.0	−16.9***	29.4	−6.51
	(9.24)	(5.03)	(3.64)	(8.04)

the loss may not be there. This is understandable: they refuse to continue using loans because they are not affected by asymmetric problems.

None of the coefficients for the transaction-cost constrained regime gives statistical meaning. However, since the sign of the coefficients are different from other credit constraint regimes, it is possible that administrative factors in formal financial institutions do not significantly affect household welfare. In other words, households are no or less affected by transaction-cost factors such as inconvenient location and unfriendly bank officers. Households may still able to cope with their financial circumstances even tough they have stopped borrowing from formal financial institutions.

For the quantity constrained households, although the coefficients are not significant, the losses are lower than other credit constraint regime. The possibility is that these households face supply side constraints, meaning that they may have other sources of financing that enable them to have lower impacts than others.

4.5 Concluding Remarks

It should be noted that the purpose of DEM is to identify circumstances in multiple type of credit constraints, not to explain how to alleviate the problems. The results provide evidence of credit constraint in Indonesian households represented in the A2F survey using the DEM approach. This approach is able to distinguish the difference

between each regime. However, the results for price and transaction-cost constraints are not sufficient due to the small number of observations.

For risk constrained, those who are unable to access credit markets suffer loss in terms of income smoothing between Rp 16 millions and 19 millions. From the welfare loss estimations, it can be inferred that the credit constraints for Indonesian households are more likely due to demand-side constraints in particular risk rationing. This fact can be seen as an opportunity to tap into constrained households by giving adequate information and offering credit terms which are appropriate for them.

In this study, the limitation comes from the survey data where it does not provide adequate information on those households who are constrained by price reason and transaction-cost factors. Another limitation is that the approach only allows for one category for each household. The argument is that the a household may be classified into various categories which is likely to change the welfare loss estimation. Furthermore, a natural expansion of this study using the same data set is investigating the spill-over effects from formal to informal financial institutions. The reasons why households use informal financial institutions may also explain inaccessible formal financial services to many Indonesian households.

Appendix 4.A Variable Definitions

Table 4.A.1
Variable Definitions

Variable	Definition	Remarks
Age	Age of the head of the household (in years)	The age for each household member was directly asked to the respondents.
Annual income	Household's annual income	The total of all household members' income for the past one year.
Asset index	A measure of household asset	This is a proxy of household asset which is derived on 21 types of household asset ownership for each household using principal component analysis as given by Filmer and Pritchett (2001). The asset list is given in Table 4.C.2.
Education	The highest education attained by the head of the household	Education category is converted into continuous variable. Since A2F do not provide specific information about the number of years spent in education, I assume that persons in each category in mandatory education follow minimum number of years in education as regulated by the government: 1. primary school: six years, 2. secondary school: three years, 3. senior high: three years. For university category, the number of years is five based on World Bank (2010). For not finished primary school category, the number of years spent in school is three years based on IFLS4 data set. Those who never go to school are given zero value. For more information about IFLS4, see Strauss et al. (2009).
Financial literacy score	The respondent's understanding toward basic financial concepts	The score is based on four basic questions in finance: compounding interest, numeracy, inflation, and diversification. The maximum score is 1 (highly financial literate) and the minimum score is zero (financial illiterate).
Risk aversion	The respondent's degree of risk aversion	This is a proxy for risk aversion which are derived from a set of questions about risk perception. The answers from the head of the household are then calculated to estimate the degree of risk aversion.

Table 4.A.2
Part of A2F Questions Used to Determine Credit Constraint Classification

	E1.1 Have you or any of your household members ever used [...] to borrow money? 1. Yes 3. No	E1.2 Are you or any of your household members currently using [...] to borrow ? money 1. Yes 3. No	E1.3 What was the main reason of stopped borrowing from [...]? 1. Do not have job or business 2. Do not have enough money 3. Do not need to borrow 4. Worry about the repayment 5. Prefer to save 6. Interest rate too high 7. The officers were unfriendly or unhelpful 8. Decided to use another source of credits	9. Unfavourable credit term 10. Inconvenient location 11. Unfavourable repayment schedule 12. The institution refused to lend 13. Institution did not exist anymore 14. Not enough collateral 95. Other (specify) _____		E1.17 In the past 12 months have you or any of your household members applied for a credit to [...]? 1. Yes 3. No	E1.18 Was the application accepted or rejected? 1. Accepted 2. Rejected 3. Still in process
a. Formal institutions b. Microfinance c. Employer d. Pawnshop e. Daily bank f. Community welfare scheme g. Neighbours, family, and/or friends h. On credit from a store							

Appendix 4.B Financial Literacy Questions

1. Suppose you borrowed Rp. 100,000 from other people and the interest rate is 2% per month. If you can not repay the within three months, how much do you owe?

   (1) Less than Rp. 102,000

   (2) Exactly Rp. 102,000

   (3) **More than Rp. 102,000**

   (4) Do not know

2. Suppose you need to borrow Rp 500,000. There are two persons who offer loan for you. The first person asks you to pay back Rp 600,000 next month. The second person requires repayment of the principal Rp 500,000 with additional interest rate of 15% next month. Which one do you choose?

   (1) Rp. 600,000 in one month

   (2) **Rp. 500,000 with 15% interest rate**

   (3) Do not know

3. Suppose you put your money in a saving account and receive interest 1% annually. If prices were increasing by 2% annually, next year would you be able to buy more than, less than, or exactly the same amount of goods today with the money in your saving account?

   (1) **Less than the same amount of goods today**

   (2) Exactly the same amount of goods today

   (3) More than the same amount of goods today

   (4) Do not know

4. Do you think the following statement is true or false? “For farmers, planting one crop is usually safer than planting multiple crops”.

   (1) True

   (2) **False**

   (3) Do not know

Appendix 4.C Asset Index Construction

Table 4.C.1
Principal Components for Asset Index

Principal components/correlation			Number of obs =	1917
			Number of comp. =	3
			Trace =	21
Rotation: (unrotated = principal)			Rho =	0.3336
Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.1875	2.7358	0.1994	0.1994
Comp2	1.4518	0.0864	0.0691	0.2685
Comp3	1.3654	0.2589	0.0650	0.3336
Comp4	1.1066	0.0245	0.0527	0.3863
Comp5	1.0821	0.0270	0.0515	0.4378
Comp6	1.0550	0.0739	0.0502	0.4880
Comp7	0.9812	0.0196	0.0467	0.5347
Comp8	0.9616	0.0661	0.0458	0.5805
Comp9	0.8955	0.0444	0.0426	0.6232
Comp10	0.8510	0.0456	0.0405	0.6637
Comp11	0.8055	0.0188	0.0384	0.7021
Comp12	0.7867	0.0176	0.0375	0.7395
Comp13	0.7691	0.0466	0.0366	0.7761
Comp14	0.7225	0.0085	0.0344	0.8105
Comp15	0.7140	0.0469	0.0340	0.8445
Comp16	0.6671	0.0183	0.0318	0.8763
Comp17	0.6487	0.1031	0.0309	0.9072
Comp18	0.5457	0.0262	0.0260	0.9332
Comp19	0.5195	0.0479	0.0247	0.9579
Comp20	0.4715	0.0594	0.0225	0.9804
Comp21	0.4121		0.0196	1.0000

Table 4.C.2
Principal Components (Eigenvectors) for Asset Index

Variable	Comp1	Comp2	Comp3	Unexplained
Telephone (landline)	0.2156	−0.1863	−0.3034	.6293
Telephone (mobile)	0.3328	−0.0671	−0.0476	.5266
TV	0.3420	0.1281	−0.0420	.4841
Parabole (satellite dish)	0.1682	0.3764	−0.1779	.6326
VCD/DVD	0.3151	0.1346	−0.0609	.5528
Radio/tape	0.1923	0.1520	−0.0368	.8097
Jewelry	0.2536	0.1028	−0.0054	.7153
Sewing machine	0.1704	−0.0214	−0.0355	.8760
Car	0.2112	−0.0606	−0.1760	.7656
Other motorised vehicle	0.2946	0.1590	0.0559	.5955
Other non-motorised vehicle	0.1108	0.2519	0.1662	.8187
Refrigerator/freezer	0.3604	−0.0771	−0.1121	.4305
Electric pump	0.2884	0.0311	−0.0170	.6499
Cow	0.0107	0.2808	0.2248	.8160
Buffalo	0.0260	0.1626	−0.0505	.9553
Pig	−0.0383	0.2286	−0.0618	.9128
Poultry	−0.0963	0.4880	0.2735	.5132
Goat	−0.0270	0.2853	0.2824	.7699
Electric fan	0.1469	−0.1212	0.4370	.6275
Rice cooker	0.2213	−0.2515	0.4700	.4014
Water dispenser	0.1685	−0.3099	0.4098	.5125

Table 4.C.3
Scoring Coefficients for Asset Index (Method = Regression)

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Factor9	Factor10
Telephone (landline)	0.0773	−0.0541	−0.2112	0.1111	−0.0046	0.0213	−0.0094	0.0762	−0.0346	0.0582
Telephone (mobile)	0.1576	−0.0525	−0.0624	−0.0423	0.0237	−0.0775	0.1654	−0.1166	0.0094	−0.0271
TV	0.1951	0.1668	0.0474	−0.3019	−0.0135	0.0559	−0.0337	0.0866	0.0782	0.0211
Satellite dish	0.0539	0.2060	0.0147	0.0052	0.2314	−0.0159	−0.0629	−0.0304	0.0062	0.0272
VCD/DVD	0.1479	0.1389	0.0222	−0.2131	0.0009	0.0716	−0.0117	0.1299	−0.0114	−0.0238
Radio/tape	0.0641	0.0618	0.0120	0.1224	−0.1099	0.0605	0.0302	0.0864	−0.0859	−0.0024
Jewelry	0.0907	0.0461	0.0269	0.0473	−0.0003	−0.0384	0.0591	0.0304	−0.0148	0.0104
Sewing machinge	0.0539	−0.0150	−0.0223	0.1264	−0.0012	0.0196	0.1417	0.0530	0.0659	−0.0408
Car	0.0783	−0.0145	−0.0976	0.1468	0.0758	0.0248	−0.1537	−0.0151	−0.0092	−0.0066
Other motorised vehicle	0.1251	0.0929	0.1008	−0.0054	−0.0785	−0.0333	0.0039	−0.1923	−0.0954	0.0233
Other non-motorised vehicle	0.0368	0.0666	0.1044	0.0900	−0.0395	−0.1347	−0.1144	0.0500	−0.0119	−0.0149
Refrigerator/freezer	0.2120	−0.0634	−0.1654	0.1430	−0.0160	0.0276	0.0747	−0.0736	0.0130	0.0222
Electric pump	0.1161	0.0092	−0.0030	0.1214	−0.0836	−0.0676	−0.1233	0.0159	0.0574	−0.0618
Cow	0.0028	0.0667	0.1182	0.0668	−0.0098	−0.1251	0.0514	−0.0169	0.0588	0.0495
Buffalo	0.0057	0.0557	0.0107	0.0411	−0.0526	0.1502	−0.0609	−0.1236	0.0548	−0.0172
Pig	−0.0108	0.0815	0.0256	0.0547	0.2163	0.0559	0.0542	0.0022	−0.0544	−0.0346
Poultry	−0.0265	0.1641	0.2205	0.1529	0.0386	0.0285	0.0583	0.0191	0.0118	−0.0044
Goat	−0.0089	0.0647	0.1442	0.0606	−0.1300	0.1371	0.0044	0.0176	0.0021	0.0307
Electric fan	0.0469	−0.1130	0.1618	−0.0754	−0.0478	−0.0308	−0.0012	−0.0268	−0.0649	−0.0331
Rice cooker	0.0968	−0.2829	0.2359	0.0143	0.0818	0.0061	−0.0226	0.0336	0.0086	0.0091
Water dispenser	0.0633	−0.2519	0.1431	0.0209	0.1201	0.0883	−0.0367	0.0141	0.0218	0.0279

Appendix 4.D Summary Statistics

Table 4.D.1
Descriptive Statistics: Urban Households

Non borrowers

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	454	40.015	13.414	16	77
Asset index	454	0.161	0.863	−1.295	2.259
Education	454	8.643	4.134	0	17
Financial literacy	454	0.489	.27	0	1
Annual income	454	−0.052	0.497	−0.434	4.072
Risk aversion	454	0.815	0.948	0.244	2.385

Unconstrained borrowers

Age	144	39.306	12.661	17	86
Asset index	144	0.737	0.811	−1.131	2.634
Education	144	11.604	3.863	3	17
Financial literacy	144	0.589	0.22	0	1
Annual income	144	0.506	1.246	−0.411	8.968
Risk aversion	144	0.809	0.947	0.244	2.385

Price rationed (base)

Age	14	44.643	13.293	30	74
Asset index	14	0.814	0.716	−0.347	1.832
Education	14	10.929	4.287	3	17
Financial literacy	14	0.571	0.267	0	1
Annual income	14	0.021	0.314	−0.314	0.568
Risk aversion	14	1.315	1.111	0.244	2.385

Risk rationed

Age	37	47.162	12.253	28	72
Asset index	37	0.562	0.917	−1.128	2.309
Education	37	9.081	4.192	3	17
Financial literacy	37	0.587	0.229	0	1
Annual income	37	0.055	0.457	−0.414	1.341
Risk aversion	37	1.228	1.082	0.244	2.385

Transaction-cost rationed

Age	5	42.4	16.861	24	68
Asset index	5	0.486	1.1378	−1.077	1.832
Education	5	12.8	4.549	6	17
Financial literacy	5	0.6	0.224	0.25	0.75
Annual income	5	2.487	5.326	−0.384	11.975
Risk aversion	5	0.244	0	0.244	0.244

Quantity rationed

Age	71	43.493	12.589	23	76
Asset index	71	.752	0.759	−0.833	2.116
Education	71	11.38	4.261	0	17
Financial literacy	71	0.595	0.248	0	1
Annual income	71	0.574	1.206	−0.394	5.833
Risk aversion	71	0.817	0.955	0.244	2.385

Table 4.D.2
Descriptive Statistics: Rural Households

Non borrowers

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	840	40.777	14.957	15	95
Asset index	840	−0.421	0.744	−1.353	2.082
Education	840	5.662	3.846	0	17
Financial literacy	840	0.391	0.268	0	1
Annual income	840	−0.216	0.673	−0.438	16.286
Risk aversion	840	0.761	0.917	0.244	2.385

Unconstrained borrowers

Age	116	43.552	11.793	17	78
Asset index	116	0.429	0.843	−1.208	2.129
Education	116	9.009	5.107	0	17
Financial literacy	116	0.537	0.266	0	1
Annual income	116	.346	1.636	−0.428	15.476
Risk aversion	116	1.001	1.028	0.244	2.385

Price rationed

Age	5	39	12.787	20	53
Asset index	5	0.409	1.073	−0.696	1.716
Education	5	10	4.637	6	17
Financial literacy	5	0.5	0.306	0.25	1
Annual income	5	0.045	0.407	−0.339	0.558
Risk aversion	5	0.672	0.958	0.244	2.385

Risk rationed

Age	31	40.839	12.681	21	65
Asset index	31	−0.104	0.778	−1.208	1.857
Education	31	6.387	2.974	3	12
Financial literacy	31	.476	0.284	0	1
Annual income	31	−0.092	0.472	−0.431	1.821
Risk aversion	31	0.728	0.91	0.244	2.385

Transaction-cost rationed

Age	8	41.25	13.036	24	64
Asset index	8	0.194	0.806	−1.076	1.387
Education	8	7.75	4.773	3	17
Financial literacy	8	0.5	0.267	0	0.75
Annual income	8	−0.226	0.106	−0.343	0.013
Risk aversion	8	1.047	1.108	0.244	2.385

Quantity rationed

Age	454	40.0154	13.414	16	77
Asset index	454	0.161	0.863	−1.295	2.259
Education	454	8.643	4.134	0	17
Financial literacy	454	.4889	0.27	0	1
Annual income	454	−0.052	0.497	−0.434	4.072
Risk aversion	454	0.815	0.947	0.244	2.385

Appendix 4.E Multinomial Logit Regression

Table 4.E.1
Multinomial Logit Regression

Number of obs =	1775	LR $\chi^2_{(149)}$ =	577.50
Log likelihood =	−1316.5798	Prob > χ^2 =	0.00
		Pseudo R2 =	0.18

Sub-district dummies are employed in the estimations but the results are not displayed.

	Coefficient	Std. Err.	z	$P>\|z\|$	95% confid. interval	
Non borrowers						
Education	−0.145	0.067	−2.160	0.031	−0.277	−0.013
Asset index	−1.099	0.379	−2.900	0.004	−1.842	−0.357
Annual income	0.833	0.673	1.240	0.216	−0.486	2.152
Risk aversion	−0.356	0.229	−1.550	0.120	−0.806	0.093
Financial literacy	−0.617	0.929	−0.660	0.506	−2.438	1.203
Age	−0.033	0.019	−1.730	0.083	−0.070	0.004
Constant	7.379	1.440	5.130	0.000	4.557	10.201
Unconstrained borrowers						
Education	−0.019	0.068	−0.270	0.786	−0.153	0.115
Asset index	−0.493	0.386	−1.280	0.201	−1.250	0.263
Annual income	1.270	0.673	1.890	0.059	−0.049	2.588
Risk aversion	−0.288	0.234	−1.230	0.219	−0.747	0.172
Financial literacy	0.310	0.951	0.330	0.744	−1.554	2.175
Age	−0.012	0.019	−0.600	0.548	−0.050	0.026
Constant	3.097	1.470	2.110	0.035	0.217	5.978
Price rationed (base outcome)						
Risk rationed						
Education	−0.127	0.075	−1.690	0.092	−0.275	0.021
Asset index	−0.714	0.418	−1.710	0.087	−1.532	0.105
Annual income	0.913	0.711	1.280	0.199	−0.482	2.307
Risk aversion	−0.170	0.258	−0.660	0.510	−0.676	0.336
Financial literacy	0.612	1.046	0.590	0.558	−1.438	2.662
Age	−0.008	0.021	−0.360	0.718	−0.049	0.034
Constant	2.753	1.592	1.730	0.084	−0.367	5.872

Continued on next page

Table 4.E.1 – continued from previous page

	Coefficient	Std. Err.	z	$P > \|z\|$	95% confid. interval	
Transaction-cost rationed						
Education	−0.008	0.103	−0.080	0.936	−0.211	0.194
Asset index	−0.925	0.556	−1.660	0.097	−2.015	0.166
Annual income	1.312	0.682	1.920	0.055	−0.026	2.650
Risk aversion	−0.351	0.392	−0.900	0.371	−1.119	0.417
Financial literacy	−0.126	1.450	−0.090	0.931	−2.968	2.715
Age	−0.010	0.029	−0.350	0.728	−0.066	0.046
Constant	1.141	2.108	0.540	0.588	−2.991	5.273
Quantity rationed						
Education	0.005	0.071	0.070	0.945	−0.134	0.144
Asset index	−0.554	0.397	−1.390	0.163	−1.333	0.225
Annual income	1.214	0.674	1.800	0.072	−0.107	2.536
Risk aversion	−0.308	0.245	−1.260	0.209	−0.789	0.173
Financial literacy	0.359	0.990	0.360	0.717	−1.582	2.300
Age	0.000	0.020	0.000	0.997	−0.039	0.039
Constant	1.746	1.527	1.140	0.253	−1.246	4.738

Table 4.E.2
Post-estimation for Multinomial Logit Regression

Log-Lik Intercept Only:	−1605.330	Log-Lik Full Model:	−1316.580
D(1553):	2633.160	LR(170):	577.500
		Prob > LR:	0.000
McFadden's R^2:	0.180	McFadden's Adj R^2:	0.083
Maximum Likelihood R^2:	0.278	Cragg & Uhler's R^2:	0.332
Count R^2:	0.733	Adj Count R^2:	0.015
AIC:	1.658	AIC*n:	2943.160
BIC:	−9486.961	BIC′:	537.252

Chapter 5

The Impacts of Earnings Risk on Education and Savings

5.1 Introduction

As the main source of income, occupational earnings or salary contributes significantly to a household's welfare. Many economic decisions that households make, including those about education and savings, are based on the nature of earnings. Education has become an important component of human capital acquisition and influences earnings.

According to Mincer (1958, 1974), the earnings function is determined by investment in human capital and work experience. Education can be considered as a contributing factor to human capital. In the field of neoclassical economics, Mincer (1958) also introduced the term "human capital" where he argues that it is highly associated with the occupational composition. Furthermore, Becker (1964, 1993) provides details and comprehensive understanding on human capital. He defines that human capital as a different type of capital, which can be gained through investment in education, training, and other expenditures such as health treatment or medical care. The most distinctive feature of human capital is that knowledge, skills, and health cannot be separable from its owner. This means that human capital cannot be transferable like physical capital. Furthermore, in terms of human capital as means of production, one's rate of return on human capital determines one's outputs.

Mincer (1958, 1974) argues that educational differences also determine inequality in earnings distribution. Mincer's approach is able to explain the return to human capital, but do not capture some factors such as earnings uncertainty, saving decisions, or schooling decisions in the past. Earnings to some extent become uncertain when households decide to enter schooling.

In anticipating uncertainty about future earnings, households use their savings as a "buffer". The results of supplying their labour services are accumulated usually as savings which mainly are regarded as "self-insurance" against shocks that arise from consumption or earnings variability. Saving behaviour and labour supply are highly related to age-earnings profile of households. Therefore, this is also related to permanent income and life cycle hypothesis (PIH/LCH). PIH/LCH theory predicts that during the early life stage households rationally tend to accumulate their assets in savings and financial instruments, and consume these assets during retirement. However, since the span of life is quite long and earnings risk is very high, households tend to save more for unpredictable circumstances. The motivation to save due to uncertainty over labour income is commonly known as precautionary motives.

The aim of this study is to investigate the role of schooling or education in anticipating earnings risk in the future. Secondly, it investigates household attitude toward earnings risk, in particular the impact of earnings risk on savings as a mechanism to mitigate future uncertainty. Therefore, this study considers that saving behaviour can be affected by schooling decisions.

At macro economic level, investment in human capital is necessary for economic growth. However at micro level, if the certainty equivalent return to such investment is lower close to higher earnings risk, there will be less incentive to enter schooling and this will possibly affect household saving as well. The rest of this study is as follows. Section 5.2 provides a literature review on savings and labour supply. Section 5.3 outlines the theoretical framework and empirical strategy employed in this study. Section 5.4 discusses empirical findings and section 5.5 concludes.

5.2 Related Literature

The labour decision in terms of occupational choice is usually influenced by educational background. Occupational choice can be defined as a set of individual decision making processes leading towards a particular occupation. Banerjee and Newman (1993) argue that the dynamics of the choice have a significant impact on the de-

velopment process in particular to the distribution of income and wealth. Moreover, the motivation to enter different occupations is determined by the individual's wealth which also affect saving decisions and risk bearing. The job decision is also influenced by educational background which is usually decided before entering certain occupations. Since different types of occupation have different risk, then the risk should be compensated in the labour wage income or earnings.

A theoretical model of risk and human capital can be found in Levhari and Weiss (1974) which is developed from the perfect foresight assumption. They studied labour earnings uncertainty which is determined by human capital where this capital can be considered riskier than physical capital. The uncertainty comes from two sources: household exogenous characteristics and imperfect knowledge of future market conditions. They argue that the risk is inversely correlated with the human capital investment. However, there is an ambiguous effect in savings, given the human capital investment, if there is an increase interest rates.

In studying human capital, the work of Mincer (1958, 1974) has been used widely in labour economics to describe the relationship between earnings function and schooling or education. In this model, the earnings process is captured by the education level and experience. Since there is a risk and return relationship between these variables, risk measure of earnings variability can be derived. Some literature on earnings risk such as Hartog et al. (2003) and Bonin et al. (2007) and others such as Pereira and Martins (2002) utilise this approach to estimate the return to education.

Pereira and Martins employ quantile regressions on this earnings function using micro data from 16 countries and compare the results to finance theory. The earnings risk is defined by the difference in returns in different deciles. They find that there is a positive relationship between the return to human capital and the related risk where the investment in human capital shares similar characteristics to other assets.

Hartog et al. (2003) and Bonin et al. (2007) use Mincer functions to derive earnings risk based on the occupational classification where both utilise cross-sectional data. Hartog et al. (2003) also find that earnings risk has a positive correlation with individual wages. Bonin et al. (2007) explore the role of risk attitudes in determining the earnings risk. Their findings show that people with low risk aversion tend to take jobs with high earnings risk. However, both do not fully explore the relationship between earnings risk and saving.

Using a similar approach, Betermier et al. (2012) investigate the relationships between earnings risk and financial investment decisions using Swedish panel data.

They estimate earnings risk from an average of earnings volatility based on industry classification. The interesting part of this study is that the risk here is not only applied to earnings risk but also human capital risk in the stock market. This study finds that in order to anticipate earnings risk, households tend to switch jobs and then adjust their investment portfolios.

The labour decision affects the way household use some part of their earnings as a precautionary savings. The first model of saving as insurance is proposed by Deaton (1991) and Carroll (1992, 1997). Their paper argues that the adjustment toward labour supply comes through household expenditure while previous models usually dissociate consumption from income.

In particular, Deaton's model provides an explanation of how flexibility in labour supply may affect household in two ways. Firstly, it allows households to work harder and earn more income in order to anticipate uncertainty shocks. Secondly, it allows households to respond to earnings shock by changing working hours in order to reduce uncertainty. He also argues that the microeconomic process of income is different from the aggregate macroeconomic process where variances in households' earnings are dominated by specific components: some are permanent and some transitory. This results in negative serial correlation of income due to a high level of transitory income. If the income process is independent, there will be no saving generated.

