Essays on the Economics of Foreign Exchange and Development Finance

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Abstract

Global economic activity and integration have been increasing dramatically over the past decades. Today, international integration is far deeper and embraces more dimensions than ever, such as migration, culture, infrastructure, security, and also economics. Thus, topics of internationalization, globalization, and development continue to create fascination and high interest in most research fields. This dissertation contributes to the on-going debate from an economic perspective. More specifically, this study comprises three works on the economics of foreign exchange and two studies on development finance.

The first chapter analyzes overconfidence of financial professionals with respect to their self-rating of their exchange rate expectations. The second chapter elaborates on heterogeneity of foreign exchange rate expectations. The third chapter provides an assessment of the effectiveness of central banks' foreign exchange interventions. The fourth chapter addresses the relationship between local financial development and welfare. The last chapter studies the impact of shocks on risk attitudes in two developing countries.

This dissertation enriches the debate on two fields in international economics, namely the economics of foreign exchange and development finance. The overall result of this thesis is that behavioral aspects matter for many dimensions of economic behavior. Exchange rate expectations appear to be biased with respect to wishful thinking and forecasters are overconfident. Risk attitudes are not as stable as usually assumed but depend on the past experience of shocks.

Keywords: foreign exchange expectations, overconfidence, central banks' foreign exchange interventions, financial development, risk attitudes.

Kurzfassung

Über die letzten Jahrzehnte hinweg sind globale Wirtschaftsbeziehungen und Integration dramatisch gestiegen. Heute ist internationale Integration weit durchdringender und umfasst viel mehr Bereiche, wie zum Beispiel Migration, Kultur, Sicherheitspolitik und Wirtschaft. Folglich kreieren die Themen, Internationalisierung, Globalisierung und Entwicklung, ungebrochen große Faszination und Interesse in den meisten Forschungsfeldern. Diese Dissertation trägt aus einer ökonomischen Perspektive zur laufenden Diskussion bei. Im Detail umfasst diese Studie drei Arbeiten im Bereich Wechselkurse und zwei zu Entwicklungsfinanzierung.

Das erste Kapitel analysiert Selbstüberschätzung von Finanzmarktexperten in Bezug auf deren Wechselkurserwartungen. Das zweite Kapitel handelt über die Heterogenität von Wechselkurserwartungen. Das dritte Kapitel bietet Ansätze für die Bewertung der Effektivität von Devisenmarktinterventionen von Zentralbanken. Das vierte Kapitel adressiert den Zusammenhang zwischen der Entwicklung von lokalen Finanzmärkten und Wohlfahrt. Das letzte Kapitel befasst sich mit dem Einfluss von Schocks auf Risikoeinstellung in zwei Entwicklungsländern.

Zusammengefasst bereichert diese Dissertation die Debatte in zwei Feldern der Internationalen Wirtschaftswissenschaft: Ökonomik der Wechselkurse und Entwicklungsfinanzierung. Als übergreifendes Ergebnis der Arbeit lässt sich zusammenfassen, dass behavioristische Aspekte in vielerlei Dimensionen von ökonomischen Entscheidungen relevant sind. Wechselkurserwartungen sind verzerrt in Bezug auf Wunschdenken und Prognostiker überschätzen ihre Fähigkeiten. Risikoeinstellungen sind nicht fix, wie häufig angenommen, sondern hängen von den vergangenen Schockerfahrungen ab.

Schlagwörter: Wechselkurserwartungen, Selbstüberschätzung, Wechselkursinterventionen von Zentralbanken, Entwicklung von Finanzmärkten, Risikoeinstellung.

Contents

Preface

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Completing a doctoral thesis is both an intellectual and a personal challenge. So it was for me. In the course of writing this dissertation I have benefited from a number of people. I would like to take this opportunity to express my earnest thanks for their support, inspiration, and advice. In the following lines some of them are gratefully acknowledged. It is without doubt that there are many more and these words cannot express the gratitude and respect I feel for all of those.

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Introduction

Global economic activity and integration have been increasing dramatically over the past decades. Today, international integration is far deeper and embraces more dimensions than ever, such as migration, culture, infrastructure, security, and also economics. Thus, topics of internationalization, globalization, and development continue to create fascination and high interest in most research fields. This dissertation contributes to the on-going debate from an economic perspective. More specifically, this study comprises three works on the economics of foreign exchange and two studies on development finance.

The foreign exchange market is the largest market in the world, having an estimated turnover in 2010 of about four trillion USD - per day (BIS, 2010). Whether the motivation for agents to engage in the foreign exchange market is based on financial reasons, or goods and services trade, is largely irrelevant for the outcome: currency trade is a by-product of globalization as well as its catalyst. Thus, no matter whether one is interested in goods, services or financial markets, it is warranted to know more about the determination of exchange rate prices. One important driver are exchange rate expectations.

The first paper characterizes exchange rate expectations and scrutinizes the formation of exchange rate expectations making use of a particularly interesting data set from Thailand. Namely, it utilizes a business survey data set from the Bank of Thailand for exchange rate expectations of the THB/USD exchange rate. The so-called "Business Sentiment Index" of the Bank of Thailand provides individual foreign exchange rate expectations of the THB/USD exchange rate for about 600 firms over nine years. The research question in this paper addresses in particular heterogeneity of these exchange rate expectations in several dimensions. It is found that exchange rate expectations capture the appreciation trend and the cyclical component of the THB/USD very well, though they are biased on average. Focusing our analysis on the heterogeneity of exchange rate expectations, we find that they are heterogeneous on average and that they display a strong trend following behavior. Exchange rate expectations depend on both public fundamentals as well as on (private) individual expectations of fundamentals, where the former appear to dominate the expectation building process. We observe wishful thinking, i.e. exporters expect less appreciation of the domestic currency than importers.

The second paper makes a contribution to a related dimension by also utilizing data of exchange rate expectations. We analyze financial experts who submit their expectations and thereby we turn the focus towards an analysis of the market participants rather than the expectation. More specifically, we analyze how each financial expert perceives her forecast performance. This angle is particularly interesting since it opens the opportunity to study a behavioral bias of these experts, namely overconfidence.

In the second paper we also use exchange rate expectations, this time employing data from the German ZEW Financial Market Survey. To study overconfidence, we calculate hit rates as a measure of performance for all the individual forecasters in the panel. This is complemented with information about the self-rating of the forecasters with respect to their actual forecasting

performance. Based on this, we calculate a measure of overconfidence, which is the difference between self-rating and hit rate, both measured relative to the same peer group. From the results we can see whether financial market participants display the behavioral bias referred to as overconfidence. The forecasters in our sample show overconfidence on average, although to a moderate degree, including many cases of underconfidence. In analyzing this, we find that working experience is accompanied by less overconfidence. Function is also related to less overconfidence, such as being a fund manager and using fundamental analysis. The same effect is found for the attitude to herd, whereas recent success is associated with more overconfident professionals.

Turning the focus back on exchange rates we can observe that most foreign exchange regimes today are freely floating. This creates the possibility of large exchange rate misalignments and excessive exchange rate volatility. Policy makers try to dampen these adverse effects of exchange rates by foreign exchange interventions. However, this policy tool is not without cost because a central bank intervening in the foreign exchange market takes a stake in favor of a particular currency and against another. Thus, an evaluation of the effectiveness of this policy tool is highly useful.

The third paper provides both a literature review as well as a proposal on the adequate measurement of the effectiveness of foreign exchange interventions. I survey success measures of foreign exchange intervention effectiveness and review strategies of identification and related issues. A foreign exchange intervention can be considered to be effective if it results in a significant change of the exchange rate, a directional change of the exchange rate, or if it achieves to ease the speed of appreciation/depreciation. The identification of a causal relationship might be exacerbated due to confounding unobserved factors and reverse causality. Solutions are provided by the inclusion of other exchange rate determinants, the estimation of exchange rate counterfactuals, and the estimation of the central bank intervention function. Higher frequency, larger size, concerted interventions, and flexible exchange rates appear to ease the identification of the interventions' effect.

Due to the expansion in the outreach of globalization, differences in living standards across countries have become more and more transparent and urging. Questions arise on how households in developing countries are affected by the changes caused by economic development and, on a more general level, how people form decisions in their daily life. The last two papers address these issues and utilize data from the DFG project FOR 756 "Impact of shocks on the vulnerability to poverty: consequences for development of emerging Southeast Asian economies". The research group maintains an on-going panel household survey which has been conducted in Thailand and Vietnam in 2007, 2008, 2010, and 2011.

