Essays on Risk, Insurance and Social Protection in Rural Thailand

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Deutsche Zusammenfassung

Risikomanagement ist von grundlegender Bedeutung für die Förderung wirtschaftlicher Entwicklung. Ein effektives Risikomanagement kann die Auswirkungen negativer Schocks verringern und Stabilität auf allen Gesellschaftsebenen schaffen. Wirtschaftliche Entwicklung erfordert darüber hinaus, Chancen zu ergreifen, die Fortschritt ermöglichen, aber auch Risiken mit sich bringen. Risikomanagement ist folglich ein wichtiges Instrument, um die Not der Menschen in Entwicklungs- und Schwellenländern zu verringern und wachsenden Wohlstand zu ermöglichen. Dies gilt insbesondere für die Bevölkerung im ländlichen Nordosten Thailands, der Region, die in dieser Dissertation untersucht wird. Die dortige Bevölkerung ist größtenteils arm oder von Armut bedroht und gleichzeitig mit einer Vielzahl von Risiken konfrontiert. Unerwartete Ereignisse können für diese Menschen dramatische Folgen haben. Ferner sind sie aufgrund ihres Lebensstandards eher dazu geneigt, auf riskante, jedoch möglicherweise profitable Investitionen zu verzichten.

Diese Dissertation trägt dazu bei, besser zu verstehen, wie Risikomanagement das Entwicklungspotenzial der Menschen im ländlichen Thailand stärken kann. Die Forschungsprojekte befassen sich mit unterschiedlichen Aspekten des Risikomanagements – vom individuellen Entscheidungsprozess über die Funktionsweise von Mikroversicherungen bis hin zu den Auswirkungen einer Sozialversicherung auf Kinder. Die Dissertation beschreibt mögliche Hindernisse für das Risikomanagement und gibt Beispiele für Institutionen und Politikmaßnahmen, die armen oder armutsgefährdeten Menschen erfolgreich finanzielle Absicherung bieten. Die Arbeit beinhaltet einen Ausblick auf künftige Herausforderungen, Gefahren für bestehende Finanzinstitutionen und mögliche Auswirkungen von Politikmaßnahmen.

Die Dissertation beinhaltet drei zentrale Ergebnisse. In Kapitel 2 wird zunächst gezeigt, dass Menschen im ländlichen Thailand dazu neigen, inkonsistente Entscheidungen unter Risiko zu treffen, die ein Hindernis für das Risikomanagement darstellen können. Kapitel 3 thematisiert eine der wenigen Institutionen, die im ländlichen Thailand Versicherungsschutz anbieten. Diese Abhandlung trägt dazu bei, die Funktionsweise und Stabilität der Versicherung besser zu verstehen und hebt Herausforderungen für deren künftige wirtschaftliche Tragfähigkeit hervor. Kapitel 4 befasst sich schließlich mit einer weiteren Institution, die Menschen im ländlichen Thailand finanzielle Absicherung bietet: die staatliche Rente. Diese

Abhandlung leistet einen Beitrag zur Literatur über die Auswirkungen staatlicher Rentensysteme, die über die eigentlichen Leistungsempfänger hinausgehen. Es wird gezeigt, dass Kinder bezüglich Schulbildung und Erwerbstätigkeit von Rentenleistungen ihrer Großeltern profitieren. In gewisser Weise knüpft dieser Essay an Kapitel 2 an, da diese Kinder aufgrund ihrer besseren Schulbildung möglicherweise weniger Inkonsistenzen in ihrem Entscheidungsverhalten aufzeigen.

Schlagwörter: Allais-Paradoxon, Versicherung, Rente, Kindeswohl, Thailand

English Summary

Risk management is of great importance for economic development. Effective risk management can reduce the impact of adverse events and build resilience at any level of society. Moreover, development requires taking advantage of opportunities for improvement that usually do not come without risk. Risk management is thus an essential tool in order to prevent hardship and enhance the well-being of people in developing and emerging countries. This is particularly the case for rural Northeast Thailand, the region studied in this dissertation. People in the region are mostly poor or vulnerable to falling into poverty, while being exposed to a variety of risks. For them, risky events can have dramatic consequences. Given their economic status, they may forego profitable but risky investment opportunities.

This dissertation contributes to the understanding of how risk management may enhance the potential for development of people in rural Thailand. The research projects address different aspects of risk management – from the individual decision-making process to the functioning of microinsurance schemes and the impact of social insurance on children. The dissertation discusses potential obstacles to risk management and examples of institutions and policies that successfully provide financial protection to the poor and vulnerable. It includes an outlook on future challenges, threats to existing financial institutions and potential policy implications.

There are three main conclusions from this dissertation. First, Chapter 2 demonstrates that people in rural Thailand tend to make inconsistent decisions under risk which may potentially be an obstacle to risk management. Chapter 3 presents one of the few institutions that provide insurance in rural Thailand: funeral insurance associations. This essay contributes to the understanding of the functioning and the stability of the insurance scheme and highlights challenges for its future financial viability. Finally, Chapter 4 addresses another institution that provides financial protection to the people in rural Thailand: the social pension scheme. The essay contributes to the literature on the impact of public pension schemes that goes beyond the beneficiaries of the schemes. It provides evidence that children benefit from the pension income of their grandparents with regard to school enrollment and the employment status. In some way, this essay links back to Chapter 2, as we would expect better educated children to make more consistent decisions.

Keywords: Allais paradox, Insurance, Pension, Child well-being, Thailand

Contents

List of Tables

List of Figures

Chapter 1

Introduction

In recent years, growing attention by researchers and practicioners was given to the importance of risk management for boosting economic development. The topic is high on the agenda of policy-makers and international organizations which is exemplified by the 2014 World Development Report on "Risk and Opportunity". As the title suggests, the relevance for development is twofold. On the one hand, effective risk management can reduce the impact of adverse events and build resilience at any level of society. On the other hand, development requires taking advantage of opportunities for improvement that usually do not come without risk. The identification of risks and an effective management thereof are thus essential in order to prevent hardship, improve the living standards, and enhance the well-being of people in developing and emerging countries.

Addressing risk management and its potential for development is of particular importance in the context of rural Thailand which is the focus of this dissertation. Substantial parts of the rural Thai population are either poor or vulnerable to falling into poverty. Because most of them are subsistence farmers, they are exposed to a variety of systemic and idiosyncratic risks such as the loss of harvest due to flooding or drought, volatility of prices of agricultural inputs and produce, or the illness of a family member. In fear of such events, poor and vulnerable people may refrain from undertaking actions that could bring improvements but also risks, such as the investment in agricultural machinery or other farm equipment that may enhance productivity at the farm level.

This dissertation contributes to the understanding of how risk management may

enhance the potential for development in rural Thailand. The research projects address different aspects of risk management – from the individual decision-making process to the functioning of microinsurance schemes and the impact of social insurance on children. The analyses, thus, involve the individual, household, institutional and state level. The dissertation discusses potential obstacles to risk management and examples of institutions and policies that successfully provide financial protection to the poor and vulnerable. It includes an outlook on future challenges, threats to existing financial institutions and potential policy implications.

The research projects that are part of this dissertation are based on household survey data collected by members of the research unit FOR 756 "Vulnerability in Southeast Asia" which was funded by the German Research Foundation. The survey was carried out in 2007, 2008, 2010 and 2013. Households in Northeast Thailand were interviewed, particularly in the province of Buriram, Nakhon Phanom and Ubon Ratchathani. The sample is representative for the rural population of the selected provinces.

In Chapter 2, the first essay investigates potential obstacles to risk management which may arise out of inconsistent decision making under risk. Here, risk management is addressed from the perspective of risk-taking in the pursue of opportunities rather than looking at reducing the impact of adverse events. The focus of this essay is on decision making with information on outcomes and corresponding probabilities given, i.e. the choice between risky lotteries. More precisely, we address Allais-type behavior – a particular pattern of inconsistent behavior which may capture suboptimal decision making in general. We study the incidence of Allais-type behavior with survey respondents in Ubon Ratchathani in 2010. Our empirical results show that more than half of the respondents in our sample are prone to Allais-type behavior which is a relatively high share compared to earlier studies, mostly from developed countries. Moreover, we find that individuals with greater general and math-related ability are less prone to this particular type of inconsistent behavior. Finally, our results suggest that Allais-type behavior is more pronounced among dynamic individuals with higher risk tolerance and more optimism. We interpret our findings as evidence that people in developing and

emerging countries may face more difficulties in (consistent) decision making. Fostering abilities (e.g. by improving educational outcomes) could be one option in order to achieve more consistent behavior.

Chapter 3 turns to investigating risk management as an instrument to reduce the negative impact of risks. The focus of this essay is on a popular institution that provides insurance in rural Thailand: funeral aid associations (FAAs). The death of a family member is a major risk for households in rural Thailand. Owing to social norms, families are compelled to arrange costly funeral ceremonies. FAAs provide financial protection by offering insurance that covers funeral expenses of the insured. In this chapter, we investigate the stability of FAAs. This is a highly interesting feature given that FAAs have no strict entry regulations and refrain from any kind of risk pricing (i.e. insurance is offered at a uniform price). Although theory predicts that in such a setting, individuals with a higher mortality risk would demand more insurance, thereby deteriorating the risk pool and potentially destabilizing the scheme, FAAs seem to be remarkably stable. We show that high-risk individuals (in particular older people and men) are indeed more likely to be insured. However, this deterioration in the quality of the risk pool seems to be partly balanced by married individuals who appear to have a greater preference for insurance at lower risk levels. Altruism or reciprocity could be among the motivations for married individuals to demand insurance, however we cannot show this empirically. Irrespective of the underlying motive, this preference-driven demand is highly important for the future financial viability of the scheme. Once alternative providers offer funeral insurance in the region using risk-based pricing, they may attract particularly those low-risk individuals with a high preference for insurance (e.g. married individuals), as for them coverage would be cheaper. This, in turn, may threaten the stability of FAAs. In order to preserve their financial stability in the future, FAAs may consider to establish a simple pricing scheme based, e.g., on age and gender.

Finally, Chapter 4 investigates another instrument which might prevent people in rural Thailand from financial hardship: the public pension scheme. The scheme provides pension benefits of rather small size in order to protect people against poverty in the old age. Although non-contributory, all eldery in the country are

eligible for pension since the reform of the scheme in 2009. This is in contrast to the previous system which only targeted the poorest elderly. The essay investigates whether pensioners share their benefits with other family members, in particular with their grandchildren. We exploit the changes due to the pension reform in order to estimate the impact of the universal pension on school enrollment and the employment status of children. We find that children who live with beneficiaries of the reform are more likely to be enrolled in school and less likely to work relative to children in households that were unaffected by the reform. However, schooling seems to improve only for boys who live with male beneficiaries, whereas reductions in employment appear to be limited to girls in households with female pensioners. These findings may be interpreted as evidence for differential preferences of grandmothers and grandfathers towards girls and boys or unequal bargaining power among pensioners within the same household. Our findings are remarkable considering the small size of pension benefits. We show that in contrast to the pre-reform ("targeted") system, beneficiaries of the universal pension scheme are poor, but not among the poorest. Therfore, they might afford to invest the extra pension income in their grandchildren. Our study thus adds an important argument to the discussion of whether pension policies should be targeted to specific individuals or provided universally.

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Chapter 2

Allais for the Poor*

2.1 Introduction

Beginning with the famous paradoxes of Allais (1953), the experimental literature has gathered abundant evidence that expected utility theory (EUT) does not provide an accurate description of individual decision behavior under risk. Whereas the existence of the Allais paradox has been well documented, there are still competing explanations about the origins of this behavior. One line of studies argues that violations of EUT are related to less ability in understanding the often complex decisions to be made (e.g. Levy (2008); Burks et al. (2009); Benjamin et al. (2013); Choi et al. (2014)). Consequently, "less able" people should be more prone to Allais-type behavior than others.

The potential relation between ability and Allais-type behavior is interesting for understanding the Allais paradox, but it is also interesting because of possible implications. Allais-type behavior is a deviation from strictly rational behavior (as predicted by EUT) in the form of inconsistent decision making, and it may thus indicate some kind of limitation in the quality of decisions. If these limitations handicap "less able" people in particular, they may contribute to cementing their inferior socio-economic position. Thus, poorly educated people in less-developed

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countries or regions, such as the rural parts of Northeast Thailand, would be strongly affected.

However, there is hardly any evidence on the relation between Allais-type behavior and the ability of individuals. The main systematic analysis we are aware of is a study by Huck and Müller (2012) in which they examine a representative sample of the Dutch population. The authors find that Allais-type behavior is more pronounced among unemployed, lower-income, less-educated and less financially sophisticated people, thereby supporting the above-mentioned "ability hypothesis". These findings strengthen our motivation to analyze the Allais paradox in a sample of a relatively poor and poorly educated population (see Charness and Viceisza (2016)).

We ran an Allais experiment with people from rural Thailand for whom we have information on socio-demographic characteristics. This allows to replicate the Huck and Müller approach with a sample of poor individuals. We expect to find a relatively high level of EUT-violations (compared to studies from developed countries) and evidence in favor of the ability hypothesis in our sample. As the power of standard socio-demographic characteristics in explaining Allais-type behavior is limited, we extend the set of explanatory variables. We assume that characteristics which were shown to influence decision making under risk may additionally be relevant for the analysis.

We consider two kinds of characteristics as additional explanatory variables. First, we consider a rather *specific ability* in handling the Allais task, where ability refers to the correct processing of probability information. We label this variable as math-related ability. Such specific ability may complement the more general ability examined so far (measured, for instance, by the educational level). We measure math-related ability using the response in an experiment to test for possible violations of "first-order stochastic dominance" (FSD; see Birnbaum (1997)). The selection of the FSD experiment is motivated by a novel theoretical contribution of this study which is based on prospective reference theory (Viscusi (1989)). Prospective reference theory (PRT) provides a model of biased processing of probability information which has been regularly observed in empirical studies (Viscusi and O'Connor (1984); Viscusi (1985); Viscusi et al. (1987)). Our analysis is the

first to show that if Allais-type behavior is caused by biased processing of probability information, it should be positively correlated with violations of FSD under PRT. We believe that biased processing of probabilities can be an important origin of Allais-type behavior, in particular for poorly educated people as those in our sample. At the same time, FSD violations clearly document suboptimal decision making which may contribute to poverty traps.

The second novel kind of characteristics that we consider are indicators of *risk-related attitudes* which may shape real economic decisions of individuals. Since, ex ante, it is unclear whether risk averse or risk tolerant individuals are prone to Allais-type behavior, we consider measures of the individual risk attitude in the analyses. Second, we test whether optimism (or mood) plays a role. If so, the relation to Allais-type behavior should be the same for both types of risk-related attitudes, i.e. we expect risk tolerant and optimistic individuals to have similar tendencies towards EUT-violations.

We investigate the behavior in the Allais experiment using a sample of 778 individuals from rural Northeast Thailand. This is Thailand's poorest region with a median annual per capita income of about 1,500 US dollar. Lack of development is also indicated by an average of 4 to 6 years of schooling of the adult population.

Overall, we have four key findings. First, about 54% of respondents in the Allais experiment violate independence which is a violation rate at the upper range of earlier studies. This level seems remarkably high since we take three measures in the experimental design in order to avoid any upward bias: (1) We keep the lotteries simple, especially when compared to the original setting (Allais (1953)). This should facilitate consistent decision making in general (e.g. Levy (2008)). (2) We avoid extremely high (hypothetical) payoffs as in the original design since they have been shown to cause more Allais-type behavior (e.g. Huck and Müller (2012)). (3) We implement incentive-compatible pay-offs of considerable size in order to overcome often voiced concerns that otherwise decisions would be less carefully made (Holt and Laury (2002)) – although the evidence of this concern is not very strong (Camerer and Hogarth (1999)).

Second, we analyze whether the relations between socio-demographic characteristics and Allais-type behavior established by Huck and Müller (2012) hold among

a poor, rural population. Similar to their study, we find that individuals with more education, relevant work experience and greater financial sophistication are less prone to Allais-type behavior. We take this as evidence that more able people show less Allais-type behavior, as argued for example by Levy (2008).

Third, we extend the set of ability characteristics by a math-related variable, i.e. the biased processing of probability information. Based on our theoretical analysis, we address this bias by analyzing violations of FSD. We find that behavior in the FSD task is related to Allais-type behavior in the expected way: Consistent with PRT, violations of FSD occur jointly with inconsistent decisions in the Allais task. Interestingly, the response in the experiment to test for violations of FSD seems to be very different from individuals' cognitive ability.

Finally, we find that measures of risk-related behavior provide further explanatory power in the cross-section of the population. More precisely, Allais-type behavior is more frequently observed among individuals with *higher* risk tolerance and *more* optimism.

The implications of our findings for development are unfavorable: The relations between various ability characteristics and Allais-type behavior may be interpreted as another contribution to the often lamented poverty traps or vicious cycles. However, the implications of the relation between risk tolerance or optimism (i.e. particularly dynamic traits) and Allais-type behavior might be even more worrisome. Since risk tolerant and optimistic individuals are particularly prone to inconsistent behavior, development problems might be reinforced.

Our research is related to many previous studies which document the incidence of Allais-type behavior (Allais and Hagen (1979); Conlisk (1989); Birnbaum (1999)). However, evidence stems mainly from laboratory experiments with students. Our study is different in that we combine a household survey with field experiments, such as in Tanaka et al. (2010) or Dohmen et al. (2011). In this respect, the study of Huck and Müller (2012) is the first (and so far only one) to run Allais experiments with a representative sample (of about 1,500 Dutch individuals). Also in line with the ability hypothesis, Finkelshtain and Feinerman (1997) show that Allais-type behavior is related to poor education and little experience using a sample of 180 Israeli farmers. However, different from our research, these studies were

conducted in advanced economies and they do not consider math- or risk-related characteristics.

The remainder of this paper is organized as follows: In Section 2.2, we derive the hypothesis to be tested from the extant literature and describe the experiments. Section 2.3 presents our sample and the survey data. In Section 2.4, we provide experimental outcomes and estimates of the relation of Allais-type behavior to socio-demographic variables and risk-related characteristics. Section 2.5 documents robustness analyses, and Section 2.6 concludes.

2.2 Hypotheses and experimental design

In this section, we present the experimental design and the theoretical background of our analysis. Based on the reasoning provided in the introductory section, we derive four hypotheses which we aim to test in our study.

2.2.1 Allais experiment

We ran an incentivized Allais experiment in the form of a standard common ratio effect (Allais (1953); Kahneman and Tversky (1979)). Stimuli in the experiment were presented as bags, each of which containing 100 cards with different payoffs written on them. Participants got to draw one card from the bag that corresponded to their choice in the experiment and received the respective amount in the local currency Baht (Bt.). The common ratio effect consists of two choice problems:

Choice 1:

Bag A	Bag B
100 cards to win Bt 75	80 cards to win Bt 100
	20 cards to win Bt 0

Choice 2:

Bag C	Bag D
25 cards to win Bt 75	20 cards to win Bt 100
75 cards to win Bt 0	80 cards to win Bt 0

We used the standard "random lottery incentive mechanism", i.e. subjects were told that only one of the two choice problems would be paid out which was determined by a coin flip (for further details, see Appendix A). Consider an expected utility maximizer with von Neumann-Morgenstern utility function u(•). As the utility function in EUT is unique up to positive linear transformation we can normalize it without loss of generality such that $u(0) = 0$. Then Bag A will be preferred to Bag B if $u(75) > 0.8u(100)$. Dividing this inequality by four yields $0.25u(75) > 0.2u(100)$ which is precisely the condition for Bag C being preferred to Bag D. In other words, EU demands that a subject either chooses A and C or B and D. Choices of A and D or B and C in contrast violate EUT. Abundant evidence has been gathered that many people violate EU in this design. As the violating choice pattern A and D is much more frequently observed than the pattern B and C, these violations are systematic and, therefore, not likely caused by random error (Conlisk (1989)).

2.2.2 Experiment of stochastic dominance

In the incentivized experiment on first-order stochastic dominance in the design of Birnbaum (1997) subjects had to tackle the following choice problem:

Choice 3:

Bag E	Bag F
90 cards to win Bt 96	85 cards to win Bt 96
5 cards to win Bt 14	5 cards to win Bt 90
5 cards to win Bt 12	10 cards to win Bt 12

This problem is easily conceived if we consider the underlying baseline gamble which offers a 90% chance of winning 96 Bt and a 10% chance of winning 12 Bt. Bag E is constructed from this baseline gamble by splitting up the 10% chance of the worse prize into two events (with 5% probability each) and making the gamble slightly better, i.e. by replacing one of the outcomes with 14 Bt. Consequently, Bag E dominates the baseline gamble. Bag F is constructed from the baseline gamble by splitting up the 90% chance of the better outcome into two events (with

85% and 5% probability) and making the gamble slightly worse by replacing 96 Bt in the split event with 5% probability by 90 Bt. Therefore, Bag F is dominated by the baseline gamble and also dominated by Bag E, as first-order stochastic dominance is transitive. Consistency with first-order stochastic dominance is one of the most fundamental criterions of rationality in decision theory. Nevertheless, Birnbaum (2004b) and Birnbaum (2004a) observed in a design identical to ours violation rates of 70% for undergraduates and 50% for doctorates.

2.2.3 Theoretical predictions

In the most prominent version of PRT the utility of a gamble $G = (x_1, p_1, x_2, p_2; ...; x_n, p_n)$ where you win the monetary amount x_i with probability p_i is given by

$$V(G) = \sum_{i=1}^{n} u(x_i) w(p_i) \; with \; w(p_i) = \frac{\gamma(\frac{1}{n}) + \xi p_i}{\gamma + \xi} \qquad (2.1)$$
$$for \; 0 < p_i < 1, \; w(0) = 0, \; and \; w(1) = 1.$$

In this representation u is a standard von Neumann-Morgenstern utility function as in EUT and $w(p_i)$ is the weight of an outcome with probability p_i. The transformation of probabilities by w represents a biased processing of risk information which is in line with empirical observations (Viscusi and O'Connor (1984); Viscusi (1985); Viscusi et al. (1987)). To interpret the weight one can think of a subject who has not full confidence in the stated probabilities and has a symmetric prior (i.e. $1/n$) where $\gamma(\xi)$ represents the informational content of the prior (stated probabilities). Then Bayesian updating leads precisely to the weights defined in Equation 2.1.