Low (2005) use simulations to show households' intertemporal choice between work and consumption. In his study, young households borrow more and middle-age households save more given a constant labour supply. When uncertainty is introduced with constant preference parameters, young households work harder in terms of working hours and they consume less. Moreover, he emphasises that precautionary saving models should include labour supply due to its effect on consumption growth and wealth accumulation. A similar theoretical framework by Basu and Ghosh (2001) shows how the role of uncertain tax rate in labour supply leads to uncertainty in earnings. Using a two period model when households work and save, they argue that the relationship between savings and income is determined by preference parameters.

From an empirical standpoint, many studies on precautionary savings have provided mixed results. Using the 1984 UK Family Expenditure Survey, Dardanoni (1991) finds that precautionary savings significantly characterise saving behaviour comprising 60% of total savings. This study also shows that when income variance is higher, the average consumption tends to be lower across occupational choice and industry.

Using PIH/LCH framework, Carroll and Samwick (1997) derive a theoretical and empirical approach to precautionary savings. They derive earnings risk estimations using the U.S. Panel Study of Income Dynamics (PSID) data to investigate the relationship between earnings risk and wealth. They find that wealth is significantly related to the level of transitory and permanent income uncertainty. In this study, the time preference is significantly important for younger households and households begin to save money for retirement around the age of 50.

The similar application of Carroll (1992, 1997) can be found for example in Lusardi (1998) and Guariglia (2001). Using the Health and Retirement Study (HRS) data set, Lusardi derives a precautionary saving estimation using subjective data. She argues that the variance in earnings can be used to explain saving behaviour and wealth accumulation. Precautionary saving is important but it does not provide an explanation of the asset holdings of very rich households. Using the British Household Panel Survey (BHPS), Guariglia uses various measures of earnings risk which are statistically significant in explaining saving behaviour. She also finds that households tend to save more if they expect that they will experience financial difficulties. Most of these studies derive earning risk from life-cycle data.

A recent study by Deidda (2014) shows that Italian households tend to have higher precautionary savings particularly those who are rationed or expect to face credit constraints. Another study by Benito and Saleheen (2013), working hours and labour market participation from BHPS data is used as a proxy for a "buffer" against future uncertainty. The risk measures are financial shocks which are derived from individuals' judgments of their financial situations. This study finds that households adjust their working hours to anticipate financial shock.

To summarise, the literature mainly focuses on two important issues. The first group has more emphasis on earnings risk as a part of the labour income process which is influenced by education background, while the second group of literature discusses precautionary savings and other labour variables as a buffer against earnings risks. One particular issue that has not yet been widely explored is the relationship between earnings risk and schooling decision. The challenge of many empirical studies concerned with precautionary savings and schooling decisions, is how to measure income or earnings risk where it is exogenously observable.

5.3 Methodology

This study aims to consider the quantitative impact of earnings risk to savings and schooling decisions using Indonesian households as a case study. Specifically, the contribution examines the sensitivity of schooling and saving to earnings risk when measured by occupational classification given the Indonesia Family Life Survey (or IFLS) data constraints. Different from previous studies, which utilise time series or panel data, IFLS is a longitudinal study which to some extent makes empirical estimations challenging.

To measure household's earnings risk, three different approaches to estimate earnings risk are implemented. This section provides the theoretical foundation of the relationship between risk, education, and savings. The earnings risk measurement is subsequently explained along with the data source and empirical strategy.

5.3.1 Theoretical Framework

The theory of human capital investment mainly assumes that households have perfect foresight over future earnings. The theoretical framework of this study is adopted from Basu and Ghosh (2001). However, their model focuses on the effect of tax rate uncertainty to labour supply decisions and savings. The present study examines the effects of earnings risk on these variables. During their time in school, individuals usually receive support from their parents. At the same time, this decision implies that they are willing to give up current potential earnings in order to earn more in the future.

Suppose there are two periods where the time is discrete. The agent spends the first part of his youth at school and then enters the labour market. The decision about schooling and work was made when he was young. The total time spent on schooling and work is given by $1-\ell_1$. The earnings from this investment is received in the second period but was uncertain at the time when the decisions about time of schooling and work is made. The stochastic earnings is given by $\widetilde{W}$. This return, which results in future earnings, is uninsurable. $1-\ell_1$ denotes labour supply and 1 is normalised time endowment. The example is a college student does not know her or his potential earnings in the future. The agent works in period 2 and receives all his earnings $\widetilde{W}(1-\ell_1)$.

Since the decision concerning schooling and work is made in the first period, the term $1-\ell_1$ can be interpreted as an investment in human capital which yields earn-

ings risk $\widetilde{W}$ in the second period. In the Mincerian framework, the time spent for work can be considered as a post-schooling investment. Therefore, $1-\ell_1$ interchangeably refers to schooling and work. Assuming that the interest rate is constant, saving amounts in period 1 can be defined as

$$S_1 = Y - C_1 \tag{5.1}$$

where Y denotes exogenous income, and C_1 denotes consumption level in period 1. The household's consumption in period 2 is given by

$$\widetilde{C}_2 = S_1 R + \widetilde{W}(1-\ell_1) \tag{5.2}$$

where R is gross risk-free rate of return on saving. The household's risk preference is characterised by constant absolute risk aversion (CARA). The risk preference is captured by

$$V\left(\widetilde{C}_2\right) = A - e^{-\gamma \widetilde{C}_2} \qquad A > 0 \tag{5.3}$$

where $\gamma > 0$ is the risk aversion parameter. Following Selden (1978), the certainty equivalent level of period 2 consumption is

$$A - e^{-\gamma \widehat{C}_2} = E\left[A - e^{-\gamma \widetilde{C}_2}\right] \tag{5.4}$$

where $\widehat{C}$ implies non random consumption. Using (5.2) and simplifying the terms to arrive at

$$-\gamma \widehat{C}_2 = -\gamma S_1 R + \log E\left[e^{-\gamma \widetilde{W}(1-\ell_1)}\right].$$

Therefore Equation (5.2) can be written as

$$\widetilde{C}_2 = S_1 R + Q \tag{5.5}$$

where

$$Q\left(\ell_1, \gamma\right) = -\frac{1}{\gamma} \log E\left[e^{-\gamma \widetilde{W}(1-\ell_1)}\right] \tag{5.6}$$

is the certainty equivalent earnings for a given labour supply. The effect of earnings risk is captured by the risk aversion parameter. Equation (5.5) and (5.6) imply the importance of utility-based specifications when the certainty equivalence is taken into consideration of schooling decision. At the certainty equivalent earnings level, a household will have no preference between work or education.

The household's optimisation problem can be written as

$$\frac{C_1^{1-\alpha}}{1-\alpha} + \frac{\ell_1^{1-\alpha}}{1-\alpha} + \beta \frac{\widehat{C}_2^{1-\alpha}}{1-\alpha}$$

subject to (5.1), (5.5), and (5.6). $\alpha > 0$ denotes the inverse of the intertemporal elasticity of substitution and $0 < \beta < 1$ denote the utility discount factor.

The first-order conditions are given by

$$C_1^{-\alpha} = \beta R \widehat{C}_2^{\alpha} \tag{5.7}$$

$$\ell_1^{-\alpha} = \beta \widehat{C}_2^{-\alpha} W_\ell \tag{5.8}$$

where $W_\ell = -Q_\ell$. The term Q_ℓ is defined as

$$Q_\ell \left(= \frac{\partial Q}{\partial \ell_1} \right) = - \frac{E\left(\widetilde{W} e^{-\gamma \widetilde{W}(1-\ell_1)} \right)}{E\left(e^{-\gamma \widetilde{W}(1-\ell_1)} \right)}. \tag{5.9}$$

Basu and Ghosh (2001) show that an increase in earnings uncertainty unambiguously increases labour supply because households want to smooth their consumption and therefore they work harder. The effect on saving, however, depends on how such an earnings uncertainty impacts the certainty equivalent wage income Q.[1] When earnings risk rises, the effect on certainty equivalent income Q can be understood by writing the following decomposition of Q:[2]

$$\frac{dQ}{d\gamma} = \frac{\partial Q}{\partial \gamma} + \frac{\partial Q}{\partial \ell_1} \times \frac{\partial \ell_1}{\partial \gamma}$$

The first term captures the "pure risk effect" which is unambiguously negative as shown by Basu and Ghosh. It implies that the earnings uncertainty decreases the certainty equivalent earnings for a given labour supply. The second term which they call "utility smoothing effect" is positive because in response to a higher earnings uncertainty the household would work harder to smooth his consumption. Although the net effect on is theoretically ambiguous, for empirically plausible parameter values

[1] Basu and Ghosh (2001) actually focuses on wage income tax uncertainty. Earnings are uncertain in Basu and Ghosh (2001) due to income tax uncertainty. I abstract from income tax issues and consider overall earnings uncertainty. The basic theoretical principle of Basu and Ghosh (2001) holds for overall earnings uncertainty which is my principal concern here.

[2] Basu and Ghosh (2001) formulate a higher income risk as a rise in the risk aversion parameter from zero level.

they argue that Q is lower when earnings risk is higher. If the certainty equivalent income Q is lower, by virtue of permanent income hypothesis it follows that savings would rise to mitigate earnings risk.

I test these two key hypotheses of Basu and Ghosh (2001) using two reduced-form equations as follows:

$$\ell_i = \theta_0 + \theta_1 Var(W_{\ell,i}) + \sum_{h=1} \theta_h V_{h,i} + \epsilon_i \tag{5.10}$$

and

$$S_i = \vartheta_0 + \vartheta_1 Var(W_{\ell,i}) + \sum_{h=1} \vartheta_h V_{h,i} + \epsilon_i. \tag{5.11}$$

where $V_{h,i}$ denote control variables h such as household characteristics for individual i and ϵ_i denotes residual terms. In order to derive the empirical results, Equation (5.10) and (5.11) can be estimated using cross-sectional approach. The reason to use cross-section household information is to accommodate the nature of IFLS data, which is a longitudinal study of Indonesian households.

5.3.2 Earnings Risk Measurement

As mentioned in the previous section, the way that earnings risk is measured, is very important in determining the effect of earnings variability on savings and the labour supply. For this purpose, the Mincer earnings function is employed to derive the risk measures. Suppose there are two periods where the return to schooling at education period is ρ_n and the return to schooling after education period is ρ_p.

Mincer assumes that individuals have identical abilities and opportunities. These individuals also do not earn during their education. There are no direct costs of education and the credit markets are perfect meaning that individuals are able to optimise earnings throughout their lifetime. The earnings function can be expressed as follows:

$$\log W_t = \log W_0 + \rho_n N_i + \rho_p \sum_{i=0}^{t-1} k_i \tag{5.12}$$

where W_t denotes earnings at period t, W_0 denotes initial earnings, and N is the length of schooling or education.

Consistent with the theory in the previous section, Equation (5.12) implies that k_i comprises two components: (1) a schooling period S where $k_i = 1$ for all i, and (2) a post-schooling investment where k_i is monotonically decreased to zero on retirement.

Define X as a post-schooling period captured by years of work experience where $t = T - n$, the estimable equation of (5.12) can be rewritten

$$\log W_{ijt} = \log W_0 + \rho_n N_{ij} + \phi_0 X_{ij} + \phi_1 X_{ij}^2 + \varepsilon_{ij} \tag{5.13}$$

which is known as the standard form of Mincer wage regression. Parameter ρ_n can be interpreted as the return to educational investment.

The ratio of ϕ_0/ϕ_1 implies the return to experience. The experience is defined as work or labour-market experience that one accumulates through his occupational activities. Therefore, the return in this case can be interpreted as the contribution of work experience to wages earned. The regression function in (5.13) can be extended by augmenting the individual or demographic characteristics, including location, age, gender, and occupation.

Earnings risk can be based on occupational sorting, that is a process of classifying occupation into certain groups based on certain parameters, mainly job tasks, requirements, environments, and locations. People tend to choose their occupation based on these characteristics and choices are usually related to their educational background or previous work experience, where it exists. When this can be done, the earnings characteristics for each sorting can be traced. Therefore, the earnings risk can be measured.

Bonin et al. (2007) shows that earnings risk can be derived from Mincerian wage regression based on the International Standard Classification of Occupations (ISCO). In this study I use job classification based on the definition given in the IFLS survey: sector/industry and employment type. The combination of sector and employment type can be considered as occupational sorting. The occupational classification or sorting in this study are defined by the sector where an individual works, and the employment type.

There are nine sectors or industries given in the IFLS: (1) agriculture, forestry, fishing and hunting, (2) mining and quarrying, (3) manufacturing, (4) electricity, gas and water, (5) construction, (6) retail, restaurants and hotels, (7) transportation, storage, and communications, (8) finance, insurance, real estate and business service, and (9) social services. The employment type consists of (1) government workers, and private workers. In the latest survey or IFLS4, there are two additional types of employment: (3) casual workers in agriculture, and (4) casual workers not in agriculture. Therefore, the earnings risk is exogenously classified by this category.

Following Hartog et al. (2003) and Bonin et al. (2007), the occupation-specific variance of the residuals is utilised as an earning risk measure. In this study, I employ three earnings risk measures. The first measure is based on the Mincer equation as in (5.13) where earnings risk is estimated by

$$\sigma_{ij}^2 = \frac{1}{N_j} \sum_i \left(\hat{\varepsilon}_{ij} - \bar{\varepsilon}_j\right)^2 \tag{5.14}$$

where $\hat{\varepsilon}_{ij}$ denotes residuals of individual observations belonging to occupation j derived from the Mincer regression in (5.13) and $\bar{\varepsilon}_j$ denotes the mean value of residuals of a specific occupation category. Since the residuals are classified based on the occupation j, it is not necessary to have a zero value in $\bar{\varepsilon}_j$.

The earnings risk here is measured by the cross-sectional variance of the earnings shock. Note that in the stylised two-period model, a mean preserving increase in variance lowers the certainty equivalent income (for proof see Basu and Ghosh, 2001). Therefore, the variance of earnings is an adequate proxy of earning risk and it relates reasonably well to the risk specification in the stylised two-period model.

The second measure is cross-sectional variances based on the following equation

$$\log W'_{ijt} = \log W_0 + \phi_0 X_{ij} + \phi_1 X_{ij}^2 + \varepsilon_{ij}. \tag{5.15}$$

Compare to (5.13), (5.15) only includes post-schooling or working experiences. The earnings risk is derived using the same steps as in the first measure where

$$\sigma_{ij}^{2,\text{ne}} = \frac{1}{N_j} \sum_i \left(\hat{\varepsilon}_{ij} - \bar{\varepsilon}_j\right)^2. \tag{5.16}$$

where $\sigma_{ij}^{2,\text{ne}}$ is earnings risk which includes only working experience. Therefore, the empirical results for this estimation is different than the results provided by (5.14) which includes both education and post-schooling activities.

For both earnings risk measures, the cross-sectional variance σ_j^2 can be estimated from earnings regression residuals $\hat{\varepsilon}_{ij}$ for each occupation type j, not individual observations i.

Since earnings risk can be also interpreted as earnings dispersion, the third measure of earnings risk is based on the earnings range, which is defined by

$$\log W_{i,\text{range}} = \log\left(W_{i,\max} - W_{i,\min}\right) \tag{5.17}$$

where $W_{i,\max}$ and $W_{i,\min}$ denotes the maximum and minimum earnings that a household received across the survey waves. Using this measure, the households' expectation towards their earnings is examined. This earnings range can be interpreted as earnings instability across the survey waves.

5.3.3 Data

The data used in this research is the Indonesia Family Life Survey where IFLS2 in 1997, IFLS3 in 2000, and IFLS4 in 2007 are employed. IFLS1 do not provide the same information about labour classification as given in the subsequent surveys. The unit of observations is a household head who is employed during the length of the survey and from whom the demographic information is obtained. Since the earnings risk is derived from one occupation choice, only the primary job that consumes the most time will be analysed. Those who are self employed cannot be included in the analysis.

The education information that is captured in IFLS is based on the highest education level attained by heads of the households. The important information of households' educational background is captured within the IFLS data set. In order to get the number of years in education, the period of education is calculated based on the last level of education attended by the head of the households.

For the purpose of analysis, the information retrieved from the data set is then related to labour supply information such as earnings, occupational sector, employment type and working hours. As usual, the respondents' demographic characteristics are also retrieved. Earnings calculation is based on the labour income received by the head of households. If the head has more than one occupation, then the occupation that consumes most of the working hours is selected.

A unique characteristic of Indonesian households is how they prepare a "buffer" against risk and uncertainty. There is no specific question about the reasons or motives for households to save. However, according to Frankenberg et al. (2003), in addition to saving in banks, Indonesian households have a tendency to keep jewellery as a precautionary measure. Therefore, the definition of savings in this study includes savings and deposits in banks, shares, and also jewellery. Another proxy for saving is the saving to earnings ratio.

The data is trimmed by dropping observations where there is an extreme value of savings to earnings ratio greater than five. This equals around 10% of the total complete observations for each IFLS wave. Finally, the earnings and saving calculations

are adjusted into 2000 Indonesian currency by using the price deflator taken from BPS.

There is some limitation of using IFLS data to assess earnings risk. As explained in the previous section, the nature of the IFLS data gives an empirical implication in interpreting the results. If the household information is pooled and estimated in a panel data environment, there is a loss of information since there is only a small number of samples that can be used in the estimations. Therefore, a cross-sectional approach is the optimal way in deriving the estimations from the respected models.

In order to control the estimation results, the study uses household-specific variables, which are available in IFLS data such as household head's age and gender. Other variables can be also derived from the dataset such as household size and dependency ratio. The dependency ratio is calculated as follows:

$$\text{Dependency ratio} = \frac{\text{number of people aged 0-14 and those aged 65 and above}}{\text{number of people aged between 15 and 64}} \times 100.$$

This ratio measures the ratio between those who are not in the labour force and those who are typically in the labour force and live under one household. People who are not in the labour force are called dependents to those who are assumed to be productive part of the household.

Appendix 5.A provides summary statistics for savings, earnings and education of IFLS households used in this study. Table 5.A.1 presents the summary statistics of samples used in this study along with the number of observations taken from total IFLS households. Table 5.A.2 gives the summary of earnings risk estimates based on occupation type and sector classification of the respondents. Table 5.A.3 presents the summary of each earnings risk measure based on age cohort.

5.4 Empirical Findings and Discussions

Earnings and employment vary across the life cycle and by occupational type. At the same time, saving decisions can be also affected by these variables. Moreover, the behaviour of saving over the life time of households in developing countries is different compare to developed economies. The difference can be a result of socio-economic environments, financial access, and related government regulations such as retirement policy. The buffer-stock theory predicts that when households face uncertainty over their earnings, they will make precautionary savings to anticipate the uncer-

tainty. Households may have impatience as well as prudent behaviour as a result of a precautionary motive.

5.4.1 Education Profiles of the Head of the Households

Until the last IFLS wave in 1997, the educational system is organised under two ministries: the Ministry of Education and Culture, and the Ministry of Religious Affairs. The educational system is historically and culturally influenced by religious systems such as Hindu–Buddhism and Islam. The modern education system was introduced by the Dutch during the occupation era: its influence has shaped current educational policy.

A mandatory schooling program has been established since 1950 when Law Number 4/1950 regarding Basic Education and Teaching in Schools (*Undang Undang Nomor 4/1950 tentang Pendidikan dan Pengadjaran di Sekolah*). Under this law, education was compulsory for children between 8 and 14 years old. In 1984, the law was changed and all Indonesia citizens must undertake mandatory education, which consists of six years in elementary level and three years in junior high school level. Under Law Number 20/2003 regarding the National Education System (*Undang Undang Nomor 20/2003 tentang Sistem Pendidikan Nasional*), all Indonesia citizens aged 6 years are able to start and participate in national education system and the government has a responsibility to provide basic education for all Indonesians. National mandatory education is based on a universal basic education paradigm which states that every Indonesian has a right to participate in basic education.

Currently, there are four broad levels of education in Indonesia: elementary school, junior high school, senior high school and higher education. For junior and senior high school, the classification can be divided into two types: general and vocational education. Those who have been in work for several years but do not have elementary, junior or senior high school are able to attend an adult education package which consists of the same duration of participation.

For higher education, the classifications are college and university. The college education which is commonly called an academy or polytechnic focuses on applied or vocational education and usually lasts for three years. University education has three levels: bachelor, masters, and doctorate degrees all of different duration. In many cases, those who already hold diplomas from college, enter the undergraduate programme in order to get higher degrees and would expect to earn more income after

graduation. Some may not be satisfied with their current occupation due to inherent occupational risk or employment conditions.

Another classification is based on religious-based education for all levels of education in particular Islamic education. The government requires these institutions to adopt the national curriculum. The students are also required to take equivalent examination as a part of the graduation process. Therefore, religious-based educational institutions generally has the same structure and duration as education in public institutions.

The level of educational background influences households' behaviour particularly in decision making processes. Since the occupation is usually determined by the educational background, this will also have effects on saving process. Figure 5.B.1 depicts the saving profiles of IFLS households based on educational level and households' current location.

In terms of average saving amount, the highest value of savings can be found in 1997. IFLS households managed to save more because the economic situation was favourable up until the first half of 1997 when the Asian financial crisis started. By 2000 the average value of savings declined and this had not changed much by 2007.

Across the survey waves, the average value of savings for urban households is higher than rural households for every category of education level, except for university graduates in 2000. This implies that the urban households may have higher earnings and are able to save more in terms of nominal amount given high living cost in the cities. There is also an increasing trend in the relationship between education and savings. As the time spent in schooling increased, the saving amount tends to increase with IFLS2 as an exception.

However, if the households' labour income is brought into consideration with savings, the savings to earnings ratios show different patterns for urban and rural households. On average, savings to earnings ratios are relatively stable around 26% for IFLS2 and IFLS3 and declined to 22.5% in IFLS4 (see Table 5.A.3). The increasing pattern is also found in IFLS3 and IFLS4 where the higher educational level, the higher the savings to earnings ratio. Only in the IFLS2, are the figures relatively constant across educational level: this is particularly the case for rural households (see Figure 5.B.1).

5.4.2 Age Profiles of Savings Based on Gender and Location

In order to understand the saving behaviour in the IFLS households, the relationship between households' saving and age is investigated. Figure 5.B.2 provides age profiles of earnings and savings to earnings ratio for each IFLS waves. The figures are classified by the respondent's gender. Most households are headed by males with the proportion standing at 99% in IFLS2, 98.1% in IFLS3, and 97.68% in IFLS4.

In Indonesia, the retirement age of many occupations is 55 years old. Some people may still work after retirement or occupations like farming or fishing may not have an upper age limit. On average, women have relatively lower earnings than men, with the exception of those under 40 and for a brief period around the age of IFLS3 and IFLS4. However, women seem to have higher savings to earnings ratios, which indicates that women are more cautious than men as head of the households. This may also result from these women being single parents, since the ratios are relatively higher after the age of 30. More over, in the last two survey waves the ratios are higher compared to men, particularly in the later ages. In summary, urban households headed by women tend to have a high marginal propensity to save compared to those which are headed by men.

Figure 5.B.3 in Appendix 5.B depicts the relationship between earnings, saving ratio and age profiles based on the location. As expected, the average value of earnings is higher for urban households across the survey waves. A possible explanation is that jobs in cities offer a higher high salary. The earnings figure based on the age cohort also has interesting aspects. The IFLS households have a low labour income at the beginning of their career, and then increase until the retirement age. After retirement age, earnings tend to fall.

For saving to earnings ratios, the rural and urban households share similar patterns until the mid 40's except for IFLS2 in 1997. In 1997, urban households tended to have a higher saving ratio than rural households. This may imply that there was more inequality between urban and rural areas before the economic crisis. For IFLS3 and IFLS4, there is a tendency to save more after mid the 40's. This suggests that households become prudent about their future earnings as predicted by PIH/LCH since they are near to retirement age. The low level of saving ratio in the micro level indicated by the IFLS data set may also characterise a low level of saving ratio in the macro level (see Appendix 3.A, Figure 3.A.3).

In summary, these figures provide evidence of the importance of saving for households. As predicted by PIH/LCH, the expectation of future earnings and its variability play a vital role in decision making on saving.

5.4.3 Earnings Risk Measurements

As mentioned earlier that the main challenge of empirical measurement is to find a proxy for earnings risk. In this study, the risk is derived from residuals of Mincerian earnings function as in Equation (5.14) and similar function excluding the education variable as in Equation (5.16). The residuals are then estimated by controlling the occupational sector and employment type to get cross-sectional variance.

The results of Mincerian earnings regressions controlled by occupational classifications are given in Table 5.1 Column (1), (2) and (3). The estimations show that initial earnings, experience and educational level have significant impact in explaining the earnings of IFLS households across the waves. Experience can be interpreted as post-schooling education investment in the form of training and job experience. The negative coefficients of the second term of experience which are significant for IFLS3 and IFLS4 confirm the convexity of earnings function. This implies that the earnings diminish near retirement age.

Across the waves, the results suggest that the level of education last attended has significant impact on return to schooling. The common practice in interpreting the return to human capital is to use the coefficients on years of schooling. Therefore, it can be interpreted that the return on human capital has decreased since 1997.

Table 5.1 Column (4), (5) and (6) provide the results of earnings regressions without taking education into account for each IFLS wave respectively. The coefficients still have similar inferences but with lower values and less explanatory power. This confirms that the estimates can be used to obtain an earnings risk measure. Using two regression specifications, the earnings risk is then derived by using cross-sectional occupation variances for all survey waves.

The estimation results of earnings risk for each classification in each wave are given in Appendix 5.A, Table 5.A.2. The information of casual employment in agricultural and non-agricultural sectors is only available in IFLS4. Given information in Table 5.A.2, people who work as government employees in the financial service sector in IFLS2 are exposed to higher earnings risk compared to the other classifications. This is also the same case in IFLS4 where these workers have a high level of earnings risk. Casual workers in the non-agricultural sector also experience similar

Table 5.1
The Estimations of Earnings Function

The dependent variable is the log of earnings. Column (1) and (4) indicate IFLS2; Column (2) and (5) indicate IFLS3; and Column (3) and (6) indicate IFLS4. Education and experience are in years. Classification dummy is a dummy variable based on the occupational sector and employment type. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source:* author's calculations from the IFLS data set.