Descending to the micro level of the household, the paper uses the 2007 wave of the survey in order to compute an indicator of local financial development for Thailand to answer the question: if and how is financial development linked to household welfare? Our analysis focuses on two dimensions of household welfare: investment and consumption. The results show that

financial development is associated with a larger volume of productive investments and is also able to improve the financing of consumption. However, the effect of financial development on credit as an instrument to insure consumption risk is not supported. This finding implies that consumption smoothing is only weakly improved by larger financial development.

But it is not just interesting how the development of local financial markets interacts with the wellbeing of the households. A common observation is the vicious cycle of poverty and vulnerability. In particular vulnerable households are often more likely to suffer from shocks, which will then further increase their risk aversion as well as their propensity to engage in less risky activities, thereby making them less likely to leave the state of poverty and vulnerability. Thus, it is of essential need to understand how individuals make their decisions and policies have to be designed in order to enable them to leave poverty and vulnerability.

The fifth paper contributes to the understanding of the aforementioned vicious cycles. We use a survey item on risk attitude and analyze whether, first, a survey item of risk attitude is a valid measure of risk attitudes and, second, if and how shocks affect risk attitudes. The paper examines whether the experience of shocks helps in explaining individual risk attitudes. For convenience, individual risk attitude is often assumed to be time-invariant, although this is empirically misleading. For the design of policy measures it is a severe shortcoming that relatively little is known about the factors and circumstances by which risk attitudes may be systematically influenced. We contribute by measuring risk attitude via a simple survey item, compiled among about 2,000 households in Thailand and Vietnam each. The experience of negative unexpected shocks is indeed correlated with a lower degree of risk aversion, even when a large set of socio-demographic controls is used. This effect is significant in Thailand and Vietnam, whereas other variables tend to have diverse importance in the two countries. We corroborate the analysis by conducting an incentivized experiment to validate the risk measure and by considering the relation between risk attitude and risk behavior, i.e. the decision for self-employment and lottery purchases. Our findings indicate that in particular negative shocks are amplified in their impact by increased, and thus possibly excessive, risk aversion. Understanding the way how this unwanted amplifier works is crucial in breaking the looming vicious cycle.

Coming to the final conclusion, this dissertation enriches the debate on two fields in international economics, namely the economics of foreign exchange and development finance. The overall result of this thesis is that behavioral aspects matter for many dimensions of economic behavior. Exchange rate expectations appear to be biased with respect to wishful thinking and forecasters are overconfident. Risk attitudes are not as stable as usually assumed and depend on the past experience of shocks. This major finding encourages us to go beyond traditional assumptions, such as rational expectations, and to dig deeper in order to obtain a more comprehensive understanding of economic behavior.

Chapter 1

Heterogeneity of Exchange Rate Expectations and Wishful Thinking in an Emerging Market[1]

[1]This chapter is based on the article by Chantapong and Gloede (2012). Thanks for helpful discussion and comments go to Christian Dick, Berit Gerritzen, Michael Kühl, Lukas Menkhoff and Maik Schmeling. We thank the Bank of Thailand for granting access to the BSI data set.

1.1 Introduction

Expectations about foreign exchange rates have a large impact on the price movement of the foreign exchange rate. This motivates a large stream of literature on the formation of exchange rate expectations (for a survey of the literature see MacDonald, 2000). A major stylized fact is the observation of heterogeneous expectations. Previous work finds heterogeneity in various dimensions, namely with respect to wishful thinking (Ito, 1990), the expectation formation process (Benassy-Quere et al., 2003), heterogenous use of information (Dreger and Stadtmann, 2007), and differences between currencies of advanced and domestic currencies (Chinn and Frankel, 1994).

We contribute to a better understanding of the heterogeneity of exchange rate expectations in three ways: (i) We analyze individual exchange rate expectations in an emerging economy, i.e. for the THB/USD exchange rate, (ii) we compare different determinants in exchange rate expectation models, i.e. exchange rate movements, public information of fundamentals, and individual (private) expectations of these fundamentals, and (iii) we check for wishful thinking by splitting our data set in export dependent firms and non-export dependent firms.

Our analysis of exchange rate expectations employs information from the Business Sentiment Index of the Bank of Thailand. This business survey collects monthly data from 2002 to 2010 on firms' qualitative expectation of the THB/USD exchange rate and fundamentals of the Thai economy. Specifically the latter covers interest rates, inflation, output, and exports. We supplement this information with data of the actual exchange rate and actual values of fundamentals. From information about the firms' industry sector we calculate the export dependency for each firm implementing the methodology of He and Zhang (2008). Using this data set we first survey briefly the THB/USD exchange rate and give some background information on the economy. Our analysis proceeds with an analysis of exchange rate expectations, which starts with some descriptives statistics and continues with an analysis of the expectation formation process. In a last step we distinguish between export dependent and non-export dependent firms in our analysis.

We find that, first, the THB/USD exchange rate has been appreciating over the last decade as it has been the case in many emerging markets. Second, exchange rate expectations generally capture both aspects, the appreciation trend and the cyclical component of exchange rate fluctuations, though they are biased predictors on average. Third, public information of fundamentals appears to play a major role for the expectation building process compared to private information of fundamentals. Fourth, with respect to individual forward-looking expectations of fundamentals, interest rate and output expectations dominate the expectation formation process. Fifth, we observe wishful thinking in the spirit of Ito (1990), i.e. exporters expect less appreciation of the domestic currency than importers.

Our paper relates to three streams of literature, (i) works on emerging market foreign exchange rate expectations, (ii) heterogeneity of the exchange rate expectation formation, and (iii) exchange rate expectations and forward-looking fundamentals.

With respect to the first stream, analyzes of exchange rate expectations in emerging economies are quite scarce which might stem from the lack of business surveys in these countries. Chinn and Frankel (1994) resolve the issue by implementing a multinational data set for 25 countries, including the emerging markets Taiwan, Singapore, the Philippines, South Korea, South Africa, Argentina, Mexico, Chile, Brazil, and Venezuela. Their study backs our hypothesis that exchange rates of advanced and emerging economies behave differently. We contribute to their analysis in analyzing a larger panel (with respect to both the cross-section and the time dimension) and use individual expectations compared to consensus forecasts which are used in their study. A second study uses data from the Central Bank of Brazil to analyze exchange rate expectations, but with a different focus, namely testing for rationality under flexible loss (Bagehstani and Marchon, 2012). A third and last study uses forecasts from Consensus Economics of the Brazilian Real and the Mexican Peso to test heterogenous loss functions (Fritsche et al., 2009). To the best of our knowledge no work has been done on heterogeneity of emerging markets exchange rates with respect to the expectation formation process nor wishful thinking.

Second, we turn our attention to the literature on heterogeneous exchange rate expectations. The first to address the issue of heterogeneous exchange rate expectations is Ito (1990). The study shows that forecasters form heterogeneous expectations which are biased by their background, i.e. being an exporter or importer. Further evidence of heterogeneity in the expectation formation is vast (MacDonald and Marsh, 1996; Benassy-Quere et al., 2003; Menkhoff et al., 2009).[2]

Third, the use of private information in expectation formation models is comparatively new. The reasoning behind including individual, i.e. private, expectations in the expectation formation process is that heterogeneity of expectations can stem from three facts. First, processing of public information could be different for each forecaster. One could interpret Benassy-Quere et al. (2003) using a randomized coefficients model as an adoption of this approach. Second, importance of fundamentals could differ between forecasters and over time (Sarno and Valente, 2009). A prominent theory that goes in this direction is the scapegoat model of exchange rates (Bacchetta and Wincoop, 2004). And thirdly, private information could be incorporated in the expectation formation process (Engel and West, 2005; Bacchetta and Wincoop, 2006). This last route is taken by Dreger and Stadtmann (2007) who show that foreign exchange rate expectations (JPY/USD) are partially forward-looking. They include GDP growth, inflation, and interest rates for the USA. The hypothesis of heterogeneous expectations is confirmed. The paper contributes in showing a significant impact of forward-looking fundamentals on the exchange rate expectations - an issue which we also address in our paper in more detail. Related to this stream of literature, Dick et al. (2011) show that forecasting performance increases if fundamentals are forecasted well.

The paper continues with a description of the data set (Section 1.2) which is followed by the results section (Section 1.3). We provide several robustness checks in Section 1.4. Section 1.5

[2]One direction which many studies follow is the analysis of two different groups of forecasters, which are chartist/fundamentalist (for a survey see Menkhoff and Taylor, 2007).

concludes.

1.2 Data

In this section we describe the details of the data set which consists of public fundamentals, business survey results for fundamentals and exchange rates as well as information on the participating firms. Descriptive statistics are displayed in Table 1.1.[3]

Section 1.2.1 provides information on the Thai economy and the THB/USD exchange rate. We follow with a description of the business survey "Business Sentiment Index" (BSI) of the Bank of Thailand (BOT) in Section 1.2.2. The last section concludes with a brief description of the calculation of export dependency by industry sectors (Section 1.2.3).