In order to see how biased processing of probability information in PRT implies violations of dominance, we assume for convenience that the utility function is linear (i.e. $u(x) = x$) and define $\gamma^* = \gamma/(\gamma + \xi)$ and $\xi^* = \xi/(\gamma + \xi)$. Then a subject will prefer Bag F to Bag E if $\gamma^*(96 + 90 + 12)/3 + \xi^*(0.85*96 + 0.05*90 + 0.1*12) > \gamma^*(96 + 14 + 12)/3 + \xi^*(0.9*96 + 0.05*14 + 0.05*12)$

which implies $66\gamma^* + 87.3\xi^* > 40.7\gamma^* + 87.7\xi^*$, i.e. $\gamma^* > 0.016\xi^*$. Hence, already an extremely small bias towards the symmetric prior implies violations of dominance.

PRT is also able to accommodate the common ratio effect. Easy calculations reveal that Bag A is preferred to B if $\gamma^* > 0.2\xi^*$ while Bag D is for all non-negative γ^* and ξ^* preferred to Bag C. Hence $\gamma^* > 0.2\xi^*$ implies the typical pattern of violation reported in the experimental literature. This condition is also sufficient for subjects violating dominance. Consequently, according to PRT, violations of dominance and Allais-type behavior should be positively correlated.

2.2.4 Hypotheses

Based on the theoretical analysis and the state of the literature sketched in the introductory section, we derive four hypotheses to be tested: **(H1)** First, we expect to find a higher incidence of Allais-type behavior in our sample of a poor population relative to previous findings from advanced economies. **(H2)** Second, we expect to detect the same correlations between socio-demographic characteristics and Allais-type behavior as in the study by Huck and Müller (2012). The idea behind this hypothesis is that lack of ability might be associated with inconsistent decision making such as in the Allais experiment. **(H3)** Extending the so far considered ability characteristics, we hypothesize that Allais-type behavior may be partly caused by biased processing of probability information. According to PRT, this implies that Allais-type behavior should be more frequently observed among subjects who violate FSD. **(H4)** Finally, reaching beyond individual ability, we expect behavior in the Allais experiment to be related to behavior regarding other dimensions of risk, i.e. the individual risk attitude and optimism.

2.2.5 Procedure of the experiments

The experiments were conducted as part of a household survey. Besides socio-demographic and other information, the survey includes measures of risk attitude

and optimism. It was carried out at the household's dwelling, and the experiments were conducted at the end.

The experiments were implemented following established standards as we argue in detail below. The Allais experiment was always conducted first and the choice problems were kept in the same order. As a result, the experiments were easier to administer in the field. Moreover, Huck and Müller (2012) show that varying the order of decisions in the Allais experiment has no effect on experimental outcomes. After both decisions in the Allais experiment were made, the enumerator flipped a coin in order to determine the choice problem to be paid out. Participants got to draw one card from the bag that corresponded to their choice in the experiment. When making choices in the Allais experiment, subjects were not aware of the additional choice to be made, i.e. the FSD experiment. Note that irrespective of the outcome of the Allais experiment, it is always optimal to choose Bag E in the FSD experiment. After making their choice in the FSD experiment and drawing a card from the chosen bag, participants received their final payment, i.e. the sum of both cards drawn. The expected average payment was 136 Bt which corresponds to roughly 4 US dollar, i.e. half a day's wage or more of an unskilled worker. This amount should ensure that financial incentives were effective and participants made careful decisions.

2.2.6 Measure of risk attitude

In order to measure risk attitude, we use two variables which have been applied, for example, by Dohmen et al. (2011). The reliability of these simple survey items in comparison with established experimental measures has been demonstrated for Germany by Dohmen et al. (2011), for Northeast Thailand by Hardeweg et al. (2013b), and for (small samples from) 30 countries by Vieider et al. (2015). These findings highlight the usefulness of survey items for measuring risk attitudes in our context. The first measure we use is based on the question "How willing are you to take risks in general?". Respondents rate their willingness on an 11-point scale from 0 to 10. A value of 0 is assigned to individuals who are unwilling to take risk, whereas being fully prepared to take risk corresponds to a value of 10.

In addition to this general measure of risk attitude, we use a more domain-specific measure based on a hypothetical investment question (see also Barsky et al. (1997)). The question is as follows: "Imagine you just won 100,000 Baht in a lottery and you can invest this money in a business. There is a 50% chance that the business is successful. If the business is successful you double the amount invested after one year. If it is not successful you will lose half the amount you invested. What fraction of the 100,000 Baht would you invest in the business?". The answer, i.e. the fraction invested, provides a measure of risk tolerance. In order to use this measure in the empirical analyses, we convert it to US dollar.

2.2.7 Measure of optimism

It is well known that risk-related behavior is influenced by the degree of optimism of an individual (see, e.g., Puri and Robinson (2007)). We therefore generate a measure of optimism based on the following question: "Do you think you in person will be better off next year?". Answers range from "much better off", "better off", "the same", "worse off" to "much worse off". We aggregate the answers and generate a binary variable which is equal to one if respondents believe they will be "better off" or "much better off", and zero otherwise. Consequently, this variable provides a rough measure of optimism.

2.3 Data

A major advantage of this study is the availability of socio-demographic data provided by a household survey and experimental data on the decision behavior of the same individuals.

2.3.1 Household survey

The household survey, which is the basis of this study, was conducted in April and May of 2010. It is part of a large research project with multiple waves of data

collection (for more information, see Hardeweg et al. (2013a)). Due to a three-stage sampling design, our data is representative for the rural population of the selected province in Northeast Thailand. We have data on about 900 households from Ubon Ratchathani, the province where the field experiments were conducted. Household heads were interviewed in the majority of cases as our aim was to access reliable information on the entire household. As a consequence, households are representative for the rural population of this province but respondents are not, as they are relatively old compared to the overall population, for example.

The household survey provides socio-demographic information about the respondent and the household. Following the study by Huck and Müller (2012), we use four groups of socio-demographic characteristics which may affect decision behavior: (1) basic personal information, i.e. gender, age and education, (2) information about the main occupation (which may indicate experience with risky decisions), (3) information about the economic situation, primarily captured by household income, and (4) information about financial behavior. We extend these variables and further consider measures of math- and risk-related behavior.

2.3.2 Socio-demographic variables

Descriptive statistics of our sample are given in Table 2.1. Our sample is somewhat biased towards women, as more than 60% of respondents are female. Respondents are on average about 52 years old. They are older compared to the population as a whole which is likely due to migration and our ambition to interview household heads. In addition to the continuous measure of age, we provide descriptive statistics for binary variables which indicate different age cohorts. We use them in the main analysis in order to allow for non-linear effects. More precisely, we use the same age cohorts as in the study by Huck and Müller (2012), as we aim to replicate their analysis. Turning to education, we find that the years of schooling completed by individuals in our sample are widely scattered. There are clear peaks at four and six years which were the minimum years of schooling required some decades ago. As for age, we use additional binary variables which indicate different education levels, i.e. primary education, lower and upper secondary education, and

having a university degree. Next, we consider the occupation of respondents. We distinguish between wage-earners, being self-employed or unemployed, working in the household (mainly housewives) and "others". In particular, farmers belong to the reference category "others". The type of occupational activity might influence familiarity with risky decisions similar to the Allais-case. Turning to the economic status, we consider annual household income classified in three groups. Thereby, we take again potential non-linearities into account. Thus, the binary variable "middle income class" indicates households whose logarithm of income is in the inner 50%-interval of all households. In the robustness analyses, we also consider the (continuous) logarithm of income, the logarithm of income per capita, and the logarithm of consumption per capita which is a reasonable welfare measure in the context of a poor population (Hentschel and Lanjouw (1996)). Finally, we proxy financial behavior by the number of savings accounts a household uses. This includes accounts at semi-formal financial institutions and multiple accounts at the same institution. This variable can be interpreted as a measure of sophistication and diversification. We use it to replace the variable "(financial) assets" applied by Huck and Müller (2012). Their reliance on a "savings account" as an indicator of inferior sophistication does not apply to Thailand because basically all households use such an account.

2.3.3 Math-related characteristic

Our empirical analyses rely on a measure of math-related ability which was described and motivated in Section 2.2: the processing of probability information (measured by the response in the FSD experiment). In the robustness section, we also use numeracy (mathscore) and a memory measure of cognitive ability. However, this information is not available for all individuals in our sample.

2.3.4 Risk-related characteristics

In our empirical analysis we use two measures of risk-related behavior because risky decisions in the Allais experiment could be influenced by individuals' attitude towards risk. These risk-related variables were introduced in Section 2.2

above because they are new to the literature on Allais-type behavior. As a minimum, they can be interpreted as control variables to analyze the robustness of the more standard socio-demographic variables. However, they can also be seen as an independent source of Allais-type behavior which would – to the best of our knowledge – establish a new relation.

2.3.5 Balanced sample

In order to analyze Allais-type behavior, we use a balanced sample where observations with missing information were excluded. The final sample is 15% smaller compared to the original sample and comprises 778 observations. The composition of excluded observations is somewhat different compared to the restricted sample. As Table 2.1 shows, excluded individuals are on average more often in the highest age category ("Age $\geq$ 65"); they are less educated, less risk tolerant and optimistic, and they have lower incomes and fewer savings accounts. Most differences seem to be a consequence of the exclusion of the very elderly.

2.4 Results

In this section, we describe the results of testing our four hypotheses. We report the outcome of the Allais experiment (Section 2.4.1), its relation to standard socio-demographic variables (Section 2.4.2) and math-related ability (Section 2.4.3), and the relationship between Allais-type behavior and risk-related characteristics (Section 2.4.4).

2.4.1 Results of the Allais experiment

The results of the Allais experiment are largely consistent with previous findings in the literature, as Allais-type behavior (i.e. choices A and D, or B and C) is shown by a considerable fraction of respondents and it reveals the usual systematic pattern. Relative frequencies of choices are given in Table 2.2. These frequencies

are all significantly different from each other which dispels possible concerns of random responses.

Allais-type behavior is shown by 53.7% of individuals in our sample which is a relatively high share compared to previous results from developed countries. We take this finding as empirical support for Hypothesis 1. In the full sample (of 915 individuals), even 56.8% of individuals show Allais-type behavior which may (potentially) indicate that we indeed exclude the less educated and optimistic people from our initial sample. As we further see from Table 2.2, and consistent with findings in previous studies, the incidence of Allais-type behavior is systematic such that the combination AD (37.4%) is much more frequent than BC (16.3%). Applying the test of Conlisk (1989), we find that the former fraction is significantly higher than the latter ($p < 0.01$). These results indicate reliability of our data so that we continue the analysis.

2.4.2 Socio-demographic correlates

Next, we analyze the role of individual socio-demographic characteristics in explaining Allais-type behavior. Column (1) of Table 2.3 presents the estimates of a probit model where Allais-type behavior is explained by the standard socio-demographic characteristics considered in the study by Huck and Müller (2012). We measure Allais-type behavior using a binary variable which is equal to one if an individual chooses option A and D, or B and C in the Allais experiment. The socio-demographic variables are chosen and coded in a way that allows to replicate the approach by Huck and Müller (2012). We discuss the variables and their relation to Allais-type behavior in the order of the benchmark study.

Gender and age of participants in the experiment seem to be unrelated to Allais-type behavior. In contrast, more education – in particular having a university degree – is associated with less inconsistent behavior. Turning to occupation, unemployed individuals and housewives are more likely to show Allais-type behavior relative to those in the reference category, although the coefficient on "housewife" is smaller. Different from our expectations, income seems to be unrelated to Allais-type behavior (and this holds for various definitions of income, as demonstrated

in the robustness section below). Finally, our measure of financial sophistication, i.e. the use of several bank accounts (or other forms of savings accounts), is associated with less inconsistent behavior. All of the above relations hold when we include only significant explanatory variables to the model (see Column (2)). In sum, our results provide empirical support for three of the four significant relations found in the benchmark study by Huck and Müller (2012). However, in contrast to their study, we do not find a negative correlation between Allais-type behavior and income. The latter may capture some form of ability (which may generate higher income), resulting in less inconsistent behavior. In our case, the coefficient is positive and at best weakly significant, which might indicate the presence of different kinds of influences; we come back to this issue in Section 2.4.4 below.

2.4.3 Math-related correlate

In a next step, we add the measure of math-related ability, i.e. violations of FSD, to the benchmark specification described above (estimated in Column (1)). Results are presented in Column (3) of Table 2.3. As expected, the coefficient on "FSD violation" is positive; it is statistically significant and improves the model's explanatory power: The pseudo R^2 increases from 0.06 to 0.07. We conclude from the above findings that not just general ability, but also math-related ability contributes to explaining Allais-type behavior.

2.4.4 Risk-related correlates

In order to investigate the relationship between the risk-related variables and Allais-type behavior, we proceed similarly to the steps demonstrated above. First, we add the general measure of risk attitude to the baseline model (estimated in Column (1) of Table 2.3). Results are presented in Column (1) of Table 2.4. The estimates demonstrate that the willingness to take risk of participants in the experiment is positively related to Allais-type behavior. In a next step, we replace the general measure of risk attitude by the domain-specific measure based on the hypothetical investment question. Again, the coefficient is positive, although it

is only weakly significant (see Column (2)). In Column (3) we include our measure of optimism in the baseline specification and find a strong positive correlation between optimism and Allais-type behavior.

Finally, we add all risk-related variables to the baseline specification and present the estimates in Column (4) of Table 2.4. This specification has the highest explanatory power, as demonstrated by a pseudo R^2 of 0.09. Moreover, our general measure of risk attitude remains significant, whereas the domain-specific measure becomes insignificant. This result might be no surprise given the estimates in Column (1) and (2). Although we add the largest number of variables to the model, the previously significant coefficients retain their sign and significance. This indicates that all groups of variables (i.e. the standard socio-demographic variables and the math- and risk-related characteristics) indeed capture different kinds of relations to Allais-type behavior. Whereas they all may represent some kind of ability, each variable may provide an independent contribution to explaining Allais-type behavior (as demonstrated by the nearly unchanged coefficients).

The standard socio-demographic characteristics could be interpreted as indicators of general ability rooted in intellectual competence or in competence based on experience. As demonstrated by the estimates of the relationship between math-related ability and Allais-type behavior, math-related ability might play an additional role in decision making in the number-based Allais setting. Finally, the risk-related characteristics require some discussion because there is no clear ex ante hypothesis regarding the sign of their coefficients (except for the identity of the signs). These variables could be interpreted as indicators of ability, e.g. the ability of carefulness. Risk tolerant and optimistic individuals may tend to make quicker and less careful decisions and they might, thus, be more likely to show Allais-type behavior, independent from their further abilities. Alternatively, the risk-related characteristics could be interpreted as indicators of how people perceive the risky choices. Choosing first option A and then option D clearly involves some willingness to take risk and it may therefore be perceived by some people as such; i.e. the choice of A and D should be related to a high level of risk tolerance.

2.5 Further results and robustness

In this section, we report further results of robustness analyses which largely support our main findings. The following analyses were conducted: (1) We estimate the baseline model again, using continuous instead of categorical variables. (2) We substitute the income measure by reasonable alternatives and (3) estimate the baseline model separately for different kinds of EUT-violations; (4) we control for cognitive ability in a restricted sample, and (5) apply alternative estimation methods.

2.5.1 Modified age and education definition

The model specifications reported so far are based on categorical variables of age and education in order to replicate the study by Huck and Müller (2012). If one aims for a more parsimonious specification, however, a continuous definition of these variables may be suitable. Thus, we use years of age and years of schooling as alternative variable definitions. As evident from the results in Table 2.5, Column (1), our previous findings do not change much. However, the model's explanatory power is somewhat worse which indicates that both relations might be non-linear. Thus, we continue to follow the categorical approach.

2.5.2 Income measures

We run further analyses where we replace our binary measure of income by the logarithm of household income, the logarithm of per capita income and the logarithm of per capita consumption. As demonstrated by the results in Columns (2) to (4) of Table 2.5, neither the coefficients nor the overall estimation quality change much when we use those alternative measures of income. Interestingly, the coefficients are all positive, and the coefficient on "Log (income per capita)" is even marginally significant. Given the positive coefficients on the risk-related variables, our findings may suggest that the income coefficients pick up characteristics related to risk-taking, as risk-taking is associated with higher income. Indeed, when we

add the risk-related variables to the baseline specification, the income coefficient decreases in size (see Table 2.3, Column (1) and Table 2.4, Column (1)).

2.5.3 Kind of EUT-violation

In Section 2.4 above, we document variables which contribute to explaining Allais-type behavior in general. We now turn to an individual examination of both kinds of Allais-type behavior, i.e. the combinations of choices AD and BC in the experiment (see Table 2.2). Thereby, we investigate whether Allais-type behavior is overall driven by individual characteristics, or whether the relations to those characteristics are different for both kinds of Allais-type behavior.

Column (1) of Table 2.6 presents again the estimates of the baseline model in Column (4) of Table 2.4. Results for choices AD and BC are given in Column (2) and (3), respectively. For most explanatory variables, there are no apparent differences between the results in Column (2) and (3). For instance, the gender coefficient remains insignificant and the coefficients on "unemployed" and "housewife" retain their sign, though the latter becomes insignificant in Column (3). The coefficients on "number of savings accounts" and "optimism" are smaller, and the former becomes insignificant.

However, there are a few marked differences between the results in Column (2) and (3). The choice of A and D seems to be driven by younger, less educated individuals who violate FSD more often; this is again in line with PRT. In short, these findings roughly match the overall results presented in Column (1). By contrast, the choice of B and C seems to be driven by older individuals willing to take more risk. Thus, there seem to be some differences which cautiously supports the notion that our results are neither due to noise nor due to a general, ability-driven (all kinds of) Allais-type behavior.

2.5.4 Cognitive abilities

The behavior in the FSD task could be interpreted as a sign of individual perception or cognitive ability. It may therefore be important to control for cognitive

ability in the empirical analysis (see, e.g., Burks et al. (2009)). Similarly, it has been argued that risk-taking is positively related to cognitive ability (see Benjamin et al. (2013)), although this has been challenged by Andersson et al. (2016). In the following analysis, we explicitly control for cognitive ability, although we only have data available for a much smaller sample. Whereas our main data is from 2010, information about cognitive ability was compiled in 2013 with the same households. However, in many cases different members of household were interviewed in each survey wave, and sticking to the exact same persons reduces the sample size from 778 to 476.

We use two measures which address aspects of cognitive ability (inspired by Christelis et al. (2010)): a measure of numeracy and a measure of memory and verbal ability (see Appendix B for a full description). The numeracy measure is based on outcomes of six tasks. Tasks 1 to 4 are adopted from Cole et al. (2011), and tasks 5 and 6 are intended to represent task 2 and 3 from a standard survey used by Christelis et al. (2010). The measure of verbal ability has been used, among others, by Christelis et al. (2010) or Dohmen et al. (2010). Both dimensions of cognitive ability are positively and significantly correlated with each other, with a coefficient of 0.37.

In Column (1) of Table 2.7, we again estimate the model of Column (4) in Table 2.4 with our restricted sample, but we exclude the domain-specific measure of risk attitude. There seem to be no qualitative differences between the results in Column (1) of Table 2.7 and those in Column (4) of Table 2.4. The coefficients on "housewife" and "number of savings accounts" become insignificant, whereas the coefficient on "upper secondary education" becomes significant. The latter could be due to the reduction in the size of our sample which no longer contains any individual holding a university degree.

In Column (2), we add the variable "numeracy (mathscore)" to the baseline specification. As expected, the coefficient on "numeracy (mathscore)" is negative which indicates that better numeracy may result in less Allais-type behavior. Next, we add our second measure of cognitive ability to the specification, i.e. the number of animals people can mention within one minute (see Column (3)). This variable is intended to measure the quality of memory and verbal expression. The coefficient

is positive but not significant.

Third, in Column (4) we provide results of the acid test of including our measures of FSD violations and numeracy in one specification. Interestingly, both coefficients retain their sign and significance which cautiously indicates that FSD violations do not primarily inform about numeracy but instead about something else. This element may be biased processing of probability information (as predicted by PRT).

The results are similar when we include all variables in one specification (see Column (5)), although the coefficient on "numeracy" is insignificant. However, most importantly, all other coefficients are almost unaffected by the inclusion of the variable "numeracy (mathscore)". This clearly indicates that neither FSD violations nor risk-taking are substitutes for cognitive ability.

2.5.5 Alternative estimation methods

So far, we estimated marginal effects of ordinary probit models, as our dependent variable is binary. Estimates of our final model, i.e. the specification of Column (4) in Table 2.4, where the investment-based measure of risk attitude is excluded, are presented in Column (1) of Table 2.8. In the following, we conduct further robustness analyses, using alternative methods to estimate the coefficients and standard errors.

The behavior of residents within a village might be different from the behavior of other people, as it could be influenced by the communication within the village and village-specific environmental conditions. For example, the failure of risky investments in a village may increase the risk aversion of other residents within the same village, while people from outside might be unaffected. In general, if a variable varies strongly between villages but only little within, the variance of the regressor (here the willingness to take risk) is too low; this is the Moulton problem (Moulton (1986)). In such a case, conventional estimations of probit models could be misleading. The effect of the individual risk attitude could be overestimated or inconsistently estimated. There are several ways to address this problem. One is to calculate village-robust standard errors. Results are presented in Column (2)

of Table 2.8. The coefficients are naturally the same as in Column (1). Although most standard errors are also very similar, some coefficients become insignificant.

The method described above does not consider a potential correlation between the village influence and the relation between risk aversion and Allais-type behavior. Similar to time-invariant individual effects in panel models, village-invariant household effects can be modeled. This is applied in Column (3) of Table 2.8. The estimated standard errors are larger than those in Column (1) and (2), but more similar to those in Column (2).

Finally, there could be an interdependent link between the dependent variable and the regressors. For instance, the positive correlation between FSD violations and Allais-type behavior could be interpreted such that FSD violations cause Allais-type behavior – or the other way around. Moreover, an additional but unobserved influence may exist, causing FSD violations and Allais-type behavior at the same time. In such a case, the coefficient on "FSD violation" in Column (1) of Table 2.8 would be overestimated and inconsistent. An instrumental variable approach could solve this problem, yet it is difficult to find adequate instruments. Lewbel (2012) suggests a method that uses only internal information and allows the identification of structural parameters. The method requires the availability of regressors that are uncorrelated with the product of heteroscedastic errors. Results of Lewbel's method are presented in Column (4) of Table 2.8. Finally, results of Lewbel's method in combination with village-robust standard errors are presented in Column (5).