	Mincerian functions			Experience only		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	12.95^{***}	14.12^{***}	15.06^{***}	14.14^{***}	14.83^{***}	16.06^{***}
	(0.537)	(0.338)	(0.313)	(0.368)	(0.384)	(0.339)
Experience	0.044^{**}	0.035^{***}	0.026^{***}	0.027^{*}	0.032^{***}	0.024^{***}
	(0.016)	(0.005)	(0.005)	(0.011)	(0.006)	(0.005)
Experience^2/100	-0.064	-0.074^{***}	-0.040^{**}	-0.049	-0.081^{***}	-0.046^{**}
	(0.036)	(0.016)	(0.015)	(0.026)	(0.017)	(0.017)
Education	0.119^{***}	0.101^{***}	0.103^{***}			
	(0.012)	(0.005)	(0.005)			
Observations	401	2040	2642	1215	2158	2711
Adjusted R^2	0.391	0.352	0.357	0.190	0.243	0.242
Classification dummy	Yes	Yes	Yes	Yes	Yes	Yes

earnings risk exposure to the former. In IFLS3, government workers in the wholesale and retail industry have the highest earnings risk exposure. In summary, working in some government-owned institutions may induce higher occupational risk, which reflect households' willingness to take risks.

Table 5.A.3 presents the summary of average earnings risk for households' age profiles along with related information of average schooling, average savings and average savings to earnings ratio. A similar pattern can be found in savings and earnings profiles with the exception of households aged between 30 and 40 years old in IFLS2 that has high average earnings. Savings and earnings decline sharply after the age of 55 , which imply households' marginal propensity to consume is increasing. The savings to earnings ratio for each of the cohorts confirm the saving behaviour of IFLS households as previously mentioned .

However, the earnings risk does not follow similar patterns to saving and earnings. There are two earnings risk measures in Table 5.A.3. The results in column (6) are estimated using residuals from (5.13) and column (7) are estimated using residuals from from (5.15) respectively. When the education variables are not included as

regressors, the risk estimates are higher. This may imply that the level of education play a significant role in reducing the variability of labour income.

For IFLS2 and IFLS3, the earnings risk is higher for younger households and lower nearer retirement. Those who are still working and are over 55 years old have higher earnings risk. The possible explanation for this is that they may have inadequate retirement money or unavoidable life circumstances. For IFLS4, the earnings risk is relatively similar across the cohorts until 50 and then lower near retirement.

5.4.4 The Impact of Earnings Risk on Schooling

The theoretical model given in Section 5.3.1 has several testable implications which will be discussed in this section and the subsequent section. From the household's point of view, the decision to enter schooling in many cases is related to the expected occupation type in the future. This decision is very risky compared to physical capital because human capital is inherent to the owner and cannot be separated. The investment in education can be also regarded as a way to diversify human capital and to gain the advantage of specific knowledge and skills.

In this study, this decision is also affected by earnings, which would be realised in the future or in period 2 according to the theoretical framework. Since one may predict the occupational type in the future, the decision to invest in education, implied by the duration in schooling, is significant. Table 5.2 provides the results of the relationship between the duration in schooling and earnings risk for each IFLS wave based on Equation (5.10) and the earnings risk estimates are derived from the residuals in Equation (5.16). The demographic characteristics of the IFLS households and dependency ratio for each household are also employed to control the estimations.

The coefficients for each IFLS wave can be interpreted because decisions about schooling and work were made in the past. In this context, the risk is interpreted as earnings dispersion based on the job classification. From Table 5.2, it can be inferred that the investment in human capital is inversely related to earnings risk. This means that high levels of schooling, which is indicated by the years in education, should benefit from a lower earnings risk. However, this is not the case in IFLS4 since the coefficient is not statistically significant.

In 1997 and 2000, there were higher risks in earnings, which gave fewer incentives to enter schooling. During these years, the economic crisis affected the schooling decision. Given these findings, the return on education seems to have different impacts in human capital investment for different periods. Based on Table 5.1, for the

Table 5.2
Schooling and Earnings Risk

Column (1) indicates IFLS2, Column (2) indicates IFLS3, and Column (3) indicates IFLS4. Province dummy is used to specify household's location at the province level, except for Column (2). Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from the IFLS data set.

	Education (in years)		
	(1)	(2)	(3)
Constant	15.69**	14.00***	7.640***
	(4.768)	(0.715)	(1.203)
Earnings risk $\sigma_{ij}^{2,\text{ne}}$	−2.332**	−2.738***	−0.656
	(0.736)	(0.277)	(0.343)
Age	0.0763	−0.0578***	0.285***
	(0.142)	(0.00800)	(0.055)
Age^2	−0.0016		−0.004***
	(0.0016)		(0.001)
Sex (male=1)	−4.982	0.225	−1.374**
	(3.441)	(0.614)	(0.459)
Location (urban=1)	0.646		
	(0.399)		
Household size	0.118	−0.049	−0.217***
	(0.106)	(0.046)	(0.052)
Dependency ratio	−0.0103		
	(0.0102)		
Observations	400	2040	2640
Adjusted R^2	0.094	0.067	0.045
Province dummy	Yes	No	Yes

period before the crisis in 1997, the return to schooling is relatively higher than the return in 2000 and 2007 which is about 10 years after the crisis. It seems that before economic crisis period, those who have made a higher investment tend to earn more from their labour.

When the crisis occurred in 2000, the return to education and earnings risk declined. In 2007, the return has slightly increased compared with figures for 2000. However, the effect of earnings risk is different for 2000 and 2007. The investment in human capital has decreased the effect of variability in labour income implied by a lower coefficient of earnings risk. Based on the earnings risk estimates, this suggests that there is more incentive in human capital investment since the economic crisis.

From the household characteristics in Table 5.2, the age is also inversely related with the investment in human capital. As the person ages, the effect of education may decrease. This implies that older people have fewer incentives for returning to

education. Surprisingly, there is a shift in gender role in education in the last wave: women seem to have a tendency to stay longer in education than men (see Table 5.2 Column (3)). Another implication of schooling can be found in household size. Households that have more members find it difficult to invest in education, which may be caused by inadequate resources.

Two other control variables do not seem to have any implications for the decision to enter education in the past. For IFLS3 and IFLS4, the inclusion of household location and dependency ratio has caused heteroskedasticity problems in the estimations. Moreover, these two variables do not have any impacts on the decision to invest in education.

Therefore, it can be concluded from Table 5.2, there is a change in terms of relationship between investment in education and occupational earnings risk between 1997 and 2007. The decision to enter education was initially influenced by earnings risk where increase in earnings risk may lead to a decrease in the number of years spent in education. However based in the results of IFLS4, this decision was determined by household-specific characteristics, not earnings risk.

To compare the findings in the previous analysis, another earnings risk measure given in Equation (5.17) is calculated and estimated against education. Since the decision was made in the past, it is possible to use all IFLS waves for this analysis, except for IFLS1. The difference between previous specifications is that the earnings risk given in Table 5.3 which is called the earnings range, should be interpreted as one's expectation over earnings in the future.

The log of earnings range is significantly related to the length in education. This implies that as the range widens, the household would expect to invest more in human capital by spending more time in schooling. As the coefficients are increased from IFLS2 to IFLS4, this clearly suggests that more households put more attention to their own education as they expect their earnings range to increase (Table 5.3 Column (1), (2) and (3)). This result is quite close to Basu and Ghosh's model (2001). This is because the log of earnings range does not take account of occupational earnings into its estimation, while the first measure of earnings risk is derived from earnings across occupations within the observations.

There are slightly different results for age and gender of the head of households. The age effect has a similar pattern as in the previous table. Similar to the results given in the previous table, this effect in 1997 is not statistically insignificant while for next waves it is statistically significant. However, the coefficients for IFLS3 in second

Table 5.3
Schooling and Earnings Range

Column (1) indicates IFLS2, Column (2) indicates IFLS3 and (3) indicates IFLS4. Earnings range is measured by calculating the difference between maximum and minimum wage across the waves for each and every household. Province dummy is used to specify household's location at the province level. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from the IFLS data set.

	Education (in years)		
	(1)	(2)	(3)
Constant	2.902	−3.108	−19.27***
	(6.075)	(2.141)	(3.775)
Log of earnings range	0.637**	0.689***	0.798***
	(0.219)	(0.071)	(0.081)
Age	0.242	0.211*	0.783***
	(0.208)	(0.089)	(0.153)
Age^2	−0.003	−0.003**	−0.009***
	(0.002)	(0.001)	(0.002)
Sex (male=1)	−6.717	−0.879	−0.593
	(3.545)	(0.900)	(1.089)
Location (urban=1)	0.682	0.920***	0.954***
	(0.548)	(0.204)	(0.246)
Household size	0.056	−0.123	−0.329***
	(0.162)	(0.069)	(0.081)
Dependency ratio	−0.012	−0.004	0.029***
	(0.015)	(0.006)	(0.007)
Observations	221	1329	1050
Adjusted R^2	0.087	0.121	0.172
Province dummy	Yes	Yes	Yes

row of Table 5.3 have positive values while in the previous table the coefficients are negative. The positive age effect of IFLS2 and IFLS3 implies that older people would expect to have more schooling years given the earnings range. Unlike in the results in the previous table, the gender effect is consistently insignificant throughout the wave in IFLS (see Table 5.3). This implies that there is no difference between woman and men in the schooling decision, given the earnings range.

In terms of other household characteristics in Table 5.3, location and size have better results compared to the results in Table 5.2. People who live in the city would decide to stay longer education as a part of their expectation over earnings range. This means that these people have invested more time in schooling compared to their rural counterpart. The coefficient of household size is only statistically significant for

the last wave. This implies that households with fewer members were able to invest more time in education compared to households with more members.

Similar to household size, the dependency ratio is only significant in the last wave. This suggests that households with more dependent members would expect a longer duration in education given the expectation of earnings variability. By doing this, they might be able to anticipate changes in their earnings and provide more resources for their family members.

In summary, the effect of earnings risk to investment in human capital is equivocal and depends on the household characteristics in different economic periods. There are always incentives to spend more resources on human capital investment but it may yield different effects on earnings risk. The estimation results using earnings range seem to have more power in explaining the decision to invest in education. The results using earnings range measure close to Basu and Ghosh (2001) and this also consistently has positive coefficients across the waves. This means that households' effort to invest in education may smooth their utility over future earnings.

5.4.5 The Implications of Earnings Risk to Savings

As explained in the theoretical framework, earnings variability which implies uncertain consumption is equated by non random consumption $\widehat{C}$. Households consider certainty equivalent earnings Q which implies their willingness to take risks for a specific employment opportunity. This earnings risk is then associated with savings, which serve as self insurance.

Table 5.4 provides estimation results of savings against earnings risk based on Equation (5.11). The estimates are also controlled by adding demographic variables such as age, gender, location, household size and dependency ratio into the empirical specification. As previously explained in the theoretical model, the effect of earnings risk on household saving is ambiguous.

Saving is negatively related to occupational earnings risk across IFLS waves. This means that where there is higher earning risk exposure, households tend to dissave and spend more. This may also include selling or liquidating some of their financial assets. In this study, the asset also includes jewellry which is also considered as a "buffer" by Indonesian households (see Frankenberg et al., 2003). The negative coefficients for earnings risk show the impact of labour income risk on savings. It can be said that IFLS households suffered from a large decrease in their savings in 2000. The possible explanation for this would be associated with the fact that the

Table 5.4
Savings and Earnings Risk

Column (1) indicates IFLS2, Column (2) indicates IFLS3, and Column (4) indicates IFLS4. Province dummy is used to specify household's location at the province level. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from the IFLS data set.

	Log of savings		
	(1)	(2)	(3)
Constant	13.02^{***}	11.30^{***}	10.78^{***}
	(1.161)	(0.710)	(0.670)
Earnings risk σ_j^2	-0.549^{**}	-0.843^{***}	-0.481^{*}
	(0.205)	(0.192)	(0.237)
Age	0.051	0.111^{***}	0.122^{***}
	(0.049)	(0.029)	(0.031)
Age^2	−0.00058	-0.0012^{***}	-0.0013^{***}
	(0.00057)	(0.0003)	(0.0004)
Sex (male=1)	−0.454	−0.0437	−0.295
	(0.554)	(0.279)	(0.236)
Location (urban=1)	0.529^{***}	0.385^{***}	0.449^{***}
	(0.118)	(0.087)	(0.084)
Household size	0.106^{**}	0.055^{*}	0.068^{*}
	(0.035)	(0.028))	(0.031)
Dependency ratio	-0.013^{***}	-0.0058^{*}	-0.0094^{***}
	(0.003)	(0.0024)	(0.0024)
Observations	894	1609	1860
Adjusted R^2	0.105	0.093	0.066
Province dummy	Yes	Yes	Yes

effect of 1997 economic crisis is still carried forward to subsequent years. In this year, households may find it difficult to anticipate and mitigate the effect of earnings risk with saving as the only form of self insurance. That is why the coefficient of earnings risk in 2000 is the highest compared to other waves (see Table 5.4). In 2007, the effect is not as large as in 2000. Moreover, since the effect of the crisis has decreased. it is possible that some households are able to cope with earnings risk only by using their savings.

The constants can be interpreted as current earnings where these are significantly positive. The coefficients of age confirm that savings increase as households grow older. However, only the coefficient of age in IFLS2 is not statistically significant (see Table 5.4 Column (1)). The coefficients of Age^2, which are statistically significant, confirm that the relationship between age and savings are not linear. This may suggest that the effect may increase at a decreasing rate when individuals are getting older.

For other household-specific characteristics, there is no difference between households headed by males or females in the decision to save. Urban households have more tendency to save despite the fact that the propensity to save is decreasing. This also means that urban households are better off than rural households. The household size also has a role in explaining the saving pattern. It can be inferred that as the size of a household grows, the household tends to save more in anticipating uncertain future needs. The dependency ratio also tells us that when the dependents in a household are lower than the productive ones, the household is able to save more.

Furthermore, the pure risk effect and utility smoothing effect should be taken into consideration in analysing the earnings risk to saving. Since the coefficients of earnings risk are negative, it can be inferred that the utility smoothing effect is less dominant than the risk effect. This implies that earnings uncertainty decreases the certainty equivalent earnings for a given labour supply. In this case, the earnings uncertainty is related to the occupational earnings given by the decision in schooling and its post-activities in the previous period. If we take a closer look at the decomposition of Q, then it can be said that since the certainty equivalent income is lower, it follows that savings would rise as predicted by the permanent income hypothesis.

Table 5.5 presents the results from alternative specifications of savings and earnings risk measurements without taking occupational type into consideration. It is interesting to see and evaluate the expectation of households towards their realised earnings and savings accumulation. However, the interpretations here are very different compared to the interpretation of the relationship between schooling and earnings range.

In Table 5.5 Column (1) and (2), the log of savings for households are assessed against the log of earnings range which is calculated by taking the maximum and minimum value of earnings from three waves of the IFLS. Based on the earnings range, it can be inferred that households would expect to save around 30% from the realised changes of their earnings in the previous waves. These results can be also interpreted as the degree of responsiveness of earnings to the change of household savings. Since the values of the earnings range are significantly positive, it can be inferred that the "pure risk" effect is less dominant than the utility-smoothing effect. This finding is close to Basu and Ghosh's prediction (2001) where the positive values imply that households tend to save more as the variability of earnings range increases. This is also consistent with the results for earnings range and schooling decision in the previous section. Therefore, this suggests that households will put

Table 5.5
Savings and Earnings Range

Column (1) and (3) indicate IFLS2. Column (2) and (4) indicate IFLS3. Earnings range is measured by calculating the difference between maximum and minimum wage across the waves for each and every household. Province dummy is used to specify household's location at the province level. Standard errors are reported in parentheses except for (3) and (4) which are estimated using OLS with robust standard errors. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from the IFLS data set.

	Log of savings		Savings/earnings	
	(1)	(2)	(3)	(4)
Constant	8.929^{***}	6.559^{***}	0.293	−0.323
	(1.521)	(1.068)	(0.442)	(0.300)
Log of earnings range	0.304^{***}	0.290^{***}	0.004	0.058^{***}
	(0.055)	(0.036)	(0.016)	(0.010)
Age	0.059	0.128^{**}	−0.006	−0.002
	(0.059)	(0.044)	(0.015)	(0.012)
Age^2	−0.0007	-0.0013^{*}	0.00002	0.00005
	(0.0007)	(0.0005)	(0.00017)	(0.00015)
Sex (male=1)	−1.325	−0.475	−0.182	-0.331^{**}
	(0.739)	(0.444)	(0.216)	(0.127)
Location (urban=1)	0.493^{***}	0.141	0.107^{**}	0.023
	(0.134)	(0.104)	(0.036)	(0.029)
Household size	0.096^{*}	0.066	0.023	0.014
	(0.044)	(0.035)	(0.016)	(0.010)
Dependency ratio	-0.012^{**}	−0.006	−0.001	-0.002^{*}
	(0.004)	(0.003)	(0.001)	(0.001)
Observations	628	1065	819	1365
Adjusted R^2	0.111	0.128	0.022	0.036
Province dummy	Yes	Yes	Yes	Yes

more investment in schooling and save more in order to anticipate variability in their earnings. The difference of the results is due to the nature of earning risk derivation. Earnings risk is derived from the variability of earnings for one particular occupation while earnings range is based on the variability of one's earnings over the observation periods.

The household-specific characteristics also provide some interesting information with only the coefficients of gender being statistically insignificant across the waves. It can be inferred from Table 5.5 Row (1), households in rural areas would expect higher saving given the variability of earnings. This is also followed by the household size and dependency ratio. Households with fewer members and dependents are able to save more compared to those who have more members and dependents. However,

only the coefficients for age and age-squared are positively significant in 2000. Given the fact that this is a post-economic crisis, it can be inferred that older households have more savings than younger households.

However, when the earnings range are assessed against the savings to earnings ratio, only the results from IFLS3 show a significant relationship between saving to earnings ratio and log of earnings range. The results are shown in Table 5.5 Column (3) and (4). In year 2000, the households would anticipate the change in their savings to earnings ratio at proportionally around 5.8% given their expectation of earnings changes. From these assessments, earnings range is able to explain the variation in the log of savings rather than the ratio of savings to earnings.

In summary, the evidence from IFLS data is consistent with the theory given in Section 5.3.1. However, savings do not seem to provide adequate protection against earnings risk. If savings can provide a "buffer" against earnings risk, then there is no relationship between savings and earnings risk. Using different a specification of savings, it can be shown that a relationship exists between savings and earnings risk. Moreover given the fact that higher pure risk effect than utility smoothing effect, households experience a decrease in their saving due to higher variability in labour income based on occupational earnings risk. However, the results for earnings range are close to the theoretical explanation provided in Basu and Ghosh (2001).

5.4.6 Robustness Checks

The study uses a range of robustness tests to check estimations results in the previous sections, mainly based on the post-estimation results: the Ramsey Regression Equation Specification Test (or RESET) test is used to examine the model specification where the null hypothesis is the model has no omitted variables. To check heteroskedasticity of the models, Breusch-Pagan test is used for models with standard errors and Cameron-Trivedi's decomposition of IM-tests for models with robust standard errors. To check whether the models suffer from multicolinearity problem, the Variance Inflation Factor (VIF) test is usedwhere the mean value of VIF is presented in the following tables.

Table 5.6 provides the summary of post-estimation tests for estimation results given in Table 5.2 and 5.3. These tables present the regressions for schooling indicated by the number of years spent in education against the earnings risk in Table 5.2 and earnings range in Table 5.3 respectively. The results in these tables are the optimal regression, which can be used to derive the earnings risk implication to

Table 5.6
Post-Estimation Results for Schooling and Earnings Risk

Column (1), (2), and (3) indicate the post-estimation results for regression estimations in Table 5.2 Column (1), (2), and (3) respectively. Column (4), (5), and (6) indicate the post-estimation results for regression estimations in Table 5.3 Column (1), (2), and (3) respectively. *Source*: author's calculations from the IFLS data set.

	Table 5.2			Table 5.3		
	(1)	(2)	(3)	(4)	(5)	(6)
Ramsey RESET test						
$F-$value	1.77	19.84	1.11	0.65	11.11	5.07
Prob $> F$	0.153	0.000	0.343	0.585	0.000	0.002
Breusch-Pagan's heteroskedasticity test						
$\chi^2(1)$	2.59	1.66	2.71	1.74	0.02	3.01
Prob $> \chi^2$	0.108	0.198	0.100	0.187	0.892	0.083
Mean VIF	10.59	1.03	6.78	11.91	7.43	11.71

schooling given a set of variables. All regressions do not have any heteroskedasticity problems as indicated by the Breusch-Pagan tests where the alternative hypotheses are rejected. It can be concluded that all models have constant variance. All models are also free from multicollinearity problems indicated by the mean VIF below 10.

However, it seems that the results of IFLS2 from both model specifications are correctly specified (see Table 5.6 Column (1) and (3)). The model specification using IFLS3 in Table 5.6 Column (2) and (4) may have omitted variables. However, if other variables are added into the model specification, then the regressions suffer from heteroskedasticity problem. Therefore, it can be concluded that the results provided in Table 5.2 Column (2) and Table 5.3 Column (2) must be interpreted cautiously. For IFLS4, the estimation results using occupational earnings risk do not have any multicollinearity problem, but this is not so for earnings range. Overall, it can be said that the model specifications using occupation earnings risk are more robust compared to earning range.

Using the same tests, Table 5.7 provides the summary of post-estimation tests for estimation results given in Table 5.4 and 5.5. All model specifications do not exhibit multicollinearity problem as indicated by mean VIF for each model are below 10. This means that there is no correlation between explanatory variables.

For all observations, the models do not suffered from heteroskedasticity problems except for IFLS4. The estimation results for IFLS4 in particular using occupation

Table 5.7
Post-Estimation Results for Savings and Earnings Risk

Column (1), (2), and (3) indicate the post-estimation results for regression estimations in Table 5.4 Column (1), (2), and (3) respectively. Column (4), (5), (6) and (7) indicate the post-estimation results for regression estimations in Table 5.3 Column (1), (2), (3), and (4) respectively. The heteroskedasticity test used in the post-estimation is Breusch-Pagan test, except for Column (6) and (7) is Cameron-Trivedi heteroskedasticity test. *Source*: author's calculations from the IFLS data set.

	Table 5.4			Table 5.5			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ramsey RESET test							
$F-$value	1.46	1.24	3.52	1.99	7.57	3.78	8.51
Prob > F	0.223	0.295	0.015	0.115	0.000	0.010	0.000
Breusch-Pagan's heteroskedasticity test							
$\chi^2(1)$	0.00	2.16	3.85	0.89	0.00	112.18	173.19
Prob > χ^2	0.957	0.141	0.050	0.345	0.969	0.283	0.020
Mean VIF	9.07	6.18	6.82	8.91	7.20	8.76	7.08

earnings in Table 5.7 Column (3) and using earning range as an explanatory variable and savings-to-earnings ratio as the dependent variable in Table 5.7 Column (7), suffer from heteroskedasticity problem at a certain level. Using different combinations of explanatory variables, the results in Table 5.4 Column (3) and Table 5.5 Column (4) are the optimal results. This is also the same case for the specification test using Ramsey RESET test (see Table 5.7 Column (3), (5), (6) and (7)).

In summary, the saving to earnings ratio is not reliable in measuring earnings risk anticipation, as the results are less robust compared to other specifications. Model specifications with occupational earnings risk provide more robust results than models with earnings range specification.

5.5 Concluding Remarks

This study considers how Indonesian households anticipate earnings risk associated with education and savings where the theoretical framework is adopted from Basu and Ghosh (2001). Education is considered as the most important factor in human capital investment. The definition of human capital investment is compatible with Mincerian earnings function, which provides the earnings risk measure. This study

has quantified the relative importance of earnings risk to schooling decisions and savings for IFLS households. It also provides evidences from the IFLS households in 1997, 2000, and 2007.

Firstly, it examines the decision of human capital investment, which includes schooling or education and post-schooling activities. This decision is made in the previous period. This study finds that occupational earnings risk decreases with educational level. However, this is not the case when the risk measure is defined by earnings range, which is based on the maximum and minimum level of an individual?s earnings across the observation. The key finding here is that there are always incentives to invest in education given the positive return across the waves. The effects of earnings risk may differ depending on the household-specific characteristics and the situation of the economy. Given these results, it can be said that education does decrease the variability over future income based on occupational earnings risk. However, the results using earnings range may have more power in explaining the schooling decision compared to occupational earnings risk; it is relatively less robust than the results using occupational earning risk.

Secondly, the impact of earnings risk against savings is studied by using the same earnings risk measures. Across the IFLS waves, this study finds the occupational earnings risk is systematically larger for urban households, households with fewer members and fewer dependents. This study also finds that the risk effect is higher than the utility smoothing effect given by the negative relationship between occupational earnings risk and savings. If savings were completely able to anticipate the earnings risk, one would expect that the coefficient of earnings risk to be zero. However, this does not completely mitigate the risk.

Thirdly, based on these findings, earnings range results are close to Basu and Ghosh's model, while earnings risk contradicts this theoretical model. This is due to the risk measure derived from occupational earnings while earnings range is derived from individual's earnings. Earning range also provides more consistent results throughout the IFLS waves compared to occupational earnings risk.

A natural expansion of this study would be related to the investigation of risk aversion parameter, which may induce saving behaviour. Further studies can examine the heterogeneity of the decision making within households given particular earnings risk measurements, which are not based on occupational sorting. Moreover, if savings as self-insurance is inadequate, it becomes important for households to join some insurance groups or find other means to mitigate earnings risk problems.