1.2.1 THB/USD exchange rate and the Thai economy

Thailand is an emerging economy with a managed floating exchange rate. Over the study period from 2002 to 2010 there was a general appreciation trend of the THB. This trend is a common feature of emerging markets and is mainly caused by the Balassa-Samuelson effect (Balassa, 1964; Samuelson, 1964). Deviations from the trend are mainly caused by common exchange rate shocks. Thus, cyclical fluctuations around 5% are pretty common.

1.2.2 The Business Sentiment Index

The main data source of our analysis is the Business Sentiment Index of the Bank of Thailand. This data set includes individual qualitative forecasts of more than 1,440 Thai firms for the years 2002 to 2010. Firms are selected on an ad hoc basis and maintain business operations in various industry sectors.

We only consider forecasts of companies who have participated at 36 occasions minimum, which corresponds to at least three years of participation. Unless noted otherwise we use this restriction of the data set throughout the following analysis. The reasoning behind is to obtain a reliable sample of continuously participating firms. If firms participate only occasionally, the seriousness of the individual forecasts can be doubted. Further, a small observation number for the individual firm creates challenges with respect to the statistical identification. In the robustness section we challenge this restriction by analyzing the full sample of available firms.

On a monthly frequency the survey asks participants for their three months ahead forecast of the THB/exchange rate. Figure 1.2 shows participation over time.[4] On average, about 425 of the forecasters submit an expectation for the THB/USD exchange rate.

[3] Table 1.7 provides an overview of the variables and their sources.
[4] In Table 1.10 we also show the participation in a histogram.

Besides the THB/USD expectations we also obtain expectations of interest rates, inflation, output, and exports. All of the aforementioned expectations are surveyed in a qualitative format as well. In general, expectations are coded in three categories. In our analysis, larger values for the fundamental expectation refer to more positive states of the economy. For example, firms are asked to give their expectations on how the business activity will be in the next three months. We code minus one as down, zero as unchanged, and one as up. [5]

1.2.3 Export dependency

To identify export dependency of industry sectors we implement the methodology of He and Zhang (2008). The methodology utilizes data from the input/output tables of the national accounts and calculates how much of the output depends on exports.

1.3 Results

In the following section we discuss the results of our analysis with respect to the exchange rate expectations. The first section addresses methodological issues and is followed by a first descriptive analysis of exchange rate expectations. In Section 1.3.3 we scrutinize the exchange rate expectation formation process, in particular with respect to the heterogeneity between firms. The last section 1.3.4 elaborates on heterogeneity in the format of wishful thinking by separating the sample into firms which are export dependent and those which are not.

1.3.1 Methodology

In general, we rely on panel estimation techniques which is feasible in the context of the given data structure of individual foreign exchange rate expectations over nine years. Three issues that are particular to our analysis, are described below.

First, we want to stress that foreign exchange rate expectations are heterogeneous. In fact, this is our main research question and has also been shown in the literature (e.g. Ito, 1990). This is why we would like to allow for some heterogeneity. We introduce heterogeneity in our model by estimating a fixed effects model which accounts for time-invariant unobserved heterogeneity. Our analysis below proofs that exchange rate expectations are indeed heterogeneous and this methodology is suitable. We apply three tests to scrutinize the evidence for heterogeneity: pooled vs. fixed effects (Greene, 2008), pooled vs. random effects (Breusch and Pagan, 1980), as well as a Hausman test (Hausman, 1978).[6]

[5] Table 1.7 provides more details to all of the variables and their codes.

[6] Other authors address heterogeneity in different models employing a random coefficients model which allows to identify an individual effect for each individual (Koske and Stadtmann, 2009; Benassy-Quere et al., 2003). The advantage of these models is that they allow us to identify a disaggregated effect: for example 50% minus and 50% plus coefficients in the random coefficients model lead to zero impact in the fixed effects average model. In the our analysis implementing this option causes some clear disadvantages. First, the number of observations for each forecaster are typically small which could deter the robustness of the results and make effects. Second, random

Second, exchange rate expectations are measured on an ordinal scale. This entails the need for non-linear estimation techniques. Provided that we also need to take into account heterogeneity of exchange rate expectations, a trade-off arises. As several studies have shown, there are two major critiques with respect to using non-linear fixed effects models (Greene, 2002). First, there is a downward bias towards zero for fixed effects estimators in non-linear models. Second, the ordered probit often can not be identified for every category for every individual. Thus, there are not enough observations to yield robust estimates. That is why we observe a trade-off between controlling for unobserved heterogeneity on the one hand and accounting for the ordinal nature of exchange rate expectations, on the other. For the main body of our analysis we employ linear fixed effects as the benchmark model and challenge the results in the robustness section by implementing a random effects ordered probit model (Greene, 2008).[7]

Third, we observe autocorrelation by construction due to overlapping time horizons (see Hansen and Hodrick, 1980). Since we observe exchange rate expectations on a monthly basis and expectations are three months ahead, our standard errors suffer from MA(2). We test for autocorrelation according to Wooldridge (2002). The evidence is vastly in favor of the null of AR(1). Our resolution to the issue is clustering standard errors on the individual (i.e. firm) level as suggested by Stock and Watson (2007).

1.3.2 Exchange rate expectations of the THB/USD exchange rate

In this section we address the behavior of the THB/USD expectations in three ways: we analyze (i) the trend behavior of the panel of exchange rate expectations, (ii) unbiasedness of exchange rate expectations, (iii) efficiency of exchange rate expectations.

Expectations of the THB/USD in the period of 2002 to 2010 show a clear tendency of THB appreciation as suggested by the actual trend of the THB/USD exchange rate. On average about 40% of the firms expect a THB appreciation, 40% report that the exchange rate remains unchanged. The remaining 20% report an expected depreciation of THB (see also Table 1.5).

The process of the exchange rate expectations over the survey period shows a clear cyclical pattern which is subject of the analysis in the consecutive sections (see Table 1.3).

To be able to better visualize the expectations, we calculate a sentiment index as an option to deal with the two dimensions of the data. We calculate a series of THB sentiment in a common way of a bull-bear spread (cf. Menkhoff and Rebitzky, 2008).

effects does not capture time-invariant unobserved heterogeneity effect (which we do observe in our analysis), although we could identify more of the heterogeneity in the coefficients.

[7] Another route to address the issue would involve the aggregation of the expectations to a single forecast, like Carlson and Parkin (1975) suggest and how it is implement in many studies (e.g. Menkhoff et al., 2008). We refrain from using this approach because of two reasons. First, using an aggregate measure does not enable us to answer our research question of heterogeneity in exchange rate forecasts. Second, the method of aggregation is always subject to some arbitrary decisions and involves some serious disadvantages as Breitung and Schmeling (2011) show.

$$\forall t = 1, 2, ..., T : \frac{\sum_{i=1}^{N} \Delta s_i^{e+} - \sum_{i=1}^{N} \Delta s_i^{e-}}{\sum_{i=1}^{N} \Delta s_i^{e}} \tag{1.1}$$

with Δs_i^{e+} as expectations of THB appreciation and Δs_i^{e-} as expectations of THB depreciation in three months time. We compute the difference of the number of expectations of THB appreciation minus the number of expectations of THB depreciation in percentage of all firms.

Displaying THB sentiment against the USD again reveals the cyclical behavior of the exchange rate expectations. When plotted jointly with the actual development of three month changes of the THB/USD exchange rate, the THB sentiment appears to be closely related to the actual exchange rate. In fact, it seems that sentiment leads future exchange rate changes by one to two months.[8]

In a second step we check for the unbiasedness of exchange rate expectations. The literature on unbiasedness tests is vast (Frankel and Froot, 1987). The idea of the test is that if exchange rate expectations are unbiased they need to be on average a good predictor of the actual exchange rate changes, which means that there is no systematic difference, i.e. no bias, between the two. The standard test equation reads as follows:

where $\Delta s_{i,t+3}^{e}$ denotes the individual expectation of exchange rate change and Δs_{t+3}^{c} the categorical change of the actual exchange rate. We categorize exchange rate changes in appreciated, unchanged, and depreciated in order to match qualitative individual expectations, in which our situation differs to the existing literature. Other works either aggregate individual forecasts to a point forecast (e.g. Menkhoff et al., 2008) or can rely on quantitative forecasts on the individual level (e.g. Frenkel et al., 2009). We use a variety of thresholds, which are 0.5%, 1%, 2%, 3%, 4%, 5%. If $\alpha = 0$ and $\beta = 1$, expectations are unbiased. Estimation is conducted by a fixed effects model with clustered standard errors on the individual level.