The estimates in Column (4) and (5) demonstrate that most coefficients, and particularly those which were significant in previous estimations, retain their sign. Most importantly, the coefficients of those variables which we introduce as new explanations of Allais-type behavior consistently retain their sign and significance level.

2.6 Conclusions

This study is the first to investigate Allais-type behavior in a large sample of a poor, rural population. The study is motivated by the concern that people in less-developed countries could be more prone to inconsistent decision making as in the Allais experiment which could be an expression of suboptimal decision making in general. We cannot compare the overall quality of decisions across countries with our data, but we find clear evidence that the degree of Allais-type behavior is remarkably high compared to previous studies.

Despite this difference to earlier work, we aim for, and succeed in, replicating the approach by Huck and Müller (2012) who are the first to relate Allais-type behavior to individual socio-demographic characteristics in a broad, representative sample (of the Dutch population). We provide empirical support for three (of four) significant relations which were found by Huck and Müller (2012) and which indicate a link of ability (e.g. captured by the educational level) to consistent decision making.

We extend the approach by also considering math- and risk-related characteristics which greatly improves the explanatory power of our model (as measured by the pseudo R^2). The coefficients of these variables are all statistically significant in various specifications. Whereas the math-related characteristic further elaborates on the ability-based explanation of Allais-type behavior, the risk-related characteristics indicate that further influences might play a role. Whatever their interpretation may be, the implication is unfortunate because particularly risk-tolerant and optimistic people tend to make inconsistent decisions under risk (as measured by the Allais experiment). At the same time, better education, including improved math-related ability, may reduce inconsistent behavior.

Our theoretical prediction derived from PRT, i.e. the positive relation between FSD violations and Allais-type behavior, is supported by the data. This finding constitutes a challenge for other theories of decision making under risk, e.g. cumulative prospect theory (Tversky and Kahneman (1992)), which cannot explain violations of FSD. In these theories, violations of FSD are regarded as random error. In this case, however, FSD violations should not be correlated with Allais-

type behavior. We do not claim that our data provide a stringent test of PRT or alternative theories; here future work under more controlled conditions is needed.

Overall, we contribute to the debate on the potential roots of Allais-type behavior by analyzing a novel kind of population and by uncovering new relations. We are aware that our sample is specific and favorable for detecting ability-based relations. We hope that our results stimulate further investigations in order to reveal robust stylized facts across various population samples and approaches.

Table 2.1: Summary statistics of explanatory variables

	Excluded Observations		Restricted sample		Tests for equality of two means	
	Mean	#Obs	Mean	#Obs	T-stat.	P-values
Female	0.63	137	0.62	778	0.56	0.57
Age	52.39	135	51.88	778	0.76	0.45
Age 17-24	0.00	135	0.01	778	-0.39	0.70
Age 25-34	0.06	135	0.04	778	1.94	0.05
Age 35-44	0.20	135	0.16	778	1.59	0.11
Age 45-54	0.32	135	0.40	778	-3.00	0.00
Age 55-64	0.23	135	0.28	778	-2.19	0.03
Age $\geq$ 65	0.19	135	0.10	778	4.20	0.00
Years of education	5.04	111	5.57	778	-2.98	0.00
No or primary education	0.89	111	0.84	778	2.35	0.02
Lower sec. education	0.06	111	0.08	778	-1.13	0.26
Upper sec. education	0.03	111	0.05	778	-1.41	0.16
University degree	0.01	111	0.03	778	-2.27	0.02
Wage-earner	0.22	111	0.23	778	-0.29	0.77
Self-employed	0.06	111	0.05	778	0.55	0.58
Unemployed	0.02	111	0.02	778	-0.66	0.51
Housewife	0.03	111	0.02	778	1.23	0.22
Other occupational status	0.68	111	0.67	778	0.18	0.86
Log(income per capita)	7.20	137	7.60	765	-8.40	0.00
Middle income class	0.47	137	0.62	778	-5.17	0.00
Log(consump. per capita)	7.56	137	7.79	774	-7.04	0.00
No. of saving accounts	0.63	134	1.76	778	-20.43	0.00
FSD violation	0.68	111	0.68	778	-0.07	0.94
Willingness to take risk	4.85	108	5.06	778	-1.28	0.20
Hypo. Investments/1000	2.23	107	2.84	778	-7.95	0.00
Optimism: better off	0.48	108	0.57	778	-2.82	0.00

Note: Other occupational status is primarily farmer. The share is 0.58 among the excluded observations and 0.62 in the restricted sample. This means that 92.5% of the individuals with other occupational status are farmers.

TABLE 2.2: OUTCOME OF THE ALLAIS EXPERIMENT

Allais decisions	Freq.	Percent	Cum.
AC	202	25.96	25.96
AD	291	37.40	63.36
BC	127	16.32	79.69
BD	158	20.31	100.00
Total	778	100.00	

Testing for uniform distribution
(H0: P(AC) = P(AD) = P(BC) = P(BD) = 0.25)

$T = 18.64 > Chi^2(3;0.95) = 7.82$

Allais behavior	Freq.	Percent	Cum.
No	360	46.27	46.27
Yes	418	53.73	100.00
Total	778	100.00	

Table 2.3: Probit estimation results: baseline and extended model

	(1)	(2)	(3)	(4)
Female	-0.043		-0.025	
	(0.040)		(0.040)	
Age 25-34	-0.025		-0.058	
	(0.259)		(0.257)	
Age 35-44	-0.147		-0.164	
	(0.242)		(0.238)	
Age 45-54	-0.133		-0.144	
	(0.241)		(0.239)	
Age 55-64	-0.262		-0.275	
	(0.231)		(0.227)	
Age $\geq$ 65	-0.143		-0.146	
	(0.245)		(0.243)	
Lower sec. education	-0.058		-0.070	
	(0.072)		(0.072)	
Upper sec. education	-0.127		-0.135	
	(0.088)		(0.087)	
University degree	-0.438***	-0.446***	-0.447***	-0.452***
	(0.080)	(0.072)	(0.077)	(0.071)
Wage-earner	-0.055		-0.057	
	(0.059)		(0.060)	
Self-employed	-0.019		-0.036	
	(0.083)		(0.083)	
Unemployed	0.411***	0.415***	0.411***	0.417***
	(0.064)	(0.060)	(0.064)	(0.059)
Housewife	0.316***	0.323***	0.319***	0.327***
	(0.105)	(0.102)	(0.103)	(0.099)
Middle income class	0.020		0.024	
	(0.039)		(0.039)	
No. of sav. accounts	-0.038*	-0.046**	-0.040*	-0.049**
	(0.021)	(0.019)	(0.021)	(0.020)
FSD violation			0.141***	0.134***
			(0.040)	(0.039)
Observations	778	778	778	778
Pseudo R^2	0.06	0.04	0.07	0.06
Prob > Chi^2	0.000	0.000	0.000	0.000

Notes: Marginal effects are reported. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. (1) baseline model (BM); (2) only significant regressors from (1); (3) BM+FSD violation; (4) only significant regressors from (3).

TABLE 2.4: PROBIT ESTIMATION RESULTS: EXTENDED MODEL

	(1)	(2)	(3)	(4)
Female	-0.043	-0.030	-0.059	-0.036
	(0.040)	(0.040)	(0.040)	(0.042)
Age 25-34	0.015	0.009	0.047	0.065
	(0.261)	(0.261)	(0.251)	(0.251)
Age 35-44	-0.104	-0.118	-0.084	-0.048
	(0.250)	(0.248)	(0.244)	(0.247)
Age 45-54	-0.080	-0.100	-0.059	-0.005
	(0.248)	(0.246)	(0.241)	(0.245)
Age 55-64	-0.210	-0.231	-0.190	-0.138
	(0.242)	(0.238)	(0.237)	(0.244)
Age $\geq$ 65	-0.084	-0.101	-0.055	0.022
	(0.255)	(0.253)	(0.249)	(0.251)
Lower sec. education	-0.053	-0.048	-0.092	-0.098
	(0.072)	(0.073)	(0.073)	(0.073)
Upper sec. education	-0.131	-0.127	-0.122	-0.131
	(0.088)	(0.087)	(0.088)	(0.088)
University degree	-0.450***	-0.448***	-0.442***	-0.464***
	(0.075)	(0.076)	(0.079)	(0.070)
Wage-earner	-0.059	-0.052	-0.079	-0.084
	(0.059)	(0.059)	(0.060)	(0.061)
Self-employed	-0.040	-0.025	0.001	-0.038
	(0.083)	(0.083)	(0.083)	(0.084)
Unemployed	0.410***	0.409***	0.428***	0.424***
	(0.067)	(0.067)	(0.052)	(0.055)
Housewife	0.308***	0.316***	0.285**	0.276**
	(0.109)	(0.105)	(0.117)	(0.120)
Middle income class	0.016	0.022	0.005	0.004
	(0.039)	(0.039)	(0.039)	(0.040)
No. of saving accounts	-0.034*	-0.042**	-0.042**	-0.042**
	(0.021)	(0.021)	(0.021)	(0.021)
Willingness to take risk	0.019**			0.019*
	(0.008)			(0.010)
Hypo. investments/1000		0.032*		0.011
		(0.017)		(0.021)
Optimism: better off			0.155***	0.160***
			(0.039)	(0.039)
FSD violation				0.145***
				(0.040)
Observations	778	778	778	778
Pseudo R^2	0.06	0.06	0.07	0.09
Prob > Chi^2	0.000	0.000	0.000	0.000

Notes: Marginal effects are reported. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; (1) baseline model (BM)+willingness to take risk; (2) BM+hypothetical investments/1000; (3) BM+optimism; (4)=(1)+hypothetical investments+optimism+FSD violation.

TABLE 2.5: PROBIT ESTIMATION RESULTS USING ALTERNATIVE VARIABLE DEFINITIONS

	(1)	(2)	(3)	(4)
Female	-0.045	-0.045	-0.044	-0.040
	(0.039)	(0.039)	(0.039)	(0.039)
Age	-0.004**	-0.005***	-0.005***	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
Years of education	-0.020***	-0.022***	-0.022***	-0.020***
	(0.007)	(0.007)	(0.007)	(0.007)
Wage-earner	-0.074	-0.076	-0.076	-0.081
	(0.056)	(0.056)	(0.056)	(0.056)
Self-employed	-0.022	-0.041	-0.040	0.018
	(0.082)	(0.083)	(0.085)	(0.084)
Unemployed	0.411***	0.413***	0.413***	0.415***
	(0.062)	(0.062)	(0.061)	(0.059)
Housewife	0.327***	0.331***	0.323***	0.323***
	(0.101)	(0.100)	(0.102)	(0.101)
Middle income class	0.029			
	(0.038)			
No. of saving accounts	-0.039*	-0.043**	-0.040*	-0.044**
	(0.020)	(0.021)	(0.020)	(0.021)
Log(income)		0.037		
		(0.023)		
Log(income per capita)			0.045*	
			(0.025)	
Log(consump. per capita)				0.029
				(0.035)
Observations	778	768	765	774
Pseudo R^2	0.04	0.05	0.04	0.04
Prob > Chi^2	0.000	0.000	0.000	0.000

Table 2.6: Probit estimation results: extended model

	AD+BC (1)	AD (2)	BC (3)
Female	-0.036	-0.053	0.011
	(0.042)	(0.040)	(0.028)
Age 25-34	0.065	-0.182	0.896***
	(0.251)	(0.191)	(0.010)
Age 35-44	-0.048	-0.312**	0.975***
	(0.247)	(0.152)	(0.004)
Age 45-54	-0.005	-0.326	0.992***
	(0.245)	(0.214)	(0.004)
Age 55-64	-0.138	-0.413***	0.996***
	(0.244)	(0.158)	(0.001)
Age $\geq$ 65	0.022	-0.307**	0.953***
	(0.251)	(0.133)	(0.006)
Lower sec. education	-0.098	-0.045	-0.051
	(0.073)	(0.068)	(0.045)
Upper sec. education	-0.131	-0.192***	0.074
	(0.088)	(0.067)	(0.079)
University degree	-0.464***	-0.310***	
	(0.070)	(0.056)	
Wage-earner	-0.084	-0.002	-0.074**
	(0.061)	(0.058)	(0.034)
Self-employed	-0.038	-0.024	-0.011
	(0.084)	(0.080)	(0.058)
Unemployed	0.424***	0.217*	0.238**
	(0.055)	(0.120)	(0.120)
Housewife	0.276**	0.214	0.042
	(0.120)	(0.144)	(0.113)
Middle income class	0.004	-0.021	0.020
	(0.040)	(0.038)	(0.027)
No. of saving accounts	-0.042**	-0.017	-0.022
	(0.021)	(0.020)	(0.016)
FSD violation	0.145***	0.176***	-0.028
	(0.040)	(0.036)	(0.029)
Willingness to take risk	0.019*	0.002	0.016**
	(0.010)	(0.010)	(0.007)
Hypo. investments/1000	0.011	0.024	-0.017
	(0.021)	(0.020)	(0.015)
Optimism: better off	0.160***	0.094**	0.062**
	(0.039)	(0.037)	(0.027)
Observations	778	778	778
Pseudo R^2	0.09	0.07	0.05
Prob > Chi^2	0.000	0.000	0.030

Notes: Marginal effects are reported. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2.7: Specification with mathscore and memory measure (restricted sample)

	(1)	(2)	(3)	(4)	(5)
Female	-0.052	-0.042	-0.033	-0.032	-0.059
	(0.051)	(0.049)	(0.050)	(0.050)	(0.051)
Age 25-34	0.335**	0.288	0.301	0.257	0.329**
	(0.143)	(0.193)	(0.183)	(0.222)	(0.150)
Age 35-44	-0.012	-0.072	-0.046	-0.116	-0.035
	(0.306)	(0.318)	(0.316)	(0.315)	(0.311)
Age 45-54	0.047	-0.054	-0.019	-0.089	0.014
	(0.300)	(0.310)	(0.309)	(0.306)	(0.304)
Age 55-64	-0.022	-0.143	-0.105	-0.179	-0.057
	(0.305)	(0.312)	(0.313)	(0.307)	(0.309)
Age $\geq$ 65	0.030	-0.129	-0.087	-0.153	-0.005
	(0.306)	(0.324)	(0.325)	(0.318)	(0.314)
Lower sec. education	-0.163*	-0.078	-0.106	-0.078	-0.142
	(0.091)	(0.089)	(0.090)	(0.090)	(0.092)
Upper sec. education	-0.375***	-0.321***	-0.363***	-0.338***	-0.345***
	(0.099)	(0.109)	(0.102)	(0.106)	(0.106)
Wage-earner	-0.129*	-0.125	-0.131*	-0.119	-0.124
	(0.078)	(0.076)	(0.076)	(0.077)	(0.078)
Self-employed	0.037	0.033	0.032	0.001	0.038
	(0.114)	(0.111)	(0.111)	(0.114)	(0.114)
Unemployed	0.391***	0.377***	0.382***	0.379***	0.388***
	(0.054)	(0.068)	(0.063)	(0.066)	(0.056)
Housewife	0.156	0.203	0.212	0.200	0.148
	(0.147)	(0.135)	(0.132)	(0.134)	(0.149)
Middle income class	0.105**	0.126***	0.126***	0.124**	0.105**
	(0.050)	(0.049)	(0.049)	(0.049)	(0.050)
No. of sav. accounts	0.021	0.017	0.018	0.016	0.018
	(0.027)	(0.026)	(0.026)	(0.027)	(0.027)
Optimism: better off	0.191***				0.188***
	(0.051)				(0.051)
FSD violation	0.112**			0.100*	0.120**
	(0.054)			(0.053)	(0.054)
Willing to take risk	0.021*				0.019*
	(0.011)				(0.011)
Mathscore		-0.036*		-0.040*	-0.034
(numeracy)		(0.021)		(0.022)	(0.022)
No. of animals			0.001		
(memory measure)			(0.005)		
Observations	476	476	476	476	476
Pseudo R^2	0.08	0.06	0.06	0.06	0.09
Prob > Chi^2	0.000	0.001	0.002	0.000	0.000

Notes: Marginal effects are reported. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. (1) baseline model (BM)+optimism+FSD+risk; (2) BM+mathscore; (3) BM+memory; (4) BM+FSD+mathscore; (5) BM +optimism+FSD+risk+mathscore.

TABLE 2.8: ALTERNATIVE ESTIMATION METHODS (AND EXTENSIONS)

	Probit	Probit with village robust std. errors	Probit with village-invariant effects	Lewbel	Lewbel with village robust std. errors
	(1)	(2)	(3)	(4)	(5)
Female	-0.040	-0.040	-0.088	-0.043	-0.043
	(0.041)	(0.062)	(0.130)	(0.037)	(0.057)
Age 25-34	0.061	0.061	0.756	-0.007	-0.007
	(0.251)	(0.368)	(0.792)	(0.230)	(0.306)
Age 35-44	-0.050	-0.050	0.298	-0.117	-0.117
	(0.247)	(0.350)	(0.749)	(0.219)	(0.277)
Age 45-54	-0.007	-0.007	0.579	-0.075	-0.075
	(0.244)	(0.335)	(0.752)	(0.217)	(0.263)
Age 55-64	-0.140	-0.140	0.101	-0.196	-0.196
	(0.243)	(0.333)	(0.755)	(0.218)	(0.265)
Age $\geq$ 65	0.017	0.017	0.610	-0.052	-0.052
	(0.250)	(0.352)	(0.780)	(0.223)	(0.283)
Lower sec. education	-0.102	-0.102	-0.304	-0.095	-0.095
	(0.073)	(0.109)	(0.222)	(0.067)	(0.100)
Upper sec. education	-0.133	-0.133	-0.368	-0.120	-0.120
	(0.088)	(0.138)	(0.276)	(0.083)	(0.132)
University degree	-0.464***	-0.464***	-1.651***	-0.411***	-0.411***
	(0.070)	(0.072)	(0.506)	(0.109)	(0.097)
Wage-earner	-0.086	-0.086	-0.250	-0.079	-0.079
	(0.060)	(0.091)	(0.204)	(0.055)	(0.083)
Self-employed	-0.039	-0.039	-0.024	-0.037	-0.037
	(0.084)	(0.108)	(0.260)	(0.078)	(0.103)
Unemployed	0.425***	0.425***	1.503**	0.431***	0.431***
	(0.055)	(0.055)	(0.637)	(0.112)	(0.074)
Housewife	0.275**	0.275	0.683	0.262*	0.262
	(0.121)	(0.180)	(0.514)	(0.139)	(0.169)
Middle income class	0.003	0.003	-0.012	-0.002	-0.002
	(0.039)	(0.063)	(0.126)	(0.036)	(0.057)
No. of sav. accounts	-0.040*	-0.040	-0.179***	-0.036*	-0.036
	(0.021)	(0.032)	(0.068)	(0.019)	(0.030)
Willing to take risk	0.022***	0.022*	0.071***	0.019**	0.019*
	(0.008)	(0.011)	(0.027)	(0.008)	(0.010)
Optimism: better off	0.160***	0.160***	0.472***	0.150***	0.150***
	(0.039)	(0.058)	(0.123)	(0.036)	(0.054)
FSD violation	0.146***	0.146**	0.409***	0.135***	0.135**
	(0.040)	(0.065)	(0.128)	(0.037)	(0.060)
Observations	778	778	778	778	778
Pseudo (centered) R^2	0.09	0.09	-	0.11	0.11
Prob > Chi^2 (F)	0.000	0.000	0.000	0.000	0.000

Notes: Marginal effects; standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix A. Description of the experiments

The decision tasks were conducted as described in the following instructions. Each enumerator had a set of six bags, each representing one of the four alternatives of the Allais questions and the two alternatives to elicit FSD violations. Each bag contained 100 cards displaying the respective payoffs, with the number of cards of each payoff corresponding to the respective probability.

Game

This is a game to learn about your behavior towards choices. It is just for research purposes. You will be asked to make a few decisions. These decisions lead to outcomes where you may win money depending on your choice; however, you can never lose any money. In the following we ask you to draw a card from one out of two bags. In each bag there are 100 cards. The 100 cards represent different pay-offs, written on each card. This pay-off varies between 0 and 100 Baht.

General procedure

1. At the beginning we tell how many cards with which pay-offs are in the bags.
2. Then, please, choose which bag you prefer.
3. Finally, you draw one card (without seeing it) from the chosen bag and you will receive the amount in Baht for which this card stands.

Do you want to participate in the game?

7 Participate in game Yes: ☐ No: ☐

If no, what is the reason why you do not want to participate in the game?

8 Reason of no-participation

Religion: ☐

Bad Experience: ☐

Never play: ☐

Other, specify: _____

Procedure for choice 1 and 2:

We ask you to make two choices (choice 1 and choice 2) between two bags each with different combinations of cards. Then the enumerator will flip a coin. If the result is "king", you can draw a card from the bag of your choice 1. If the result is "palace" then you can draw a card from the bag of your choice 2. From which bag would you prefer to draw a card, considering that you will receive the pay-off written on the card you draw?

Choice 1:

Bag A	Bag B
100 cards to win Bt 75	80 cards to win Bt 100
	20 cards to win Bt 0

What is your choice 1?

9 Choice 1 A: ☐ B: ☐

Choice 2:

Bag C	Bag D
25 cards to win Bt 75	20 cards to win Bt 100
75 cards to win Bt 0	80 cards to win Bt 0

What is your choice 2?

10 Choice 2 C: ☐ D: ☐

What is the result of the coin toss?

11 Coin King: ☐ Palace: ☐

PAY-OFF

What was the pay-off written on the card drawn?

12 Pay-off 1 0: ☐ 75: ☐ 100: ☐

Procedure for choice 3:

Now you can win additional money by making one more choice (choice 3). From which bag do you prefer to draw a card?

Choice 3:

Bag E	Bag F
90 cards to win Bt 96	85 cards to win Bt 96
5 cards to win Bt 14	5 cards to win Bt 90
5 cards to win Bt 12	10 cards to win Bt 12

What is your choice 3?

13 Choice 3 E: ☐ **F:** ☐

PAY-OFF

What was the pay-off written on the card drawn?