Appendix 5.A Summary Statistics of Education, Earnings, and Savings

Table 5.A.1
Summary of Education, Earnings, and Savings: All Samples

This table provides relevant statistics of all samples from the IFLS data set. The total number of observations is given in Column (1). Column (2) shows the mean of the number of years spent in education by the head of the households. Savings and earnings in Column (3) and (4) are in annual value and thousand rupiah. The number of samples which has complete information and used in the analysis is given in Column (5). Finally, Column (6) provides the percentage of samples used in the analysis, which is calculated by Column (5) divided by Column (1). *Source*: author's calculations from the IFLS data set.

Cohort	(1) Total Observations	(2) Education (in years)	(3) Savings	(4) Earnings	(5) Final Samples	(6) Percentage Samples Used
IFLS2 - 1997						
25-29	288	9.14	1401.39	6967.05	96	33.33%
30-34	687	10.36	1552.69	22900.00	241	35.08%
35-39	812	9.32	2392.95	7633.85	277	34.11%
40-44	755	8.92	3016.80	8957.23	205	27.15%
45-49	671	9.15	2534.33	9415.19	179	26.68%
50-55	505	8.28	9182.09	9264.36	127	25.15%
>55	1244	7.49	5688.07	6361.37	90	7.23%
Total	4962				1215	24.49%
IFLS3 - 2000						
25-29	612	9.57	993.29	4989.12	280	45.75%
30-34	830	10.12	1502.40	5879.98	418	50.36%
35-39	885	9.00	1957.88	6446.63	387	43.73%
40-44	888	8.41	1923.41	6112.91	380	42.79%
45-49	779	8.42	2563.76	6912.31	287	36.84%
50-55	544	8.62	3784.62	7764.21	188	34.56%
>55	1416	7.22	2391.92	3252.97	220	15.54%
Total	4538				2160	47.60%
IFLS4 - 2007						
25-29	1030	10.36	1147.70	6099.34	496	48.16%
30-34	1060	10.08	1226.96	6831.54	536	50.57%
35-39	1042	10.20	1609.44	6823.64	529	50.77%
40-44	895	9.70	1940.90	7363.32	406	45.36%
45-49	849	8.51	1942.42	7440.32	302	35.57%
50-55	712	8.53	3857.20	8421.80	252	35.39%
>55	1398	7.73	2130.52	5070.67	190	13.59%
Total	5588				2711	48.51%

Table 5.A.2
Occupation Classification and Earnings Risk

The estimations are based on the Mincer regressions. The number on the table heading indicates employment type classification: (1) government worker, (2) private worker, (3) casual worker in agriculture, and (4) casual worker not in agriculture. Agriculture includes forestry, fishing and hunting. Mining includes quarrying. Wholesale includes retail, restaurants and hotels. Transportation sector includes storage and communications. Finance includes insurance, real estate and business services. *Source*: author's calculations from the IFLS data set.

Sector	Employment type					Earnings risk			
	(1)	(2)	(3)	(4)	Total	(1)	(2)	(3)	(4)
IFLS2 - 1997									
Agriculture	32	115			147	0.145	0.737		
Mining and quarrying	5	15			20		0.045		
Manufacturing	25	215			240	0.433	0.579		
Electricity, gas, water	10	9			19	0.190	0.100		
Construction	12	138			150	0.100	0.359		
Wholesale	9	73			82	0.078	1.052		
Transportation	20	84			104	0.211	0.736		
Finance	8	13			21	1.392	0.275		
Social services	272	155			427	0.236	0.616		
Not classified		5			5		0.021		
Total	393	822			1215				
IFLS3 - 2000									
Agriculture	37	336			373	0.264	0.710		
Mining and quarrying	2	23			25	0.176	0.603		
Manufacturing	27	327			354	0.449	0.432		
Electricity, gas, water	9	6			15	0.398	1.217		
Construction	13	251			264	1.217	0.344		
Wholesale	4	140			144	2.634	0.563		
Transportation	28	128			156	0.605	0.446		
Finance	7	33			40	0.183	0.606		
Social services	412	371			783	0.268	0.684		
Not classified		4			4		0.091		
Total	539	1619			2158				
IFLS4 - 2007									
Agriculture	20	170	159	33	382	0.269	0.571	0.575	0.996
Mining and quarrying	5	25		11	41	0.996	1.306		0.594
Manufacturing	22	435	9	28	494	0.744	0.411	0.782	0.485
Electricity, gas, water	11	13		1	25	0.594	0.441		2.330
Construction	9	127	1	204	341	0.441	0.413		0.408
Wholesale	4	222	1	20	247	0.485	0.460		1.035
Transportation	10	110	1	35	156	0.226	0.447		0.483
Finance	4	41		2	47	2.330	0.408		0.389
Social services	457	435	2	79	973	0.437	0.564	0.020	0.755
Not classified		5			5		0.097		
Total	542	1583	173	413	2711				

Table 5.A.3
Mean Values of Relevant Variables

All figures are in 2000 Indonesian rupiah except for working hours. All figures are average value of respective variables except the observations. N denotes the number of samples. Earnings risk in Column (6) is estimated from the Mincerian regression residuals, while in Column (7) are estimated from earnings function that consists of working experience without considering education level. Savings are calculated from savings/deposits in banks and jewellery. Earnings are compensation from primary job and calculated as annual earnings in thousand rupiah. σ_j^2 denotes cross-sectional occupational earnings risk and σ_j^2 denotes cross-sectional occupational earnings risk without considering education. Earnings range is measured by calculating the difference between maximum and minimum wage across the waves for each and every household. *Source*: author's calculations from the IFLS data set.

Cohort	(1) N	(2) Education (in years)	(3) Savings	(4) Earnings	(5) $\frac{\text{Savings}}{\text{Earnings}}$	(6) Earnings risk (σ_{ij}^2)	(7) Earnings risk ($\sigma_{ij}^{2,\text{ne}}$)	(8) Earnings range (W_{range})
IFLS2 - 1997, total samples = 1125								
25-29	96	9.568	1253.59	7320.04	0.219	0.579	0.713	3741353
30-34	241	10.966	2052.89	30000.00	0.264	0.553	0.718	25100000
35-39	277	10.620	2164.93	8764.66	0.258	0.513	0.714	3647809
40-44	205	10.700	3398.18	10800.00	0.268	0.448	0.619	3465825
45-49	179	10.375	3892.89	11300.00	0.297	0.445	0.586	3817582
50-55	127	9.786	6765.86	11900.00	0.318	0.421	0.596	1765195
>55	90	9.416	5539.76	10800.00	0.233	0.483	0.655	1668294
All samples		10.204	3581.16	12983.53	0.265	0.492	0.657	6172294
IFLS3 - 2000, total samples = 1940								
25-29	280	9.845	928.47	4939.29	0.178	0.529	0.726	2087646
30-34	418	10.813	1641.84	6099.16	0.268	0.514	0.692	15200000
35-39	387	9.970	1949.32	6385.53	0.246	0.500	0.670	3164790
40-44	380	9.767	2284.54	6492.95	0.274	0.477	0.642	3010283
45-49	287	9.535	2380.42	7356.03	0.272	0.481	0.648	3077750
50-55	188	10.088	3598.68	8294.80	0.381	0.449	0.610	2806790
>55	220	7.840	1613.96	3714.65	0.320	0.542	0.751	1159869
All samples		9.694	2056.75	6183.20	0.277	0.499	0.677	4358161
IFLS4 - 2007, total samples = 2521								
25-29	496	10.513	1113.19	5914.07	0.1875	0.5136	0.6344	0
30-34	536	10.601	1045.56	6825.38	0.1586	0.5091	0.6291	327187
35-39	529	10.817	1332.99	7019.50	0.1760	0.4936	0.6061	11700000
40-44	406	10.787	2003.17	7754.08	0.2273	0.5060	0.6171	2599663
45-49	302	9.993	2275.68	7857.69	0.2768	0.5070	0.6093	3420887
50-55	252	10.142	4900.83	8886.47	0.3810	0.4890	0.6018	2898346
>55	190	9.024	2273.39	5714.33	0.3260	0.5114	0.6136	3656449
All samples		10.268	2134.97	7138.79	0.248	0.504	0.616	3514647

Appendix 5.B Saving and Earnings Profiles

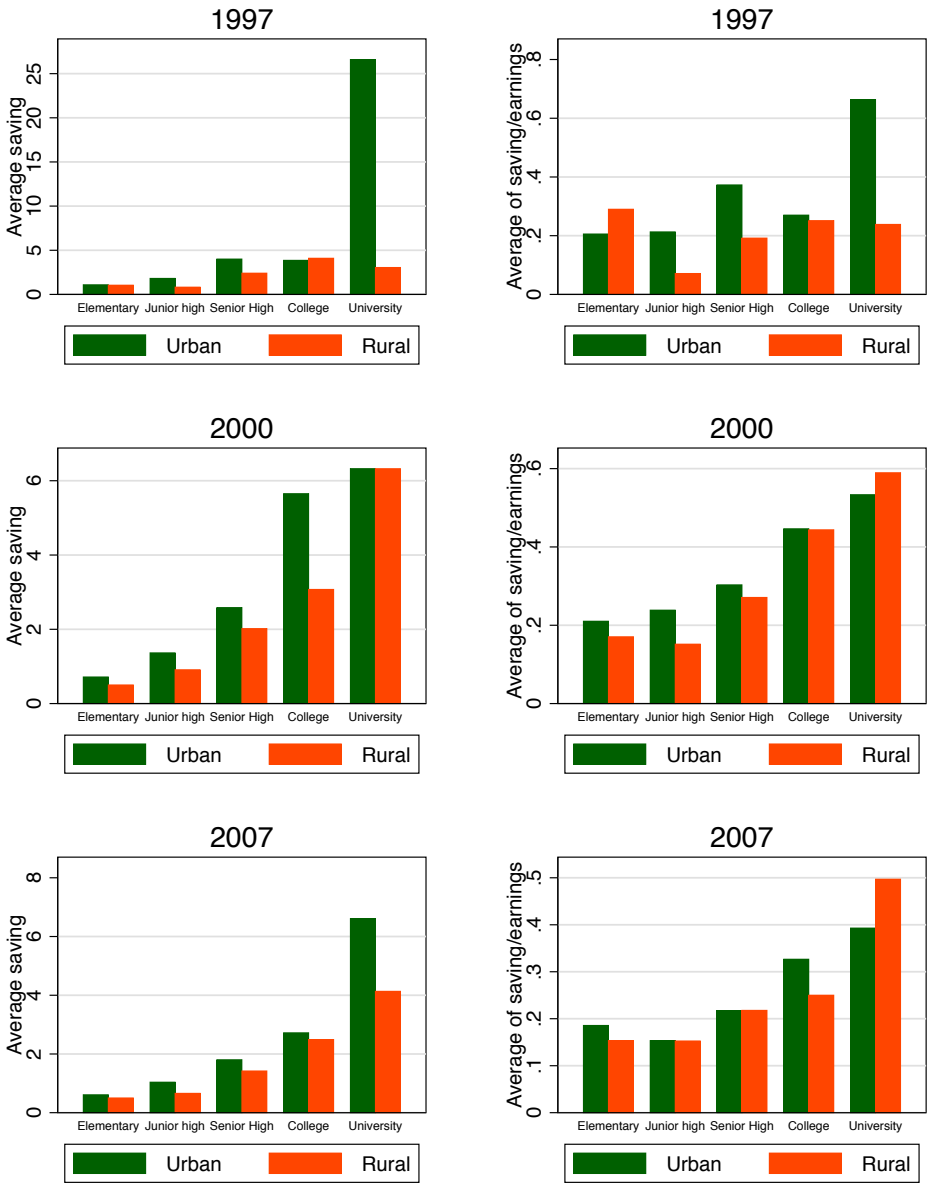

Figure 5.B.1. Savings and Savings/Earnings Ratios Based on Education. The figures are in 2000 Indonesian rupiah except for savings to earnings ratio. Earnings are in millions rupiah. Savings includes saving, deposits, shares, and jewellery. *Source:* author's calculations from IFLS data set.

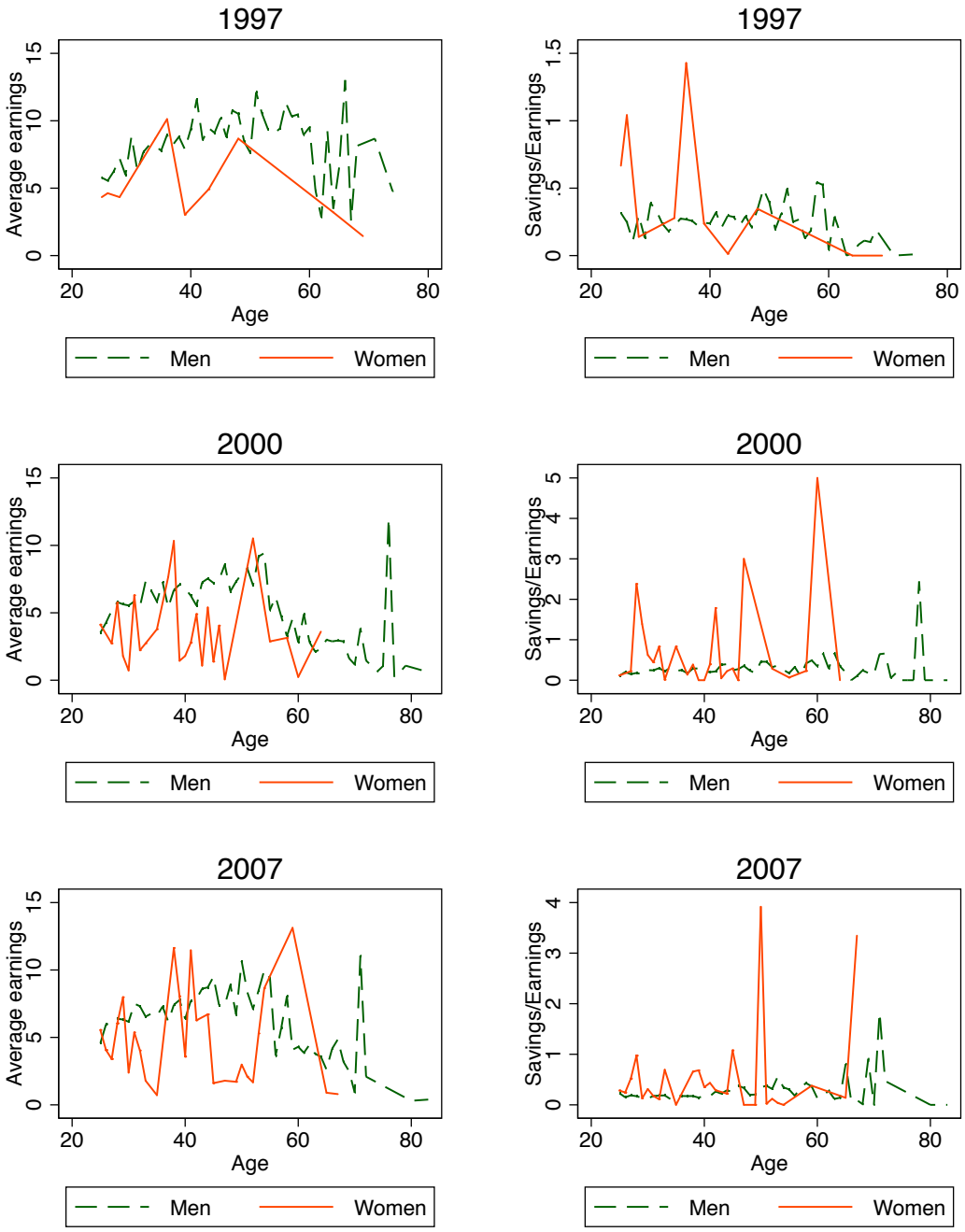

Figure 5.B.2. Earnings and Savings to Earnings Ratio Based on Gender. The figures are in 2000 Indonesian rupiah except for savings to earnings ratio. Earnings are in millions rupiah. Savings includes saving and deposits in the bank or other financial institutions, shares, and jewellery. *Source:* author's calculations from the IFLS data set.

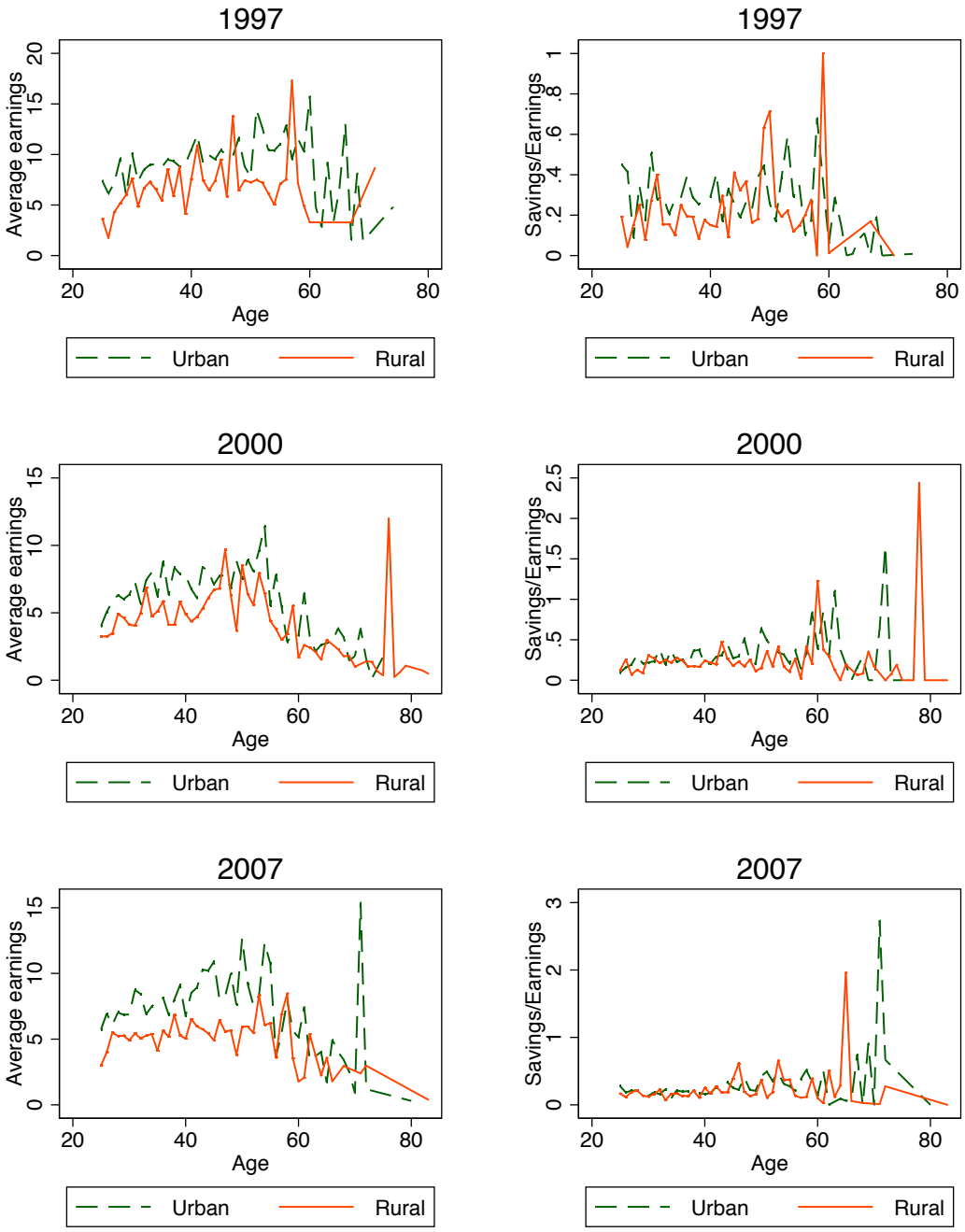

Figure 5.B.3. Earnings and Savings to Earnings Ratio Based on Location. The figures are in 2000 Indonesian rupiah except for savings to earnings ratio. Earnings are in millions rupiah. Savings includes saving, deposits, shares, and jewellery. *Source:* author's calculations from the IFLS data set.

Chapter 6

Insurance, Credit Access and Risk Sharing Among Indonesian Households

6.1 Introduction

At a time of great uncertainty, it is important to understand how households as economic agents can adequately cope with risk and uncertainty. Friedman (1957) shows the importance of household or individual consumption in coping with negative shocks. This can be done by consumption smoothing or keeping one's expenditure stable overtime through appropriate timing of borrowing and lending. Friedman's seminal work of permanent income hypothesis (PIH) is an important paper, which influences economic theories, related particularly to consumption and related variables, such as labour income or earnings. By performing transactions with others, economic agents are able to protect themselves against uncertainty which would also affect their economic well-being. The decision is based on a calculation of traded assets and its payoff against uncertainty. The basic and most obvious example is through insurance contracts. However, the facts show that not all risks can be protected by insurance contracts: it depends on the nature of these risks. Other assets using insurance principles include bonds and stocks, where economic agents can buy when they are in good economic circumstances and sell when circumstances change. Another mechanism that uses insurance principles is social security or unemployment benefit which gives limited protection for household who are covered.

The risk mitigating mechanisms vary across countries which are dependent on the development of their financial system and related institutions. Financial systems in many developing countries are typically underdeveloped, and often mainly serve large firms and wealthy individuals. As one of the emerging economies, Indonesia has been struggling in developing financial systems: the majority of its population still has difficulties in accessing financial services.

Households, particularly those who are working in the informal sector and rural areas possess no or limited insurance and are often not aware of any basic social security provided by the government. These people are vulnerable not only to idiosyncratic or individual risks, but also to macroeconomic and financial risks. For example, Thomas and Frankenberg (2007) show that the 1997 financial crisis has affected the poorest, middle- and upper-income households in Indonesia. They also found that there was a significant increase in levels of poverty and a decline in the living standards as the crisis unfolded. The effects were indicated by lower levels of consumption and income, a decrease in households' assets and a reduction in human capital investment.

Given little access to social security systems and formal insurance institutions, households tend to form informal groups to overcome their needs and to alleviate their problems. One of the important aspects that should be addressed is why there is a lack of available insurance for these households. The second is how these households are able to conduct informal arrangements and share their risk and uncertainty. Local villages or communities play an important role in allocating resources and risks: these include the villages' internal resources and also transfers from government. Government's efforts to increase households' welfare such as the poverty alleviation program depend on the community's response and management of the funds, since formal guidelines may not be effective (for example see Chikako, 2010).

This chapter investigates how risk sharing groups form whenever barriers to insurance exist. After literature reviews in Section 6.2, Section 6.3 describes the methodology used to assess different types of insurance barriers and risk sharing group formation. Section 6.4 describes the data which is employed in this study. Section 6.5 the approach described in the previous section. Section 6.7 summarises empirical findings and discusses their implications.

6.2 Related Literature

The way to cope with uncertainty and to smooth consumption is by conducting economic transactions through competitive and complete financial markets where prices are determined by supply and demand mechanisms. Since households may face various constraints in constructing their intertemporal choices, access to insurance matters. When formal insurance is inaccessible or not available, informal insurance such as a risk sharing group is likely to emerge between households. Some early work on risk sharing tests assumed complete market proposition in order to explain consumption insurance across households. Moreover, the risk sharing hypothesis at household level is calibrated and tested using very rich data sources such U.S. Panel Study of Income Dynamics (Cochrane, 1991), U.S. Consumer Expenditure Survey (Mace, 1991). However, empirical investigation of risk sharing using micro data tends to reject the efficient risk sharing hypothesis. Attanasio and Davis (1996) reject the risk sharing using complete market proposition: they state that consumption risk sharing is incomplete using consumption, labour supply and wage data in the United States.

However, things are very different for developing countries. A study by Beck et al. (2008) shows that many households in low-income countries do not have adequate access to the financial services that are taken for granted by many households in developed countries. They found that the barriers have strong linkages with economic development and financial accession measures. Therefore, households need to find an efficient way to smooth their consumption and to insure themselves against idiosyncratic shocks.

Halliday (2006) classifies research on household risk management in developing countries into two categories. The first category is the research that focuses on household behaviour in using and managing their asset accumulation as a self-insurance mechanism. This category assumes that households are in autarky. The theoretical framework can be traced back to Deaton (1991) and empirical studies can be found in for example Paxson (1992) and Udry (1995).

The second category is related to research that investigates risk sharing arrangement formed by households within the same unit, such as a village or a community. Within a community, the mechanism may take place between families and friends who facilitate risk sharing between economic agents, for instance between young and old, and between families in specific regions. Simply, this can happen because there is mutual assistance among them. This becomes important particularly for low-

income and developing economies where access to finance is absent or limited and risk becomes ubiquitous. The insurance mechanism is usually conducted via state-contingent transfers such as in Townsend (1994) and Udry (1994).

From the theoretical point of view, informal risk sharing arrangements can be modelled as altruistically motivated mechanisms (for example Altonji et al., 1992; Cox and Fafchamps, 2007; Ravallion and Dearden, 1988; Witoelar, 2013) and game-theoretical approach (for example Ambrus et al., 2014; Bloch et al., 2008; Bold, 2009; Coate and Ravallion, 1993; Ligon et al., 2002). The literature shows how the connection of households was established and developed and how it culminated in networks or groups.

Since the structure of the networks are not always stable, risk sharing arrangements are not full insurance or perfect conditions. The sources of network stability usually come from moral hazard, asymmetric information, and limited commitment. Moral hazard may exist if one alters his behaviour and takes more risks where other households may not known. Asymmetric information may occur due to the imperfect instability of households' income.

Since the structure of the networks is not always stable, risk sharing arrangements do not provide full insurance or perfect conditions. The sources of network stability usually come from moral hazard, asymmetric information, and limited commitment. Moral hazard may exist if an individual alters his behaviour and take more risks: furthermore, other households are unaware of these changes to behaviour. Asymmetric information may occur due to the imperfect instability of households' income.