Results in Table 1.2 show that $\widehat{\alpha}$ ranges from -0.298 to -0.0256, whereas $\widehat{\beta}$ lies in between 0.138 and 0.0114. α (β) increases (decreases) with larger values of thresholds which determine a change in the exchange rate. Regardless of the exact threshold value of a categorical exchange rate change, the unbiasedness hypothesis is rejected on the 1% significance level by a Wald test of the joint hypothesis that $\alpha = 0$ and $\beta = 1$.

Results are robust to variations in the estimation method. In the Table 1.14 we estimate a random effects model which also show the same qualitative results of significant violation of the unbiasedness hypothesis. In other words, exchange rate expectations are robustly found to be biased predictors of future exchange rates.

Our third step is to challenge the hypothesis of efficient foreign exchange rate forecasts. We want to see if a component of the forward premium can explain failures in the prediction of foreign exchange rate changes (Froot and Frankel, 1989; Menkhoff et al., 2008). If the forward premium is able to explain forecast errors, forecasters could have improved their expectations

[8]Since we want to focus on heterogeneity in this paper we do not follow this result here, even though we see the interest in scrutinizing the observation further.

by making use of the forward premium. In a first regression, we forecast exchange rate changes using individual exchange rate expectations:

$$\Delta s_{t+3} = \alpha_i + \beta_1 \Delta s_{i,t}^{e+} + \beta_2 \Delta s_{i,t}^{e-} + \varepsilon_{it} \tag{1.2}$$

with $\Delta s_{i,t}^{e+}$ as a dummy indicating the individual expectation of a THB appreciation and $\Delta s_{i,t}^{e-}$ as an indicator of an expected depreciation of THB. In a second step we regress the forecasting error (individual component) of equation 1 on the forward premium.

$$\widehat{\varepsilon} = \alpha_i + \delta f p_{t+3} + \varepsilon \tag{1.3}$$

We alter fixed and random effects estimation methods for both stages to challenge the robustness of the results. First stage results of the forecasting equation are as expected, i.e. expectations of THB appreciation and THB depreciation significantly explain future exchange rate changes, as it can be seen from column (1) and (4) in Table 1.3. Regressing the predicted residuals of the first stage on the forward premium reveals that the forward premium is not correlated with the errors. We conclude that exchange rate expectations are efficient in the sense that the forward premium does not include any information which is not already covered by the expectations.

1.3.3 Heterogeneity of the expectation formation process

In the following section we analyze the exchange rate expectation building process. We focus on the heterogeneity of the expectation building process in the spirit of Ito (1990). Our analysis consists of three building blocks: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals.

$$\Delta s_{i,t}^{e} = \alpha_i + X_{i,t}^{1}\beta_1 + X_{i,t}^{2}\beta_2 + X_{i,t}^{3}\beta_3 + \varepsilon_{i,t} \tag{1.4}$$

First, we include the traditional mixed models of exchange rate expectation formation in our model. The model consists of an extrapolative part $s_t - s_{t-1}$, an adaptive part $\widehat{\varepsilon_i}$ (see equation 1.2), and a mean reverting part $s_t - \sum i = 024 s_{t-i-1}$, which is the difference of the actual exchange rate and a long run moving average over 24 months. Second, we control for public information on fundamentals, which means differentials of Thailand and USA in interest rates, inflation, output, and exports (Ehrmann and Fratzscher, 2005). Third, we make use of the private individual expectations of the firms about the fundamentals in Thailand, namely interest rate, inflation, output, and export (Dreger and Stadtmann, 2007).

We implement a linear fixed effects regression model with standard errors clustered on the individual level.[9]

[9]For robustness checks, we also run a random effects ordered probit model (see Section 1.4 and Table 1.9).

The regression results clearly support fixed effects as the appropriate model. The Wald test on the 1% significance level if all fixed effects are significantly different from zero. We conclude that a fixed effects model is more appropriate than a pooled estimator. Additionally, we also test the appropriateness of the random effects model against the pooled model and find highly significant evidence in favor of the random effects model (Breusch and Pagan, 1980). To decide between the fixed effects from the random effects model we run a Hausman test (Hausman, 1978), which is rejected on a 5% significance level at least. This means that a fixed effects model is feasible in contrast to the random effects model. We conclude that on average our sample firms form heterogenous exchange rate expectations.

Exchange rate movements explain the major part of the overall and within variation, which amounts to up to 11% explained variance of the overall variation. In terms of the estimated coefficients, all are statistically significant which means that forecasters rely on all three, an extrapolative term, an adaptive term, as well as a mean reverting term. The signs of the coefficients are throughout positive which implies a strong preference for trend following expectations. This phenomenon is plausible as the THB/USD exchange rate shows a strong appreciation trend over the last decade as it has been the case in many emerging markets.

The effects with respect to public information on fundamentals show highly significant results for all four coefficients. Interest rate differentials are used in line with the carry trade hypothesis, i.e. the larger Thai interest rates are compared to the USA, the more is the THB expected to appreciate (Menkhoff et al., 2012). Inflation differentials support the theory of purchasing power theory as the THB is expected to depreciate for larger price differentials between Thailand and USA. The negative sign of the coefficient on the output differential is intuitive as with increasing output, the THB is also expected to appreciate. The same relationship can be observed for exports and is plausible, too.

Individual information on the expectation of future fundamentals allows us to differentiate between the the effect of public and private information. We observe two significant impacts of expected fundamentals on exchange rate expectations. First, expected interest rates affect the formation of exchange rate expectations in line with the theory of uncovered interest rate parity. The higher expected interest rates are, the larger is the expected depreciation of the THB. This result is different from the effect of past interest rate differentials, which is in line with the carry trade theory. The difference could stem from the varying time horizons, private individual expectation is forward-looking, whereas public information of fundamentals is backward-looking.

When comparing the importance of public and private information, an analysis of the R^2 backs up public factors, as in specification (2) with the public fundamentals, the overall-R^2 is larger than the R^2 of specification (3) with private information. Note that the R^2 of both specifications is far lower than the one for the traditional exchange rate models in specification (1), which means that past exchange rate developments are the main determinant of exchange rate expectations. Alternatively, we can test our hypothesis by including all variables in one model, see specification (4). Note that we do not put much emphasis on the sign of the coefficients

in this full specification as the estimates are likely to suffer from multicollinearity. We can perceive this model as a horse race between the public and private fundamentals. Public factors appear to be more pronounced and remain largely significant whereas private factors do not. The result could be driven by the so-called Moulton bias, which means that standard errors for clustered variables are larger than for unclustered (Moulton, 1986). But as we cluster standard errors on the individual level, the analysis can be assumed to be robust to the Moulton bias.

1.3.4 Expectation formation and wishful thinking

We scrutinize the finding of heterogeneity by analyzing the data set separately for firms which operate in export dependent industry sectors and for those which are not (for details on the identification of export dependency see Section 1.2.3). Ito (1990) infers that different groups of forecasters form different exchange rate expectations and terms this finding wishful thinking. We test the classic hypothesis of wishful thinking, i.e. that exporters expect on average a depreciation and importers an appreciation of the domestic currency.

We start by comparing the average exchange rate expectation of the exporter group against the one of the non-exporter group. Table 1.5 shows the tabulation of exchange rate expectations by group. It is evident (and confirmed by the test statistics) that importers expect a depreciation slightly more often than exporters. A Wilcoxon rank-sum test for exporters and non-exporters yields the test statistic -2.771 with a corresponding p-value of 0.0056 and proofs the high significance of the difference between both groups.

To further analyze the hypothesis of wishful thinking, we challenge the finding with other controls. We disentangle the effect from other influences like fundamentals or expectations of fundamentals by estimating the expectation formation regressions from above for the two samples separately (see Table 1.6).

Also for the sample split, regression diagnostics recommend the use of a fixed effects model. Our main attention is on the individual effect of the two groups for each specification. We note that the average individual effect is always more negative for the non-exporter than for the exporter, even when controlling for other factors. This means that our result from above is robust, importers expect a depreciation more often than exporters. The results of the other covariates are maintained for both groups when compared to the full sample.

1.4 Robustness

In the following we run robustness checks in three dimensions. First, checks are with respect to the ordinal nature of the exchange rate expectations. Second, we rerun estimates for different sample sizes. Third, we challenge the assumptions on some of the covariates.