14 Pay-off 2 12: ☐ **14:** ☐ **90:** ☐ **96:** ☐

Total amount received _____ **THB**

Signature _____

Name _____

Appendix B. Description of the tasks on cognitive ability

The first task is a measure of memory and verbal ability. The numeracy variable is based on answers to the following six questions which are displayed below (question 2 to question 7), and the respective "mathscore" is constructed as number of correct answers (ranging from 0 to 6).

1	**I would like you to name as many different animals as you can in 60 seconds.** *Enumerator: write responses in box below. Please, do not tell the respondent whether the answer is right or wrong. Please mark answers using the check list.)*		
2	**What is 45+72?**	*Please fill in answer here or tick box to the right*	☐ Do not know ☐ No answer
3	**If you have four friends and would like to give each of your friends four sweets, how many sweets do you need?**		☐ Do not know ☐ No answer
4	**What is 5% of 200?**		☐ Do not know ☐ No answer
5	**Suppose you want to buy a bag of rice that costs 270 Baht. You only have one 1000 Baht note. How much change will you get?**		☐ Do not know ☐ No answer
6	**In a sale, a shop is selling all items at half price. Before the sale a mattress costs 3000 Baht. How much will the mattress cost in the sale?**	☐ 1500 Baht ☐ 4500 Baht ☐ 6000 Baht	☐ Do not know ☐ No answer
7	**A second-hand motorbike dealer is selling a motorbike for 12000 Baht. This is two thirds of what it costs new. How much did the motorbike cost new?**	☐ 9000 Baht ☐ 16000 Baht ☐ 18000 Baht ☐ 24000 Baht	☐ Do not know ☐ No answer

Chapter 3

Risk-type and preference-based selection, and stability of funeral insurance associations in Northeast Thailand[‡]

3.1 Introduction

Adverse selection is a significant problem for the insurability of risks in community-based insurance organizations, as it may shift premiums upwards and destabilize insurance schemes (Biener and Eling (2012)).[3,4] In contrast to conventional insurance markets, preventive measures such as risk classification, signaling or strict, formal entry regulations are often not applied, because collecting the necessary

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[3]In a systematic review of the literature on microinsurance, Biener and Eling (2012) identify information asymmetries as the leading cause hindering the insurability of risks. Further, the authors note that insufficient resources to evaluate risks, the small size of insurance groups, and high premiums seem to be prominent problems.

[4]Examples of studies that report on destabilized community-based insurance schemes or adverse selection in microinsurance are, for instance, Wang et al. (2006), Criel and Waelkens (2003), Allegri et al. (2006), Polonsky et al. (2009), Supakankunti (2000), Ito and Kono (2010), McCord and Osinde (2005), Morduch (2006), Giesbert et al. (2011).

information is costly and the organizational capacity is limited (Biener (2013)). However, despite the absence of such preventive measures, one line of community-based insurance organizations does not seem to suffer from adverse consequences: funeral insurance associations (see e.g. Bryant and Prohmmo (2002), Dercon et al. (2006)).

In this study, we shed light on the mechanisms that contribute to the stability of funeral insurance schemes by taking a closer look at Funeral Aid Associations (FAAs) in Northeast Thailand. FAAs offer funeral insurance at a uniform price without (strict) entry regulations. This provides an incentive for high-risk individuals to join the scheme, as they may benefit financially from insurance membership. Surprisingly, FAA premiums seem to be very stable and membership figures are even rising (see, e.g., McCord and Tatin-Jaleran (2013)). To explain this puzzle, two general directions of reasoning are possible. First, for whatever reason, individuals with a high mortality risk may not react to the financial incentive to join the scheme. Second, a counter-balancing selection of low-risk individuals may coexist. In our empirical analysis we find that high-risk individuals are indeed more likely to join an FAA, making the first hypothesis unlikely. Hence, this finding suggests the coexistence of a counter-balancing selection: Low-risk individuals may deliberately join the scheme, although for them, the insurance premium exceeds the expected value of compensations, i.e. premiums are not actuarially fair. In this study, we investigate potential drivers of this counter-balancing selection. Previous studies by Bryant and Prohmmo (2002) and Dercon et al. (2006) suggest strong intra-community ties as an explanation for the stability of funeral insurance associations.[5] The authors argue that social ties imply solidarity and inclusiveness, forcing low-risk individuals to subsidize high-risk members of their community. However, in our context this explanation seems unlikely given that FAAs usually have thousands of members and cover large areas. In this study, we argue that the stability of funeral insurance schemes does not (only) rely on

[5]The authors investigate patterns of selection into funeral societies. Dercon et al. (2006) find that larger households are better represented in funeral insurance schemes in Ethiopia and Tanzania. Those households may benefit more from the equal-contribution per household rule than smaller households. Further, Bryant and Prohmmo (2002) provide evidence that certain riskier households are much more likely to receive payments from funeral societies in Northeast Thailand, while paying equal premiums.

social cohesion. We assume that it might be based on a family-oriented willingness of certain low-risk individuals to pay more for insurance than the actuarially fair premium. We provide a theoretical framework which demonstrates that individuals with close family ties may join the insurance at lower risk levels. Such a high preference for insurance could be based on family pressure, reciprocity or altruism, as in the event of death, the family of the deceased, and in particular the spouse, may suffer the most from the social and financial costs of an uninsured funeral. Our empirical results demonstrate that married individuals are indeed more likely to join the insurance, and that their mortality risk is relatively low. However, we do not find similar results for the presence of children in a household.

3.2 Background

Before we analyze selection patterns and the stability of FAAs, it is important to highlight some key features of the FAA insurance scheme. We briefly give some background information about the high demand for funeral insurance in the region of our study. Moreover, we provide information on how the FAA insurance mechanism is set up, on the characteristics and comparability of FAAs across the region and eligibility criteria for membership.

General. Funeral insurance is a popular financial service in rural Northeast Thailand. The region is mainly populated by Buddhists who traditionally spend great amounts of financial resources on funeral arrangements. The costs for the religious ceremony held at the temple and other funeral-related expenses usually range between THB 50,000 and THB 100,000 (McCord and Tatin-Jaleran (2013)) which exceeds the average annual disposable income of households in the region.[6] However, funeral expenses are to a large extent socially enforced. A failure in keeping up with the tradition entails high social costs, i.e. families lose prestige and respect among fellow villagers. Since the timing of death is unpredictable, households highly value insurance products that mitigate the financial burden of a funeral. To meet this need, based on traditional, informal insurance groups, the

[6]The average annual household income in our sample was THB 82,000 in 2008.

Bank of Agriculture and Agricultural Cooperatives (BAAC) initiated the foundation of large-scale, membership-based funeral aid associations (FAA) throughout its branch network in 1980.[7] Nearly 5.5 million people were member of one of the 521 FAAs that existed by the end of 2002 (Sompadung (2013)).

Insurance mechanism, premiums, and benefits. The key features of the insurance scheme are the pay-as-you-go character, the uniform pricing strategy (set according to the average community risk), and the resolution to provide full insurance coverage (McCord and Tatin-Jaleran (2013)). FAAs follow a pay-as-you-go system, where the total amount of benefits paid out in a given period is divided by the number of FAA members. The resulting share of costs is the premium each member has to pay in that period.[8] The sum insured, i.e. the amount of benefit paid out in the event of death, is usually THB 100,000 per person (which is enough to cover the average funeral costs in the region).[9] Some FAAs prefix higher payments, yet within an FAA they are equal for all members. Hence, the FAA premium is a linear function of the sum insured and a contribution parameter which represents the average mortality risk in the community in a given period (1.2 percent as of 2002). Most importantly, FAAs do not pursue any activities related to risk management (e.g. screening, signaling, risk classification, etc.).

Comparability of FAAs. Our theoretical and empirical analyses are based on the assumption that FAAs are comparable in the way they operate. In general, FAAs are non-profit insurance associations which are independent and self-organized. Yet, the BAAC acts as a promoter and supporter of FAAs by providing office space for rent, guidance in administration and management, and payment

[7] The tradition of giving donations to the family of the deceased is deeply rooted in village communities. In many villages, it led to the establishment of semi-formal burial societies – village-based insurance groups which rely on the principle of mutual aid. For a detailed description of a village-based burial society, see the study by Bryant and Prohmmo (2002).

[8] Further, all members share the administrative costs of the association equally.

[9] When a member passes away, the sum insured is paid out to pre-assigned beneficiaries through the BAAC system. The decision how to utilize the compensation is left to the recipients. Most importantly, the BAAC does not have any legal claims on the proceeds to cover outstanding loan repayments. Most members honor their debts with the bank, though. Nevertheless, out of the THB 6.7 billion which were paid out in 2002, only 18 percent were used for debt settlements (Sompadung (2013)).

services. Further, all BAAC-supported FAAs are based on the legal foundation of the Funeral Association Act (initially issued in 1974, recent version of 2002) that regulates the organizational structure and procedures, upper limits of administrative fees, etc.[10] Due to the technical assistance of the bank and the regulatory framework, FAAs are quite comparable across the country. They might differ, however, in the level of premiums (e.g. due to variation in administrative efficiency), the number of members, and average member characteristics (e.g. the mortality risk). While these differences across FAAs are of no concern for our theoretical analysis (our conclusions are transferable across FAAs which vary in the above characteristics), we have to take them into account when investigating FAAs empirically, as described in more detail in Section 3.4.2.

Eligibility for membership. Our analyses further rely on the assumption that membership in an FAA is voluntary and accessible for (almost) everybody. Membership in a funeral association is available, but not compulsory, for BAAC clients (borrowers and depositors) and their spouse (McCord and Tatin-Jaleran (2013)). Not being a BAAC customer, although formally required, is not a de facto restriction. BAAC clients are allowed to remain a member of an FAA when their relationship with the bank ends. Anecdotal evidence suggests that individuals that are not yet with the BAAC strategically open bank accounts or take out small loans (a service practically available to any resident in rural areas) in order to become eligible for FAA membership. In an official report the bank states that for many people, FAA membership is more important than the loan itself (Sompadung (2013)). Further, FAA membership is officially restricted to healthy individuals between the age of 20 and 65 (McCord and Tatin-Jaleran (2013)). Good health has to be certified by a physician, yet no in-depth health examinations are necessary. In fact, only severely ill individuals are rejected when applying for membership. To sum up, membership decisions are made voluntarily and applications are usually approved. The few supply-side restrictions – old age and extreme illness – will be accounted for in our empirical analyses.

[10] See Sompadung (2013) and the Funeral Association Act, B.E. 2545 (2002) on http://www.lawreform.go.th.

3.3 Theoretical analysis

3.3.1 Determinants of membership decision

Individual $i \in I$ will take out funeral insurance for period $t+1$ if the expected utility of insurance membership at time t is greater than the expected utility of not being a member of an FAA:

$$EU_{i1,t} > EU_{i0,t}. \tag{3.1}$$

In a simplified framework, individual i considers in period t the utility U_i of the disposable income w_i, and the loss L_i^d his dependents would experience in $t+1$ if i should die. For the purpose of this framework, we define dependents as those family members who would be most negatively affected by i's death and funeral, e.g. i's spouse and children. The loss may reflect social costs, i.e. the family's loss of reputation among fellow villagers if the funeral would fail to meet local expectations. It may further materialize in the form of financial costs, e.g. the total costs of emergency loans taken up at extreme interest rates in order to fund an uninsured funeral. For simplicity, we assume that i's decision to join the insurance is the only way for his dependents to be financially prepared for a funeral.

We adopt a standard framework for insurance demand, e.g. as in Rothschild and Stiglitz (1976). We modify it by adding a parameter that allows for heterogeneity in insurance preferences unrelated to the individual risk type. If individual i is not a member of the insurance, the expected utility can be expressed as

$$EU_{i0,t} = (1 - r_{i,t+1})U_{i,t}(w_{i,t}) + r_{i,t+1}U_{i,t}(w_{i,t} - \delta_{i,t}L^d_{i,t+1}), \tag{3.2}$$

where $r_{i,t+1}$ is the probability that i will pass away in period $t+1$, with $0 \leq r_{i,t+1} \leq 1$. Further, $\delta_{i,t} \geq 0$ is a weighting parameter which indicates how much the family's loss $L^d_{i,t+1}$ affects i's utility, and therefore his insurance decision in t. $\delta_{i,t}$ is zero if i does not have any dependents, and greater than zero otherwise, where $\delta_{i,t} = 1$ indicates *normal* preferences for insurance and $\delta_{i,t} < (>)1$ indicates

low (*high*) preferences. The parameter allows for several interpretations. First, it may reflect the bargaining power of i's dependents, i.e. the degree of pressure the family may exert in order to convince i to take out insurance. Second, it may be interpreted as the degree of cooperation within the household, reflecting, for instance, reciprocity among family members with respect to insurance take-up. Third, it may be interpreted as a bequest motive or as the degree of empathy-based altruism that the individual harbors for his dependents. In all three cases $\delta_{i,t}$ may depend on the degree of how much i's family cares about whether an appropriate funeral is held or not. Finally, $\delta_{i,t}$ could also reflect the degree to which members of the family serve as a substitute for insurance. For instance, the individual might worry less about the loss of his dependents with increasing family size, as financial costs would be borne by more relatives. For the rest of this paper we refer to $\delta_{i,t}$ as the family-related preference for insurance.

If individual i is a member of the insurance, the expected utility can be expressed as

$$EU_{i1,t} = (1 - r_{i,t+1})U_{i,t}(w_{i,t} - c_t) + r_{i,t+1}U_{i,t}(w_{i,t} - c_t - \delta_{i,t}(b^d_{t+1} - L^d_{i,t+1})) \quad (3.3)$$

where c_t is the premium paid by i in period t in order to take out insurance coverage for $t+1$, and b^d_{t+1} is the benefit payment received by the dependents if i passes away in $t+1$. As described above, FAAs provide full insurance coverage. We therefore assume that b^d_{t+1} is equal to $L^d_{i,t+1}$. Hence, Equation (3.3) can be expressed as

$$EU_{i1,t} = U_{i,t}(w_{i,t} - c_t). \quad (3.4)$$

From Equations (3.1), (3.2) and (3.4) we obtain the necessary condition for individual i to join an FAA:

$$\frac{U_{i,t}(w_{i,t}) - U_{i,t}(w_{i,t} - c_t)}{U_{i,t}(w_{i,t}) - U_{i,t}(w_{i,t} - \delta_{i,t}b^d_{t+1})} < r_{i,t+1}. \quad (3.5)$$

Whether the above condition holds depends on the level of the family-related preference for insurance, on the mortality risk and the shape of the utility function.

If an individual does not have any dependents, i.e. $\delta_{i,t} = 0$, $EU_{i0,t}$ is always greater than $EU_{i1,t}$. Hence, such an individual will never take out funeral insurance. Conditional on having dependents, an increase in the mortality risk (e.g. due to age or illness) or in the family-related preference for insurance would raise $EU_{i1,t}$ relative to $EU_{i0,t}$.[11] Finally, the more risk averse an individual is (i.e. the more concave the utility function), the higher is his or her willingness to pay a risk premium in order to gain certainty about the future (i.e. to avoid the possible loss $L^d_{i,t+1}$). Therefore, the probability to take out insurance should rise with increasing individual risk aversion, ceteris paribus.

3.3.2 FAA budget constraint

An FAA insurance scheme is in a stable equilibrium, if the accumulated premiums c_t of all members $i \in M(c_t)$ are equal to or greater than total payments made to beneficiaries in a particular period, i.e. the budget constraint of the insurance can be expressed as

$$\sum_{i \in M(c_t)} r_{i,t+1} b^d_{t+1} \leq \sum_{i \in M(c_t)} c_t, \tag{3.6}$$

where $M(c_t)$ is the set of members attracted to the insurance at a given premium level c_t. As b^d_{t+1} is predetermined and fixed to the usual costs needed in order to arrange a funeral, the balance of Equation (3.6) depends on the endogenous relationship between the premium level c_t and the average mortality risk $\bar{r}_{t+1}$ of all members $i \in M(c_t)$.[12] To meet the budget constraint, the average risk of all members must satisfy the condition

$$\bar{r}_{t+1} \leq \frac{c_t}{b^d_{t+1}}. \tag{3.7}$$

[11] In the most extreme case, individuals may choose to insure themselves just before death. Many FAAs therefore couple eligibility for benefits to a minimum period of membership of a few weeks or months.

[12] The endogeneity of the relationship arises because, on the one hand, FAAs set their premium level according to the average mortality rate of their members (see the pay-as-you-go system, described in Section (3.2)). On the other hand, the average mortality rate depends on the quality of the risk pool attracted to the insurance at a given premium level.

Note the sharp contrast of this budget constraint to the membership condition in Equation (3.5).

3.3.3 Stability

From Equation (3.5) it is evident that individuals with

$$r_{i,t+1} > \frac{c_t}{\delta_{i,t} b^d_{t+1}} \tag{3.8}$$

will join the insurance of whom those may threaten the stability of FAAs who benefit financially from insurance membership, i.e. individuals with $\delta_{i,t} \leq 1$, and therefore with

$$r_{i,t+1} > \frac{c_t}{b^d_{t+1}}. \tag{3.9}$$

For the purpose of the remaining analysis we define those individuals as high-risk types. The selection of high-risk individuals into the insurance scheme may threaten the financial stability if it is not counter-balanced by a sufficiently high share of low-risk individuals who are willing to pay more than the actuarially fair premium, i.e. individuals with

$$r_{i,t+1} < \frac{c_t}{b^d_{t+1}}. \tag{3.10}$$

More precisely, since $\bar{r}_{t+1}$ must be greater than the left-hand side of Equation (3.5) divided by the number of insurance members $|M(c)|$ (and given the fixed levels of c_t and b^d_{t+1}), we can combine Equation (3.5) and (3.7), and obtain the static condition for insurance stability:

$$\frac{1}{|M(c)|} \sum_{i \in M(c)} \frac{U_{i,t}(w_{i,t}) - U_{i,t}(w_{i,t} - c_t)}{U_{i,t}(w_{i,t}) - U_{i,t}(w_{i,t} - \delta_{i,t} b^d_{t+1})} < \frac{c_t}{b^d_{t+1}}. \tag{3.11}$$

Equation (3.11) conveys that stability is possible even though FAAs are particularly attractive to high-risk individuals. Moreover, it becomes evident that pref-

erences for insurance are crucial for the stability of the insurance. First, low-risk individuals who demand insurance based on risk-averse preferences increase the likelihood that Equation (3.11) holds. Second, and most importantly for the focus of this paper, family-related preferences $\delta_{i,t}$ influence the left-hand side and, hence, the likelihood that Equation (3.11) holds. If $\delta_{i,t}$ is greater than one, individuals may be attracted to the insurance at low mortality-risk levels, and they may contribute to stabilize the scheme (given the fixed premium level). We investigate this further in our empirical analysis below by testing how the presence of a spouse or children in a household accounts for insurance demand at lower risk levels.

In the above framework, we leave out any emotional cost the individual may directly face when knowing that he or she may pass away without a "proper" funeral. Nevertheless, these feelings may play a role for insurance demand and for the stability of FAAs. However, our theoretical framework could be easily adjusted such that $L_{i,t+1}$ represents i's direct loss while $\delta_{i,t}$ would capture an intrinsic preference for insurance, i.e. how much the individual cares about the funeral. The latter could depend on the degree of reputational considerations, guilty feelings of breaking with religious traditions (both of which Buddhists may even care about beyond death), or the pure feeling of sadness to end life without a "proper" celebration. In an adjusted model of this kind the conclusions would essentially remain the same: heterogeneous preferences (of whatever kind) play an important role for the stability of funeral insurance schemes.

3.4 Empirical analysis

We use household panel data which is representative for rural households in Northeast Thailand. Our empirical strategy unfolds in three steps. First, we investigate the selection into FAAs based on the individual risk type. Second, we demonstrate that (low-risk) preference-based selection into FAAs coexists. Finally, we show that the latter (partially) balances the former type of selection.

TABLE 3.1: DESCRIPTIVE STATISTICS

	Total (Mean)	Total (SD)	Non-member (Mean)	Non-member (SD)	FAA-member (Mean)	FAA-member (SD)	Difference (T-test)
Passed away between 2008 and 2013	0.062	(0.241)	0.061	(0.239)	0.065	(0.247)	0.004
FAA member in 2008	0.198	(0.398)	0.000	(0.000)	1.000	(0.000)	1.000
Age	49.072	(15.342)	47.518	(15.835)	55.374	(11.119)	7.856***
65 or older	0.171	(0.376)	0.162	(0.368)	0.206	(0.405)	0.044***
Male	0.460	(0.498)	0.444	(0.497)	0.523	(0.500)	0.079***
Can read and write	0.920	(0.271)	0.918	(0.274)	0.926	(0.261)	0.008
Illness	0.248	(0.432)	0.230	(0.421)	0.319	(0.466)	0.089***
Severe illness	0.024	(0.153)	0.023	(0.150)	0.028	(0.165)	0.005
Subjective health: feels healthy	0.604	(0.489)	0.627	(0.484)	0.511	(0.500)	-0.117***
Subjective health: can manage	0.245	(0.430)	0.231	(0.422)	0.303	(0.460)	0.071***
Subjective health: feels sick	0.150	(0.357)	0.141	(0.348)	0.187	(0.390)	0.045***
Marital status: Married	0.792	(0.406)	0.769	(0.422)	0.886	(0.318)	0.117***
Marital status: Widow	0.090	(0.286)	0.089	(0.285)	0.092	(0.289)	0.003
Marital status: Divorced	0.022	(0.146)	0.026	(0.158)	0.007	(0.085)	-0.018***
Marital status: Never married	0.097	(0.296)	0.117	(0.321)	0.015	(0.120)	-0.103***
Household wealth, quartile 1 (top)	0.250	(0.433)	0.266	(0.442)	0.185	(0.389)	-0.080***
Household wealth, quartile 2	0.241	(0.428)	0.265	(0.441)	0.147	(0.354)	-0.118***
Household wealth, quartile 3	0.251	(0.434)	0.242	(0.428)	0.289	(0.454)	0.047***
Household wealth, quartile 4 (lowest)	0.257	(0.437)	0.228	(0.419)	0.378	(0.485)	0.151***
Travel time to BAAC (in minutes)	24.883	(13.508)	25.007	(13.766)	24.381	(12.398)	-0.626
Household has car/motorcycle	0.869	(0.337)	0.867	(0.340)	0.879	(0.327)	0.012
N	4876	-	3914	-	962	-	-

3.4.1 Data

We use data from a household panel survey which comprises 2113 households, including 4876 individuals at age 20 or older.[13,14] The data set features information on individual demographics, and on the wealth and finances of households. Summary statistics are provided in Table 3.1. 20 percent of individuals in our sample were a member of an FAA in 2008. In the subsequent five years, 6.2 percent of individuals passed away. The mortality rate does not differ significantly between members (6.5 percent) and non-members (6.1 percent). FAA members are older, and they are more often male and married. Moreover, FAA members suffer more often from severe illness or feel sick, and they are richer compared to non-members.