Limited commitment is one aspect that uniquely characterises informal insurance in low-income and developing economies. The transfers between households may not occur perfectly if an individual does not comply with the group's terms and agreement. Another possible reason is that usually there is no collateral when the groups emerge. Bold (2009) studies how risk sharing groups can be endogenously formed among households under limited commitment. In her model, the consumption of constrained households is determined by the history of shocks and the interaction with other constrained households in terms of the current income. The other property of this model is the stability of groups given the deviation by subgroups. This model provides an empirical test of endogenous group formation given the size of the group.

Bloch et al. (2008) study bilateral risk sharing arrangement across networks where the transfers are influenced by social norms. Households engage in risk sharing ar-

rangements if this exogenous enforcement is exogenously formed. The stability of the network is enhanced by strong punishment. Their work shows how limited commitment affects the structure of the networks. They argue that risk sharing networks can emerge endogenously under different social norms.

Ambrus et al. (2014) build a risk sharing model based on a set of pre-existing relationship between households such as family ties and friendship. Using Peruvian household and community data, they examine the informal risk sharing where the endogenous groups can be formed for each realisation of network uncertainty. The size and location of the risk sharing networks is endogenously determined by the social structure and the realisation of income shocks. A household's consumption will experience co-movement with close neighbours. Barr et al. (2012) also find similar results in term of group structure. Using experimental survey, they examine the group formation in rural Zimbabwe by focusing on the enforcement mechanisms which households use when entering risk sharing arrangement. They use three treatments which assess perfect external enforcement, intrinsic incentives such as trust and altruism, and external enforcement such as social punishment. They conclude that the group formation is likely to happen when members share characteristics like gender, or belong to the same organisation or community.

For the Indonesian context, Ravallion and Dearden (1988) study risk sharing in terms of private transfers between Javanese households in Indonesia using 1981 Susenas data. They find a difference between rural and urban households in terms of transfer behaviour. Okten and Osili (2004) utilise IFLS1 and IFLS2 data set to investigate how consumption smoothing may occur from accessing the credit market. They find that social and community networks are important in gaining access to credit markets. Witoelar (2013) study how risk sharing emerges within families using IFLS data set. However, there is little or no literature that study the barriers to insurance and group formation specifically for Indonesian households.

6.3 Alternative Models of Risk Sharing

The main objective of this study is to investigate risk sharing at the micro level with specific characteristics where the condition of imperfect markets exist in many developing economies, particularly in Indonesia as a case study. Therefore this study contributes to the existing literature by providing empirical evidence for credit access, barriers to insurance and risk sharing groups specifically in Indonesia.

As suggested by many studies, the presence of endogenous group formation is very important to risk sharing arrangement. To examine the informal risk sharing groups, it is also important to assess the barriers to insurance for Indonesian households. The first question to be addressed is about the presence of efficient risk sharing between Indonesian households.

The second question is related to the barriers to insurance such as moral hazard, limited commitment, and hidden income. Through lending and borrowing mechanisms, perfect financial markets should have a significance impact on households' consumption smoothing. By taking account of the uncertainty of consumption behaviour, different types of barriers may have important implications for consumer behaviour particularly in limiting households' ability to smooth their consumption.

The third question is related to informal insurance within endogenous risk sharing groups. If the endogenous groups exist, what will be the implications for efficient risk sharing?

How groups share risk and smooth consumption can be understood through different models. In next section, the specific framework for examining risk sharing will be discussed. The first part will discuss a full risk sharing hypothesis, followed by a partial risk sharing model, which includes moral hazard, limited commitment, and hidden income frameworks. I include a borrowing saving model in the latter model. The last part will discuss how a coalition could be formed given inaccessible financial market conditions.

6.3.1 Theoretical Framework

The perfect risk sharing model is based on the assumption of complete markets given in Arrow (1964); Arrow and Debreu (1954); Debreu (1959), from now on it is referred as *A-D* model. Let $y_{i,t}$ be household i's income at date t where the future income $y_{i,t+1}$ is unknown with probability $\pi^{\mathscr{S}}$ and $\mathscr{S}$ denotes state of nature. Suppose that state of nature $\mathscr{S}$ has two realisations of r and s. The consumption utility can be written as

$$U = U\left(c_{i,t}\right) + \beta\left[\pi^{r} U\left(c^{r}_{i,t+1}\right) + \pi^{s} U\left(c^{s}_{i,t+1}\right)\right] \tag{6.1}$$

subject to

$$y_{i,t} = c_{i,t} + \frac{p^r}{1+R} F^r_{i,t+1} + \frac{p^s}{1+R} F^s_{i,t+1} \tag{6.2}$$

$$y^r_{i,t+1} = c^r_{i,t+1} - F^r_{i,t+1} \tag{6.3}$$

$$y^s_{i,t+1} = c^s_{i,t+1} - F^s_{i,t+1} \tag{6.4}$$

where F^r_{t+1} and F^s_{t+1} denote the financial asset of state r and s at date $t+1$ respectively, p^r and p^s denote the price of security for state 1 and 2 which pays one unit of consumption if one particular state occurs, R is the real interest rate, and $\pi^r + \pi^s = 1$. (6.2) and (6.3) denote budget constraint at date t and $t+1$ respectively.

The first-order condition is given by

$$U'\left(c_{i,t}\right) \frac{p^r}{1+R} = \pi^r \beta U'\left(c^r_{i,t}\right) \tag{6.5}$$

$$U'\left(c_{i,t}\right) \frac{p^s}{1+R} = \pi^s \beta U'\left(c^s_{i,t}\right) \tag{6.6}$$

In *A-D* world, the market is competitive where *A-D* securities exist for every state s. Household i who owns *A-D* security will be compensated with 1 unit of output if state $\mathscr{S}$ takes place and 0 otherwise. (6.5) implies

$$\left(p^r + p^s\right) U'\left(C_{i,t}\right) = (1+R)\left[\pi^r \beta U'\left(c^r_{i,t+1}\right) + \pi^s \beta U'\left(c^s_{i,t+1}\right)\right]$$

which can be written as

$$U'\left(c_{i,t}\right) = (1+R)\beta E_t U'\left(c_{i,t+1}\right). \tag{6.7}$$

Therefore, the expected marginal rate of substitution is equal to the relative price of consumption in date $t+1$.

Now, suppose there exists a community made up of two households with consumption $c_{1,t}$ for household 1 and $c_{2,t}$ for household 2 at date t. Their income is defined by $y_{1,t}$ and $y_{2,t}$. In equilibrium, they have

$$c_{1,t} + c_{2,t} = y_{1,t} + y_{2,t}. \tag{6.8}$$

At date $t+1$, the equilibrium can be written as

$$c^{\mathscr{S}}_{1,t+1} + c^{\mathscr{S}}_{2,t+1} = y^{\mathscr{S}}_{1,t+1} + y^{\mathscr{S}}_{2,t+1} \tag{6.9}$$

for all $\mathscr{S}$. The community total income is given by $y_{kt} = y_{1,t} + y_{2,t}$. Following Obstfeld and Rogoff (1996), the utility function is assumed to be constant relative risk aversion (CRRA). Both households are assumed to have the same risk aversion parameter, γ. The Euler equation in (6.5) shows that for household 1 and 2 will have $c^{\mathscr{S}}_{1,t+1} = [\pi^{\mathscr{S}}\beta(1+R)/p^{\mathscr{S}}]^{1/\gamma}c_{1,t}$ and $c^{\mathscr{S}}_{2,t+1} = [\pi^{\mathscr{S}}\beta(1+R)/p^{\mathscr{S}}]^{1/\gamma}c_{2,t}$ respectively. Using these properties, (6.8) and (6.9), the community income at date $t+1$ can be written

$$y^{\mathscr{S}}_{k,t+1} = \left[\frac{\pi^{\mathscr{S}}\beta(1+R)}{p^{\mathscr{S}}}\right]^{\frac{1}{\gamma}} y_{kt} \tag{6.10}$$

and the price of financial asset at date t is

$$\frac{p^{\mathscr{S}}}{1+R} = \pi^{\mathscr{S}}\beta\left[\frac{y^{\mathscr{S}}_{k,t+1}}{y_{kt}}\right]^{-\gamma}. \tag{6.11}$$

In complete markets, all households will equate their marginal rate of substitution of consumption between date t and $t+1$ to the financial asset prices.

The consumption level is given by

$$\frac{p^{\mathscr{S}}}{1+R} = \frac{\pi^{\mathscr{S}}\beta U(c^{\mathscr{S}}_{1,t+1})}{U(c_{1,t})} = \frac{\pi^{\mathscr{S}}\beta U(c^{\mathscr{S}}_{2,t+1})}{U(c_{2,t})} \tag{6.12}$$

and

$$\frac{p^r}{p^s} = \frac{\pi^r U(c^r_{1,t+1})}{\pi^s U(c^s_{1,t+1})} = \frac{\pi^r U(c^r_{2,t+1})}{\pi^s U(c^s_{2,t+1})}. \tag{6.13}$$

Using (6.11), (6.12) and (6.13), the equilibrium condition is given by

$$\frac{c^r_{1,t+1}}{c^s_{1,t+1}} = \frac{c^r_{2,t+1}}{c^s_{2,t+1}} = \frac{y^r_{k,t+1}}{y^s_{k,t+1}}. \tag{6.14}$$

Equation (6.14) implies the implication of efficient risk sharing within a community. This is also characterised by Borch's rule which implies this as the first-best risk sharing. The consumption growth rates are the same across households in each state and date. These are also equal to the total growth rate of community income. Therefore, household income ceases to play any role in determining household consumption.

6.3.2 Full Risk Sharing Hypothesis

Under the first-best allocation, household consumption does not move with income, and community consumption moves with average household consumption. To examine this, I use Townsend's standard test of full insurance (1994) using IFLS data set from Wave 1 until Wave 3 which is given by

$$\ln c_{i,t} = \alpha \ln y_{i,t} + \theta_i + \varepsilon_{i,t} \tag{6.15}$$

where $c_{i,t}$ is household i's consumption at date t, $y_{i,t}$ is household i's income at date t and θ_i is a household-fixed effect. Following Kinnan (2010), to capture the changes in households' consumption due to changes in aggregate resources, I add a community-wave dummy variable δ_{kt} in the following estimation

$$\ln c_{ik,t} = \alpha \ln y_{ik,t} + \theta_{ik} + \delta_{kt} + \varepsilon_{ik,t}. \tag{6.16}$$

Under full risk sharing hypothesis, the term α should be equal to zero meaning that the changes in household income do not track the change in consumption. This means that each household's consumption is independent of their own income under the absence of information or a commitment problem.

Since households attempt to insure their consumption against income fluctuation, any effects from the shock can be fully mitigated by risk sharing networks. If the term α is significant, it implies that household i's income tracks consumption. Households are affected by the changes in their income.

6.3.3 Consumption Smoothing

To some extent, consumption smoothing relates to risk sharing. However, this exist across time, while risk sharing is consumption smoothing across state. If full risk sharing breaks down, there is a possibility that households may have borrowing constraints. If this happens, then their consumption pattern is sensitive to income or driven by their income. Therefore, risk sharing is connected to borrowing constraints.

Given the break down in full risk sharing, another component that should be considered is household saving. Saving can be regarded as "self-insurance" while risk sharing can be considered as "co-insurance" (see Coate and Ravallion, 1993). Saving determines a household's ability to give or to transfer since risk sharing arrangements depend not only current income but also previous saving.

Households can manage their finance by saving and borrowing at rate R and discounting the future income at rate β; their marginal utility of consumption follows a random walk pattern (see Hall, 1978). The relationship can be written as

$$U'(i,c_t) = \beta R E_{t-1} U'\left(c_{i,t}\right). \tag{6.17}$$

This means that previous marginal utility of consumption is able to sufficiently capture information at date $t-1$ in forecasting today's marginal utility of consumption. Following Garcia et al. (1997), the test is given by

$$\ln c_{i,t} = \alpha_0 + \alpha_1 \ln c_{i,t-1} + \theta_i + \delta_t + \varepsilon_{i,t} \tag{6.18}$$

where δ_t is a time-fixed effect (or specification dummy).

However, when households are only able to save but not to borrow, the standard Euler equation will not be applicable because of liquidity constraints (see Deaton, 1991). This leads to a saving model where income in the previous period may contain information that cannot be captured by consumption in the same period. The model can be examined by

$$\ln c_{i,t} = \alpha_0 + \alpha_1 \ln y_{i,t-1} + \theta_i + \delta_t + \varepsilon_{i,t}. \tag{6.19}$$

Under the saving-only model, current consumption should be negatively correlated with income in the previous period given the consumption at that time. The negative relationship here is due to liquidity constraints.

When consumption equals income, liquidity constraint is likely not binding. At some point income will be higher than consumption, then households will have a condition to save. In this model, past income may include some information that is not captured by past consumption. When past income was low, it suggests that households may face liquidity constraints which have caused past consumption is lower than expected by households. The impact is current consumption will be higher than predicted from the past consumption due to low income.

6.3.4 Hidden Income

Suppose all households agree to form a risk sharing group. The households' effort is observable but not their income. In this case, households have private information about income realisation and asset status. The information emerges when household

income cannot be observed directly by a community, then a barrier to insurance is likely to emerge. Households may hide their wealth in terms of physical goods such as gold, jewellery or in terms of saving and other financial deposits. However, they may not be able to borrow secretly (see Cole and Kocherlakota, 2001).

In order to examine the hidden income hypothesis, I utilise household i's consumption and income in two-step tests. Following Kinnan (2010), the first step is to regress the consumption against its lag in which the specification is given by (6.18). The second step is to derive residuals which are estimated from

$$\hat{\varepsilon}_{i,t} \equiv \ln c_{i,t} - \widehat{\varphi} \ln c_{i,t-1} - \widehat{\delta}_t$$

and then regress it against previous log income $y_{i,t-1}$ as follows

$$\hat{\varepsilon}_{i,t} \equiv \varphi_0 + \varphi_1 \ln y_{i,t-1} + u_{i,t}. \tag{6.20}$$

Under hidden income hypothesis, φ_1 should not be different than zero. The sign of φ_1 have different implication. If the value of coefficient is negative, it implies borrowing constraint. If the value of coefficient is positive, it implies hidden income. If the household hides information about his income, residuals of the results in consumption smoothing should be correlated with past income.

6.3.5 Limited Commitment and Moral Hazard

Risk sharing with moral hazard models is widely used to explain household behaviour in developing economies. When households join an informal group and agree to exert effort, the efforts are likely to be unobservable. This circumstance tends to make households not fully commit their effort. In other words, they tend to shirk, given such circumstances.

This condition also implies that households may hide their commitment and full effort under the risk sharing arrangement. The non existence of commitment problems or asymmetric information will lead to an independent relationship between households' consumption and income realisation given the aggregate resources within that particular village.

Kocherlakota and Pistaferri (2009) show that under the incomplete market model, the non-central moment of the cross-sectional distribution of consumption at a particular date can be used to estimate moral hazard models. When households' consump-

tion grows at different rates, it cannot satisfy optimality conditions given by standard Euler equation. Kocherlakota and Pistaferri also show that it is possible to use the inverse Euler equation as an alternative restriction.

Using the inverse Euler equation, I compare two moral hazard and limited commitment models. In this particular test, moral hazard and limited commitment are empirically difficult to distinguish. In the first model, I consider the raw moment or uncentered definition of community consumption k as follows:

$$\ln\left(\frac{\sum_{i=1}^{N} 1/c_{ik,t}^{-\gamma}}{N}\right) = \alpha_0 + \alpha_1 \ln\left(\frac{\sum_{i=1}^{N} 1/c_{ik,t-1}^{-\gamma}}{N}\right) + \alpha_2 \ln y_{ik,t-1} + \theta_i + \varepsilon_{ik,t} \tag{6.21}$$

where $c_{ik,t}$ is household i's per capita consumption in community k at date t, γ denotes cross sectional moment of consumption, $y_{ik,t}$ denotes household's i income in community k at date t, θ_i denotes household-fixed effect, and $\varepsilon_{ik,t}$ denotes error terms. N is different from community to community.

Following Kinnan (2010), an alternative empirical model for this is using level regression for community consumption c_k as follows:

$$\ln c_{kt} = \alpha_0 + \alpha_1 \ln c_{k,t-1} + \alpha_2 \ln y_{k,t-1} + \delta_k + \varepsilon_{kt} \tag{6.22}$$

where δ_k is community fixed effect. For (6.21) and (6.22), the coefficient α_1 should be close to unity and the coefficient α_2 is close to zero. The intuition of both models is the income should be observable and therefore it should not change as the whole community's consumption change.

6.3.6 Endogenous Group Formation

In a complete market world, all individuals in a community perfectly share risk. This is explained in the earlier section, where I show that regardless of its income history, a household in a community consumes a constant fraction of the community income. This means that consumption growth of two households in a community will be perfectly correlated. For illustration, take two households in a community and let their consumption be $c_{1,t}$ and $c_{2,t}$ at date t. The perfect risk sharing with a homothetic preference means that $c_{1,t}/c_{2,t}$ is either a constant over time or serially uncorrelated. Individual history of income of 1 and 2 does not determine their income. All income risks are pooled through security market. I have explained in earlier section, how this can be accomplished using Arrow-Debreu markets.

The implicit assumption here is that all financial contracts are honoured and there is no reneging from the individuals after a contract is agreed and signed. In a world with extreme form of incompleteness of markets, this kind of risk pooling is impossible. Therefore, if households are unable to access the formal insurance markets in order to smooth their consumptions, they should look for another type or mechanism of insurance. The alternative to market completeness is to form groups in the community where members within the group will have an implicit contract to help each other to insure against individual specific idiosyncratic shocks. In many developing countries, this can be done by forming a risk sharing group or coalition through a contractual agreement between them: the contract may be implicit or explicit. This kind of group formation is fragile because a subgroup of individuals can defect anytime from the group and form a coalition to defeat the risk sharing arrangement. I use Bold's model (2009) to examine risk sharing arrangement between households.

Bold (2009) derives conditions for coalition proof group formation where it is not incentive compatible for agents to defect from a group and form coalition of this nature. The basic principle is that the past history of relative consumption of groups must influence current consumption. In addition, individual income should also influence the current $c_{1,t}/c_{2,t}$. There are two conditions of contracts considered in Bold's model: a sub-game perfect contract and a coalition-proof contract. Consider a sub-game perfect contract of three players with two possible outcomes: high-income realisation y_h and low-income realisation y_ℓ.

In date t, household 2 and 3 agree to support household 1 who has y_ℓ. If this arrangement is an equal-sharing allocation and is not self-enforced, then household 2 and 3's consumption and payoffs should be indifferent between cooperating or defecting. These households will cooperate as long as the payoff to cooperate is at least the same as they would have in autarchy. In a sub-game perfect contract, the "second-best" stays the same as in equal-sharing allocations since a player's autarchy payoff is determined by this player's income realisation, and is not based on the history of the game.

In a coalition-proof contract, consider the same number of players or households where up to date t, the history in this contract is similar to the one described in a sub-game perfect contract. Now suppose household 1 and 2 have y_h in date $t+1$ and agree to support household 3 who has low-income realisation y_ℓ. In a coalition-proof contract, household 1 and 2 are better off in risk sharing rather than in an autarchy condition. Therefore, their consumption should be adjusted to the level where they

are indifferent to cooperating or defecting jointly. A summary of Bold's model (2009) is provided in Appendix 6.A.

Bold's model for endogenous group formation can be empirically examined using specifications as follows:

$$\frac{c_{1,t}}{c_{2,t}} = \phi_0 + \phi_1 \frac{c_{1,t-1}}{c_{2,t-1}} + \phi_2 \log y_{1,t} + \phi_3 \log y_{2,t} + \phi_4 \log Y_t + \varepsilon_t \tag{6.23}$$

$$\begin{aligned} \frac{c_{1,t}}{c_{2,t}} = {} & \phi_0 + \phi_1 \frac{c_{1,t-1}}{c_{2,t-1}} + \phi_2 \log y_{1,t} + \phi_3 \log y_{2,t} + \phi_4 \log Y_t \\ & + \phi_5 \left(\left(\frac{c_{1,t-1}}{c_{2,t-1}} - 1 \right)^2 \times \log y_{2,t} \right) + \varepsilon_t. \end{aligned} \tag{6.24}$$

where $\frac{c_{1,t}}{c_{2,t}}$ denotes the ratio between household 1's consumption and household 2's consumption at date t, $\frac{c_{1,t-1}}{c_{2,t-1}}$ denotes the ratio between household 1's consumption and household 2's consumption at date $t-1$, $\log y_{1,t}$ and $\log y_{2,t}$ denote log income of household 1 and 2 at date t respectively, and $\log Y_t$ denotes log income for respective community at date t.

Both equations estimate relative change in shares between household 1 and 2. I calculate the income change or growth from IFLS2 and IFLS3 and then classify the households into two groups: household 1 is a group that has low-income growth and household 2 has high-income growth.

The regression given by (6.23) examines whether constrained households' past history given by the past marginal utility ratio is statistically adequate to explain their own consumption. If the groups are exogenously formed, then the coefficient for $c_{1,t-1}/c_{2,t-1}$ is statistically insignificant.

If otherwise, then the groups are endogenously formed where there is an increase in $c_{2,t-1}$ followed by relative increase in $c_{1,t-1}$. In this case, household 2 is expected to have a higher payoff than household 1 due to the binding of enforcement constraints. Therefore, the coefficient is expected to be positively significant.

In the second regression (6.24), the interaction term $\left(\frac{c_{1,t-1}}{c_{2,t-1}} - 1 \right)^2 \times \log y_{2,t}$ is introduced to examine the effect between consumption shares and household two's current income. The effect of household two's income changes on the current marginal ratios is determined by the marginal ratio of household 1 and 2 from the previous date under endogenous group formation.

6.3.7 Summary

Based on the discussions of the previous sections, the alternative models of risk sharing is summarised in Table 6.3.1 where a specific test is given for each model. In this table, the empirical analysis starts with different type of barriers to insurance, which impede formal insurance for the IFLS households, and then examines the endogenous group formation of risk sharing networks.

6.4 Data

The data are gathered from the Indonesia Family Life Survey. These longitudinal surveys consist of two levels: community and household surveys where the latter can be decomposed into individual and family level. There are four waves so far: IFLS1 in 1993, IFLS2 in 1997, IFLS3 in 2000, and IFLS4 in 2007. In IFLS, around 90% of sample households are retained from the first wave until the latest which is considered the advantage of using this data set to make an economic analysis of risk sharing and related testable implications. For this study, I only use IFLS data up until Wave 3. I cannot utilise IFLS4 data due to inadequate information to convert consumption data so it can be spatially and temporally adjusted.

Furthermore to conduct the empirical analysis, the data should fulfil some conditions: (1) all necessary information regarding household variables are available, meaning that only households who exist for all waves are considered, (2) these variables, particularly consumption and income, do not take extreme values; any extreme values will have five percentiles trimmed from the top and bottom of the respected distribution, and (3) households stay within their villages for the whole period.

To test coalition among households as formulated in (6.23) and (6.24), I use community data that consist of at least three households. The descriptive statistics for relevant analysis are given in Table 6.4.1. The consumption is measured by per capita expenditure (PCE) and the income is also measured by per capita income (PCI). This means that the consumption and income for each household is divided by the number of people living in that household.

However, two potential problems may arise if Least Squares estimators are applied to the estimate equation that includes consumption and income, namely the endogeneity of income change and income measurement error.

Table 6.3.1
Summary of Risk Sharing Hypotheses and Related Tests

	Specification		Expected Sign
Full risk sharing	$\ln c_{ik,t} = \alpha \ln y_{ik,t} + \theta_{ik} + \delta_{kt} + \varepsilon_{ik,t}$	(6.16)	$\alpha = 0$
Borrowing-saving	$\ln c_{i,t} = \alpha_0 + \alpha_1 \ln c_{i,t-1} + \theta_i + \delta_t + \varepsilon_{i,t}$	(6.18)	$\alpha_1 \neq 0$
Saving only	$\ln c_{i,t} = \alpha_0 + \alpha_1 \ln y_{i,t-1} + \theta_i + \delta_t + \varepsilon_{i,t}$	(6.19)	$\alpha_1 < 0$
Hidden income	$\hat{\varepsilon}_{i,t} = \varphi_0 + \varphi_1 \ln y_{i,t-1} + u_{i,t}$	(6.20)	$\varphi_1 > 0$
Moral hazard and limited commitment	$\ln\left(\frac{\sum_{i=1}^{N} 1/c_{ik,t}^{-\gamma}}{n}\right) = \alpha_0 + \alpha_1 \ln\left(\frac{\sum_{i=1}^{N} 1/c_{ik,t-1}^{-\gamma}}{n}\right) + \alpha_2 \ln y_{ik,t-1} + \theta_i + \varepsilon_{ik,t}$	(6.21)	$\alpha_1 \neq 0,\ \alpha_2 = 0$
	$\ln c_{kt} = \alpha_0 + \alpha_1 \ln c_{k,t-1} + \alpha_2 \ln y_{k,t-1} + \delta_k + \varepsilon_{kt}$	(6.22)	$\alpha_1 \neq 0,\ \alpha_2 = 0$
Endogenous group formation	$\frac{c_{1,t}}{c_{2,t}} = \phi_0 + \phi_1 \frac{c_{1,t-1}}{c_{2,t-1}} + \phi_2 \log y_{1,t} + \phi_3 \log y_{2,t} + \phi_4 \log Y_t + \varepsilon_t$	(6.23)	$\phi_1 \neq 0$
	$\frac{c_{1,t}}{c_{2,t}} = \phi_0 + \phi_1 \frac{c_{1,t-1}}{c_{2,t-1}} + \phi_2 \log y_{1,t} + \phi_3 \log y_{2,t} + \phi_4 \log Y_t + \phi_5 \left(\frac{c_{1,t-1}}{c_{2,t-1}} - 1\right)^2 \times \log y_{2,t} + \varepsilon_t$	(6.24)	$\phi_1 \neq 0, \phi_5 \neq 0$

To address these potential problems, I use two instruments for household level tests: asset and health measures. The first instrument is household assets, which include current and fixed assets. In the IFLS, household assets include the house, vehicles, appliances, savings, jewellery, furniture and utensils. I also include assets that are used by households for farming and non-farming businesses.