Ordinal nature of exchange rate expectations. Exchange rate expectations are measured on an ordinal scale in our main analysis. We do not account specifically for this

feature of the data for two reasons. First, there is a downward bias towards zero for fixed effects estimators in non-linear models (Greene, 2002). Second, the ordered probit model often cannot be identified for every category of every individual unit. Thus, we use linear estimation fixed effects models for the main analysis. Regardless of the reasons mentioned, the linear model does not account for the ordinal structure of the data. That is why we employ in the following a random effects ordered probit model (Greene, 2008). Because of the second reason, this robustness analysis is not computable when splitting up the sample between exporters and non-exporters. The observations are sparsely distributed in the categories of exchange rate expectation. Table 1.9 shows the evidence.

On a qualitative basis results remain mainly unchanged when using non-linear estimation methods. Exchange rate expectations appear to be strong trend followers as it is warranted for the appreciating THB/USD. Public information seems to play a major role for the expectation process. Signs of coefficients are the same for all fundamentals, except for the output differential. Here we observe a positive sign in all specifications, i.e. the more Thai output increases compared to US output, the more is the THB expected to depreciate. Turning to the individual expectations of fundamentals, some turn out to remain significant even when controlling for public information on fundamentals. These variables are expectations of interest rates and output. Overall, the results from the main analysis can be maintained.

Alternations in sample size. In the main analysis we only consider observations which were submitted by firms which participated 36 times at minimum. For robustness checks we suspend this restriction and analyze all observations from all firms. The results are shown in Table 1.10 and Table 1.11. Regression results again suggest that fixed effects estimation is superior to pooled and random effects. The impact of all three blocks of covariates remains qualitatively the same. With respect to wishful thinking we observe the same effect as in our main analysis: exporters expect less appreciation than non-exporters.

The number of observations varies among specifications since we do not possess information on industry and individual expectations of fundamentals for all firms. To check the robustness of our results against those changes in the sample, we restrict the sample to those firms which submit all relevant information for all specifications. Tables 1.12 and 1.13 display the regression results. Again, the findings suggest that fixed effects estimation is superior to pooled and random effects. The impact of all three blocks of covariates remains qualitatively the same, except for the effect of output differential. In general, public fundamentals still appear to be more important for exchange rate expectation formation than individual expectations of fundamentals. The effect of wishful thinking is again approved: exporters expect less appreciation than non-exporters.

Alternative calculation of forecast errors. We also expose some of the covariates to robustness checks. Table 1.15 displays the results of the main analysis with a different proxy for past forecast error. In the main analysis we used the forecast errors of a fixed effects model and exchange these for the errors of a pooled and a random effects model. The results display hardly any difference when compared to the benchmark results from above.

1.5 Conclusion

Using the Thai business survey BSI of the Bank of Thailand we analyze exchange rate expectations of the THB/USD exchange rate for about 600 firms over nine years. Focusing our analysis on the heterogeneity of exchange rate expectations, we contribute to the literature in three ways: (i) we analyze individual exchange rate expectations in an emerging economy, i.e. for the THB/USD exchange rate, (ii) we contrast the impact of traditional exchange rate expectation formation models against public information on fundamentals and individual expectations of these fundamentals (which are private information), and (iii) we check for wishful thinking by splitting our data set in export dependent firms and non-export dependent firms.

We find that, first, the THB/USD exchange rate has been appreciating over the last decade as it has been the case in many emerging markets. Second, exchange rate expectations generally capture both aspects, the appreciation trend and the cyclical component of exchange rate fluctuations, though they are biased predictors on average. Third, public information on fundamentals appears to play a major role for the expectation formation process compared to private information on fundamentals. Fourth, with respect to individual forward-looking expectations of fundamentals, interest rate and output expectations dominate the expectation formation process. Fifth, we observe wishful thinking in the spirit of Ito (1990), i.e. exporters expect less appreciation of the domestic currency than importers.

Summing up the results, we observe a couple of distortions in exchange rate expectation formation. Overall, the bias is even larger for export dependent firms. Thailand in general is an export-oriented country and its economic success is closely linked to the success of its exporters. Based on these observations one might hope that exporters base their economic decisions wisely, taking into account that exchange rates might not develop as positive as they wish they would.

1.6 Appendix

Figure 1.1: THB/USD foreign exchange rate

The figure displays the development of the THB/USD exchange rate (S_t) and its monthly log change (Δs_{t-1}).

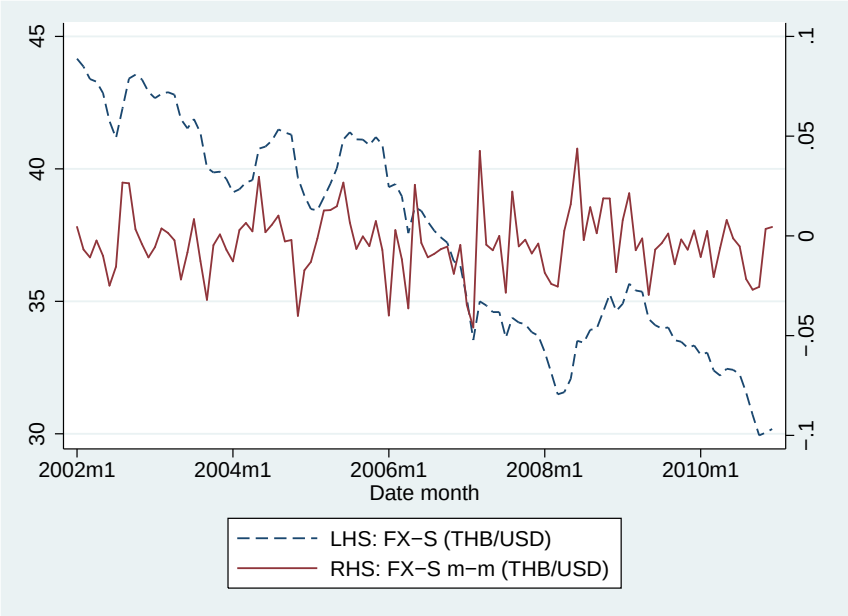

Figure 1.2: BSI survey participation in exchange rate expectation question over time

Count of number of the exchange rate expectations over time. We only consider observations, which were submitted by firms which participated 36 times at minimum.

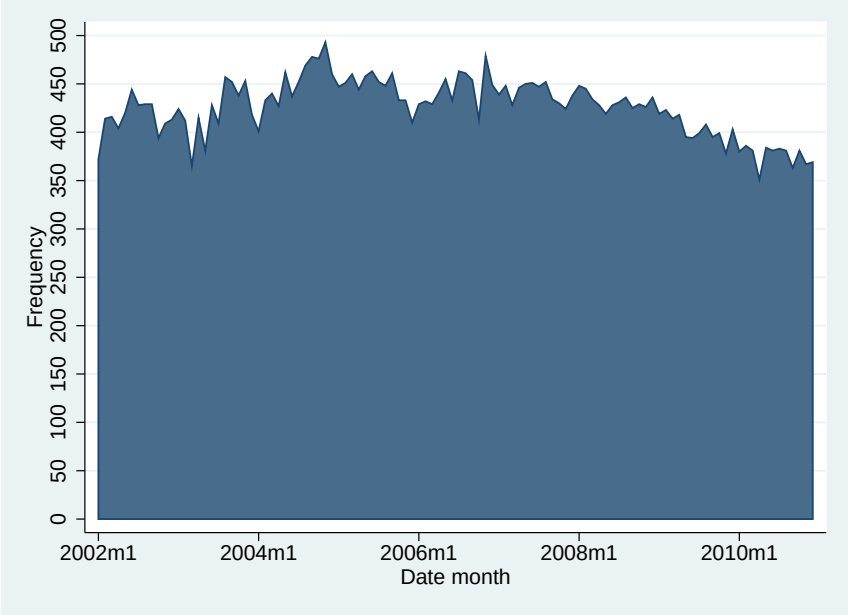

Figure 1.3: Distribution of exchange rate expectations over time

Stapled percentages of qualitative THB/USD expectations over time. Exchange rate expectations are coded in three categories, THB appreciation, THB unchanged, THB depreciation. We only consider observations, which were submitted by firms which participated 36 times at minimum.