3.4.2 Method

In order to investigate the selection based on the risk type and family-related preferences, and the balance between the two, we adopt two methods from the literature on conventional insurance markets.

Testing for risk-type and preference-based selection. For the first series of tests, we follow Finkelstein and McGarry (2006) and estimate two probit models:

$$\Pr(Died = 1) = \Phi(X\beta_{\mathbf{1}} + \beta_2 Z), \tag{3.12}$$

$$\Pr(Insured = 1) = \Phi(X\alpha_{\mathbf{1}} + \alpha_2 Z). \tag{3.13}$$

[13]The survey was carried out as part of the project "Impact of shocks on the vulnerability to poverty – consequences for the development of emerging Southeast Asian economies" (FOR 756, German Research Foundation). A three-stage cluster sampling strategy was applied, selecting two villages from each of the 49 subdistricts which are representative for the rural population of three predetermined provinces in Northeastern Thailand in 2007. In each of the 98 sample villages, ten households were randomly selected. Households were followed over four subsequent survey waves (2007, 2008, 2010, and 2013). For a detailed description on the sampling strategy, see Hardeweg et al. (2013a).

[14]We exclude individuals at age 19 or younger in 2008 from our sample, as the minimum age for FAA membership is 20.

Died is a binary variable which is equal to one for individuals who passed away between 2008 and 2013, and zero otherwise. *Insured* is a binary variable which is equal to one for members of a funeral association in 2008, and zero for non-members. Further, X is a vector of confounding characteristics described in more detail below. The explanatory variables of interest are the characteristics Z. In order to test for potential drivers of selection, we add one characteristic at a time to both equations. This approach allows to observe whether a characteristic that captures (private) information on the risk type or on preferences drives both the mortality and demand for insurance.

First, we use this approach in order to test for selection based on the risk type. A positive and significant coefficient β_2 in Equation (3.12) would indicate that the respective characteristic Z is a driver of mortality. In case α_2 in Equation (3.13) is also positive and significant, Z is also a driver of insurance demand. Thus, in such a situation, individuals may base their insurance decision on the (private) information about their risk type implied by the particular characteristic, i.e. this would be a strong indication for selection based on the risk type.

Second, we use this approach in order to test for selection based on family-related preferences. In this opposite case, we test whether a characteristic is negatively correlated with mortality ($\beta_2<0$), and positively correlated with insurance membership ($\alpha_2>0$). Thus, in such a situation, the insurance decision of an individual would be based on the (private) information about the preference for insurance which is captured by the particular characteristic, i.e. this would be a strong indication for preference-based selection.

Balance of both types of selection. The second approach we adopt is the classical positive correlation test. We use it to test whether the average mortality risk is balanced across FAA members and non-members.[15] In other words, the test provides evidence whether the selection patterns of high- and low-risk individuals investigated in the first series of tests, as described above, (partly) off-set each

[15]The test was initially suggested by Chiappori and Salanié (2000) and has traditionally been used to elicit whether insurance coverage and the ex-post realization of the insured risk are (conditionally) independent. We use a slightly different version of the test which was, for instance, suggested by He (2009), and which is more intuitive for our purpose.

other. We therefore estimate the following probit model

$$\Pr(Insured = 1) = \Phi(X\gamma_{\mathbf{1}} + \gamma_2 Died). \tag{3.14}$$

The estimate of interest is the coefficient γ_2. If γ_2 is positive and significant, it would indicate that overall FAA membership is associated with a higher mortality rate – a sign of unbalanced selection of high-risk types. This could be due to asymmetric information or information that was observed by the insurance but "neglected", i.e. not used for insurance pricing.[16] If γ_2 is close to zero and insignificant, in turn, such a hypothesis would be rejected. By adding characteristics that were identified as drivers of risk-type or preference-based selection, we gain knowledge of their importance for maintaining the balance between the selection patterns and, hence, for the stability of the insurance.

Basic and alternative specifications. Both approaches described above are usually performed conditional on a set of known characteristics X which insurance companies use for the classification of risks and the pricing of insurance contracts. As mentioned above, FAAs charge a uniform price and, thus, refrain from any kind of risk classification. In our basic specification, we therefore do not include any control variables. However, premium levels of FAAs are subject to community risk-rating, i.e. they are set according to the average mortality rate in a district – the administrative unit an FAA usually operates in. Also, the administrative efficiency may vary across FAAs. Hence, while equal within one particular FAA, the price for insurance might differ between FAAs. In order to allow for diverse premium levels across districts, we estimate a second specification where we include district dummies. This ensures that our estimates do not capture the variation in

[16] By "neglected" information we mean asymmetrically used rather than asymmetrically distributed information, i.e. individual demographic characteristics the funeral association observes (based on the registration form) but does not use for risk-rating. The term "asymmetrically used" information was coined by Finkelstein and Poterba (2014). The authors found that insurers in the UK annuity market did not use certain known characteristics of policy holders for setting insurance premiums, although those characteristics were correlated with subsequent claims and insurance demand. They emphasize that disregarding this information in the process of underwriting created market inefficiencies similar to those that arise when holders of annuities have private information about their mortality risk.

insurance demand that is due to district level characteristics, e.g. differences in the average mortality rate or in administrative costs.

FAAs may reject applicants based on personal characteristics (e.g. severe illness or old age). Moreover, demand for FAA membership might be affected by transaction costs or individual restrictions such as mobility, literacy, or the distance to the nearest FAA office (usually located in the neighborhood of a BAAC branch). The average travel time to the nearest BAAC office is 25 minutes for individuals in our sample. A total of 13 percent of individuals live in households that do not own a car or motorcycle and, therefore, might have a harder time reaching an FAA. Moreover, 8 percent of individuals in our sample are illiterate and would depend on help when filling in the application form.[17] Yet, none of these characteristics are significantly different when we compare FAA members and non-members applying a t-test (see Table 3.1 above). This suggests that the characteristics mentioned above do not restrict access to FAAs. Nevertheless, we verify our results by providing additional estimations of specifications in which we control for characteristics that may (potentially) restrict FAA membership.

3.4.3 Measures

In order to test for selection based on the risk type, we focus on three characteristics which are commonly used by providers of health- and mortality-related insurance products in order to classify risks: age, health, and gender.[18] Our data set does not provide detailed information on illness. It includes, however, self-reported statements about how healthy a person feels ("healthy", "can manage", or "sick") and information about whether a person reports to suffer from illness in 2008.[19]

[17] However, application forms are kept simple. They consist of one or two pages asking for the name, date of birth, age, nationality, name of the spouse, and contact information.

[18] See, e.g., Finkelstein and McGarry (2006) for the long-term care insurance market in the US, Finkelstein and Poterba (2014) for the annuity market in the UK, and He (2009) for the life insurance market in the US.

[19] Suffering from illness may or may not increase the mortality risk, depending on how fatal a disease is. Moreover, the actual mortality risk of a disease might depend on the overall health condition of an individual. We make use of both health measures as they may complement each other in a favorable way. The health measures are reported for all members of household by the household head.

Together, these measures proxy (private) information about the mortality risk in a very condensed way. If our health measures (partly) predict mortality, they should serve as adequate proxies to test for selection based on the risk type. In order to capture family-related motives to take out insurance, we use individuals' marital status which has been frequently applied by studies on bequest motives and life insurance demand.[20] Moreover, we consider the number of children in a household. Finally, we control for household wealth measured as the total asset value owned by a household, net of total loans owed.

3.4.4 Results

In this section, we report results of our empirical analyses in three steps. Using the first test described in Section 3.4.2, we first document selection based on the risk type. In a second step, we use the same test to investigate preference-based selection. Finally, we examine the overall balance of mortality across members and non-members of the insurance using the second test described in Section 3.4.2, and we investigate how the previously identified drivers of selection affect this balance.

Selection based on the risk type

Table 3.2 reports estimates of marginal effects of the probit models in Equation (3.12) and (3.13). In Panel A, we add each characteristic separately to the equations. Each cell reports the estimate from a separate regression. As expected, the older an individual is in 2008, the more likely he or she passes away between 2008 and 2013. A ten-year increase in age raises the probability to pass away by four percentage points (see Column (1)). More importantly, older people are also more likely to be a member of an FAA in 2008. As demonstrated by the estimates in Column (2), a ten-year increase in age raises the probability to take out insurance by five percentage points. Unsurprisingly, individuals who report to suffer from illness in 2008 are also more likely to die in the subsequent five years. The same seems to be true for those who report to feel sick. The less healthy an

[20] See, e.g., Liebenberg et al. (2012), Bernheim (1991), and Sauter (2012).

Table 3.2: The relation of demographic and health characteristics to mortality risk and FAA membership

	Panel A						Panel B			
	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Age (2008)	0.004***	0.005***	0.004***	0.005***	0.003***	0.010***	0.002***	0.009***	0.002***	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Illness (2008)	0.072***	0.070***	0.069***	0.063***	0.037***	0.061***	0.001	0.021	0.002	0.023
	(0.007)	(0.014)	(0.007)	(0.013)	(0.007)	(0.014)	(0.009)	(0.018)	(0.009)	(0.018)
Subjective health (2008):	-	-	-	-	-	-	-	-	-	-
Feels healthy (omitted)	-	-	-	-	-	-	-	-	-	-
Can manage	0.060***	0.075***	0.060***	0.067***	0.030***	0.070***	0.017**	0.001	0.021***	0.007
	(0.009)	(0.016)	(0.009)	(0.015)	(0.008)	(0.015)	(0.007)	(0.015)	(0.007)	(0.015)
Feels sick	0.126***	0.078***	0.126***	0.069***	0.075***	0.070***	0.056***	-0.011	0.059***	-0.007
	(0.014)	(0.019)	(0.014)	(0.018)	(0.011)	(0.018)	(0.014)	(0.021)	(0.015)	(0.021)
Male	0.017***	0.050***	0.018***	0.050***	0.024***	0.047***			0.028***	0.046***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.006)	(0.008)			(0.006)	(0.008)
District dummies			x	x	x	x	x	x	x	x
Restricting characteristics					x	x	x	x	x	x
N	4876	4876	4876	4876	4876	4876	4876	4876	4876	4876

Notes: Sample is limited to individuals who are at least 20 years old. The table reports marginal effects from probit regressions, heteroskedasticity-consistent standard errors adjusted for clustering at the household level in parentheses. Each cell in Panel A reports results from a separate regression. *Died (2008 - 2013)* indicates whether an individual passed away during the period of 2008 to 2013. *Insured (2008)* indicates FAA membership in 2008. *Illness* indicates whether an individual self-reports to suffer from illness. *Subjective health* was determined by asking how healthy the individual is: feels sick, can manage, or feels healthy. The left out category is *Feels healthy*. Panel B reports probit regressions on the respective variables in each column. Models in Columns (3) to (10) include district dummies. Models in Columns (5) to (10) control for restricting characteristics (*Severe illness*, *Can read and write*, *Travel time to next BAAC branch*, *Household owns car or motorbike*, and *Age is 65 or older*). ***, **, * denote statistical significance at the 1-percent, 5-percent, and 10-percent level, respectively. Means of *Died (2008 - 2013)* and *Insured (2008)* are 0.06 and 0.20, respectively.

individual feels in 2008, the more likely he or she passes away between 2008 and 2013 (odd columns). At the same time, suffering from illness or not feeling healthy (irrespective of the intensity) is related to a higher probability of having insurance in 2008 (even columns). Finally, the mortality rate of men is significantly higher relative to women in our sample (odd columns). This finding is confirmed by a United Nations study which demonstrates that the life expectancy of Thai women is three years longer compared to men at age 60 (UN DESA (2012)). Most importantly, men are also significantly more likely to be a member of an FAA in 2008 (even columns).[21] These results suggest that private or "neglected" information on the mortality risk, derived from age, health and gender, may translate into greater insurance demand.

Overall, the size and significance of our estimates remain largely unchanged when we control for differences in FAA characteristics by including district dummies in the specification (see Column (3) and (4)). Yet when we further add those characteristics which may restrict FAA membership (Column (5) and (6)), the results demonstrate a notable change in the size of the correlation between age and insurance membership (upwards), and between our health measures and ex-post mortality (downwards).[22] Even in this conservative specification, the coefficients remain robust and quantitatively meaningful. However, when we include our measures of age, gender and health in one specification (see Panel B), it turns out that

[21] This finding could be due to different levels of disposable income of men and women in a household. However, we cannot test whether income differentials play a role for insurance demand, as we do not have information on individual income. Sauter (2012) controls for reallocation motives within the household using the income differential between men and women. He finds that before the German reunification, women in East Germany were more likely to have life insurance relative to men. Previous studies, which did not control for different levels of income, found opposite effects. Gandolfi and Miners (1996) report that in 1984, women in the US were less likely to have insurance compared to men. Moreover, Chen et al. (2001) provide evidence for gender-specific differences in life cycle effects. They find larger age effects on life insurance demand for men relative to women. However, the authors attribute their findings mainly to the different roles men and women traditionally played in the family.

[22] These changes in the size of the coefficients are most likely due to the inclusion of two binary variables which indicate the age of 65 and above, and suffering from severe illness (in 2008). Both characteristics could have caused rejections from FAA membership in 2008. The change in the age coefficient suggests that applicants at the age of 65 or older are indeed rejected, and that the relation between age and insurance membership is underestimated when we do not control for old age. The change in the health coefficients suggests that the indicator variable for severe illness captures indeed the incidence of fatal diseases.

age and gender are the drivers of selection based on the risk type, as the health coefficients decrease in size and become (partly) insignificant.

In summary, the first key finding of our empirical analysis is that high-risk individuals are more likely to select into FAAs as predicted by our theoretical analysis. The results in Table 3.2 provide clear evidence of private or insurance-neglected information on risk types which is positively related to insurance demand. As this selection of high-risk individuals is not reflected in insurance pricing, it may have adverse effects on the stability of FAAs if it is not counter-balanced by a sufficiently high share of low-risk types.

Preference-related selection

In order to investigate selection based on family-related preferences, we again estimate Equation (3.12) and (3.13). We include binary variables which indicate whether an individual is married, separated/divorced or widow. Individuals who have never been married serve as the reference category. Further, we include the number of children (below the age of 20) in a household in a separate specification. As the spouse and children would probably be most severely affected by an uninsured funeral, we expect married individuals and those with children to be more likely to take out insurance (in line with our theoretical predictions). All specifications additionally control for age, health and gender. Results are reported in Table 3.3. The estimates of our baseline specification demonstrate that married individuals are less likely to pass away within the subsequent five years relative to those who never married (Column (1)). Consistent with our theoretical predictions, married individuals are more likely to take out insurance (Column (2)) relative to those in the reference category. This is the second major finding of our study: Despite their relatively low mortality risk, our results suggest that married individuals are more likely to take out insurance. We argue that this finding could be due to family-related preferences for insurance (i.e. $\delta_{i,t} > 1$). We, thus, interpret the results as empirical support for our theoretical predictions.[23] The

[23] Our findings are in line with previous results in the literature. Liebenberg et al. (2012), for instance, conduct a dynamic analysis of the demand for whole life insurance, and they provide evidence that being (newly) married is positively related to insurance take-up. Bernheim (1991)

TABLE 3.3: THE RELATION OF MARITAL STATUS AND NUMBER OF CHILDREN TO MORTALITY RISK AND FAA MEMBERSHIP

	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)	Died (2008 - 2013)	Insured (2008)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Marital status: Married	-0.044***	0.167***			-0.047***	0.171***	-0.047***	0.171***	-0.048***	0.167***	-0.043***	0.145***
	(0.019)	(0.016)			(0.019)	(0.016)	(0.019)	(0.015)	(0.019)	(0.015)	(0.018)	(0.018)
Widow	-0.019	0.073***			-0.023	0.077***	-0.023	0.083***	-0.028	0.085***	-0.023	0.081***
	(0.022)	(0.023)			(0.022)	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)	(0.021)	(0.025)
Divorced/Separated	-0.052*	0.024			-0.055*	0.025	-0.055*	0.028	-0.055*	0.026	-0.048*	0.015
	(0.026)	(0.029)			(0.026)	(0.028)	(0.026)	(0.028)	(0.026)	(0.028)	(0.026)	(0.030)
Never married (omitted)	-	-			-	-	-	-	-	-	-	-
	-	-			-	-	-	-	-	-	-	-
Number of children			0.003	-0.004	0.003	-0.009*	0.004	-0.010*	0.005**	-0.009*	0.004*	-0.006
			(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)
Household wealth quartile: Top							-0.000	-0.151***	-0.001	-0.115***	-0.003	-0.110***
							(0.009)	(0.019)	(0.009)	(0.018)	(0.009)	(0.018)
Second							0.005	-0.178***	0.004	-0.152***	0.004	-0.133***
							(0.009)	(0.019)	(0.009)	(0.018)	(0.009)	(0.018)
Third							-0.005	-0.068***	-0.006	-0.056***	-0.007	-0.047**
							(0.009)	(0.020)	(0.009)	(0.019)	(0.009)	(0.018)
Bottom (omitted)							-	-	-	-	-	-
							-	-	-	-	-	-
Age	x	x	x	x	x	x	x	x	x	x	x	x
Illness	x	x	x	x	x	x	x	x	x	x	x	x
Subjective health	x	x	x	x	x	x	x	x	x	x	x	x
Male	x	x	x	x	x	x	x	x	x	x	x	x
District dummies									x	x	x	x
Restricting characteristics											x	x
N	4876	4876	4876	4876	4876	4876	4876	4876	4876	4876	4876	4876

Notes: Sample is limited to individuals who are at least 20 years old. The table reports marginal effects from probit regressions, heteroskedasticity-consistent standard errors adjusted for clustering at the household level in parentheses. *Died (2008 - 2013)* indicates whether an individual passed away during the period of 2008 to 2013. *Insured (2008)* indicates FAA membership in 2008. *Married*, *Widow*, and *Divorced/Separated* indicate whether an individual is married, widow, or divorced/separated, respectively. The left out category is *Never married*. *Number of children* counts household members below 20 years of age. *Wealth quartiles* are based on household value of assets subtracted by household debt. Left out category is the bottom quartile. All models control for risk-type related characteristics (*Age* and *Male*). Models in Columns (9) to (12) include district dummies. Models in Columns (11) and (12) control for restricting characteristics (*Severe illness*, *Can read and write*, *Travel time to next BAAC branch*, *Household owns car or motorbike*, and *Age is 65 or older*). ***, **, * denote statistical significance at the 1-percent, 5-percent, and 10-percent level, respectively. Means of *Died (2008 - 2013)* and *Insured (2008)* are 0.06 and 0.20, respectively.

reported associations remain largely unchanged when we control for the wealth of households, differences across FAAs and (potential) membership-restricting characteristics (see Columns (7) to (12)).

We do not find evidence for similar selection patterns when using the number of children in a household as proxy for family-related preferences (Column (3) and (4)). However, in this case, the relation to insurance demand is less clear. Parents might want to protect their children from the negative consequences of an unexpected funeral, but their willingness to pay for insurance might also decrease in the number of children, as financial costs would be borne by more relatives. In fact, there is some evidence that individuals with more children are less likely to take out insurance (even columns). Interestingly, having more children is also associated with a higher mortality risk (odd columns). However, the coefficients are very small and insignificant in most specifications (or only marginally significant).

Stability

In a final step, we investigate the stability of FAAs and analyze how it is affected by the selection patterns detected above. Table 3.4 presents the relation between mortality and insurance membership estimated from Equation (3.14). The coefficient on mortality is close to zero and insignificant (Columns (1) to (3)) which indicates that *overall* the probability of being a member of the insurance is not significantly different for high-risk individuals and low-risk types, i.e. on average the mortality rate does not differ between members and non-members of FAAs. This implies that both demand patterns, i.e. the selection based on risk types (see Table 3.2) and insurance preferences (see Table 3.3), balance each other out, so that FAA insurance schemes are in a stable equilibrium.

In order to demonstrate the magnitude of this balancing effect, we subsequently

finds a negative relationship between being widow and having insurance which he attributes to the conversion of the insurance to cash when a spouse passes away. Further, the author finds a positive relation between being single and having insurance which he attributes to a strategic bequest motive, i.e. the promise of bequest in return for taking care of the policy holder in the old age. Sauter (2012) finds no relation between individuals' marital status and insurance demand. He argues, however, that his findings are due to the strong role of the welfare state in pre-unified East Germany.

TABLE 3.4: CORRELATION BETWEEN MORTALITY RISK AND FAA MEMBERSHIP CONTROLLING FOR DRIVERS OF RISK-TYPE AND PREFERENCE-BASED SELECTION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Coefficient from probit regression of	0.011	0.008	-0.012	-0.062**	-0.054**	-0.052**	
Insured (2008) on *Died (2008 - 2013)*	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	
District dummies		x	x	x	x	x	x
Restricting characteristics			x	x	x	x	x
Age				x	x	x	x
Illness				x	x	x	x
Subjective health				x	x	x	x
Male				x	x	x	x
Marital status					x	x	x
Number of children						x	x
Household wealth							x

Notes: Sample is limited to individuals who are at least 20 years old. The table reports marginal effects from probit regression of *Insured (2008)* on *Died (2008 - 2013)*, heteroskedasticity-consistent standard errors adjusted for clustering at the household level in parentheses. *Died (2008 - 2013)* indicates whether an individual passed away during the period of 2008 to 2013. *Insured (2008)* indicates FAA membership in 2008. Models in Columns (2) to (6) include district dummies. Columns (3) to (6) control for restricting characteristics (*Severe illness*, *Can read and write*, *Travel time to next BAAC branch*, *Household owns car or motorbike*, and *Age is 65 or older*). Models (4) to (6) add risk-type related characteristics (*Age*, *Illness*, *Subjective health*, and *Male*). Models (5) and (6) subsequently add the set of dummies indicating *Marital status*, *Number of children in the household* and *Household wealth quartiles*. ***, **, * denote statistical significance at the 1-percent, 5-percent, and 10-percent level, respectively. Means of *Died (2008 - 2013)* and *Insured (2008)* are 0.06 and 0.20, respectively.

add the drivers of both types of selection to Equation (3.14). First, we control for the drivers of selection based on the risk type. Our estimates reveal a significant negative correlation between FAA membership and mortality (Column (4)). Thus, within a group of individuals who are equal in terms of age, gender and health, those with a lower residual mortality risk are more likely to self-select into the insurance. When we additionally control for individuals' marital status, the correlation (i.e. the conditional relationship between mortality and insurance membership) is somewhat closer to zero (Column (5)). We interpret this finding as empirical evidence that family-related preferences positively affect the balance of the selection patterns and, hence, the stability of FAAs. However, a large share of this balancing effect remains unexplained, as indicated by the negative and significant coefficient on mortality. Thus, our findings suggest that further low-risk individuals might be willing to pay more for the insurance than the actuarially fair premium. Such a high willingness to pay for insurance could be due to an additional, unobserved type of preference. As suggested by our theoretical predictions, this preference could be based on risk aversion. Finally, as indicated by the results in Section 3.4.4, the number of children in a household does not play a quantitatively meaningful role for the stability of FAAs (Column (6)).