The second instrument that can be utilised is activities of daily living or ADLs (from now it will be referred as ADL or ADLs). ADL is a measure that indicates the physical ability of an individual to perform daily living activities. The reliability and validity of ADLs have been tested extensively, mainly in the United States and Southeast Asia (see Gertler and Gruber, 2002). The ADLs is transformed into an index as follows

$$\frac{\text{Score} - \text{Min. Score}}{\text{Max. Score} - \text{Min. Score}}.$$

The ADL index takes on values from 0 to 1, where zero is when the individual cannot perform any ADLs at all and one is when the individual can easily perform all of the ADLs.

In IFLS, the ADLs are divided into 10 components. These are ability to carry a heavy load for 20 metres, ability to walk for 5 kilometres, ability to walk for 10 kilometres, ability to bow, squat and kneel, ability to sweep the house floor, ability to draw a pail of water from a well, ability to stand up from sitting on the floor without help, ability to stand up from sitting position in a chair without help, ability to bathe without help, and ability to dress without help. The first four activities are classified as intermediate ADLs, while the last five activities are classified as the basic ADLs (see Nguyet and Mangyo, 2010).

For community or village level tests, the instruments are rainfall and the availability of financial institutions. Rainfall or precipitation rate is commonly used for income at community level. Since most of the regions in Indonesia are dominated by agricultural occupation, it is feasible to use rainfall as an instrumental variable (for example see Arezki and Brückner, 2012; Fichera and Savage, 2015). The daily rainfall data are obtained from the Indonesian Agency for Meteorological, Climatological and Geophysics (BMKG). I use the last year average precipitation for each IFLS wave respectively, then match these data using community data using altitude and longitude to nearest BMKG weather station. The data from 25 BMKG stations are matched with 310 IFLS communities. The matching process is done by calculating a community location to the nearest station.

Table 6.4.1
Summary Statistics of Key Variables

Per capita income and per capita consumption figures are in monthly and in 2000 Indonesia rupiah. The values are transformed into logarithmic values. ADLs denote activities of daily living index. Log of household assets are calculated from total value of assets for each household in 2000 Indonesia rupiah. *Source*: author's calculations from IFLS data set.

Variable	Obs.	Mean	Std. Dev.	Min	Max
			IFLS1 – 1993		
log(Asset)	2983	16.4163	1.8059	9.1528	22.6116
log(PCE)	3014	11.9606	0.7678	9.4761	15.6449
log(PCI)	3014	10.4283	2.0057	0.9641	18.6922
ADLs	3014	0.7593	0.0697	0.1667	1
			IFLS2 – 1997		
log(Asset)	2824	16.9993	1.8739	7.6834	23.2693
log(PCE)	3014	12.3732	0.7711	9.9135	17.2958
log(PCI)	3014	11.5175	1.41564	−1.5757	18.8558
ADLs	3014	0.9679	0.0846	0	1
			IFLS3 – 2000		
log(Asset)	2897	16.9239	1.8724	6.2146	22.4968
log(PCE)	3014	12.3829	0.7116	10.2886	15.5103
log(PCI)	3014	11.5690	1.1714	5.6268	17.2419
ADLs	3014	0.9607	0.0976	0	1

The second instrument for income at community level is the presence of formal financial institutions in that village or community. IFLS provides some relevant information with respect to formal financial institutions such as the presence of formal financial institution within the village or community, the distance to nearest bank or other formal financial, mode of transportation and transportation cost to reach the institution. These are relevant and possible instruments that can be used for community-level analysis in particular related to financial market variables.

As of 2000 or in IFLS3, the majority of people in the IFLS are working in the agricultural sector: this comprises 35% of the total sample. Furthermore, in rural areas 51% of the IFLS samples are working in the agricultural sector (see Table 3.B.6 for more detail). Most of these households also live in rural area. Based on the community data, more than 55% of the IFLS communities are located in rural area.

In this study, community is considered as a risk sharing unit. To assess risk sharing within communities, the IFLS provides information on community participation

such as Roscas (rotating saving and credit associations) for each respondent along with individual social and economic characteristics. For endogenous group analysis, I use the data from IFLS3 and IFLS2. IFLS1 however do not provide information about Roscas.

6.5 Analysis and Discussions

Roscas characterise many aspects in finance development in Asia including Indonesia. Therefore, the discussion of finance is incomplete if this informal finance is not included. Such institutions mobilise financial resources in local community or village, where this will enable to foster economic development in the community.

Arisan or Roscas have long been known in Indonesia as a part of the social and economic tradition. Indonesian households use various forms of Rosca to share their risk. With diverse demographic characteristics, Roscas are generally formed by group of people who usually have weekly gathering and rotate part of the pooled assets in certain ways using random pot or systematic rotation. Since Roscas are a simpler approach to conducting financial contract than formal financial institutions, a lot of people, especially those who are credit constrained, prefer to use Roscas: this is particularly the case for short-term needs.

Roscas depend on social factors such as family relationship and social ties. This factor may also limit other people to join the group if they do not have the common factor. Cole and Slade (1996) describe common features that usually exist in Roscas. It requires certain contribution payment in a regular basis for its members based on mutual trust between them and usually no interest rate is specified or paid. The payment is then pooled and distributed accordingly to certain mechanisms.

The Rosca members agree to have periodic meetings or gatherings where the pooled fund is rotated and rotated between members. The members will get back their contribution based on the amount they put in. Some people may join more than one Rosca to diversify their risk. Some people may also contribute and pay more than average members. The money is usually used for special expenditures such as wedding, education expenses or unanticipated events. The cycle of the rotation depends on the number of members.

The book keeping is usually managed at least by one member who keeps records of the fund and its distribution. In some groups, the distribution is based on initial agreement between members and others may have random order. In some urban area

where the members consist of higher income people, the groups may turn into a social club where the distribution is usually random and to some extent may exhibit gambling aspects. Roscas may fail if the members do not make an adequate contribution.

Other community-based arrangements that operate based on the same principles as Roscas can be found in village level. For example, Seibel (2008) studies LPD (*Lembaga Perkreditan Desa*) or a village credit institution in Bali which is integrated fully with local culture. This study provides a comprehensive framework of LPD as a financial institution which is owned and organised by the customary village (*desa adat*). It is strongly influenced by cultural and religious value. It has also several advantages in reaching people who do not have access to formal institutions. With regard to risk sharing arrangement, some of these institutions succeed but some are not successful. Although it manages substantial amount of funds, these institutions are not supervised by the central bank.

Based on these facts, this section presents and discusses the testable implications of several risk sharing hypothesis and related empirical tests as given in Table 6.3.1. The main research question is identifying different type of barriers to insurance, which lead to endogenous group formation.

6.5.1 Full Risk Sharing Tests

If full risk sharing exists, household's consumption should not move with the changes in income, but should move with the average consumption within a community. However this is not the case for the IFLS households because of the barriers to insurance that exist.

I undertake tests given in (6.15) and (6.16) are employed. The results are presented in Table 6.5.1. For regression with a household-fixed effect, there is a change in income is associated with 11.4% change in per capita consumption (see Column (1)). This measure also explains the magnitude of household consumption smoothing without taking community into consideration. Then by adding the community effect, the correlation between per capita income and expenditure decreases to 5.4% (see Column (2)).

The potential problem that could arise from these regressions is the classical measurement errors which lead the estimated α to decrease toward zero. The results also show that indeed the α is close to zero in particular for the first result. The problem exists because the income estimation is correlated with the measurement error, which is the case for the second result.

Table 6.5.1
Full Risk Sharing: Individual and Community Level

The household consumptions and incomes are deviations from means of respective household variables. All variables are in 2000 Indonesian rupiah. In Column (3) and (4), ADLs of the household's head and log of household assets are use as instruments and passed the endogeneity test for final estimation (Column (4)). See Appendix 6.B for full results. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from IFLS data set.

	Log of per capita expenditure			
	(1)	(2)	(3)	(4)
Log of per capita income	0.114***	0.0535***	0.355***	0.102**
	(0.0047)	(0.0050)	(0.0140)	(0.0465)
Households	3014	3014	2946	2946
Observations	9042	9042	8644	8644
Community-wave fixed effect	No	Yes	No	Yes
Sargan statistic			17.290	0.2940
p-value			0.000	0.5877
R^2	0.090	0.236	−0.324	0.185

To address this problem, I instrument ADLs and log of household asset with respect to log per capita income. These variables are relevant to provide explanation of the changes in per capita income, which are calculated from deviations of per capita income. Moreover, there is correlation between health and income where this is supported by Fichera and Savage (2015). Household assets may also provide some protection against shocks since households usually accumulate their wealth in terms of physical assets.

Tests for the instrumental variables along with first-stage estimation results for Table 6.5.1 are given in Appendix 6.B (Table 6.B.4 and 6.B.5). The instruments are valid indicated by the values of Sargan test statistics. For the third regression, these instruments are weak since it appears to invalid. After adding community-wave dummy, these two instruments are valid and passed the Sargan endogeneity tests in particular for estimation in Column (4) where the test of over identifying restrictions cannot reject its null hypothesis. To test the joint significance of community-wave effects, $F-$statistics are statistically significant. This also provides a strong indication that indeed communities play important role in providing insurance mechanisms for households.

From Table 6.5.1 Column (3), the coefficient of log per capita income changes into 35.5%. Since the coefficients are statistically significant, there is indirect evidence

that community level (indicated by community-wave indicators) is providing insurance to households. This is indicated by the correlation between income and consumption, which has decreased to 10.2% (see Column (4)). However, the risk sharing is incomplete. The remaining questions are on what kind of barriers limit risk sharing and the way households can smooth their consumption.

6.5.2 Consumption Smoothing Tests

Credit markets may have important impacts as insurance markets or mechanisms: they are less effective in providing protection for households. The purpose of this section is to investigate the availability of the insurance mechanisms provided by credit markets.

Table 6.5.2 provides results for the borrowing-saving, and saving only tests. These two tests are to some extent related to the existence of credit or financial markets. Column (1) provides the results from borrowing-saving test given by (6.18). The results show that the current consumption for IFLS households is associated with the lag of consumption indicated by per capita expenditure in the previous waves by 35.8%. Since the past marginal utility of consumption is sufficient to predict current marginal utility, IFLS households are able to conduct borrowing and saving to smooth their consumption. This means that households can partially smooth their consumption by performing transactions with the credit markets.

Table 6.5.2 Column (2) provides the results for the saving only model as given in (6.19). Under the saving only model, the hypothesis is rejected since there is positive correlation between current consumption and past income. Given the condition where households are not able to borrow, this means that the IFLS households cannot sufficiently mitigate risks by using only their own resources. They must have other mechanisms for risk mitigation: self insurance is insufficient. The result can be also used to support the need for risk sharing.

6.5.3 Hidden Income Test

Another problem, which probably caused the full risk sharing test to fail, is hidden income. Households who engage in risk sharing groups may not fully reveal their actual income.

To identify this problem, a hidden income test as given in (6.20) is conducted and the results are presented in Table 6.5.3. It can be inferred from the results that

Table 6.5.2
Borrowing-Saving and Saving Only Tests

All variables are in 2000 Indonesian rupiah. PCE is per capita expenditure which represents per capita consumption for each household. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from IFLS data set.

	(1) Log of PCE	(2) Log of PCE
Constant	7.881^{***}	12.46^{***}
	(0.291)	(0.0633)
Lag of log per capita expenditure	0.358^{***}	
	(0.0118)	
Lag of log per capita income		-0.00678
		(0.00541)
Households	3014	3014
Observations	6028	6028
Community fixed effect	Yes	Yes
Overall R^2	0.3782	0.0009

Table 6.5.3
Hidden Income Test

All variables are in 2000 Indonesian rupiah. PCE is per capita expenditure which represents per capita consumption for each household. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from IFLS data set.

	Residuals
Constant	-0.261^{***}
	(0.0413)
Lag of log per capita income	0.0238^{***}
	(0.0460)
Households	3014
Observations	6028
Community fixed effect	No
Overall R^2	0.0055

the residuals are correlated with income from the previous wave. The significantly positive coefficient of lag income indicates some of IFLS households do not fully reveal their income. This suggests that the failure of full risk sharing can be explained by hidden income indicated by a positive and significant income coefficient. Since the value is small at 2.38%, this means the correlation effect between hidden income and predicted consumption is small.

Moreover, the test does not clearly explain variations within the observation since the explanatory power is relatively small. This suggests that additional information from the previous period provides a less predictive power of previous history. Therefore, the result of this test provides an explanation of why efficient risk sharing does not occur between IFLS households.

6.5.4 Moral Hazard and Limited Commitment Tests

Moral hazard implies a hidden type of household. Limited commitment implies hidden commitment from households, which also means that households may leave the risk sharing group.

Under limited commitment or moral hazard, the current marginal utility of consumption should depend on the previous marginal utility. In this case, the parameter of α_1 should be different than zero and α_2 should be zero given by (6.21) and (6.22). Parameter α_2 provides any information from the previous date which is captured in the income component. Table 6.5.4 and 6.5.5 provide the results for moral hazard and limited commitment tests. The estimation results of (6.21) are given in Table 6.5.4 and the results in Table 6.5.5 are based on (6.22) respectively.

In the first part, I investigate the risk preference at community level which is given by parameter γ that denotes the degree of risk aversion. In Table 6.5.4, setting the value of parameter γ range between one and two, the lag consumption moments are decreasing, while the average log income is increasing. When parameter γ equal to 1 or risk neutral, the coefficient for lag consumption moment is significantly negative but has a higher value when $\gamma > 1$. The average of the log of the previous income coefficient and the value of the constant are significantly positive. However, when communities are willing to take more risk, indicated by the value of parameter γ is greater than one, their current consumption can be predicted by the previous consumption. Given different parameter values, the results imply that neither limited commitment or moral hazard is not able to explain the failure of full risk sharing in the community.

Table 6.5.4
Moral Hazard and Limited Commitment Tests
Using Raw Moments

This table presents simulation results based on (6.21). All variables are in 2000 Indonesian rupiah. The constants and coefficients for log income are increasing as the parameters of γ are decreasing. Robust OLS estimation with fixed-effects are employed. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's simulation using IFLS data set.

	Consumption moment					
	(1)	(2)	(3)	(4)	(5)	(6)
γ value (simulated)	1.00	1.20	1.40	1.60	1.80	2.00
Constant	17.93^{***}	21.98^{***}	26.01^{***}	30.01^{***}	33.98^{***}	37.93^{***}
	(0.526)	(0.642)	(0.758)	(0.878)	(1.000)	(1.127)
Log of previous	-0.577^{***}	-0.609^{***}	-0.628^{***}	-0.638^{***}	-0.644^{***}	-0.646^{***}
consumption moment	(0.0537)	(0.0539)	(0.0538)	(0.0535)	(0.0534)	(0.0533)
Average log of	0.174^{***}	0.219^{***}	0.264^{***}	0.307^{***}	0.350^{***}	0.392^{***}
previous income	(0.0231)	(0.0292)	(0.0358)	(0.0429)	(0.0504)	(0.0583)
Community	310	310	310	310	310	310
Observations	620	620	620	620	620	620
Adjusted R^2	0.480	0.508	0.520	0.522	0.518	0.512
$F-$statistic	57.72	63.69	68.17	71.06	72.68	73.46
$p-$value	0.00	0.00	0.00	0.00	0.00	0.00

Table 6.5.5
Moral Hazard and Limited Commitment Tests
at the Community Level

This table presents estimation results based on (6.22). All variables are in 2000 Indonesian rupiah. The OLS method is used in (1) which suffers from endogeneity problem. In Column (2), the average log community income is instrumented using rainfall rate in the previous year and the presence of formal banking in the community. The instruments passed the endogeneity test. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from IFLS data set.

	(1) Consumption level	(2) Consumption level
log(Lag of community consumption)	-0.167^{***}	-0.132^{*}
	(0.0343)	(0.0609)
log(Lag of community income)	0.0409^{*}	-0.105
	(0.0178)	(0.204)
Community	310	310
Observations	620	620
R^2	0.079	-0.122

To confirm the results presented in Table 6.5.4, the second test given by (6.22) is conducted. The results are presented in Table 6.5.5 where the consumption and income level are calculated based on the total per capita consumption and per capita income for each community respectively. The first column of Table 6.5.5 shows the results derived from the OLS method which suffers from the classical measurement errors indicated by the correlation between residuals and dependent variables (for complete results, see Table 6.E.1).

To overcome this problem, I use two instrumental variables at household level: the previous year?s rainfall rate and the presence of formal banking within the community. Rainfall rate is a variable that is commonly used to instrument income variable. However, for village-level regressions, this is not adequate because the result of overidentifying restrictions is not valid or in other words it is exactly identified. At least one instrument should be added which in this case is the presence of formal financial institution: this is measured by the distance to nearest bank or other formal financial institutions. With these two instruments, the test of overidentifying restrictions cannot reject its null hypothesis as indicated by the Sargan statistic. Table 6.E.2 provides the results along with the first-stage regression.

The results are summarised and given in the second column of Table 6.5.5. Based on this table, it can be inferred that the previous period of consumption at community level is able to predict current consumption while the coefficient of the log of previous income level cannot be distinguished from zero. This may suggest that limited commitment or moral hazard may explain the failure of full risk sharing. This result is different from the results in Table 6.5.4. One possible explanation for this, is that the risk preference parameter may not be sufficient to distinguish the information captured by previous community income.

6.5.5 Endogenous Group Formation Tests

Given that $\alpha < 1$ in Equation (6.16) implies full risk sharing failure between IFLS households, the next question is how consumption smoothing may take place. The common explanation for this is that households have access to informal credit or insurance instruments that lead to risk sharing group formation. The results in Table 6.5.1 also provide evidence that communities play an important role in consumption smoothing. The risk sharing mechanisms may take place in various groups such as in the workplace or in the village. Therefore, this section examines how a risk sharing

group or network can be formed. The risk sharing is examined at community level. In addition, this section also assesses Roscas as a case study of risk sharing groups.

The model assumes that constrained and unconstrained households can be properly distinguished. Under endogenous group formation, the consumption of constrained households is determined by the history or past information relatinf to shocks, as well as the interaction of current income with other households who are also constrained. According to Borch's rule, the ratio of marginal utility of consumption is a sufficient statistic to capture the history of the game.

Therefore, to estimate the existence of endogenous group formation, the samples are divided into two groups: low and high-income growth. The low-income group consists of households who experience a change of income below or equal to one and greater than one for the high-income group. The households then are paired with their respected counterpart within their community according to (6.23) and (6.24). There are 311 communities used in the full sample analysis after treatment. By filtering the subsamples based on the Roscas participation, there are 36 communities used in the third analysis.

The empirical tests of endogenous group formation is the complement to the risk sharing model with moral hazard and limited commitment since it is based on the assumption of imperfect enforceability. Similar to the full risk sharing hypothesis, Equation (6.23) and (6.24) also assume that households exhibit constant relative risk aversion (CRRA).

Table 6.5.6 presents the results of endogenous group formation test of the IFLS households. As indicated in Column (1) and (2), if there is no treatment on the data, the heteroskedasticity problem arises for both tests. Therefore, I conducted several simulations to get the optimal value for $c_{1,t-1}/c_{2,t-1}$ which is 1.8. Then, the observations above this value are dropped.

The results in Column (3) show that endogenous group formation exists in IFLS households indicated by positive and significant coefficients for $c_{1,t-1}/c_{2,t-1}$. In explaining the change in their own consumption, this test examines the importance of the past history of constrained households, provided by the past marginal utility ratio. However, it the nonlinearity problem in the regression residuals should be noted, as indicated by the Ramsey RESET test. However, by adding the interaction effect $\left(\frac{c_{1,t-1}}{c_{2,t-1}}-1\right)^2 \times y_t^2$ as given by (6.24), this problem is alleviated. This interaction term can be also interpreted as the difference of initial consumption between household 1 and household 2. Under endogenous group formation, the effect of this interaction term

is expected to be low as the difference of initial consumption is high. The coefficient of this interaction term is significantly negative with small value. This implies that when the interaction term is imposed, it provides more evidence for the importance of past information in explaining the group formation.

Table 6.5.6 Column (3) presents the results for (6.23) that show a small value of $c_{1,t-1}$ relative to $c_{2,t-1}$ implies a minimum payoff for household 1 which is optimal to deter a deviation. But when $c_{1,t-1}$ is higher than $c_{2,t-1}$, then household 2 will have a continuation payoff which is also the minimum payoff and household 1 will get the maximum payoff. Under exogenous group formation, the coefficient of $c_{1,t-1}/c_{2,t-1}$ implies that the optimal punishment path will lead to autarchy conditions.

The income coefficients of household 1 and 2, which have different signs, confirm that there is transfer between them as stipulated under risk sharing networks. The higher value of income coefficient for household 1 tells us that the benefit exists under this arrangement. Household 2 experiences a relatively small change in their income. The coefficient of community income also implies that there is correlation between households with overall income in that community. This is consistent with risk sharing hypothesis.

To observe participation in risk sharing groups, the study uses the information about Rosca participation given in IFLS. Table 6.5.6 Column (5) and (6) provide the results from subsamples based on Rosca participation. Since the coefficient of $c_{1,t-1}/c_{2,t-1}$ in this regression is lower than the coefficient in Column (3), the benefits of risk sharing are not fully captured by Rosca participation. This is also supported by the coefficient of community income, which is statistically insignificant. Although there is an income transfer between household 1 to household 2 as indicated by the value of respected variables, the potential of risk sharing is not fully achieved by Roscas as an insurance mechanism.

In summary, the estimations in Table 6.5.6 Column (3) and (4) provide stronger evidence of the existence of endogenous group formation compare to the results of full samples in Column (1) and (2). This is indicated by a significantly positive coefficient of ϕ_1. Furthermore, this result also confirms that the past history of constrained household can be used to explain current consumption.

Table 6.5.6
Empirical Tests of Consumption Shares

This table presents the testable implications of endogenous group formation. Only communities with at least three households are included in the tests. Column (1) and (2) provide the results for the treatment applied to the data. The treatment is conducted by dropping observations where ratio of $c_{1,t}/c_{2,t}$ is above 1.8. The tests for full samples after treatments are given in Column (3) and (4) while Column (5) and (6) present the results for those who join Roscas. IFLS2 and IFLS3 are employed for these tests. All variables are in 2000 Indonesian rupiah and per capita. Standard errors are reported in parentheses. Coefficients significant at the 10% level are denoted by *, at the 5% level by **, and at the 1% level by ***. *Source*: author's calculations from the IFLS data set.

	Before treatment		Full samples		Rosca only	
	(1)	(2)	(3)	(4)	(5)	(6)
$c_{1,t-1}/c_{2,t-1}$	0.0981***	0.264***	0.318***	0.272***	0.297***	0.299***
	(0.00347)	(0.00608)	(0.00744)	(0.00836)	(0.0464)	(0.052)
Household 1's income	0.471***	0.420***	0.0604***	0.0596***	0.0739***	0.0741***
	(0.0113)	(0.0111)	(0.00302)	(0.003)	(0.0189)	(0.0191)
Household 2's income	−0.115***	−0.103***	−0.0150***	−0.0107***	−0.0588***	−0.0589***
	(0.0111)	(0.0109)	(0.00284)	(0.00285)	(0.0160)	(0.0161)
Community income	−0.0895***	−0.0724***	−0.0143***	−0.0150***	−0.0369	−0.0369
	(0.0154)	(0.0151)	(0.00397)	(0.00395)	(0.0256)	(0.0257)
$\left((c_{1,t-1}/c_{2,t-1})-1\right)^2 \times y_{2,t}$		−0.000229***		−0.0162***		0.000667
		(0.00000694)		(0.00138)		(0.00835)
Constant	−1.170***	−1.263***	0.273***	0.323***	0.920*	0.918*
	(0.268)	(0.262)	(0.0697)	(0.0695)	(0.441)	(0.442)
Observations	25167	25167	15911	15911	399	399
Adjusted R-square	0.103	0.140	0.134	0.141	0.159	0.157
Ramsey RESET tests						
F-value	427.29	217.61	47.42	2.91	3.11	3.21
Prob>F	0.0000	0.0000	0.0000	0.0329	0.0263	0.0231
Heteroskedasticity tests						
$\chi^2(1)$	427.29	19834.78	32.21	54.32	1.33	1.41
P-value	0.0000	0.0000	0.0000	0.0000	0.248	0.2335
Mean VIF	1.08	1.95	1.08	1.18	1.18	1.26

6.6 Robustness Results

The panel regressions results presented earlier are subject to a limitation because of the limited number of waves. There are three waves of IFLS1 (1993), IFLS2 (1997), and IFLS3 (2000) which are three and two years apart respectively. For full risk sharing tests this is not a problem because left hand side and right hand side variables are both contemporaneous. However, for other test results where lagged variables are introduced as an explanatory variable, a legitimate concern is about the consistency of the series across waves. It is possible that a household surveyed in one wave might have changed its occupation or profession in the subsequent wave because several years have passed between two waves. Therefore, the risk sharing arrangement of households across different waves might not represent the risk sharing arrangement portrayed by the theoretical model, which assumes identical households. This is a problem which is endemic to any panel study with a limited number of waves (for example see Fichera and Savage, 2015; Frankenberg et al., 2003).

6.6.1 Robustness Results for Consumption Smoothing

To deal with this problem, this study conducts two types of robustness checks for consumption smoothing tests. Firstly, households? occupations are classified and the same battery of tests is run for each occupation and see whether a similar result holds. Secondly, weights are attached to observations in different waves, with greater weight to the latest wave and smaller weights to the earlier wave. These weights are of course arbitrarily chosen. and so alternative weights are used and the results examined, which provides the optimal goodness-of-fit measures. The results are reported in the Appendix 6.C. For robustness checks, it is found that agriculture and forestry accord well with earlier risk sharing result for both robustness checks. This means that on average people who are working in agriculture, forestry, and fishery sector tend to conduct transactions with banks and other credit institutions than the rest. Given that agriculture and forestry comprise about 76% of the sample, the study considers this as an adequate robustness check of my basic test results.