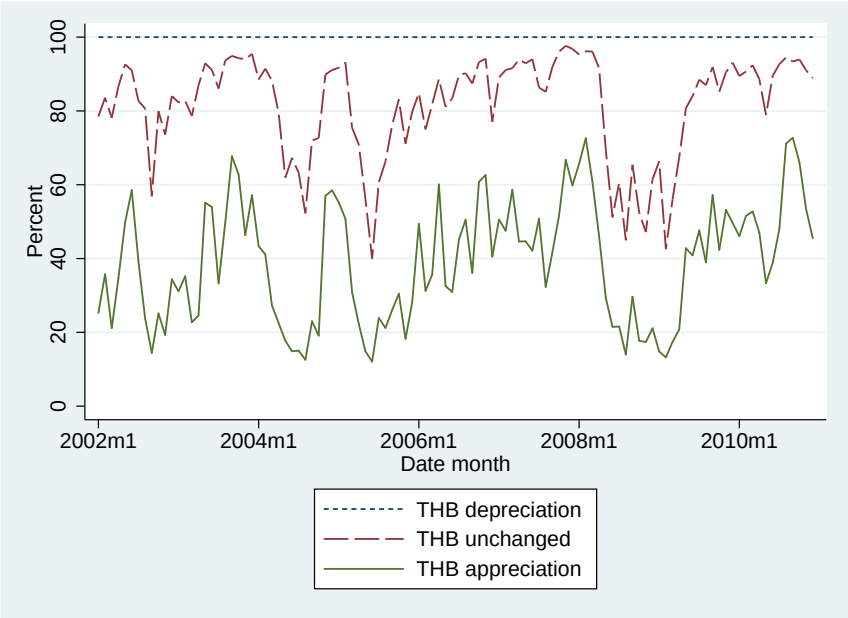

Figure 1.4: THB sentiment over time

We plot the development of THB sentiment against the USD over time. THB sentiment is calculated as a bull-bear spread (see e.g. Menkhoff and Rebitzky, 2008), $\forall t = 1, 2, ..., T$: $\frac{\sum_{i=1}^{N} \Delta s_i^{e+} - \sum_{i=1}^{N} \Delta s_i^{e-}}{\sum_{i=1}^{N} \Delta s_i^{e}}$ with Δs_i^{e+} as expectations of THB appreciation and Δs_i^{e-} of THB depreciation in three months. We only consider observations, which were submitted by firms which participated 36 times at minimum.

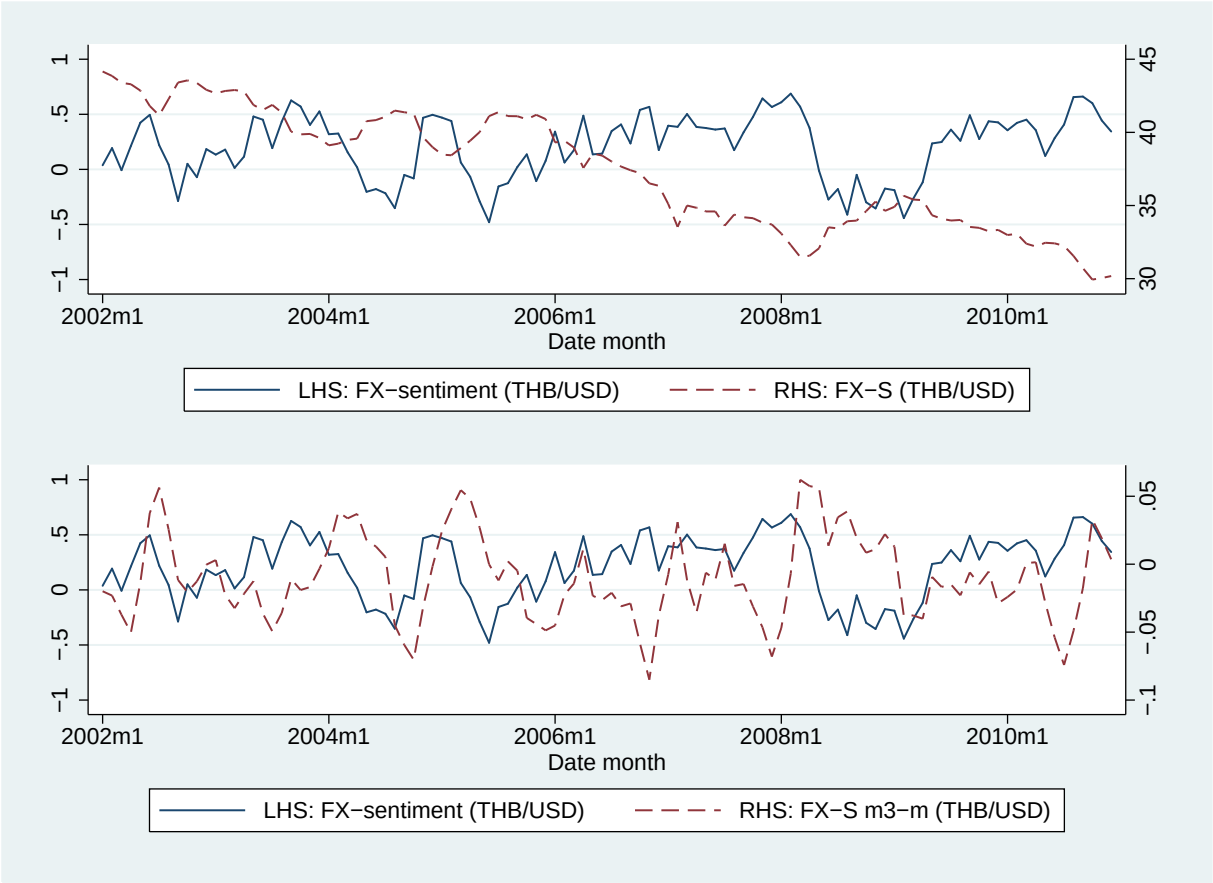

Table 1.1: Descriptive statistics of all variables

We use information from (i) financial statistics, like actual exchange rates, fundamentals etc., (ii) expectation data on foreign exchange rates and their fundamentals, and (iii) information on the firm industry to which degree the firm is export dependent. Descriptions and sources for all variables are given in Table 1.7. We test for stationarity for the time series variables (e.g. fundamentals) with the Philips-Perron Test and for the panel variables (e.g. expectations) in a Fisher-type Philips-Perron Test. Level of significance is denoted by * ($\leq$10%), **($\leq$5%), ***($\leq$1%).

Variable	Obs	Mean	Std. Dev.	Min	Max	Philips-Perron Test / Fisher-type Test
FX-S (THB/USD)	108	37.386	3.986	29.940	44.160	0.825
FX-S m-m (THB/USD)	108	-0.003	0.016	-0.046	0.044	0.0000***
FX-S m3-m (THB/USD)	108	-0.010	0.031	-0.085	0.062	0.0007***
FX-S m-MA(2y) (THB/USD)	108	-0.037	0.044	-0.150	0.054	0.1161
FX-F-3m (THB/USD)	108	37.463	3.996	30.007	44.500	0.7992
Forward premium 3m	108	0.002	0.004	-0.004	0.020	0.0002***
Interest 3m TH	108	2.716	1.323	1.313	5.450	0.6534
Interest 3m m-m TH	108	-0.007	0.211	-0.920	0.600	0.0000***
Interest 3m US	108	2.503	1.784	0.249	5.506	0.8544
Interest 3m m-m US	108	-0.015	0.263	-1.599	0.666	0.0000***
Interest 3m m-m differential	108	0.008	0.250	-0.538	1.268	0.0000***
Inflation m-m12 TH	108	2.739	2.321	-4.380	9.170	0.0978*
Inflation m-m12 US	108	2.352	1.495	-2.100	5.600	0.0939*
Inflation m-m12 differential	108	0.386	1.273	-2.600	3.750	0.0531*
Output TH	108	154.186	26.831	99.582	212.448	0.2761
Output m-m12 TH	108	0.071	0.095	-0.295	0.285	0.0343**
Output US	108	97.772	4.713	88.600	107.400	0.2590
Output m-m12 US	108	0.001	0.047	-0.147	0.064	0.4473
Output m-m12 differential	108	0.070	0.072	-0.182	0.320	0.0067***
Exports TH	108	10763.860	3640.113	4821	18380	0.7230
Exports m-m12 TH	108	0.122	0.146	-0.333	0.379	0.0222**
Exports US	108	82764.190	18517.630	52667	117480	0.7373
Exports m-m12 US	108	0.062	0.129	-0.307	0.237	0.0924*
Export m-m12 differential	108	0.060	0.065	-0.216	0.210	0.0000***
FX expectation 3-month (THB/USD)	45974	-0.202	0.731	-1	1	0.0000***
Interest rate expectation 3-month	31323	0.156	0.648	-1	1	0.0000***
Price expectation 3-month	32280	0.066	0.535	-1	1	0.0000***
Output expectation 3-month	32095	0.167	0.649	-1	1	0.0000***
Export expectation 3-month	19130	0.089	0.628	-1	1	0.0000***
Prediction error (RE)	44857	-0.001	0.031	-0.079	0.074	na
Prediction error (FE)	44857	-0.001	0.031	-0.079	0.074	na
Prediction error (POOL)	44857	-0.001	0.031	-0.079	0.074	na
Export (industry)	64044	0.022	0.035	0	0.14	na
Exporter (industry)	64044	0.309	0.462	0	1	na