3.5 Discussion and conclusion

In this study, we show theoretically and empirically that high-risk individuals (i.e. older people and men) are more likely to be a member of a funeral aid association (FAA) in Northeast Thailand compared to low-risk types. In a simple theoretical framework, we demonstrate that family-related preferences may result in additional insurance demand of low-risk individuals which could consolidate the stability of the scheme. In fact, our empirical analyses provide evidence that married individuals are more likely to be a member of an FAA, and that they are less likely to pass away during the period of observation. In line with these findings, we show that on average the mortality rate does not differ significantly between members and non-members of the scheme. However, married individuals can only partly counterbalance the demand of high-risk types. Thus, our findings

suggest that further low-risk individuals might be willing to pay more than the actuarially fair premium. This could be due to an additional but unobserved type of preference for the insurance.

We assume that due to the balance between the different patterns of selection, insurance premiums could settle down at reasonable levels which resulted in large numbers of members. However this stabilizing cross-subsidization of high-risk members by low-risk types raises concerns about the future financial stability of FAAs. For instance, it is easily conceivable that low-risk individuals may have joined FAAs due to a lack of alternative providers of risk-rated insurance policies. Once alternative providers offer funeral insurance at a risk-rated premium, low-risk individuals would have an incentive to switch providers. Such a shift of low-risk members out of FAAs would result in a sharp increase in premium levels and possibly in a continuous decline in the number of members. This dynamic may eventually cause the collapse of the scheme which is known as the adverse selection "death spiral".[24] It might, therefore, be advisable for FAAs to consider the implementation of risk-rated premiums.

Finally, we address the question of why risk-rating is not common among FAAs although it may contribute to the long-term stability of the scheme. On the one hand, exact underwriting on cohort-based death probabilities might be inapplicable due to the additional costs. On the other hand, a simple linear pricing scheme based on applicants' age and gender could be feasible even in very small insurance associations. As we demonstrate in the empirical analysis, gender and age seem to be the drivers of the high-risk selection, and they are, thus, the most relevant characteristics for risk-rating. For a basic but informative risk classification of (potential) FAA members it may therefore be adequate to consider only applicants' age and gender. However, raising the price for insurance contingent on age might be difficult to implement since respect for the elderly is a crucial part of Thai culture. Finally, political economy explanations could also be at play. Insurance committees often consist of elderly men, and they may therefore lack incentives to raise the price for insurance along the above mentioned dimensions.

[24] For real-life examples of adverse selection death spirals, see e.g. Cutler and Zeckhauser (1998) and Butler (2002).

Chapter 4

The impact of the social pension on child outcomes in rural Thailand[‡]

4.1 Introduction

As in most of the developed world, population aging is a growing challenge for societies and policy makers in many developing and emerging countries. In these regions, informal employment is often very common and most people lack formal protection against poverty in the old age. In order to provide a basic income to the elderly, social pension schemes are becoming an increasingly popular policy instrument. Empirical evidence suggests that such policies have been successful in increasing the wellbeing of the elderly, e.g. by facilitating a reduction in labor supply at earlier ages, especially for men (Carvalho Filho (2008), Kaushal (2014), Juarez and Pfutze (2015), Galiani et al. (2016)), and by enhancing mental health and nutritional intake (Galiani et al. (2016), Salinas-Rodríguez et al. (2014)).

In order to assess the overall effect of a pension scheme, however, taking into account family members other than the pensioner is crucial. In fact, the empirical literature on the impact of social pensions goes beyond considering the wellbeing of pensioners. For instance, pension eligibility of an elderly may allow prime-age adults to migrate in order to find (better) employment (Posel et al. (2006),

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Ardington et al. (2009)), and it may allow migrants to reduce transfers made to those pensioners who were left behind, especially if households are very poor (Jensen (2003), Maitra and Ray (2003), Fan (2010), Juarez (2009)).

In this study, we add to the literature by investigating the effect of a social pension on child outcomes in rural Thailand – more precisely on school enrollment and child work. We exploit the pension reform in 2009 in order to estimate the impact of an exogenous increase in income of the elderly. Previous studies have shown that children may benefit from pension eligibility of co-residing grandparents. Duflo (2003) demonstrates for the South African social pension that children experience better nutrition and health due to the pension eligibility of co-residing elderly. However, the effect is limited to girls who live with an eligible grandmother. Edmonds (2006) finds further evidence for the South African pension to improve schooling and reduce hours worked, especially for boys in households with pension-eligible men. The changes due to male eligibility seem to result in levels of schooling and work which are similar to those of children living with an elderly women close to qualifying age. Edmonds (2006) argues that households, and especially men, might be credit constrained because the pension scheme was already in place at the time the survey was conducted, i.e. the cash transfer was anticipated.

This study is more closely related to the work by Ponczek (2011) and Carvalho Filho (2012) who exploit a pension reform in order to estimate the impact of a social pension on child outcomes in Brazil. As a result of the reform, eligibility was expanded to more than one person per household, the minimum qualifying age was lowered, and benefits were scaled up to the level of minimum wage. Using the same data but different empirical strategies and age cohorts, the authors show that school attendance increases for girls who live with beneficiaries of the reform, i.e. elderly who became eligible or receive greater transfers after the reform[26]. Whereas Carvalho Filho (2012) finds no evidence for differential effects with respect to the gender of the beneficiary, the estimates by Ponczek (2011) demonstrate that schooling improves only for girls who co-reside with a male beneficiary. Child

[26]To be precise, both authors draw on the same household data, but Ponczek (2011) uses two additional survey waves.

work is only investigated by Carvalho Filho (2012). He shows that when beneficiaries of the reform are female, girls tend to work less (yet there is also weak evidence for girls to work more when beneficiaries are male).

This study differs notably from the work by Ponczek (2011) and Carvalho Filho (2012) owing to the distinct history and characteristics of the social pension scheme in Thailand and its implications for the empirical analysis. Unlike in Brazil, before the reform in 2009 the social pension in Thailand was designed to target only the poorest elderly. In the wake of the reform, coverage was expanded to all elderly in the country. As households in the region of our study are generally poor, the change from targeting to universal coverage made elderly eligible for pension who are mostly poor, yet not among the very poorest. We argue that this setting allows to identify an effect of the social pension on child outcomes although the amount of pension guaranteed by the scheme is very small. As newly-eligible elderly are not extremely poor, it is reasonable to assume that their most basic needs are met which may allow them to invest the extra income in their grandchildren.

To the best of our knowledge, this is the first study to show that already a very small amount of pension can have a large and significant impact on child outcomes, i.e. on school enrollment and the employment status. Pension schemes studied so far guarantee benefits of at least moderate size, and some are even very generous. Most of the empirical literature on the impact of social pensions draws on data from South Africa. The South African social pension scheme has been studied at length, partly because of the highly generous benefits it guarantees (about twice the median per capita income of African households). More recently, there is a growing literature addressing pension schemes in Latin America and Asia. As mentioned above, the social pension in Brazil provides another example of a generous scheme[27]. In contrast, pension schemes in Mexico and Taiwan guarantee benefits of rather moderate size (corresponding to about 30% of the average income of eligible individuals[28]).

[27] Carvalho Filho (2012) notes that pension payments correspond to about 16% of total income of mature households, i.e. households with eligible or almost eligible members.

[28] In the case of Mexico, separate pension schemes were set up in Mexico city and rural Mexico, however both guarantee benefits of similar relative size. For additional information on the Mexican pension schemes, see Juarez (2009) and Juarez and Pfutze (2015). Fan (2010) provides

In this study, we conduct an analysis similar to difference-in-differences. Similar to the study by Ponczek (2011), we compare children who live with newly-eligible pensioners (i.e. beneficiaries of the reform) to children in similar but unaffected households before and after the reform[29]. To make both groups comparable, we restrict our sample to children in households with members of three generations. Thereby, we make sure that children in the control group live with at least one member that will soon qualify for pension, and we make sure that households in both groups are of comparable structure. In addition to children living in households without pension-eligible elderly, our control group includes children in households with elderly who received pension payments already before the reform. We cannot distiguish the latter from all other households in the empirical analysis because pre-reform eligibility criteria were not precise enough. Our results demonstrate that due to the reform, school enrollment improves, and work is reduced, for children who live with newly-eligible pensioners. In line with the existing literature, we find strong evidence for gender effects, i.e. for male (female) pensioners to favor boys (girls). The positive impact on school enrollment seems to be limited to boys who co-reside with newly-eligible men (or men and women), whereas the negative impact on the employment status seems to be limited to girls in households with female beneficiaries. We substantiate our findings further by demonstrating that pension income translates into greater spending on education, and we show that this additional investment in children's education is driven only by the presence of male pensioners. Finally, we provide additional empirical evidence which demonstrates that the above effects are due to the pension reform, and we show that the behavioral response of households receiving pension payments already before the reform was substantially different as they were poorer.

The remainder of this paper is structured as follows. In Section 4.2, we give a brief overview of the history and characteristics of the social pension scheme in Thailand. We describe the data in Section 4.3 and the empirical strategy in Section 4.4. Our

additional information on the social pension scheme in Taiwan. The relative size of pension benefits, i.e. the share of household income, is not explicitly reported by Fan (2010) but information on absolute values is given. Based on this information, we calculate the share reported here.

[29]However, in contrast to Ponczek (2011), we use pension eligibility to instrument for pension receipt, as was done for instance by Duflo (2003) and Carvalho Filho (2012). Moreover, we use panel data in the analyses which contrasts to most of the previous studies.

main results are presented in Section 4.5, and results of robustness analyses are given in Section 4.6. Concluding remarks are provided in Section 4.7.

4.2 The universal pension scheme

In 2009, the Government of Thailand initiated a policy reform which made public pension available to all elderly in the country. Since the implementation of the universal pension scheme in October 2009, all Thai at age 60 or older have been eligible for the program - except for those who live in a public retirement home or receive any other government pension (e.g. former civil servants)[30]. The scheme is non-contributory, yet registration is required in order to receive pension payments. The size of benefits was initially set to 500 Baht which corresponds to two or three median daily wages. In October 2011, the level of benefits was further increased and set to vary by the age of beneficiaries. The minimum monthly payment was raised to 600 Baht for individuals at age 60 to 69, and benefits for individuals at age 70 to 79, 80 to 89, and 90 or older were set to 700 Baht, 800 Baht, and 1000 Baht, respectively.

The universal pension scheme replaced a means-tested program which was designed to provide financial assistance only to the poorest elderly. It fell short on adequately targeting the elderly poor as coverage was perceived to be insufficient and unfair (Jitsuchon et al. (2012)). Figure 4.1 depicts the trend in the number of beneficiaries and the corresponding government expenditures before and after the reform[31]. In 2008, the year before the reform, approximately 1.8 million elderly were registered under the targeted program. In 2010, the first post-reform year, about 5.7 million beneficiaries were reported to receive pension payments. Due to administrative problems, coverage was still incomplete in 2010, and only about 70% of the eligible population was registered (Jitsuchon et al. (2012)). Finally, in 2013 most elderly who qualified for pension were reported to receive benefits (about 7.3 million).

[30] Those restrictions, however, do not influence our analyses since elderly in the region studied usually live alone or with their families. Moreover, the share of households with elderly members who receive any other government pension is below 1% in our sample.

[31] The data is provided by the National Economic and Social Development Board of Thailand.

4.3 Data

We use panel data from a household survey which was conducted in 2007, 2008, 2010 and 2013 by members of the research unit FOR 756, and funded by the German Research Foundation[32]. The data is representative for the rural population of three provinces in Northeast Thailand and covers 2136 households. It includes child-level information on education and the employment status, as well as detailed household-level information, e.g. on income, expenditures, and social security transfers. We restrict our sample to children at age 6 to 18 in 2008 who live in households with three generations. Thereby, our sample covers all children who were of official primary or secondary school age in 2008[33]. We use data on 1220 children and 748 households.

In order to estimate the impact of the social pension on school enrollment, we use a binary variable which is equal to one if a child is reported to be enrolled in school or any other educational institution, and zero otherwise. In order to measure the employment status of a child, we construct another binary variable based on information on the (main or second) occupation. It is equal to one if a child is reported to perform any full- or part-time work, and zero otherwise[34].

Table 4.1 shows the trend in school enrollment and the employment status of children before and after the reform. The table presents the share of children (in %) who are reported to be enrolled in school or to perform any kind of work, respec-

[32]For detailed information on the survey and the sampling procedure, see Hardeweg et al. (2013b). We use data from 2013, since in 2010 the pension reform might not have taken its full effect. Most importantly, the time span from October 2009, when the universal pension was first in place, to April 2010, when data collection started, is rather short. Implementation problems seem to be less severe in the region studied since about 85% of eligible elderly were reported to receive pension benefits already in 2010.

[33]Officially, children in Thailand should attend primary school at age 6 to 11 and secondary school at age 12 to 17. However, late enrollment is very common, especially in the region studied, and most children enter primary school at age 7 (UNICEF (2014)).

[34]This includes children who are reported to be engaged in own agriculture or related activities (e.g. fishing), to run a (family-owned) business, to be engaged in any (casual or permanent) off-farm agriculture or non-agriculture, to be a housewife or to serve in the army. Since housewives in our sample are typically married, the decision to work might be very different in that particular case. However, whether we include housewives in our definition of work does not change the results.

tively. Numbers are given separately for children in beneficiary households and for those in the control group, as well as for boys relative to girls. Overall, school enrollment is decreasing over time as children get older and drop out of school. However, the trend is somewhat weaker for children in beneficiary households, and for girls relative to boys. In contrast, the share of children who perform any kind of work is increasing over time; again, the trend seems to be weaker for children in beneficiary households, and for girls relative to boys.

4.4 Methodology

To verify our hypothesis that already a small amount of public pension could affect outcomes of children in a household, we follow a standard practice in the literature, such as in Duflo (2003), and restrict our sample to households with three generations, i.e. grandparents, parents and children. Since the introduction of the universal social pension policy in 2009 and the increase in amount of social pension in 2012 were exogenous policy changes beyond the influence of households, we employ an identification strategy similar to difference-in-differences and formulate an empirical model for educational choice and the decision to work for children as follows:

$$y_{it} = \beta_0 + \mathbf{X_{it}'}\boldsymbol{\beta_1} + \beta_2 Pension_{it} + D_t + e_{it} \tag{4.1}$$

where y_{it} is the dependent variable which can be a binary variable for the enrollment or employment status of child i at time t. X_{it} is a vector of child and household characteristics. The child characteristics include age, age-squared and gender while the household characteristics include the number of household members in predefined gender-age groups[35], household income, the size of land owned by the household in 2008 and years of education of the head of household. $Pension_{it}$ is a binary variable for the pension status. It is equal to 1 if child i stays in a household

[35]The gender-age groups are categorized by gender and age groups for each five-year interval starting from 0-4, 5-9, ... , 55-59, 60-64 to 65-69, continuing with ten-year intervals for 70-79 and 80-89, and finally 90 years old onwards.

reporting to receive public pension in period t. Lastly, D_t are time dummies for the post-reform periods (2010 and 2013) and e_{it} are the error terms.

However, the enrollment and employment status of children in households who receive public pension could be differently influenced by unobservable characteristics from households who do not; for example, they might be better connected to local politicians who make decisions regarding the allocation of the public pension, especially before the pension scheme became universal. Even after the reform, seniors in better connected households might be more likely to register to receive pension than less connected counterparts. To circumvent this endogeneity concern, we exploit the change in the reform in 2009 that made everyone older than 60 eligible to claim for the pension regardless of their level of income. We then replace the dummy variable for the actual pension status in Equation 4.1 with a dummy variable based on the age of members in the household after the reform ($PenAge$) and specify the following model:

$$\begin{aligned} y_{it} = \delta_0 + \mathbf{X'_{it}}\boldsymbol{\delta_1} + \delta_2 PenAge_{it} + \delta_3 PenAge70_{it} \\ + \delta_4 PenAge80_{it} + \delta_5 PenAge90_{it} + D_t + \epsilon_{it} \end{aligned} \tag{4.2}$$

Specifically, $PenAge_{it}$ is equal to one if there are some members of household who are at least 60 years old in 2010 or 2013, and zero otherwise. In addition, we account for the increase in pension benefits in 2013 by including additional dummy variables for households with members' age 70-79 ($PenAge70_{it}$), 80-89 ($PenAge80_{it}$) and 90 or older ($PenAge90_{it}$) in 2013. Since our model controls for the number of household members in different age-groups by gender (particularly, those at age 55-59 who were almost eligible for pension, and those at age 60-64 who just became eligible) as well as the common time effects for each period after the reform, the estimated coefficient of $PenAge_{it}$ would capture an *intent-to-treat* effect of the universal pension scheme on children's outcomes by comparing children in households with eligible members (treatment) to children in households with *almost* eligible members (control). Another specification in this paper is based on instrumental variable regressions using $PenAge_{it}$, $PenAge70_{it}$, $PenAge80_{it}$ and $PenAge90_{it}$ as instruments for the pension status ($Pension_{it}$). Thus, the regres-

sion in Equation 4.2 can be viewed as a reduced form of the IV estimation. Our first stage regression is the following:

$$\begin{aligned} Pension_{it} = \alpha_0 + \mathbf{X'_{it}}\boldsymbol{\alpha_1} + \alpha_2 PenAge_{it} + \alpha_3 PenAge70_{it} \\ + \alpha_4 PenAge80_{it} + \alpha_5 PenAge90_{it} + D_t + u_t \end{aligned} \tag{4.3}$$

Lastly, the impact of the social pension could differ by the gender of the child and the pensioner in a household due to differential preferences of grandmothers and grandfathers towards girls and boys or unequal bargaining power among pensioners within the same household (Ponczek (2011)). Hence, we add gender-specific pension variables to the model in Equation 4.1 – $PenF_{it}$ (a dummy variable equal to one for households with female pensioner(s)) and $PenMF_{it}$ (a dummy variable equal to one for households with male and female pensioners). We then estimate the model in separate regressions for boys and girls in the household. Our new second stage regression is modeled as follows:

$$y_{it} = \theta_0 + \mathbf{X'_{it}}\boldsymbol{\theta_1} + \theta_2 Pension_{it} + \theta_3 PenF_{it} + \theta_4 PenMF_{it} + D_t + \nu_{it} \tag{4.4}$$

where y_{it}, X_{it} and D_t are the same as in Equation 4.1, and ν_{it} are the error terms. As for the first stage of this specification, we generate two dummy variables for households with newly-eligible female, or male and female members, respectively (i.e. members who are at least 60 years old in 2010 or 2013). Together with $PenAge_{it}$, we use them as instrumental variables for $Pension_{it}$, $PenF_{it}$ and $PenMF_{it}$. $PenF_{it}$ and $PenMF_{it}$, thus, estimate the difference in the effect of the pension policy on children's outcomes if a household has female, or male and female pensioners, respectively, relative to the effect when there are only male pensioners in the household. Finally, we classify the pension dummy ($Pension_{it}$) in three categories in order to estimate individual effects by the gender of the pensioner (in contrast to measuring the difference in the effects as described above). We generate two dummy variables for households with "only" female, or "only" male pensioner(s), respectively, and another binary variable for households with "both" female and male pensioners. Moreover, we generate three dummy variables for

households with "only" female, "only" male, or "both" male and female members who became eligible for pension in 2010 or 2013 (i.e. who are at least 60 years old in 2010 or 2013). We use them as instrumental variables in the first stage of this specification. Standard errors of all regressions in this paper are clustered at the village level[36].

4.5 Results

4.5.1 School enrollment

In this section, we report estimates of the impact of the universal pension on school enrollment of children in our sample. Table 4.2 presents results of the reduced-form (Columns (1)-(3)) and IV estimation (Columns (4)-(6)). We estimate the impact on school enrollment in separate regressions for children at age 6-18, 6-11 and 12-18 in 2008. Overall, pension eligibility of a member of household does not relate to a change in the probability of being enrolled in school for children in our sample, as the coefficient on "Eligible HH" (variable *PenAge*) is insignificant and close to zero (Column (1)). The same is true for children among the younger cohort (age 6-11), though this is not surprising, because even in 2013 most of them were still at an age when enrollment was almost complete already before the reform. However, pension eligibility has a positive and significant impact on school enrollment of children among the older cohort. When living with a post-reform eligible pensioner, these children are almost 20 percentage points more likely to be enrolled in school compared to those in the control group (see the coefficient on "Pension HH", i.e. variable *Pension*, in Column (6)). We interpret our finding such that on average children at age 12-18 (in 2008) who live in households that benefit from the reform drop out of school at older ages. Comparing the coefficients in Columns (3) and (6) reveals that pension take-up is incomplete. Yet our instruments are powerful predictors of pension receipt, as the first-stage F-statistics exceed the critical value by far in most of the estimations, including those below.

[36] Our main results do not change if we employ White-adjusted standard errors instead.