Since the value of consumption in the previous period is lower than in the full test, this suggests that the impact would not be higher than the overall households. Table 6.C.3 provides the same regressions using industry category for the saving only model. The results are quite similar across the occupational sectors or industry. This supports findings given in the full test where households across different occupation

may not be able to protect against risks using their own savings (see Table 6.C.4). Therefore, using this robustness checks, only the results for households who work in agriculture, forestry, and fishery sector are consistent with the initial findings for borrowing -saving and saving only tests.

For the second robustness check, the results using pooled estimation are not close to the results in Table 6.5.2. Moreover, giving more weight to the recent data increases the coefficients of lag consumption, which is not theoretically sufficient. Another reason is that the log of consumption for IFLS3 are correlated with the interpolated values of weighted variables in the pooled regressions. Therefore, a robustness check is conducted using interpolated values derived from IFLS1 and IFLS2 data, and then regress it to IFLS3 data.

The results of the second robustness check for borrowing-saving and saving only tests are given in Table 6.C.5 and 6.C.6 respectively. However, the results may not be as strong as in the previous robustness: a number of observations should dropped to gain optimal results and to achieve similar coefficients in Table 6.5.2. For both borrowing-saving and saving only test, the observations in the second robustness check are dominated by households who work in agriculture, forestry and fishery sector. This comprises 76.85% of all observations in this robustness check. Therefore, based on the second robustness check it can be inferred that the results in Table 6.5.2 are consistent for households who work in agriculture, forestry and fishery sector.

6.6.2 Robustness Results for Hidden Income Tests

Since the hidden income test is quite similar to the borrowing-saving and saving only tests, the year gap may also become a problem to the estimation results due to the nature of IFLS data. Therefore, the study uses two types of robustness check, which are similar to the previous section: regressions based on occupational sector or industry and weighted values of lagged variables. The results are provided in Appendix 6.D.

Table 6.D.2 provides the results for the first robustness check. There are two occupation or industry classifications that have similar results in the initial hidden income test: (1) agriculture, forestry, and fishery, (2) social services. As expected, households who work in agriculture, forestry, and fishery may exhibit similar characteristics as in the initial results. In this category, household income is quite volatile and is determined by factors that are not easily predictable such as weather and other environmental-linked variables. This may affect some households who may not fully disclose information about their true income. This also implies that these households

may not fully rely on their risk-sharing group. The other reason is possibly their educational background: most people who work in this industry have lower level of education than in other sectors.

On the other hand, households who work in social or community services have different characteristics compared to those who work in other industries. However, they exhibit similar patterns as in the initial result of hidden income test. This is probably due to the nature of the social sector, which is not a profit-oriented service. People who work in this sector may have less commitment in their risk-sharing group since they may have less cohesiveness. Therefore, they may not fully disclose their income to their group.

In the second robustness check, the similar procedure is applied as in the previous section. The results are given in Table 6.D.2. However, the second robustness check for hidden income test employs "two-step" regression. The first regression is intended to derive residual values from consumption regression against interpolated values of previous consumption values using arbitrary weights. The aim of the second regression is to infer hidden income information by using residuals from the first regression and regress it against the interpolated values of previous income values using arbitrary weights.

Since the optimal weights are already known from the previous section, the next step is to simulate possible regression with different values to get similar results in Table 6.5.3. The closest result is when the observation values for log of per capita income higher than 11 are dropped. Therefore, the cut-off point for log of per capital income to get a similar result in the initial regression is 11, which is higher than the cut-off points for robustness check of borrowing-saving and saving only tests. Hidden income may take place when households have higher per capita income than in the case of borrowing-saving or saving only test. In other words, the explanation that the failure of the full risk sharing test due to hidden income exists when households have higher income if they do not fully use credit markets or their own savings.

Although many observations have been excluded , the results can be used to support the initial findings of the hidden income test. Moreover, the households' occupations that are used in the second robustness check for the hidden income test are dominated by agriculture, forestry, and fishery. This is consistent with the first robustness check and also with the results for borrowing-saving and saving only tests.

6.7 Concluding Remarks

This study starts by examining whether full risk sharing exists between IFLS households. Under the full risk sharing hypothesis, this study finds that IFLS households do not have efficient risk sharing within their communities. This finding leads to the implications of barriers to insurance. By testing the barriers, the failure may be caused by hidden income, meaning that some households keep private information about their resources. However, the impact of hidden income is relatively low. Another possible explanation is that the failure of full risk sharing may be caused by limited commitment or moral hazard. This implies that households are either able to leave the network when they experience income growth or communities may not be able to detect deviation from risk sharing arrangements.

Given the fact that limited commitment and moral hazard tend to characterise risk-sharing networks, the issue is investigated further by examining endogenous group formation in order to smooth household consumption. The power of the tests depends on the identification of constrained and unconstrained households. The study finds that endogenous group formation emerges between the IFLS households within their community. Furthermore, the effect of group formation is higher when the estimation is based on Rosca participation. The interaction between households is theoretically explained by endogenous group formation between three households. The IFLS households are staying in the formation as long as enforcement constraints are binding. This finding gives important insights into how risk-sharing groups facilitate their members in facing consumption fluctuations.

Appendix 6.A A Summary of Bold's Endogenous Group Formation (2009)

Let U_{sn} be a risk sharing group with size n which the Pareto frontier is to be solved by the constrained dynamic programming. A social planner solves this problem by promising utility $U_{s,1},...,U_{s,n-1}$ to household $1,...,n-1$. Households must decide their consumption and continuation utilities in the first date in order to maximise household n's payoff with respect to self-enforcing constraints.

Each household consumes his own income, $c^s_{i,t} = y^s_{i,t}$ at date t and state s. Within the group, all households are able to transfer $[\tau^s_t]^n_{i=1}$, which therefore the consumption will be $c^s_{i,t} = y^s_{i,t} - \tau^s_{i,t}$ for $i = 1,...n$, and otherwise will be $c^s_{i,t} = y^s_{i,t}$. For any date $t \geq 0$, the infinitely repeated game G is characterised by a set of $t-$histories H_t where $H_t = \{H_{t-1}, s_t\}$ and $H_0 = \{s_0, [\tau^{s0}_t]^n_{i=1}\}$.

Suppose that following history h_t and the constrained-payoffs on the equilibrium path for household 1 and 2 are

$$U^r_1 \geq u\left(y^r_1\right) + \widetilde{V}_1 \tag{A.1}$$

$$U^r_2 \geq u\left(y^r_2\right) + \beta V_2\left(\widetilde{V}_1\right). \tag{A.2}$$

These payoffs are in a risk sharing group with size n which maximise a set of utility $U^r_n(U^r_1, U^r_2, ..., U^r_{n-1})$ and supported by $\widetilde{V}$. The problem of finding constrained-efficient contract can be divided into two stages.

The first stage is to solve the optimal penal code $\widetilde{V}$ after history h_t is known. This optimises the household's continuation payoff on the equilibrium path which equates with the discounted punishment payoffs from autarchy condition when the enforcement constraints are binding.

The second stage is to choose consumption and continuation payoffs which are supported by the punishment path derived in the first stage. Therefore, the optimisation can be written as follows

$$U^s_n\left(U^s_1, ..., U^s_{n-1}\right) = \max u\left(c^s_n\right) + \beta \sum_{r=1}^{\mathscr{S}} \pi^r U^r_n\left(U^r_1, ..., U^r_{n-1}\right) \tag{A.3}$$

subject to promise-keeping, aggregate resource, and enforcement constraints.

The objective is to optimise $[(U_i^r)_{r=1}^{S}]_{i=1}^{n-1}$ which denotes a set of utility for household $1,...,n-1$ in each state $1,...,\mathscr{S}$, $(c_i^s)_{i=1}^{n}$ denotes household $i-$th consumption at date $1,...,t$ in each state $1,...,\mathscr{S}$.

The term $\{[(\widetilde{V}_{j_g,J}^r)_{g=1}^{m(k)}]_{J\in\mathbb{J}}\}_{r=1}^{\mathscr{S}}$ denotes a set of optimal penal code for each coalition J after history h_t in repeated game $g,...,m(k)$ and each state $1,...,\mathscr{S}$, $\mathbb{V}^*[m(k)]$ denotes payoff for the largest stable group size not exceeding k, β denotes common discount factor, and π^r denotes the probability of state r takes place.

A set of promise-keeping constraints is

$$U\left(c_i^s\right)+\beta\sum_{r=1}^{\mathscr{S}}\pi^r U_i^r\geq U_i^s \qquad \forall i\neq n \tag{A.4}$$

The aggregate resource constraint is given by

$$\sum_{i=1}^{n}y_i^s\geq\sum_{i=1}^{n}c_i^s.$$

The set of enforcement constraints for each coalition $J\in\mathbb{J}$ and each state $r=1,...,\mathscr{S}$ for the next date is given by

$$U_{j_1}^r\geq U\left(y_{j_1}^r\right)+\beta\widetilde{V}_{1,J}^r \tag{A.5}$$

$$U_{j_2}^r\geq U\left(y_{j_2}^r\right)+\beta\widetilde{V}_{2,J}^r \tag{A.6}$$

$$...\geq... \tag{A.7}$$

$$U_{j_{m(k)}}\geq U_{j_{m(k)}}+\beta\widetilde{V}_{m(k),J}^r \tag{A.8}$$

$$...\geq... \tag{A.9}$$

$$U_{j_k}^r\geq U\left(y_{j_k}^r\right)+\beta\widetilde{V}_{k,J}^r. \tag{A.10}$$

In this setting, $\widetilde{V}=\{\widetilde{V}_1^r,...,\widetilde{V}_k^r\}$ is ordered based on increasing payoff value for element of coalition J. After state r has occurred, the expected punishment payoff V_g^r is chosen. The a set of payoff $V_{m(k),J}^r,...,V_{k,J}^r$ is set to have same values to $V_{m(k)}(V_{1,J},...,V_{m(k)-1})$ and $U_{j_g}^r=U_{j_g}^r(U_1,...,U_{n-1}^r)$ when $j_g=n$.

The first order conditions for this problem are

$$\frac{U'\left(c_n^s\right)}{U'\left(c_i^s\right)}=\mu_i \qquad \forall i\neq n \tag{A.11}$$

and

$$\frac{\partial U_n^r}{\partial U_i^r} = \mu_i \frac{1+\eta_i^r}{1+\eta_n^r} \qquad \forall r \in \mathscr{S}, \quad \forall i \neq n \tag{A.12}$$

where $(\mu_i)_{i=1}^{n-1}$ are non negative multipliers associated with the promise-keeping and enforcement constraints and $\left(\beta\pi^r \mu_{j_g} \eta^r_{j_g,J}\right)_{g=1}^{k}$ for every coalition $J \in \mathbb{J}$ and each state $r = 1,...,\mathscr{S}$. The envelope conditions for $n-1$ are given as follows

$$\mu_i = -\frac{\partial U_n^s}{\partial U_i^s} \quad \forall i \neq n. \tag{A.13}$$

The envelope conditions for next period are

$$\mu_i = -\frac{\partial U_n^r}{\partial U_i^r} = \mu_i \frac{1+\eta_i^r}{1+\eta_n^r} = \frac{U'\left(c_r^n\right)}{U'\left(c_r^i\right)} \qquad \forall r \in \mathscr{S}, \quad \forall i \neq n. \tag{A.14}$$

From (A.13) and (A.14), μ_i can be interpreted as a trade-off measure between household n's and household i's discounted lifetime utility at date t and μ_i^r as trade-off measure for the next period at state r. In dynamic contract setting, (A.13) can be interpreted where the ratio of marginal utility stay constant when the previous date has been a constrained optimum. This means that the contract which is constrained and efficient is history-dependent and it is "first best" when the game history is revealed.

Now let C_t be the set of constrained household i when the enforcement is binding and let $\underline{U}_i^r$ be the payoff for household i when this household's enforcement constraint is binding. This is not necessarily payoff for autarkic condition and depends only on the household's own income realisation in a sub-game perfect contract.

While in the coalition-proof, this payoff depends on the history of the contract and the realisation of other constrained households. Therefore, the consumption c_i^r of a constrained household in is given by

$$\frac{u'\left(c_n^r\right)}{u'\left(c_i^r\right)} = -\frac{\partial U_n^r}{\partial U_i^r} \tag{A.15}$$

under the sub-game perfect contract and the coalition-proof contract.

The continuation values are determined by the previous history indicated by the marginal utilities ratios in the previous dates and by the current income realisations. Therefore (A.15) can be written in terms of the previous period's marginal ratios. The

Euler equation for the ratio of marginal utilities over time is

$$\frac{U'(c_{nt})}{U'(c_{i,t})} = (\mu_{i,t})_{i\in C_t} = g\left[(\mu_{m,t-1})_{m\in UC_t}, (y_{k,t})_{k\neq i\in C_t}, y_{i,t}, Y_t\right] \tag{A.16}$$

where Y_t is aggregate income. In the coalition-proof contract, the marginal utility of constrained households today is determined by the marginal utility ratio last period and all households' income today where $k \in C_t$.

The effect of income will be higher if the two constrained households' marginal utility ratios in date $t-1$ are similar, which can be determined as follows,

$$(\mu_{i,t})_{i\in C_t} = g\left\{(\mu_{m,t-1})_{m\in UC_t}, (\mu_{k,t-1})_{k\in UC_t}, \left[y_{jt}, \left(\frac{\mu_{i,t-1}}{\mu_{j,t-1}} - 1\right)^2 \times y_{jt}\right]_{j\neq i\in C_t}, y_{i,t}, Y_t\right\} \tag{A.17}$$

Equation (A.17) implies implications on the sub-game perfect and coalition-proof contract. In a sub-game perfect efficient contract, a constrained bys marginal utility ratio $\mu_{i,t}$ is *independent* of the other households' past shock history indicated by $(\mu_{k,t-1})_{k\in UC_t}$. The effect emerges from the constrained households' income realisation $(y_{jt})_{j\neq i\in C_t}$ on the constrained household's marginal utility ratio is also independent of the past shock history.

In a coalition-proof contract, a constrained household's marginal utility ratio $\mu_{i,t}$ depends on the other households' past shock history $(\mu_{k,t-1})_{k\in UC_t}$. The effect which emerges from the constrained household's income realisation $(y_{jt})_{j\neq i\in C_t}$ on the constrained household's marginal utility ratio also depends on the past shock history.

If the groups are exogenously formed, the coefficient for $c_{1,t-1}/c_{2,t-1}$ should be statistically insignificant. The interaction effect, $(c_{1,t-1}/c_{2,t-1} - 1)^2 \times y_{2,t}$, implies differential effect of household 2's current income $y_{2,t}$ under endogenous versus exogenous group formation.

Appendix 6.B Full Risk Sharing Tests

Table 6.B.1
Summary of Total Observations and Samples Used

This table provides highlights of key variables used in this study. Column (1) gives information about all household observations in IFLS. Column (2) provides information about samples used in full risk sharing, borrowing-saving, saving only and hidden income tests. This also includes endogenous group formation tests. Column (2) can be compared to observations in Column (1). Column (4) provides information about samples used for moral hazard and limited commitment tests which are based on consumption in community level. This can be compared with information given in Column (3), which gives information about the number of community in IFLS. N denotes the number of samples used in the tests. Total expenditure, total income, per capita income (PCI) and per capita expenditure (PCE) figures are in monthly and in 2000 Indonesia rupiah. Household assets are in 2000 Indonesia rupiah. ADLs (activities of daily living) is an index which has values between 0 and 1 for each head of the household. *Source*: author's calculations from IFLS data set.

	(1)			(2)		(3)			(4)	
	Total household observations			Samples used in full risk sharing other household-based tests (N = 3014)		Total community observations			Samples used in moral hazard and limited commitments (N = 310)	
	N	Mean	Standard deviation	Mean	Standard deviation	N	Mean	Standard deviation	Mean	Standard deviation
IFLS1 – 1993										
Total expenditure	7136	937446	1174976	967050	1110809	31221400000	12400000	16600000	11000000	
Total income	7185	785204	7646235	3071341	26700000	31256900000	134000000	57200000	134000000	
Per capita expenditure	7136	226340	323472	219087	281850					
Per capita income	7184	742186	6826075	744799	6860007					
IFLS2 – 1997										
Total expenditure	7536	1487939	5030252	1590827	5702683	80212700000	2200000	28800000	28400000	
Total income	6868	1057141	8119044	1209823	11700000	802 9029415	26700000	20200000	40100000	
Per capita expenditure	7536	370856	1083243	365533.4	968622					
Per capita income	6868	243059	1971027	277861.6	2870812					
IFLS3 – 2000										
Total expenditure	10229	1251246	1501540	1324453	1355169	244611900000	16700000	27800000	12500000	
Total income	9590	725643	1241060	809671	1156538	244613100000	53200000	15500000	8565246	
Per capita expenditure	10229	344916	451654	320096	350270					
Per capita income	9590	192046	476065	200336	608888					

Table 6.B.2
Estimation Results for Table 6.5.1 Column (1)

The household consumptions and incomes in this table are deviations from means of respective household variables. All variables are in 2000 Indonesian rupiah. *Source*: author's calculations from IFLS data set.

Fixed-effects (within) regression			Number of obs	=	9042
Group variable:	hhid		Number of groups	=	3014
R-sq:	within	= 0.0900	Obs per group:	min =	3
	between	= 0.0021		avg =	3.0
	overall	= 0.0900		max =	3
				F(6027) =	596.18
corr(u_i, X_b) =	−0.0000			Prob > F =	0.0000

Log of PCE	Coef.	Std. Err.	t	$P>\|t\|$	95% Conf.	Interval
Log of PCI	0.1139	0.0047	24.42	0.000	0.1048	0.1231
Constant	2.9e-9	0.0056	0.00	1.000	-0.0110	0.0111
σ_u	2.616e-07					
σ_e	.53581821					
ρ	2.383e-13	(fraction of variance due to u_i)				
F test that all $u_i = 0$:		F(3013, 6027) =	0.00		Prob > F =	1.0000

Table 6.B.3
Estimation Results for Table 6.5.1 Column (2)

The household consumptions and incomes in this table are deviations from means of respective household variables. All variables are in 2000 Indonesian rupiah. *Source*: author's calculations from IFLS data set.

Fixed-effects (within) regression			Number of obs	=	9042
Group variable:	hhid		Number of groups	=	3014
R-sq:	within	= 0.2363	Obs per group:	min =	3
	between	= 0.0000		avg =	3.0
	overall	= 0.0565		max =	3
				F(253,6135) =	7.36
corr(u_i, X_b) =	−0.8723			Prob > F =	0.0000

Log of PCE	Coef.	Std. Err.	t	$P>\|t\|$	95% Conf.	Interval
Log of PCI	0.0535	0.0049	10.80	0.000	0.0438	0.0632
Constant	-0.2806	0.0299	-9.37	0.000	-0.3394	-0.2219
Community-wave dummy coefficients are not shown						
σ_u	0.3977					
σ_e	0.5010					
ρ	0.3866	(fraction of variance due to u_i)				
F test that all $u_i = 0$:		F(3013, 5785) =	0.05		Prob > F =	1.0000

Table 6.B.4
Estimation Results and Endogeneity Tests for Table 6.5.1 Column (3)

The household consumptions and incomes in this table are deviations from means of respective household variables. All variables are in 2000 Indonesian rupiah. *Source*: author's calculations from IFLS data set.

First-stage results

Number of groups = 2946		Obs per group:	min =	2	
			avg =	2.9	
			max =	3	
OLS estimation, Fixed-effects		Number of obs	=	8644	
		F(2, 5696)	=	583.15	
		Prob > F	=	0.0000	
Total (centered) SS	= 12388.2435	Centered R^2	=	0.1700	
Total (uncentered) SS	= 12388.2435	Uncentered R^2	=	0.1700	
Residual SS	= 10282.7734	Root MSE	=	1.3440	

Log of PCI	Coef.	Std. Err.	t	$P>\|t\|$	95% Conf.	Interval
Log of assets	0.1250	0.0144	8.69	0.000	0.0968	0.1532
ADLs	4.0879	0.1351	30.27	0.000	3.8231	4.3526

Included instruments: Log of assets, ADLs

Group variable: = 2946		Obs per group:	min =	2	
			avg =	2.9	
			max =	3	
IV (2SLS) estimation, Fixed-effects		Number of obs	=	8644	
		F(1, 5697)	=	646.30	
		Prob > F	=	0.0000	
Total (centered) SS	= 1766.7367	Centered R^2	=	−0.3238	
Total (uncentered) SS	= 1766.7367	Uncentered R^2	=	−0.3238	
Residual SS	= 2338.8176	Root MSE	=	0.6407	

Log of PCE	Coef.	Std. Err.	t	$P>\|t\|$	95% Conf.	Interval
Log of PCI	0.3549	0.0139	25.42	0.000	0.3276	0.3824

Underidentification test (Anderson canon. corr. LM statistic):		968.416
	$\chi^2(2)$ P-val =	0.0000
Weak identification test (Cragg-Donald Wald F statistic):		583.148
Stock-Yogo weak ID test critical values:	10% maximal IV size	19.93
	15% maximal IV size	11.59
	20% maximal IV size	8.75
	25% maximal IV size	7.25
Sargan statistic (overidentification test of all instruments):		17.290
	$\chi^2(2)$ P-val =	0.0000

Instrumented: Log of PCI
Excluded instruments: Log of assets, ADLs

Table 6.B.5
Estimation Results and Endogeneity Tests for Table 6.5.1 Column (4)

The household consumptions and incomes in this table are deviations from means of respective household variables. All variables are in 2000 Indonesian rupiah. *Source*: author's calculations from IFLS data set.

First-stage results						
Number of groups	= 2946		Obs per group:		min =	2
					avg =	2.9
					max =	3
OLS estimation, Fixed-effects			Number of obs		=	8644
			F(227, 5471)		=	7.44
			Prob > F		=	0.0000
Total (centered) SS		= 12388.2435	Centered R^2		=	0.2359
Total (uncentered) SS		= 12388.2435	Uncentered R^2		=	0.2359
Residual SS		= 9465.7106	Root MSE		=	1.315
Log of PCI	Coef.	Std. Err.	t	$P > \|t\|$	95% Conf.	Interval
Log of assets	0.1131	0.0146	7.74	0.000	0.0845	0.1417
ADLs	0.6737	0.2780	2.41	0.016	0.1249	1.2226
Community-wave coefficients are not shown						
Included instruments: Log of assets, ADLs, community-wave (not shown)						

Group variable:	= 2946		Obs per group:		min =	2
					avg =	2.9
					max =	3
IV (2SLS) estimation, Fixed-effects			Number of obs		=	8644
			F(237, 5806)		=	6.46
			Prob > F		=	0.0000
Total (centered) SS		= 1766.7367	Centered R^2		=	0.1850
Total (uncentered) SS		= 1766.7367	Uncentered R^2		=	0.1850
Residual SS		= 1439.9714	Root MSE		=	0.4935
Log of PCE	Coef.	Std. Err.	t	$P > \|t\|$	95% Conf.	Interval
Log of PCI	0.1452	9.0466	3.12	0.002	0.0539	0.2366
Community-wave coefficients are not shown						
Underidentification test (Anderson canon. corr. LM statistic):						74.159
					$\chi^2(2)$ P-val =	0.0000
Weak identification test (Cragg-Donald Wald F statistic):						36.062
Stock-Yogo weak ID test critical values:					10% maximal IV size	19.93
					15% maximal IV size	11.59
					20% maximal IV size	8.75
					25% maximal IV size	7.25
Sargan statistic (overidentification test of all instruments):						0.2940
					$\chi^2(2)$ P-val =	0.5877
Instrumented: Log of PCI. Included instruments: community-wave (not shown)						
Excluded instruments: Log of assets, ADLs						

Appendix 6.C Consumption Smoothing Tests

Table 6.C.1
Estimation Results for Table 6.5.2 Column (1)

The household consumptions in this table are in 2000 Indonesian rupiah and in per capita. *Source*: author's calculations from IFLS data set.

Random-effects GLS regression			Number of obs	=	6388
Group variable:	hhid		Number of groups	=	3194
R-sq:	within	= 0.1124	Obs per group:	min =	2
	between	= 0.6684		avg =	2.0
	overall	= 0.3837		max =	2
				Wald $\chi^2(526)$ =	3345.50
corr(u_i, X) =	0 (assumed)			Prob > χ^2 =	0.0000

Log of PCE	Coef.	Std. Err.	t	$P>\|t\|$	95% Conf.	Interval
Lag of log(PCE)	0.3664	0.0113	32.33	0.0000	0.344	0.3886
Constant	7.7886	0.2870	27.13	0.0000	7.2261	8.3513
Community dummy coefficients are not shown						
σ_u	0.102					
σ_e	0.447					
ρ	0.049	(fraction of variance due to u_i)				

Table 6.C.2
Estimation Results for Table 6.5.2 Column (2)

The household consumptions and income in this table are in 2000 Indonesian rupiah and in per capita. *Source*: author's calculations from IFLS data set.