Table 1.2: Unbiasedness of exchange rate expectation

Test of unbiased exchange rate expectations, i.e. $\Delta s^c_{t+3} = \alpha_i + \beta \Delta s^e_{i,t+3} + \varepsilon_{it}$ with $\Delta s^e_{i,t+3}$ individual expectation of exchange rate change and Δs^c_{t+3} as the categorical change of the actual exchange rate. We categorize exchange rate changes in appreciation, unchanged, depreciation to match qualitative individual expectations. We use a variety of thresholds, which are 0.5%, 1%, 2%, 3%, 4%, 5%. If $\alpha = 0$ and $\beta = 1$ expectations are unbiased. Estimation is conducted by fixed effects models with clustered standard errors on the individual level. We only consider observations, which were submitted by firms which participated 36 times at minimum. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1) df3fxs_c05	(2) df3fxs_c1	(3) df3fxs_c2	(4) df3fxs_c3	(5) df3fxs_c4	(6) df3fxs_c5
FX expectation 3-month (THB/USD)	0.138***	0.0945***	0.0306***	0.0155***	0.0121***	0.0114***
	(0.00758)	(0.00685)	(0.00526)	(0.00426)	(0.00314)	(0.00233)
Constant	-0.298***	-0.271***	-0.204***	-0.127***	-0.0891***	-0.0256***
	(0.00153)	(0.00139)	(0.00106)	(0.000862)	(0.000636)	(0.000472)
Observations	45,974	45,974	45,974	45,974	45,974	45,974
Number of uid	615	615	615	615	615	615
Wald test	12935	17472	33946	53371	98774	179548
p-value	0	0	0	0	0	0

Table 1.3: Efficiency of exchange rate expectation

Test of efficient exchange rate expectations, i.e. whether the forward premium is able to predict the forecast error of exchange rate expectations. In a first regression, we forecast exchange rate changes using individual exchange rate expectations, $\Delta s_{t+3} = \alpha_i + \beta_1 \Delta s^{e+}_{i,t} + \beta_2 \Delta s^{e-}_{i,t} + \varepsilon_{it}$ with $\Delta s^{e+}_{i,t}$ as a dummy indicating the individual expectation of a THB appreciation and $\Delta s^{e-}_{i,t}$ to indicate an expected depreciation of THB. In a second step we regress the forecasting error (individual component) of equation 1 on the forward premium. We alter fixed and random effects methods for both stages to challenge the robustness of the results. We only consider observations, which were submitted by firms which participated 36 times at minimum. Standard errors are clustered on the individual level for all specifications. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	(1)	(2)	(3)	(4)	(5)	(6)
	1st FE	1st FE / 2nd FE	1st FE / 2nd RE	1st RE	1st RE / 2nd FE	1st RE / 2nd RE
VARIABLES	df3fxs	fxerr_u	fxerr_u	df3fxs	fxerr_u	fxerr_u
Expectation THB appreciation	-0.00138***			-0.00132***		
	(0.000411)			(0.000329)		
Expectation THB depreciation	0.00452***			0.00424***		
	(0.000479)			(0.000426)		
Foward premium 3m		0.0109	0.0140		0.0148	0.0179
		(0.0145)	(0.0142)		(0.0145)	(0.0142)
Constant	-0.0102***	-2.21e-05	-2.84e-05	-0.0101***	-3.00e-05	-3.63e-05
	(0.000213)	(2.95e-05)	(8.61e-05)	(0.000176)	(2.95e-05)	(8.59e-05)
Observations	45,974	45,974	45,974	45,974	45,974	45,974
Number of uid	615	615	615	615	615	615

Table 1.4: Heterogeneity of exchange rate expectations

We regress $\Delta s^e_{i,t} = \alpha_i + X_{i,t}\beta + \varepsilon_{i,t}$ using a linear fixed effects regression model with standard errors clustered on the individual level. $X_{i,t}$ includes three blocks of covariates: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals. We only consider observations, which were submitted by firms which participated 36 times at minimum. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1)	(2)	(3)	(4)
FX-S m-m (THB/USD)	4.256***			2.965***
	(0.256)			(0.398)
Prediction error (FE)	3.403***			2.792***
	(0.205)			(0.327)
FX-S m-MA(2y) (THB/USD)	2.830***			3.180***
	(0.154)			(0.320)
Interest 3m m-m differential		-0.158***		-0.188***
		(0.0126)		(0.0358)
Inflation m-m12 differential		0.0294***		0.0245***
		(0.00352)		(0.00841)
Output m-m12 differential		-0.443***		0.793***
		(0.0580)		(0.171)
Export m-m12 differential		-0.856***		-0.836***
		(0.0608)		(0.127)
Expectation interest rates lower			-0.121***	-0.0278
			(0.0209)	(0.0228)
Expectation interest rates higher			0.0590***	-0.0152
			(0.0193)	(0.0206)
Expectation price down			-0.0231	-0.0284
			(0.0252)	(0.0255)
Expectation price up			0.0129	0.0213
			(0.0208)	(0.0202)
Expectation output down			-0.00861	-0.0131
			(0.0218)	(0.0224)
Expectation output up			-0.0584***	-0.0490***
			(0.0172)	(0.0181)
Expectation export worse			-0.0177	0.00207
			(0.0223)	(0.0221)
Expectation export better			-0.0184	-0.0104
			(0.0189)	(0.0202)
Constant	-0.0786***	-0.131***	-0.200***	-0.0656***
	(0.00580)	(0.00480)	(0.0110)	(0.0220)
Observations	37,978	45,974	17,901	14,270
Number of uid	615	615	474	458
R-sq within	0.126	0.0179	0.00791	0.113
R-sq between	0.00894	0.00626	0.00850	0.0558
R-sq overall	0.114	0.0157	0.00714	0.104
AR(1) (F-test)	152.3	275.6	81.53	40.13
AR(1) (p-value)	0	0	0	6.91e-10
All $\alpha_i = 0$ (F-test)	7.002	6.890	4.732	4.700
All $\alpha_i = 0$ (p-value)	0	0	0	0
Breusch-Pagan (lm)	9961	9480	3277	3064
Breusch-Pagan (p-value)	0	0	0	0
Hausman test (chi2)	87.68	12.75	18.13	29.01
Hausman test (p-value)	0	0.0126	0.0203	0.0160

Table 1.5: Exporter and exchange rate expectation

Tabulation of a dummy for being an export industry vs. qualitative exchange rate expectations. Exchange rate expectations are surveyed as THB appreciation, unchanged THB, and depreciation of THB versus USD. Wilcoxon rank-sum test -2.771 with p-value 0.0056, i.e. importers expect significantly more often THB appreciation than exporters.

	Exchange rate expectation			
Exporting industry	THB appreciation	THB unchanged	THB depreciation	Total
No	12,164	13,061	5,707	30,932
	39.32	42.22	18.45	100.00
Yes	5,339	5,960	2,706	14,005
	38	43	19	100
Total	17,503	19,021	8,413	44,937
	38.95	42.33	18.72	100.00

Table 1.6: Wishful thinking and exchange rate expectations

We regress $\Delta s^e_{i,t} = \alpha_i + X_{i,t}\beta + \varepsilon_{i,t}$ in a linear fixed effects regression model with standard errors clustered on the individual level. $X_{i,t}$ includes three blocks of covariates: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals. Models are separately estimated for two groups of firms, these firms which are identified as export dependent and those which are not. We only consider observations, which were submitted by firms which participated 36 times at minimum. Level of significance is denoted by * ($\leq$10%), **($\leq$5%), ***($\leq$1%).