4.5.2 Employment status

Next, we investigate the impact of the universal pension on the employment status of children in our sample. Results are presented in Table 4.3. As before, we report reduced-form (Columns (1)-(3)) and IV estimates (Columns (4)-(6)), separately for the younger and older cohort, and for all children in our sample. Overall, pension eligibility of a member of household is associated with a decrease in the probability that a child works, as the coefficient on "Eligible HH" is negative and significant (Column (1)). The same is true for children among the older cohort, yet not for younger children, i.e. the overall result seems to be driven by older children in our sample. When living with a post-reform eligible pensioner, older children are more than 20 percentage points less likely to work, relative to children in the control group (Column (6)). We interpret our findings such that those children either stop working (e.g. in the case of part-time labor), or that they do not take up work in the first place. As for school enrollment, it is no surprise that we do not find an effect for younger children, since even in 2013, most of them were still at an age when full- or part-time work was very uncommon already before the reform.

4.5.3 Gender analyses

Given the above findings, we investigate in a next step the presence of gender effects such that male or female pensioners would favor either boys or girls in the household in their schooling or work decision. Such gender-specific changes may indicate different preferences or bargaining power within the household, as demonstrated e.g. by Ponczek (2011). We therefore run further analyses, separately for boys and girls in our sample, and include additional gender-specific pension (eligibility) variables to the first- and second-stage regressions, as described in Section 4.4.

School enrollment. IV estimates of the impact of the universal pension on school enrollment are given in Tabel 4.4 for boys and girls, respectively, in odd and even columns. As before, we estimate the impact in separate regressions for the younger and older cohort, and for all children in our sample. In line with the above findings, the universal pension has neither an effect on school enrollment of boys or girls

in the younger cohort, nor on all boys or girls in our sample, regardless of the gender of the pensioner. Our results further demonstrate that school enrollment improves only for older boys who live with post-reform eligible male, or male and female beneficiaries of the reform. Older boys who live with a male (or male and female) pensioner(s) are about 40 (30) percentage points more likely to be enrolled in school compared to those in the control group (Column (5)). When only female beneficiaries are present in a household, however, the coefficient is smaller and insignificant. In contrast to boys, school enrollment of girls at age 12-18 is not affected by the universal pension, irrespective of the gender of the pensioner(s), as none of the coefficients on the pension variables is significantly different from zero. Since before the reform, enrollment rates of girls were generally higher compared to boys in our sample (i.e. girls seemed to drop out of school at later ages), we interpret our findings such that male beneficiaries might support boys in catching up with girls in terms of schooling.

Child work. Next, we investigate the impact of the universal pension on children's employment status by the gender of the child and the pensioner. IV estimates are presented in Table 4.5 which is set up just as Table 4.4. In contrast to school enrollment, the employment status of boys is not affected by the universal pension, irrespective of the gender of the pensioner. However, our findings are very different for girls. Overall, girls are significantly less likely to work when living with a newly-eligible female pensioner – a finding which seems to be driven by older girls in our sample. For them, the probability to work full- or part-time is 25 percentage points lower compared to girls in the control group (Column (6)). Yet, when male (or male and female) pensioners are present in a household, we do not find such an effect as the coefficients on the pension variables are all insignificant.

4.5.4 Expenditure analyses

In order to substantiate the above findings, we analyze in a next step whether households adjust their education expenditure in response to the universal pension. We therefore use data at the household level, restricted to three-generation households with children at age 6-18 in 2008. IV estimates are reported in Table 4.6

for the overall effect (Column (1) and (2)), and by the gender of the pensioner (Column (3) and (4)). We measure education expenditure using the natural logarithm (odd columns) and the share of total expenditures (even columns). Overall, our results provide some (albeit weak) evidence that households with beneficiaries of the reform increase their education expenditure. The universal pension is associated with higher education expenditure both in absolute and relative terms, yet only the latter is marginally significant. Households with a post-reform eligible pensioner raise the share they spend on education relative to total expenditures by 3 percentage points (see Column (2)). As for school enrollment, the change in education expenditure seems to be mostly due to the presence of male pensioners in the household. The latter is associated with an increase in education expenditure by 123 percentage points (see Column (3)). This increase in the total amount invested in children's education corresponds to a rise in relative expenditure by almost 5 percentage points.

Finally, we estimate the above relations for the expenditure categories food, non-food and health, and for total expenditures, using the same measures as before. Results are presented in Table 4.7. None of the coefficients on "Pension HH" is statistically significant, independent from the measure used. Households do not seem to adjust their expenditure on any of the above categories (neither in absolute nor in relative terms) – except for education.

4.6 Robustness Analyses

4.6.1 Alternative outcome variables

As part of the robustness analyses, we estimate further regressions in order to demonstrate that our main findings remain largely unchanged when using alternative measures of schooling and employment. We therefore generate a binary variable that indicates whether a child is a student[37]. We construct further binary variables by excluding either domestic chores, or domestic chores and work in the

[37] As for the employment status, we use information on children's main or second occupation in order to construct the variable.

family farm or business (i.e. off-farm employment only) from our definition of the employment status. Results are presented in Table 4.8, again separately for the younger and older cohort, and for all children in our sample. Each cell presents the estimate from a separate regression of *Pension HH* on the dependent variable indicated in the first column. Neither the size nor the significance of the coefficients change much relative to our main findings in Section 4.5.1 and 4.5.2 when using alternative measures of schooling and employment.

4.6.2 Alternative sample restrictions

Since the effect of the universal pension on the enrollment and employment status is most pronounced for children at age 12 to 18 (in 2008), we demonstrate in a next step that our findings are robust to alternative definitions of the age cohort. Specifically, we estimate the impact of the universal pension on school enrollment and the employment status of children at age 12 to 17 and 12 to 19 (in 2008). Results are presented in Column (1) and (2) of Table 4.9. As before, each cell presents the estimate from a separate regression of $PensionHH$ on the dependent variable indicated in the first column. Our main findings from Section 4.5.1 and 4.5.2 are robust to alternative cohort definitions, as the size and significance of the coefficients remain largely unchanged. Finally, we conduct further analyses where we restrict our sample to households with oldest members at age 50 to 70. Thereby, we compare children in households which are even more similar relative to those in our main analyses. Results for the younger and older cohort, and for all children in our sample are presented in Columns (3)-(5) of Table 4.9. The estimates of our main analyses are again largely robust to alternative sample definitions. The coefficients are of similar size and still marginally significant.

4.6.3 Placebo analyses

In a final step, we demonstrate that the changes in the enrollment and employment status of children described above are due to the reform of the social pension scheme in Thailand. In particular, we show that households with pensioners under

the targeted scheme (before the reform) were poorer and responded differently to the extra pension income compared to households with beneficiaries of the universal scheme (after the reform). Households with pensioners before the reform were indeed significantly poorer compared to all other households, i.e. it seems that the targeting of the poorest elderly under the previous system was (to some extent) successful. Median annual per capita income of households with "targeted" elderly was 784 US$ in 2008, compared to 1021 US$ for all other households.

Next, we conduct several placebo analyses in order to investigate whether the presence of a pensioner in the household before the reform (under the targeted scheme) relates to children's enrollment or employment status, or to education expenditures of the household. As before, we provide IV estimates of the models described in Section 4.4 (for the overall effect), however we only use pre-reform data from 2007 and 2008[38]. Results for the analyses at the child level (i.e. for the dependent variables "enrollment" and "employment status") are presented in Table 4.10, separately for the different age cohorts. The presence of a newly-eligible pensioner in the household before the reform seems to be unrelated to the enrollment and employment status of children, independent from their age. In Column (5), the coefficient on $PensionHH$ is marginally significant, however the second-stage F-statistic is only 0.18, i.e. jointly the coefficients are not significant.

Results of the expenditure analyses are presented in Table 4.11. In line with the findings from Table 4.10, the presence of a newly-eligible pensioner in the household before the reform seems to be unrelated to education expenditure. Moreover, households do not seem to adjust their expenditures on any of the categories (neither in absolute nor in relative terms) except for their expenditures on health. More precisely, households with pensioners under the targeted scheme raise their health expenditures by more than 100 percentage points relative to all other households. Again, this finding seems to be in line with the above results. Since most households with pensioners under the targeted scheme were very poor, it is reasonable to assume that they chose to use the extra pension income in order to cover their most basic needs, i.e. to invest it in their members' health.

[38] We cannot identify eligible individuals in the placebo analyses because pre-reform qualification criteria were not very precise. Yet age is a reasonable approximation as demonstrated by the size of the first-stage F-statistics reported below.

4.7 Conclusion

The reform of the social pension scheme in Thailand made public pension available to all elderly in the country. The expansion from targeted to universal coverage allows to investigate the impact of exogenous pension payments on the enrollment and employment status of grandchildren of moderately poor pensioners. Our estimates suggest that children benefit to a great extent from the pension income of their grandparents, yet there are considerable differences with respect to the gender of the child and the pensioner. For boys, the probability of being enrolled in school increases significantly when living with a post-reform eligible male (or male and female) pensioner(s). In contrast, girls are less likely to work full- or part-time when beneficiaries are female. We do not find evidence for similar effects on school enrollment of girls or the employment status of boys. In line with previous studies (e.g. by Ponczek (2011)), we argue that our findings could be due to differential preferences of grandmothers and grandfathers towards girls and boys or unequal bargaining power among pensioners within the same household.

Although we argue that our findings are due to the distinct history and characteristics of the social pension scheme in Thailand, their implications are of general importance, particularly with regard to the design of pension policies (or even cash transfers in general). More precisely, we contribute to the discussion on the trade-off between the targeting of public policies to specific individuals (or households) and the universal provision of such policies. For instance, targeted policies might be more difficult to implement, as individuals (or households) must be identified and reached. The latter might be particularly difficult to achieve in rural and remote areas, i.e. especially when targeting the poor. On the other hand, targeting might be more efficient as it may allow for smaller financial budgets compared to universal policies. For instance, in the case of the social pension in Thailand, the budget increased dramatically from 10.6 billion in 2008 (targeted) to 58.3 billion (universal). However, as we show in this study, such arguments might ignore important effects on individuals who do not belong to a policy's target group. Such effects could be easily overlooked in particular if they were not part of a policy's initial intention or primary objective. Further research is needed to get a

more comprehensive understanding of the impact of targeted relative to universal policies in order to better gauge their trade-off.

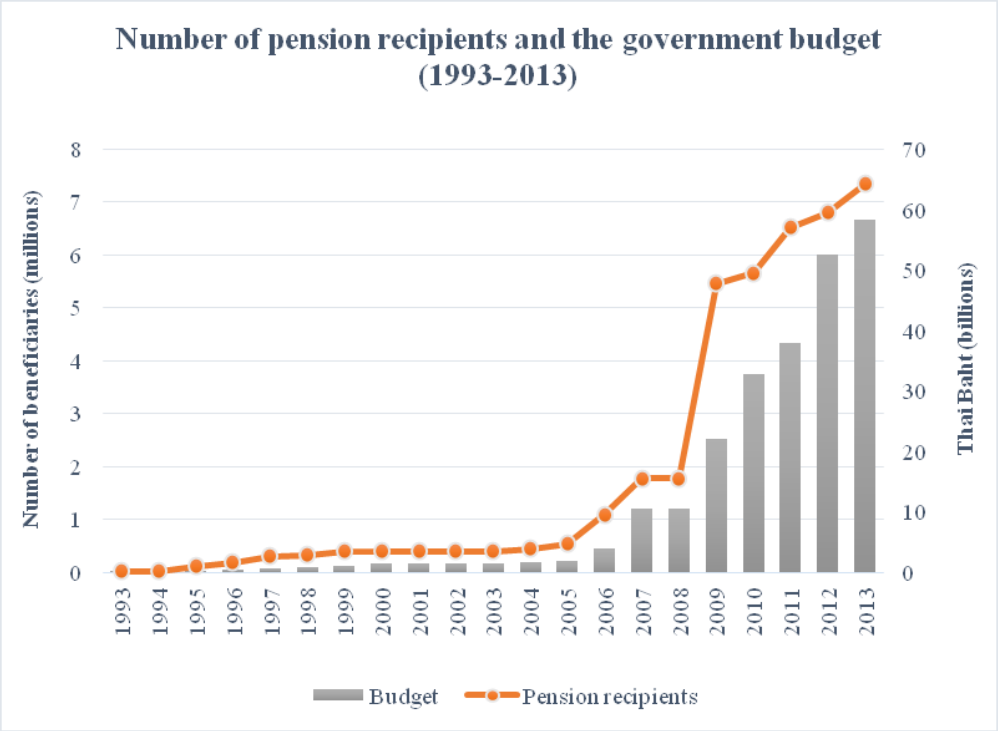

FIGURE 4.1: Number of beneficiaries of the social pension scheme and corresponding size of government budget in Thailand, 1993-2013.

TABLE 4.1: DESCRIPTIVE STATISTICS: SCHOOL ENROLLMENT AND EMPLOYMENT STATUS (IN %)

	Before reform	After reform	
	2008	2010	2013
Panel A: Enrollment			
Children with newly eligible elderly	81.8	82.3	64.1
Children in control group	79.3	77.0	58.0
All boys	79.0	76.3	58.3
All girls	81.7	82.0	62.6
Panel B: Employment status			
Children with newly eligible elderly	9.2	13.5	28.5
Children in control group	9.7	19.7	34.7
All boys	11.0	19.7	35.0
All girls	8.1	14.5	29.2

Note: School enrollment and employment status of children aged 6 to 18 in 2008.

TABLE 4.2: THE IMPACT OF THE SOCIAL PENSION ON SCHOOL ENROLLMENT: OLS AND 2SLS

	Reduced form			2SLS		
	6-18	6-11	12-18	6-18	6-11	12-18
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible HH	0.021	-0.021	0.089**	-	-	-
	(0.023)	(0.025)	(0.035)			
Pension HH	-	-	-	0.041	-0.045	0.186**
				(0.052)	(0.055)	(0.075)
Girl	0.046**	0.020	0.058*	0.046**	0.020	0.055*
	(0.019)	(0.020)	(0.030)	(0.019)	(0.020)	(0.029)
Age	0.222***	0.527***	-0.067*	0.222***	0.527***	-0.061*
	(0.011)	(0.030)	(0.035)	(0.011)	(0.030)	(0.036)
Age^2	-0.009***	-0.022***	-0.001	-0.009***	-0.022***	-0.001
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Total HH income	0.036***	0.011	0.054***	0.036***	0.012	0.056***
	(0.008)	(0.008)	(0.013)	(0.008)	(0.008)	(0.012)
Land area in 2008	0.004**	0.000	0.008***	0.004**	0.000	0.008***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Education of HH head	0.006*	0.004	0.010*	0.007**	0.003	0.013**
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.006)
F-statistic 1^{st} stage	-	-	-	46.6	38.4	34.5
R^2	0.361	0.363	0.364	0.360	0.361	0.347
Observations	3387	1570	1817	3387	1570	1817
Control variables						
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes	Yes	Yes

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to children living in households where three or more generations were present in 2008. Standard errors are clustered at the village level. All models control for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 5-9 ... 65-69,70-79, 80-89 and 90+. *Pension HH* indicates whether a household member receives the pension after becoming eligible due to the reform.

TABLE 4.3: THE IMPACT OF THE SOCIAL PENSION ON EMPLOYMENT STATUS: OLS AND 2SLS

	Reduced form			2SLS		
	6-18	6-11	12-18	6-18	6-11	12-18
	(1)	(2)	(3)	(4)	(5)	(6)
Eligible HH	-0.062***	-0.024	-0.105***	-	-	-
	(0.023)	(0.022)	(0.035)			
Pension HH	-	-	-	-0.136***	-0.047	-0.226***
				(0.051)	(0.049)	(0.075)
Girl	-0.041***	-0.025**	-0.052*	-0.041***	-0.025**	-0.049*
	(0.016)	(0.012)	(0.027)	(0.015)	(0.012)	(0.027)
Age	-0.095***	-0.020	0.019	-0.095***	-0.019	0.012
	(0.008)	(0.014)	(0.035)	(0.008)	(0.014)	(0.036)
Age^2	0.005***	0.001*	0.002**	0.005***	0.001*	0.003**
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Total HH income	-0.028***	-0.017***	-0.031**	-0.027***	-0.016***	-0.033***
	(0.008)	(0.006)	(0.012)	(0.008)	(0.006)	(0.012)
Land area in 2008	-0.002	0.003*	-0.006**	-0.001	0.003*	-0.005*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Education of HH head	-0.005*	-0.002	-0.010*	-0.008**	-0.003	-0.013**
	(0.003)	(0.002)	(0.005)	(0.003)	(0.002)	(0.006)
F-statistic 1^{st} stage	-	-	-	46.6	38.4	34.5
R^2	0.381	0.067	0.341	0.364	0.055	0.309
Observations	3387	1570	1817	3387	1570	1817
Control variables						
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes	Yes	Yes

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to children living in households where three or more generations were present in 2008. Standard errors are clustered at the village level. All models control for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 5-9 ... 65-69,70-79, 80-89 and 90+. *Pension HH* indicates whether a household member receives the pension after becoming eligible due to the reform.

TABLE 4.4: THE IMPACT OF THE SOCIAL PENSION ON SCHOOL ENROLLMENT BY GENDER: 2SLS

	6-18		6-11		12-18	
	Boys (1)	Girls (2)	Boys (3)	Girls (4)	Boys (5)	Girls (6)
Male Recipient	0.178	-0.002	-0.066	-0.219	0.404**	0.174
	(0.127)	(0.150)	(0.159)	(0.165)	(0.167)	(0.247)
$\Delta FemaleRecipient$	-0.153	0.035	0.017	0.226	-0.256	-0.047
	(0.163)	(0.169)	(0.170)	(0.210)	(0.240)	(0.261)
$\Delta Male + FemaleRecipient$	0.107	-0.105	0.004	-0.136	0.152	-0.091
	(0.102)	(0.096)	(0.120)	(0.124)	(0.140)	(0.140)
F-statistic 1st stage	36.7	21.5	8.9	11.4	20.1	10.0
R^2	0.355	0.378	0.395	0.374	0.314	0.382
Observations	1662	1723	793	775	869	948
Control variables						
Child and family variables	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes	Yes	Yes
Female Recipient	0.023	0.033	-0.049	0.010	0.142	0.126
	(0.103)	(0.068)	(0.099)	(0.087)	(0.162)	(0.096)
Male + Female Recipient	0.129	-0.072	-0.044	-0.125	0.295**	0.035
	(0.104)	(0.089)	(0.136)	(0.103)	(0.142)	(0.135)

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to children living in households where three or more generations were present in 2008. Standard errors are clustered at the village level. All models control for individual and household characteristics reported in Tables 4.2 and 4.3, as well as for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 5-9 ... 65-69,70-79, 80-89 and 90+. *Male (Female / Male + Female) Recipient* indicates whether a male (female / male and female) household member receives the pension after becoming eligible due to the reform. $\Delta Female(Male + Female)Recipient$ measures the additional effect if a women (men and women) receives the pension after becoming eligible due to the reform compared to a men (the individual effects of a men and woman).

TABLE 4.5: THE IMPACT OF THE SOCIAL PENSION ON EMPLOYMENT STATUS BY GENDER: 2SLS

	6-18		6-11		12-18	
	Boys	Girls	Boys	Girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)
Male Recipient	-0.154	-0.069	-0.138	0.063	-0.219	-0.187
	(0.111)	(0.145)	(0.120)	(0.139)	(0.151)	(0.247)
$\Delta FemaleRecipient$	0.015	-0.104	0.058	-0.140	0.002	-0.068
	(0.140)	(0.169)	(0.134)	(0.173)	(0.210)	(0.280)
$\Delta Male + FemaleRecipient$	-0.000	0.070	-0.097	0.015	0.037	0.107
	(0.093)	(0.085)	(0.095)	(0.085)	(0.134)	(0.138)
F-statistic 1st stage	36.7	21.5	8.9	11.4	20.1	10.0
R^2	0.388	0.345	0.077	0.060	0.333	0.303
Observations	1662	1723	793	775	869	948
Control variables						
Child and family variables	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes	Yes	Yes
Female Recipient	-0.137	-0.173**	-0.079	-0.078	-0.214	-0.255***
	(0.104)	(0.067)	(0.103)	(0.071)	(0.157)	(0.096)
Male + Female Recipient	-0.136	-0.103	-0.174	-0.063	-0.178	-0.148
	(0.100)	(0.070)	(0.113)	(0.060)	(0.144)	(0.118)

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to children living in households where three or more generations were present in 2008. Standard errors are clustered at the village level. All models control for individual and household characteristics reported in Tables 4.2 and 4.3, as well as for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 5-9 ... 65-69,70-79, 80-89 and 90+. *Male (Female / Male + Female) Recipient* indicates whether a male (female / male and female) household member receives the pension after becoming eligible due to the reform. $\Delta Female(Male + Female)Recipient$ measures the additional effect if a women (men and women) receives the pension after becoming eligible due to the reform compared to a men (the individual effects of a men and woman).

TABLE 4.6: THE IMPACT OF THE SOCIAL PENSION ON EDUCATION EXPENDITURE: OVERALL AND BY GENDER OF PENSIONER

	Log (1)	Share (2)	Log (3)	Share (4)
Pension HH	0.619	0.030*	-	-
	(0.396)	(0.017)		
Male Recipient	-	-	1.230*	0.049*
			(0.738)	(0.028)
HH income (lagged)	0.281***	0.001	0.267***	0.001
	(0.087)	(0.003)	(0.088)	(0.003)
Land area in 2008	0.050***	0.000	0.050***	0.000
	(0.012)	(0.001)	(0.012)	(0.001)
Education of HH head	0.082***	0.002**	0.082***	0.002**
	(0.031)	(0.001)	(0.031)	(0.001)
$\Delta FemaleRecipient$	-	-	-1.029	-0.033
			(0.862)	(0.033)
$\Delta Male + FemaleRecipient$	-	-	0.168	0.011
			(0.519)	(0.019)
F-statistic 1st stage	56	56	28	28
R^2	0.165	0.082	0.164	0.081
Observations	2121	2121	2120	2120
Control variables				
Year dummies	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes
Female Recipient			0.193	0.016
			(0.474)	(0.020)
Male + Female Recipient			0.354	0.026
			(0.527)	(0.022)

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to households with children aged 6 to 18 where three or more generations were present in 2008. Standard errors are clustered at the village level. All models control for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 20-24 ... 65-69,70-79, 80-89 and 90+ and binary variables indicating the presence of a child of age 5, 6 ... 18 and 19 separately for boys and girls. *Male (Female / Male + Female) Recipient* indicates whether a male (female / male and female) household member receives the pension after becoming eligible due to the reform. $\Delta Female(Male + Female)Recipient$ measures the additional effect if a women (men and women) receives the pension after becoming eligible due to the reform compared to a men (the individual effects of a men and woman).