Random-effects GLS regression			Number of obs	=	6388
Group variable:	hhid		Number of groups	=	3194
R-sq:	within	= 0.0121	Obs per group:	min =	2
	between	= 0.3614		avg =	2.0
	overall	= 0.2813		max =	2
				Wald $\chi^2_{(526)}$ =	1600.76
corr(u_i, X) =	0 (assumed)			Prob > χ^2 =	0.0000

Log of PCE	Coef.	Std. Err.	t	$P>\|t\|$	95% Conf.	Interval
Lag of log(PCI)	.04718	.004534	10.41	0.000	.0382974	.0560703
Constant	11.52069	.3244611	35.51	0.000	10.88476	12.15662
Community dummy coefficients are not shown						
σ_u	.4108139					
σ_e	.4904337					
ρ	.4123402	(fraction of variance due to u_i)				

Table 6.C.3
Borrowing-Saving Models: Tests Based on Industry Classification

This table provides the first robustness check for estimation results of borrowing-saving test in Table 6.5.2. The column number represents the field of work or industry where the head of the household works: (1) agriculture, forestry, and fishery, (2) mining and quarrying, (3) manufacturing, (4) electricity, gas, and water, (5) construction, (6) wholesale, retail, restaurants and hotels, (7) transportation, storage and communication, (8) finance, insurance, real estate, and business services, and (9) social services. *Source*: author's calculations from IFLS data set.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	8.961***	10.82**	13.59***	18.79**	14.05***	11.69***	13.48***	13.26***	13.13***
	(0.474)	(3.296)	(0.857)	(6.164)	(1.054)	(0.680)	(1.031)	(2.704)	(0.745)
Lag of log PCE	0.285***	0.145	−0.067	−0.523	−0.122	0.071	−0.155	−0.099	−0.048
	(0.024)	(0.269)	(0.063)	(0.506)	(0.079)	(0.041)	(0.084)	(0.213)	(0.047)
Household	830	6	149	6	91	367	79	3	291
Observations	1660	12	298	12	182	734	158	6	582
Overall R^2	0.349	0.281	0.672	0.938	0.721	0.430	0.803	0.904	0.583

Table 6.C.4
Saving-Only Models: Tests Based on Industry Classification

This table provides the first robustness check for estimation results of saving-only test in Table 6.5.2. The column number represents the field of work or industry where the head of the household works: (1) agriculture, forestry, and fishery, (2) mining and quarrying, (3) manufacturing, (4) electricity, gas, and water, (5) construction, (6) wholesale, retail, restaurants and hotels, (7) transportation, storage and communication, (8) finance, insurance, real estate, and business services, and (9) social services. *Source*: author's calculations from IFLS data set.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	12.11***	11.12***	12.50***	13.93***	12.58**	12.93***	12.38***	13.76*	12.77***
	(0.108)	(0.530)	(0.241)	(0.733)	(0.253)	(0.229)	(0.372)	(2.260)	(0.173)
Lag of log PCI	0.008	0.122	−0.010	−0.084	−0.027	−0.031	−0.008	−0.081	−0.002
	(0.101)	(0.050)	(0.021)	(0.063)	(0.023)	(0.019)	−0.033	(0.178)	(0.015)
Household	830	6	149	6	91	367	79	3	291
Observations	1660	12	298	12	182	734	158	6	582
Overall R^2	0.006	0.152	0.006	0.040	0.015	0.005	0.034	0.125	0.004

Table 6.C.5
Robustness Check for Borrowing-Saving Tests Using Weighted Values

This table provides the second robustness check for estimation results of borrowing-saving test in Table 6.5.2. The interpolated values are calculated by giving certain weights to the previous observations so that the results are similar to the results in Table 6.5.2 Column (1). After several simulations, the optimal weighted values of PCE in this particular case are $w_{pce1} = 0.1$ and $w_{pce2} = 0.9$. For this particular case, the coefficient of PCE is close to the initial results in Table 6.5.2 and this does not exhibit heteroskedasticity problem. When $w_{pce1} > 0.1$, the results exhibit more heteroskedasticity. The simulations also include several cut-off points for per capita income where in this table the observations with log of per capita income above 10.35 are dropped. *Source*: author's calculations from IFLS data set.

Source	SS	df	MS	Number of obs =	119
Model	5.221	1	5.2206	$F(1,117)$ =	25.13
Residual	24.307	117	0.2077	Prob > F =	0.0000
Total	29.528	118	0.2502	R-squared =	0.1768
				Adj R-squared =	0.1698
				Root MSE =	0.4558

Log of PCE_{IFLS3}	Coef.	Std. Err.	t	$P > t$	[95% Conf.	Interval]
Weighted PCE	0.323	0.0643	5.01	0.000	0.1951	0.4499
Constant	7.931	0.7488	10.59	0.000	6.4475	9.4135

Cameron & Trivedi's decomposition of IM-test

Source	χ^2	df	p
Heteroskedasticity	2.66	2	0.2649
Skewness	2.04	1	0.1530
Kurtosis	0.85	1	0.3571
Total	5.55	4	0.2357

Ramsey RESET test

F(3, 114) =	1.44
Prob > F =	0.2351

Variable	VIF	1/VIF
Weighted PCE	1.00	1.0000
Mean VIF	1.00	

Table 6.C.6
Robustness Check for Saving-Only Tests Using Weighted Values

This table provides the second robustness check for estimation results of saving-only test in Table 6.5.2. The interpolated values are calculated by giving certain weights to the previous observations so that the results are similar to the results in Table 6.5.2 Column (2). In this case, the weighted values of PCI provided in this table is the optimal weights where $w_{pci1} = 0.1$, and $w_{pci2} = 0.9$. The simulations also include several cut-off points for per capita income where in this table the observations with log of per capita income above 10.35 are dropped. *Source*: author's calculations from IFLS data set.

Source	SS	df	MS	Number of obs =	119
Model	0.280	1	0.2804	$F(1,117)$ =	1.12
Residual	29.248	117	0.2499	Prob > F =	0.2918
Total	29.528	118	0.2502	R-squared =	.4999
				Adj R-squared =	0.1698
				Root MSE =	.4558

Log of PCE_{IFLS3}	Coef.	Std. Err.	t	$P > t$	[95% Conf.	Interval]
Weighted PCI	−0.075	0.0708	−1.06	0.292	−0.2151	0.0652
Constant	12.389	0.6722	18.43	0.000	11.0574	13.7197

Cameron & Trivedi's decomposition of IM-test

Source	χ^2	df	p
Heteroskedasticity	3.59	2	0.1660
Skewness	0.22	1	0.6381
Kurtosis	0.09	1	0.7626
Total	3.90	4	0.4192

Ramsey RESET test

F(3, 114) =	1.42
Prob > F =	0.2410

Variable	VIF	1/VIF
Weighted PCE	1.00	1.0000
Mean VIF	1.00	

Table 6.C.7
Robustness Checks for Borrowing-Saving Tests Using Different Weighted Values

This table provides the results of different weights used in saving-only tests as given in (6.18). Although the result using $w_1 = 0.1$ and $w_2 = 0.9$ does not have the minimum MSE, the regression coefficients are close to the results in Table 6.5.2 Column (1). Moreover, it does not exhibit heteroskedasticity problem compare to the results using $w_1 > 0.1$. *Source*: author's calculations from IFLS data set.

w_1	0.1	0.2	0.3
w_2	0.9	0.8	0.7
R-square	0.1768	0.1871	0.1980
Root MSE	0.4558	0.4529	0.4505
MSE	0.2078	0.2051	0.2029
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity			
$\chi^2(1)$	3.01	3.49	3.69
Prob > χ^2	0.0826	0.0618	0.0548

Table 6.C.8
Robustness Checks for Saving-Only Tests Using Different Weighted Values

This table provides the results of different weights used in saving-only tests as given in (6.19). The results using $w_1 = 0.1$ and $w_2 = 0.9$ are more robust where it is close to the results in Table 6.5.2 Column (2) and also it has the lowest MSE. *Source*: author's calculations from IFLS data set.

w_1	0.1	0.2	0.3
w_2	0.9	0.8	0.7
R-square	0.0095	0.0064	0.0034
Root MSE	0.4999	0.5008	0.5015
MSE	0.2499	0.2508	0.2515
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity			
$\chi^2(1)$	1.11	1.44	1.76
Prob > χ^2	0.2913	0.2299	0.1841

Appendix 6.D Hidden Income Tests

Table 6.D.1
Estimation Results for Table 6.5.3

The household income in this table are in 2000 Indonesian rupiah and in per capita. The residuals are derived from the results in Table 6.C.1. *Source*: author's calculations from IFLS data set.

Random-effects GLS regression			Number of obs	=	6388
Group variable:	hhid		Number of groups	=	3194
R-sq:	within	= 0.0172	Obs per group:	min =	2
	between	= 0.0728		avg =	2.0
	overall	= 0.0055		max =	2
				Wald $\chi^2_{(526)}$ =	35.33
corr(u_i, X) =	0 (assumed)			Prob > χ^2 =	0.0000

Residuals	Coef.	Std. Err.	t	$P>\|t\|$	95% Conf.	Interval
Lag of log(PCI)	0.0237	0.0040	5.94	0.000	0.0159	0.0315
Constant	−0.2595	0.0443	−5.86	0.000	−0.3462	−0.1727
Community dummy coefficients are not shown						
σ_u	0					
σ_e	0.6015					
ρ	0	(fraction of variance due to u_i)				

Table 6.D.2
Hidden Income Models: Tests Based on Industry Classification

This table provides robustness check for estimation results of borrowing-saving tests in Table 6.5.3. The column number represents the field of work or industry where the head of the household works: (1) agriculture, forestry, and fishery, (2) mining and quarrying, (3) manufacturing, (4) electricity, gas, and water, (5) construction, (6) wholesale, retail, restaurants and hotels, (7) transportation, storage and communication, (8) finance, insurance, real estate, and business services, and (9) social services. *Source*: author's calculations from IFLS data set.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	−0.259**	−0.633	−0.109	0.208	−0.064	−0.228	−0.329	−0.014	−0.257*
	(0.079)	(0.530)	(0.139)	(0.307)	(0.182)	(0.145)	(0.198)	(1.53)	(0.124)
Lag of log PCI	0.025**	0.06	0.0098	−0.018	0.006	0.019	0.029	0.001	0.023*
	(0.008)	(0.050)	(0.012)	(0.026)	(0.182)	(0.012)	(0.018)	(0.121)	(0.011)
Household	830	6	149	6	91	367	79	3	291
Observations	1660	12	298	12	182	734	158	6	582
Overall R^2	0.007	0.126	0.022	0.045	0.001	0.003	0.018	0.000	0.008

Table 6.D.3
Robustness Check for Hidden Income Test Using Weighted Values

This table provides the second robustness check for estimation results of hidden income test in Table 6.5.3. The interpolated values are calculated by giving certain weights to the previous observations so that the results are similar to the results in Table 6.5.3 Column (1). Following the results in Table 6.C.5, the optimal weighted values of PCE are $w_{pce1} = 0.1$ and $w_{pce2} = 0.9$. The residuals are derived from this regression. The residuals then are regressed against the optimal weighted values of PCI are $w_{pce1} = 0.1$ and $w_{pce2} = 0.9$. The simulations also include several cut-off points for per capita income where in this table the observations with log of per capita income above 11 are dropped. *Source*: author's calculations from IFLS data set.

Source	SS	df	MS	Number of obs =	406
Model	19.0697	1	19.0697	$F(1,404)$ =	65.49
Residual	117.6374	404	0.2912	Prob > F =	0.0000
Total	136.7071	405	0.3376	R-squared =	0.1395
				Adj R-squared =	0.1374
				Root MSE =	0.5396

Log of PCE_{IFLS3}	Coef.	Std. Err.	t	$P > t$	[95% Conf.	Interval]
Weighted PCE	0.3445	0.0426	8.09	0.000	0.2612	0.4288
Constant	7.7602	0.5021	15.45	0.000	6.7731	8.7473

Source	SS	df	MS	Number of obs. =	119
Model	0.1223	1	0.1223	$F(1,404)$ =	0.42
Residual	117.5151	404	0.2909	Prob > F =	0.0010
Total	117.6375	405	0.2904	R-squared =	0.0010
				Adj R-squared =	−0.0014
				Root MSE =	0.5393

Residuals	Coef.	Std. Err.	t	$P > t$	[95% Conf.	Interval]
Weighted PCI	0.0233	0.0360	0.65	0.517	−0.0474	0.0941
Constant	−0.2313	0.3576	−0.65	0.518	−0.9342	0.4717

Cameron & Trivedi's decomposition of IM-test

Source	χ^2	df	p
Heteroskedasticity	4.06	2	0.1316
Skewness	4.67	1	0.0307
Kurtosis	3.93	1	0.0476
Total	12.65	4	0.0131

Ramsey RESET test

F(3, 114) =	1.62
Prob > F =	0.1832

Variable	VIF	1/VIF
Weighted PCI	1.00	1.0000
Mean VIF	1.00	

Table 6.D.4
Robustness Checks for Hidden Income Tests Using Different Weighted Values

This table provides the results of different weights used in hidden income tests as given in (6.20). The results using $w_1 = 0.1$ and $w_2 = 0.9$ are close to the results in Table 6.5.6. The results also show that the regressions do not have heteroskedasticity problem. *Source*: author's calculations from IFLS data set.

w_1	0.1	0.2	0.3
w_2	0.9	0.8	0.7
R-square	0.0200	0.0173	0.0137
Root MSE	0.4512	0.4490	0.4474
MSE	0.2036	0.2016	0.2001
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity			
$\chi^2(1)$	1.56	1.6	1.66
Prob > χ^2	0.2119	0.2054	0.1973

Appendix 6.E Moral Hazard and Limited Commitment Tests

Table 6.E.1
Estimation Results for Table 6.5.5 Column (1)

The consumption and income in this table are at community level where each variable are sum of households' consumption and income. All variables are in 2000 Indonesian rupiah and in per capita. *Source*: author's calculations from IFLS data set.

Fixed-effects (within) regression		Number of obs	=	620
Group variable:	hhid	Number of groups	=	310
R-sq:	within = 0.0792	Obs per group:	min =	2
	between = 0.5336		avg =	2
	overall = 0.1229		max =	2
			F(2,309) =	4.55
corr(u_i, X_b) =	−0.5448		Prob > χ^2=	0.0000

(Std. Err. adjusted for 310 clusters in commid)

log(Comm. consumption)	Coef.	Std. Err.	t	$P>\|t\|$	95% Conf.	Interval
log(Lag of comm. consumption)	−0.1665	0.0693	−2.40	0.017	−0.3028	−0.0302
log(Lag of comm. income)	0.0409	0.0185	2.21	0.028	0.0045	0.0772
Constant	19.1259	1.1460	16.69	0.000	16.8709	21.3808
σ_u	0.5032					
σ_e	0.3280					
ρ	0.7018					

Table 6.E.2
Estimation Results for Table 6.5.5 Column (2)

The consumption and income in this table are at community level where each variable are sum of households' consumption and income. All variables are in 2000 Indonesian rupiah and in per capita. *Source*: author's calculations from IFLS data set.

First-stage results						
Number of groups	= 310		Obs per group:		min =	2
					avg =	2
					max =	2
OLS estimation, Fixed-effects			Number of obs		=	620
			F(3, 307)		=	2.52
			Prob > F		=	0.0581
Total (centered) SS		= 343.9227	Centered R^2		=	0.0240
Total (uncentered) SS		= 343.9227	Uncentered R^2		=	0.0240
Residual SS		= 335.6584	Root MSE		=	1.046
log(Comm. consumption)	Coef.	Std. Err.	t	$P > \|t\|$	95% Conf.	Interval
log(Lag of comm. consumption)	0.1842	0.1131	1.63	0.104	−0.0384	0.4067
log(Lag of comm. income)	0.1076	0.0733	1.47	0.143	−0.0367	0.2518
Lag of distance	−0.0618	0.0695	−0.89	0.374	−0.1985	0.0748
Included instruments: lag of comm. consumption, lag of rainfall, lag of distance						

Group variable:	= 310		Obs per group:		min =	2
					avg =	2
					max =	2
IV (2SLS) estimation, Fixed-effects			Number of obs		=	620
			F(237, 5806)		=	8.83
			Prob > F		=	0.0002
Total (centered) SS		= 35.9904	Centered R^2		=	−0.1223
Total (uncentered) SS		= 35.9904	Uncentered R^2		=	−0.1223
Residual SS		= 40.3937	Root MSE		=	0.361
Comm. consumption	Coef.	Std. Err.	t	$P > \|t\|$	95% Conf.	Interval
log(Lag of comm. consumption)	−0.1321	0.0609	−2.17	0.030	−0.2514	−0.0128
log(Lag of comm. income)	−0.1055	0.2039	−0.52	0.605	−0.5050	0.2941
Underidentification test (Anderson canon. corr. LM statistic):						2.869
					$\chi^2(2)$ P-val =	0.2383
Weak identification test (Cragg-Donald Wald F statistic):						1.434
Stock-Yogo weak ID test critical values:					10% maximal IV size	19.93
					15% maximal IV size	11.59
					20% maximal IV size	8.75
					25% maximal IV size	7.25
Sargan statistic (overidentification test of all instruments):						0.247
					$\chi^2(2)$ P-val =	0.6195
Instrumented: log(Lag of community income)						
Included instruments: log(Lag of community consumption)						
Excluded instruments: lag of rainfall, lag of distance						

Chapter 7

Conclusions and Directions for Future Research

7.1 Summary

Access to financial markets is believed to have significant impact on household welfare. Besides providing capital for production or investment, the function of financial institutions is to provide protection for households against risk and uncertainty. Moreover, this will also help households to strengthen their livelihood and economic capabilities. However, in many developing countries, these institutions may not be able to perform its functions effectively. Access to finance may become problem for some households which affect their welfare.

The objective of this study is to investigate household welfare when access to finance is absent or limited. It also establishes a set of characteristics to identify household welfare from three dimensions: human capital, barriers to insurance, and risk sharing group formation.

Chapter 2 sets the foundation of this research by examining existing literature on household economy, in particular the way they manage their risks. Chapter 3 highlights financial development in Indonesia and puts this research into context: it is related to two main data set utilised throughout the study. Building on these chapters, the subsequent chapters take a closer look at household welfare in contemporary Indonesia in terms of financial and labour markets.

Chapter 4 estimates household welfare loss due to credit constraints that are identified by using Direct Elicitation Methodology (DEM) as proposed by Boucher et al. (2009). Households' credit status can be classified based on their notional and effective demand for loans, and loan supply. This happens because of asymmetric information between lenders and borrowers. Households can be considered unconstrained when they are not affected by this problem. Those who are affected can be said to be constrained households: this condition can also be caused by transaction cost, perceived risk, and lender's credit rule.

Chapter 5 investigates the impacts of earnings risk on schooling and saving. I discuss the theoretical framework when the decision on schooling and work in the first period affects human capital in the next period. This may also have implications for the saving made by the households for a precautionary reason.

Whereas the previous two chapters focus on households which are represented by their breadwinner, Chapter 6 incorporates analysis not only at the household level but also at the community level. This chapter studies informal groups as a substitute for formal insurance and also measures the efforts of households to overcome economic hardship. If households are constrained and barriers to insurance exist, then the question is how households are able to form risk sharing groups. I examine endogenous group formation as proposed by Bold (2009) to examine whether efficient risk sharing would exist between households. Whenever credit and insurance markets are inaccessible, this condition brings households to find a way to smooth their consumption by forming risk sharing group. If the groups are endogenously formed, then efficient risk sharing may exist. In exogenous group formation, households may find the enforcement constraints are not binding and this may lead to autarchy.

7.2 Findings

This study employs two dataset. The first data set is the A2F (Access to Finance) survey in 2007 that comprises detail credit information on the sample households. This information is very useful for investigating credit constraints. The second data set is IFLS (Indonesia Family Life Survey), which consists of four waves: 1993, 1997, 2000, and 2007.

The first empirical chapter contributes to the existing literature by providing the empirical study of impacts of access to finance on household welfare. First, the classification is established by using opinions from the A2F households' credit status par-

ticularly considering the reasons to stop borrowing. The study divides credit constraints based on the demand and supply of credit markets. Using DEM method, the households can be classified into: price constrained, risk constrained, transaction-cost constrained, and quantity constrained. Other households who do not fall into these categories are either non-borrowers or unconstrained. It can be inferred that most households who stop borrowing do so because of price-related reasons. The price constrained and transaction-cost constrained households cannot be inferred due to inadequate observations. For unconstrained borrowers, financial literacy has the highest marginal effect compare to other variables. This shows how important financial literacy in accessing services from formal financial institutions. Furthermore, welfare loss is calculated using matching methods; where the control is unconstrained borrowers against constrained households as the treated observations. This study finds that the welfare loss due to risk- constraints would significantly result in a decrease in annual income between 16 millions and 19 millions.

In the second empirical study, I investigate the sensitivity of earnings risk toward investment in education and household saving. I adopt a theoretical framework from Basu and Ghosh (2001) and use it to explain the relationship between these variables using a simple two-period model. This study also finds that education does decrease the variability over future income. Given the positive return on the investment of human capital across the waves, the effects of earnings risk may differ depending on the household characteristics and its related factors such as economic condition. Across the IFLS waves, savings are inversely related to occupational earnings risk due to pure risk effect. This means that savings would rise since the certainty equivalent income is lower. The results across the IFLS waves are also show that savings tend to increase for households in urban area, with fewer members, and fewer dependents. This study finds that earnings range measurement provides close results to Basu and Ghosh's model since it does not take occupational earnings into account.

In the third empirical chapter, I intend to contribute to the current literature in risk sharing by providing understanding of several barriers to insurance and endogenous group formation using Indonesian households as a case study. I also propose a raw moment approach to examine moral hazard and limited commitment. This study provides evidence of the failure of the full risk sharing hypothesis for IFLS households. It also finds that risk sharing in Indonesia is characterised mainly by limited commitment and moral hazard. Given these facts, I investigate how the dynamic of risk sharing between IFLS households by testing endogenous group formation within

the community. The results also reiterate the importance of risk sharing networks to provide consumption smoothing for households. By adding interaction terms in the specification that allows for the difference of initial consumption between households, this study provides evidence of endogenous group formation using full samples of IFLS households and subsamples based on Rosca participation.

For empirical implications, policymakers who wish to engage in community development should pay more attention to financial constraints and networks between households. The barriers to financial markets, which are highly related to credit and insurance, may affect the sustainability of household finance. Understanding various type of barriers may give better knowledge towards evaluation of related policies which aim to increase households' access to finance: these include social security, micro insurance, micro finance and credit penetration in rural economy.

7.3 Limitations of the Research

Like any other empirical research, this study has some caveats since it is constrained by the data set, which is used to investigate several issues in its respective chapter.

The models in the first empirical study in Chapter 4 are not derived from any structural model of credit constraints. Therefore, the analysis really depends on the nature of the data employed in the research. For the same reason, the analysis cannot be extended to the households who are constrained due to transaction costs. Another limitation in this chapter is that it only investigates the failure of formal financial institutions without looking at the role of informal institutions. Since it is also based on the elicitation method, which comes from the demand side, the supply side of financial markets is not widely covered in this study.

In Chapter 5, the incomplete information of household characteristics in education and income, reduced the number of observations for panel data estimations. Therefore, the findings are interpreted specifically based on that respective year. Furthermore, given the definition in IFLS data set, the earnings risk estimation is based on the occupation type and sector. The estimation can be extended if the information about primary duty is consistently provided throughout the survey waves.

In Chapter 6, based on the reduced forms given in the literature, the study is able to find the constraints that characterise risk sharing group formation between IFLS households. However, it comes with some caveats. First, it is empirically difficult to distinguish between moral hazard and limited commitment. Secondly, the time

observation and the nature of data in the IFLS give limitations on empirical analysis since some theoretical approaches in the study argue with the time series framework. Thirdly, it also assumes that households exhibit constant relative risk aversion in order to empirically examine the risk sharing hypothesis. This can be elaborated more by using different specification of utility function.

For Chapter 5 and 6, data have become the main constraint of the empirical part since there is no data on Indonesian households that would fit to the theoretical models in each chapter. Currently there is none or similar data on the Indonesian households that would have the same structure and survey design such as the British Household Panel Survey or the Panel Study of Income Dynamics. The IFLS would be the optimal data set that can be found since it retain most of household samples from the first survey wave until the last one. It also contains a lot of information about Indonesian households, which can be ensured its validity and reliability. However, the longitudinal design of IFLS may give some empirical complexity on this research. Moreover, different time interval between one way to another may add to this complexity.

7.4 Directions for Further Research

The work on credit constraints in Chapter 4 have some interesting findings which can be used for further research. The positive results on quantity constraint using matching methods can be taken further into investigation of the spillover effect between formal and informal financial institutions. There is the possibility that consumption smoothing using informal institutions has a greater effect than using formal institutions. Household surveys on financial behaviour such A2F can be employed to investigate these questions. Another possibility is to look further at the transaction costs of conducting transactions with different types of financial service provider.

This study also examines one particular risk which arises due to variability of earnings or labour income. From a household survey perspective, the possibility to investigate various sources of risk affecting household welfare is still open using the IFLS or A2F data set. For example, disaster risk, climate risk, and health shocks cam all be studied with regard to financial market conditions in Indonesia. A2F survey, which contains significant information about remittances, is another option. At macro level, remittances constitute a significant amount of capital inflow to Indonesia. At

micro level, it has long term impact on household circumstances: it also improves household livelihood.

Some theoretical issues that can be incorporated are the heterogeneity and risk preferences among households. Since full risk sharing assumes that households follow constant relative risk aversion, there is the possibility to empirically study risk preferences among IFLS households. Therefore, the welfare loss under homogenous and heterogeneous risk preference can be compared. However, this may need more time observations.

From the theoretical framework given in Chapter 5, the model can be developed by separating household decision between school and work. In this study, work experience is regarded as a post-schooling activity, which can have an influence on human capital investment. Further study can be carried out by looking into working and schooling as separate decisions and investigating the impact of these decisions on earnings risk and saving. Another possible topic is to use different definitions of earnings risk, for example by looking at the subjective probability of earnings or distribution of earnings based on hours worked and the geographic base.

Based on the standpoint of social security, risk sharing groups which are regarded as traditional insurance systems may not be adequate to cover households' needs at large. For example, some economic events, which have large impacts on households such as an economic crisis, may affect the community as a whole. Therefore, this study can be extended to the linkages between informal group risk sharing and government policies toward community development. Such studies may also include the interaction between formal and informal insurance for example the crowding out effect between these insurance mechanisms or the cooperation between informal groups and formal financial institutions.

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