TABLE 4.7: THE IMPACT OF THE SOCIAL PENSION ON OTHER EXPENDITURE CATEGORIES

	Total (Log)	Food (Log)	Food (Share)	Non food (Log)	Non food (Share)	Health (Log)	Health(Share)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pension HH	-0.127	-0.106	0.001	-0.177	-0.032	-0.341	-0.004
	(0.101)	(0.098)	(0.028)	(0.139)	(0.028)	(0.375)	(0.005)
HH income (lagged)	0.194***	0.155***	-0.020***	0.253***	0.020***	0.075	-0.000
	(0.019)	(0.019)	(0.006)	(0.026)	(0.005)	(0.078)	(0.001)
Land area in 2008	0.021***	0.018**	-0.001	0.025***	0.001	0.019	-0.000
	(0.007)	(0.007)	(0.001)	(0.007)	(0.001)	(0.014)	(0.000)
Education of HH head	0.040***	0.025***	-0.006***	0.051***	0.004**	0.054**	0.000
	(0.006)	(0.006)	(0.002)	(0.009)	(0.002)	(0.024)	(0.000)
F-statistic 1^{st} stage	56	56	56	56	56	56	56
R^2	0.252	0.261	0.153	0.179	0.086	0.040	0.034
Observations	2121	2121	2121	2121	2121	2121	2121
Control variables							
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes	Yes	Yes	Yes

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to households with children aged 6 to 18 where three or more generations were present in 2008. Standard errors are clustered at the village level. All models control for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 20-24 ... 65-69,70-79, 80-89 and 90+ and binary variables indicating the presence of a child of age 5, 6 ... 18 and 19 separately for boys and girls. *Pension HH* indicates whether a household member receives the pension after becoming eligible due to the reform.

TABLE 4.8: 2SLS ESTIMATION OF THE IMPACT OF THE SOCIAL PENSION ON CHILD OUTCOMES: ALTERNATIVE OUTCOME MEASURES

	6-18	6-11	12-18
Dependent variable	(1)	(2)	(3)
Student	0.058	-0.044	0.203***
	(0.054)	(0.057)	(0.075)
Child work	-0.127***	-0.061	-0.194***
(Outside HH farm/business)	(0.046)	(0.038)	(0.071)
Observations	3387	1570	1817
Control variables			
Child and family variables	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Household composition	Yes	Yes	Yes

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.
Note: The sample is limited to children living in households where three or more generations were present in 2008. Standard errors are clustered at the village level. All models control for individual and household characteristics reported in 3.2, as well as for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 5-9 ... 65-69,70-79, 80-89 and 90+. Each cell reports estimates of *Pension HH* in separate regressions, where *Pension HH* indicates whether a household member receives the pension after becoming eligible due to the reform.

TABLE 4.9: 2SLS ESTIMATION OF THE IMPACT OF THE SOCIAL PENSION ON CHILD OUTCOMES: ALTERNATIVE SAMPLE RESTRICTIONS

	Alternative cohort definition		HH with oldest member 50-70		
	12-17	12-19	6-18	6-11	12-18
Dependent variable	(1)	(2)	(3)	(4)	(5)
School enrollment	0.191**	0.144**	0.107	0.023	0.197*
	(0.082)	(0.070)	(0.070)	(0.081)	(0.105)
Child work	-0.234***	-0.186***	-0.120*	-0.071	-0.177*
	(0.083)	(0.072)	(0.068)	(0.073)	(0.103)
Observations	1584	2041	1923	979	944
Control variables					
Child and family variables	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes	Yes

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to children living in households where three or more generations were present in 2008. Standard errors are clustered at the village level. All models control for individual and household characteristics reported in 3.2, as well as for year dummies and the number of male and female household members in separate age groups 0-4, 5-9 ... 65-69,70-79, 80-89 and 90+. Each cell reports estimates of *Pension HH* in separate regressions, where *Pension HH* indicates whether a household member receives the pension after becoming eligible due to the reform.

TABLE 4.10: PLACEBO ANALYSES: SCHOOL ENROLLMENT AND EMPLOYMENT STATUS

	Enrollment			Employment status		
	6-18	6-11	12-18	6-18	6-11	12-18
	(1)	(2)	(3)	(4)	(5)	(6)
Pension HH	-0.022	-0.017	-0.008	0.066	0.047*	0.112
	(0.065)	(0.073)	(0.098)	(0.055)	(0.026)	(0.107)
Girl	0.016	-0.009	0.039	-0.017	-0.007	-0.024
	(0.023)	(0.022)	(0.040)	(0.017)	(0.007)	(0.035)
Age	0.310***	0.529***	0.280***	-0.124***	0.005	-0.279***
	(0.023)	(0.108)	(0.085)	(0.015)	(0.008)	(0.090)
Age^2	-0.014***	-0.025***	-0.012***	0.007***	-0.000	0.012***
	(0.001)	(0.006)	(0.003)	(0.001)	(0.000)	(0.003)
Total HH income	0.035***	0.005	0.054***	-0.014	0.004	-0.025
	(0.013)	(0.012)	(0.020)	(0.011)	(0.004)	(0.020)
Land area in 2007	-0.001	-0.001	-0.001	-0.001	-0.000	-0.002
	(0.002)	(0.002)	(0.004)	(0.002)	(0.000)	(0.003)
Education of HH head	0.003	0.004	0.005	-0.002	-0.001	-0.007
	(0.004)	(0.004)	(0.006)	(0.003)	(0.001)	(0.006)
F-statistic 1^{st} stage	93.8	58.7	71.8	92.0	59.2	71.0
R^2	0.343	0.358	0.376	0.333	-0.005	0.311
Observations	2085	1000	1085	2098	1020	1078

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to children living in households where three or more generations were present in 2007. Standard errors are clustered at the village level. All models control for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 5-9 ... 65-69,70-79, 80-89 and 90+. *Pension HH* indicates whether a household member receives the pension after becoming eligible before the reform.

Table 4.11: Placebo analyses: Expenditure categories

	Total (Log)	Educ. (Log)	Educ. (Share)	Food (Log)	Food (Share)	Non food (Log)	Non food (Share)	Health (Log)	Health(Share)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pension HH	-0.032	0.201	0.015	-0.113	-0.035	-0.033	0.010	1.145**	0.016
	(0.130)	(0.576)	(0.019)	(0.136)	(0.038)	(0.184)	(0.039)	(0.571)	(0.010)
HH income	0.344***	0.345***	-0.001	0.243***	-0.037***	0.430***	0.040***	0.043	-0.005***
	(0.027)	(0.117)	(0.003)	(0.025)	(0.006)	(0.036)	(0.006)	(0.099)	(0.001)
Land area in 2007	0.012*	0.011	0.000	0.012**	-0.000	0.014	0.000	0.024	0.000
	(0.007)	(0.023)	(0.001)	(0.006)	(0.001)	(0.010)	(0.001)	(0.022)	(0.000)
Education of HH head	0.036***	0.056*	0.002	0.019***	-0.006***	0.045***	0.004**	0.069**	0.001*
	(0.007)	(0.031)	(0.001)	(0.007)	(0.002)	(0.010)	(0.002)	(0.032)	(0.001)
F-statistic 1st stage	75.2	75.2	75.2	75.2	75.2	75.2	75.2	75.2	75.2
R^2	0.324	0.233	0.123	0.195	0.105	0.267	0.093	0.028	0.034
Observations	1282	1282	1282	1282	1282	1282	1282	1282	1282
Control variables									
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household composition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

***, ** and * indicate significance at the 1%, 5% and 10% level respectively. Standard errors are in parentheses.

Note: The sample is limited to households with children aged 6 to 18 where three or more generations were present in 2007. Standard errors are clustered at the village level. All models control for *Household composition*, i.e. the number of male and female household members in separate age groups 0-4, 20-24 ... 65-69,70-79, 80-89 and 90+ and binary variables indicating the presence of a child of age 5, 6 ... 18 and 19 separately for boys and girls. *Pension HH* indicates whether a household member receives the pension after becoming eligible before the reform).

Bibliography

Allais, M. (1953): "Le comportement de l'homme rationnel devant le risque: Critique des postulats et axiomes de l'école américaine," *Econometrica*, 21, 503–546.

Allais, M. and O. Hagen (1979): *Expected utility hypotheses and the Allais paradox: Contemporary discussions of the decisions under uncertainty with Allais' rejoinder*, Dordrecht: Reidel.

Allegri, M. d., M. Sanon, J. Bridges, and R. Sauerborn (2006): "Understanding consumers' preferences and decision to enrol in community-based health insurance in rural West Africa," *Health Policy*, 76, 58–71.

Andersson, O., H. J. Holm, J.-R. Tyran, and E. Wengström (2016): "Risk aversion relates to cognitive ability: Preferences or noise?" *Journal of the European Economic Association*, 14, 1129–1154.

Ardington, C., A. Case, and V. Hosegood (2009): "Labor supply responses to large social transfers: Longitudinal evidence from South Africa," *Applied Economics*, 1, 22–48.

Barsky, R. B., T. F. Juster, M. S. Kimball, and M. D. Shapiro (1997): "Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study," *Quarterly Journal of Economics*, 112, 537–579.

Benjamin, D. J., S. A. Brown, and J. M. Shapiro (2013): "Who is 'behavioral'? Cognitive ability and anomalous preferences," *Journal of the European Economic Association*, 11, 1231–1255.

Bernheim, B. D. (1991): "How strong are bequest motives? Evidence based on estimates of the demand for life insurance and annuities," *Journal of Political Economy*, 99, 899–927.

Biener, C. (2013): "Pricing in microinsurance markets," *World Development*, 41, 132–144.

Biener, C. and M. Eling (2012): "Insurability in microinsurance markets: An analysis of problems and potential solutions," *Geneva Papers on Risk and Insurance*, 37, 77–107.

Birnbaum, M. H. (1997): "Violations of monotonicity in judgment and decision making," in *Choice, decision and measurement: Essays in honor of R. Duncan Luce*, ed. by A. A. J. Marley, Mahwah: Erlbaum, 73–100.

——— (1999): "Testing critical properties of decision making on the Internet," *Psychological Science*, 10, 399–407.

——— (2004a): "Causes of Allais common consequence paradoxes: An experimental dissection," *Journal of Mathematical Psychology*, 48, 87–106.

——— (2004b): "Tests of rank-dependent utility and cumulative prospect theory in gambles represented by natural frequencies: Effects of format, event framing, and branch splitting," *Organizational Behavior and Human Decision Processes*, 95, 40–65.

Bryant, J. and A. Prohmmo (2002): "Equal contributions and unequal risks in a North-east Thai village funeral society," *Journal of Development Studies*, 38, 63–75.

Burks, S. V., J. P. Carpenter, L. Goette, and A. Rustichini (2009): "Cognitive skills affect economic preferences, strategic behavior, and job attachment," *Proceedings of the National Academy of Sciences*, 106, 7745–7750.

Butler, J. R. G. (2002): "Policy change and private health insurance: Did the cheapest policy do the trick?" *Australian Health Review*, 25, 33–41.

Camerer, C. F. and R. M. Hogarth (1999): "The effects of financial incentives in experiments: A review and capital-labor-production framework," *Journal of Risk and Uncertainty*, 19, 7–42.

Carvalho Filho, I. E. d. (2008): "Old-age benefits and retirement decisions of rural elderly in Brazil," *Journal of Development Economics*, 86, 129–146.

——— (2012): "Household income as a determinant of child labor and school enrollment in Brazil: Evidence from a social security reform," *Economic Development and Cultural Change*, 60, 399–435.

Charness, G. and A. Viceisza (2016): "Three risk-elicitation methods in the field: Evidence from rural Senegal," *Review of Behavioral Economics*, 3, 145–171.

Chen, R., K. A. Wong, and H. C. Lee (2001): "Age, period, and cohort effects on life insurance purchases in the U.S," *Journal of Risk and Insurance*, 68, 303–327.

Chiappori, P.-A. and B. Salanié (2000): "Testing for asymmetric information in insurance markets," *Journal of Political Economy*, 108, 56–78.

Choi, S., S. Kariv, W. Müller, and D. Silverman (2014): "Who is (more) rational?" *American Economic Review*, 104, 1518–1550.

Christelis, D., T. Jappelli, and M. Padula (2010): "Cognitive abilities and portfolio choice," *European Economic Review*, 54, 18–38.

Cole, S., T. Sampson, and B. Zia (2011): "Prices or knowledge? What drives demand for financial services in emerging markets?" *Journal of Finance*, 66, 1933–1967.

Conlisk, J. (1989): "Three variants on the Allais example," *American Economic Review*, 79, 392–407.

Criel, B. and M. P. Waelkens (2003): "Declining subscriptions to the Maliando Mutual Health Organisation in Guinea-Conakry (West Africa): What is going wrong?" *Social Science & Medicine*, 57, 1205–1219.

Cutler, D. M. and R. J. Zeckhauser (1998): "Adverse selection in health insurance," in *Frontiers in Health Policy Research, Volume 1*, ed. by A. M. Garber, Cambridge: MIT Press, 1–31.

Dercon, S., J. d. Weerdt, T. Bold, and A. Pankhurst (2006): "Group-based funeral insurance in Ethiopia and Tanzania," *World Development*, 34, 685–703.

Dohmen, T., A. Falk, D. Huffman, and U. Sunde (2010): "Are risk aversion and impatience related to cognitive ability?" *American Economic Review*, 100, 1238–1260.

Dohmen, T., A. Falk, D. Huffman, U. Sunde, J. Schupp, and G. G. Wagner (2011): "Individual risk attitudes: Measurement, determinants, and behavioral consequences," *Journal of the European Economic Association*, 9, 522–550.

Duflo, E. (2003): "Grandmothers and granddaughters: old-age pensions and intrahousehold allocation in South Africa," *World Bank Economic Review*, 17, 1–25.

Edmonds, E. V. (2006): "Child labor and schooling responses to anticipated income in South Africa," *Journal of Development Economics*, 81, 386–414.

Fan, E. (2010): "Who benefits from public old age pensions? Evidence from a targeted program," *Economic Development and Cultural Change*, 58, 297–322.

Finkelshtain, I. and E. Feinerman (1997): "Framing the Allais paradox as a daily farm decision problem: Tests and explanations," *Agricultural Economics*, 15, 155–167.

Finkelstein, A. and K. McGarry (2006): "Multiple dimensions of private information: Evidence from the long-term care insurance market," *American Economic Review*, 96, 938–958.

Finkelstein, A. and J. Poterba (2014): "Testing for asymmetric information using "unused observables" in insurance markets: Evidence from the U.K. annuity market," *Journal of Risk and Insurance*, 81, 709–734.

Galiani, S., P. Gertler, and R. Bando (2016): "Non-contributory pensions," *Labour Economics*, 38, 47–58.

Gandolfi, A. S. and L. Miners (1996): "Gender-based differences in life insurance ownership," *Journal of Risk and Insurance*, 63, 683–693.

Giesbert, L., S. Steiner, and M. Bendig (2011): "Participation in micro life insurance and the use of other financial services in Ghana," *Journal of Risk and Insurance*, 78, 7–35.

Hardeweg, B., S. Klasen, and H. Waibel (2013a): "Establishing a database for vulnerability assessment," in *Vulnerability to poverty: Theory, measurement and determinants, with case studies from Thailand and Vietnam*, ed. by H. Waibel and S. Klasen, New York: Palgrave Macmillan, 50–79.

Hardeweg, B., L. Menkhoff, and H. Waibel (2013b): "Experimentally validated survey evidence on individual risk attitudes in rural Thailand," *Economic Development and Cultural Change*, 61, 859–888.

He, D. (2009): "The life insurance market: Asymmetric information revisited," *Journal of Public Economics*, 93, 1090–1097.

Hentschel, J. and P. Lanjouw (1996): "Constructing an indicator of consumption for the analysis of poverty: Principles and illustrations with reference to Ecuador," *World Bank LSMS Working Paper*, 124.

Holt, C. A. and S. K. Laury (2002): "Risk aversion and incentive effects," *American Economic Review*, 92, 1644–1655.

Huck, S. and W. Müller (2012): "Allais for all: Revisiting the paradox in a large representative sample," *Journal of Risk and Uncertainty*, 44, 261–293.

Ito, S. and H. Kono (2010): "Why is the take-up of microinsurance so low? Evidence from a health insurance scheme in India," *Developing Economies*, 48, 74–101.

Jensen, R. T. (2003): "Do private transfers 'displace' the benefits of public transfers? Evidence from South Africa," *Journal of Public Economics*, 88, 89–112.

Jitsuchon, S., E. Skoufias, and M. Wiener (2012): "Reducing elderly poverty in Thailand: The role of Thailand's pension and social assistance programs," *World Bank*.

Juarez, L. (2009): "Crowding out of private support to the elderly: Evidence from a demogrant in Mexico," *Journal of Public Economics*, 93, 454–463.

Juarez, L. and T. Pfutze (2015): "The effects of a noncontributory pension program on labor force participation: The case of 70 y más in Mexico," *Economic Development and Cultural Change*, 63, 685–713.

Kahneman, D. and A. Tversky (1979): "Prospect theory: An analysis of decision under risk," *Econometrica*, 47, 263–292.

Kaushal, N. (2014): "How public pension affects elderly labor supply and well-being: Evidence from India," *World Development*, 56, 214–225.

Levy, H. (2008): "First degree stochastic dominance violations: Decision weights and bounded rationality," *Economic Journal*, 118, 759–774.

Lewbel, A. (2012): "Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models," *Journal of Business and Economic Statistics*, 30, 67–80.

Liebenberg, A. P., J. M. Carson, and R. E. Dumm (2012): "A dynamic analysis of the demand for life insurance," *Journal of Risk and Insurance*, 79, 619–644.

Maitra, P. and R. Ray (2003): "The effect of transfers on household expenditure patterns and poverty in South Africa," *Journal of Development Economics*, 71, 23–49.

McCord, M. J. and S. Osinde (2005): "Reducing vulnerability: The supply of health microinsurance in East Africa," *Journal of International Development*, 17, 327–381.

McCord, M. J. and C. Tatin-Jaleran (2013): "Towards inclusive insurance in Thailand: An analysis of the market and regulations," *Asian Development Bank Technical Assistance Consultant's Report*.

Morduch, J. (2006): "Microinsurance: The next revolution?" in *Understanding poverty*, ed. by A. V. Banerjee, R. Benabou, and D. Mookherjee, New York: Oxford University Press, 337–356.

Moulton, B. R. (1986): "Random group effects and the precision of regression estimates," *Journal of Econometrics*, 32, 385–397.

Polonsky, J., D. Balabanova, B. McPake, T. Poletti, S. Vyas, O. Ghazaryan, and M. K. Yanni (2009): "Equity in community health insurance schemes: Evidence and lessons from Armenia," *Health Policy and Planning*, 24, 209–216.

Ponczek, V. (2011): "Income and bargaining effects on education and health in Brazil," *Journal of Development Economics*, 94, 242–253.

Posel, D., J. A. Fairburn, and F. Lund (2006): "Labour migration and households: A reconsideration of the effects of the social pension on labour supply in South Africa," *Economic Modelling*, 23, 836–853.

Puri, M. and D. T. Robinson (2007): "Optimism and economic choice," *Journal of Financial Economics*, 86, 71–99.

Rothschild, M. and J. Stiglitz (1976): "Equilibrium in competitive insurance markets: An essay on the economics of imperfect information," *Quarterly journal of Economics*, 90, 629–649.

Salinas-Rodríguez, A., B. Manrique-Espinoza, K. Moreno-Tamayo, P. Torres-Pereda, V. d. La Cruz-Góngora, G. Ángeles-Tagliaferro, and M. M. Téllez-Rojo Solís (2014): "Impact evaluation of the non-contributory social pension programme 70 y más in Mexico," *3ie Impact Evaluation Report 5*.

Sauter, N. (2012): "Bequest motives and the demand for life insurance in East Germany," *German Economic Review*, 15, 272–286.

SOMPADUNG, S. (2013): "Risk management strategies: Case of Bank for Agriculture and Agricultural Cooperatives," *Asia-Pacific Rural and Agricultural Credit Association Best Practice and Innovation Report*.

SUPAKANKUNTI, S. (2000): "Future prospects of voluntary health insurance in Thailand," *Health Policy and Planning*, 15, 85–94.

TANAKA, T., C. F. CAMERER, AND Q. NGUYEN (2010): "Risk and time preferences: Linking experimental and household survey data from Vietnam," *American Economic Review*, 100, 557–571.

TVERSKY, A. AND D. KAHNEMAN (1992): "Advances in prospect theory: Cumulative representation of uncertainty," *Journal of Risk and Uncertainty*, 5, 297–323.

UN DESA (2012): "Population ageing and development 2012," *Report of the United Nations Department of Economic and Social Affairs (UN DESA) - Population Division*.

UNICEF (2014): "Addressing the Gaps: Key results from the Multiple Indicator Cluster Survey Thailand 2012," *Report of the United Nations Children's Fund (UNICEF) Thailand*.

VIEIDER, F. M., M. LEFEBVRE, R. BOUCHOUICHA, T. CHMURA, R. HAKIMOV, M. KRAWCZYK, AND P. MARTINSSON (2015): "Common components of risk and uncertainty attitudes across contexts and domains: Evidence from 30 countries," *Journal of the European Economic Association*, 13, 421–452.

VISCUSI, W. K. (1985): "Are individuals Bayesian decision makers?" *American Economic Review*, 75, 381–385.

——— (1989): "Prospective reference theory: Toward an explanation of the paradoxes," *Journal of Risk and Uncertainty*, 2, 235–264.

VISCUSI, W. K., W. A. MAGAT, AND J. HUBER (1987): "An investigation of the rationality of consumer valuations of multiple health risks," *RAND Journal of Economics*, 18, 465–479.

Viscusi, W. K. and C. J. O'Connor (1984): "Adaptive responses to chemical labeling: Are workers Bayesian decision makers?" *American Economic Review*, 74, 942–956.

Wang, H., L. Zhang, W. Yip, and W. Hsiao (2006): "Adverse selection in a voluntary Rural Mutual Health Care health insurance scheme in China," *Social Science & Medicine*, 63, 1236–1245.