	Non-exporter				Exporter			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FX-S m-m (THB/USD)	4.428***			3.055***	3.891***			2.185**
	(0.305)			(0.434)	(0.487)			(0.998)
Prediction error (FE)	3.216***			2.489***	3.653***			3.844***
	(0.245)			(0.349)	(0.389)			(1.013)
FX-S m-MA(2y) (THB/USD)	2.863***			3.433***	2.815***			1.555*
	(0.190)			(0.347)	(0.265)			(0.805)
Interest 3m m-m differential		-0.165***		-0.180***		-0.138***		-0.198*
		(0.0149)		(0.0380)		(0.0237)		(0.109)
Inflation m-m12 differential		0.0280***		0.0195**		0.0323***		0.0521***
		(0.00447)		(0.00925)		(0.00580)		(0.0194)
Output m-m12 differential		-0.526***		0.763***		-0.318***		0.706*
		(0.0690)		(0.190)		(0.106)		(0.394)
Export m-m12 differential		-0.838***		-0.826***		-0.893***		-1.114***
		(0.0736)		(0.139)		(0.109)		(0.340)
Expectation interest rates lower			-0.119***	-0.0186			-0.0974	-0.0207
			(0.0228)	(0.0245)			(0.0666)	(0.0784)
Expectation interest rates higher			0.0517**	-0.0206			0.0648	-0.0191
			(0.0213)	(0.0228)			(0.0461)	(0.0493)
Expectation price down			-0.0169	-0.0207			-0.0706	-0.112*
			(0.0276)	(0.0281)			(0.0663)	(0.0673)
Expectation price up			0.00741	0.0258			0.0680	0.0172
			(0.0229)	(0.0216)			(0.0551)	(0.0623)
Expectation output down			-0.0142	-0.0128			0.0203	-0.0128
			(0.0243)	(0.0250)			(0.0471)	(0.0531)
Expectation output up			-0.0548***	-0.0384*			-0.120***	-0.184***
			(0.0188)	(0.0196)			(0.0433)	(0.0430)
Expectation export worse			-0.0149	-0.00432			-0.0289	0.0546
			(0.0249)	(0.0241)			(0.0559)	(0.0625)
Expectation export better			-0.00311	-0.00227			-0.149***	-0.0929
			(0.0206)	(0.0219)			(0.0482)	(0.0599)
Constant	-0.0835***	-0.133***	-0.204***	-0.0600**	-0.0629***	-0.125***	-0.164***	-0.0385
	(0.00725)	(0.00586)	(0.0121)	(0.0241)	(0.00991)	(0.00841)	(0.0275)	(0.0546)
Observations	25,472	30,932	15,282	12,179	11,634	14,005	2,157	1,706
Number of uid	410	410	360	356	183	183	100	89
R-sq within	0.124	0.0189	0.00674	0.112	0.130	0.0168	0.0216	0.117
R-sq between	0.0257	0.0108	0.000383	0.0398	0.000384	0.000587	0.0317	0.0672
R-sq overall	0.114	0.0168	0.00621	0.104	0.114	0.0145	0.0163	0.102
AR(1) (F-test)	100.7	175.3	72.49	31.65	53.80	109.2	20.35	18.30
AR(1) (p-value)	0	0	0	4.18e-08	0	0	3.35e-05	8.31e-05
All $\alpha_i = 0$ (F-test)	6.342	6.173	5.116	4.988	9.076	9.043	3.882	4.148
All $\alpha_i = 0$ (p-value)	0	0	0	0	0	0	0	0
Breusch-Pagan (lm)	5487	4976	2848	2648	4627	4719	422.2	418.3
Breusch-Pagan (p-value)	0	0	0	0	0	0	0	0
Hausman test (chi2)	23.53	16.59	14.86	24.72	na	57.00	13.75	18.20
Hausman test (p-value)	3.14e-05	0.00232	0.0620	na	1	0	0.0885	0.252

Table 1.7: Variable description

The table provides an overview of the data series which are used for the analysis, including a brief description and their source.

Variable	Description	Source
	Expectation data	
$\Delta s^e_{i,t+3}$	Expectation of Baht value (against US-$) in the next 3 months compared with the current month: 0 = THB appreciation, 1 = THB unchanged, 2 = THB depreciation.	Bank of Thailand (BSI)
i^e	Expectation of interest rate in the next 3 months compared with the current month: -1 = lower, 0 = unchanged, 1 = higher.	Bank of Thailand (BSI)
π^e	Selling price in the next three months: -1 = down, 0 = unchanged, 1 = up.	Bank of Thailand (BSI)
y^e	Production/business activity in the next 3 months: -1 = down, 0 = unchanged, 1 = up.	Bank of Thailand (BSI)
e^e	Export situation in the next 3 months: -1 = worse, 0 = same, 1 = better.	Bank of Thailand (BSI)
	Firm data	
expdepn	Export dependence, larger values correspond with stronger export dependence (cf. He and Zhang, 2008)	National accounts (IO tables), BOT calculation
	Fundamentals	
S_t	THB/USD spot (small letter used to indicate log)	Datastream/ WM Reuters
F_t	THB/USD 3-month forward	Datastream/ WM Reuters
i_{TH}	TH interbank offered rate (3-month)	Datastream/ Bangkok Bank
i_{US}	US Interbank offered rate (3-month)	Datastream/ BBA
π_{TH}	Consumer price changes in Thailand (yoy, nsa)	Datastream/ IFS
π_{US}	Consumer price changes in USA (yoy, nsa)	Datastream/ IFS
y_{TH}	Manufacturing production index in Thailand (Index, 2000=100)	Datastream/ Bank of Thailand
y_{US}	Industrial production in USA (Index, 2000=100)	Datastream/ IFS
e_{TH}	TH exports	Datastream/ IFS
e_{US}	US exports	Datastream/ IFS

Figure 1.5: Exchange rate forward

The figure displays the 3-month forward rate of THB/USD (F_{t+3}), the corresponding spot rate (S_t), and the forward premium ($fp = f_{t+3} - s_t$).

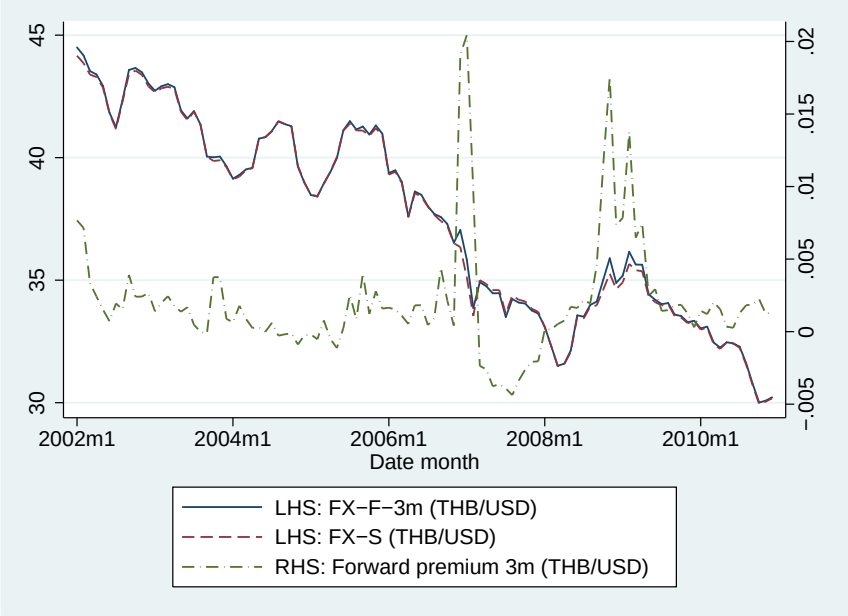

Figure 1.6: Production

The figure displays industrial production in Thailand and the United States.

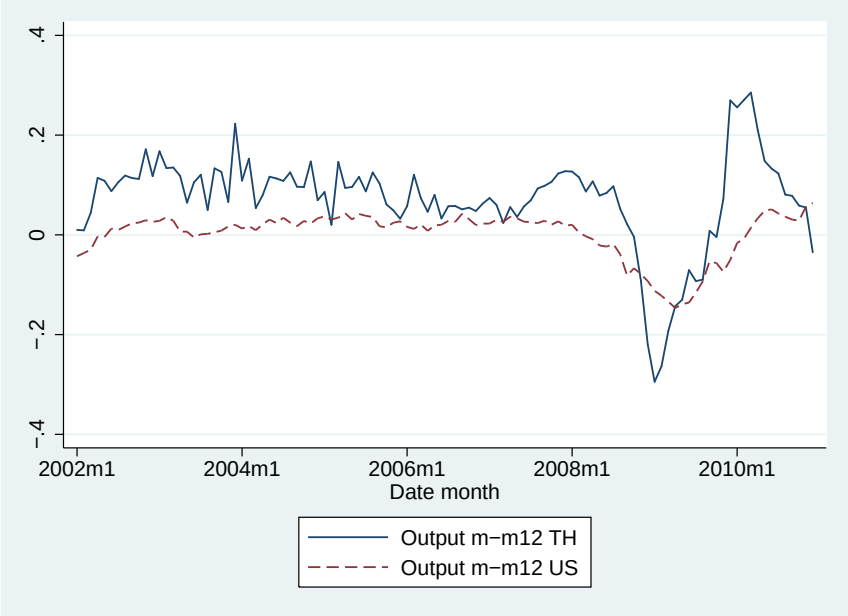

Figure 1.7: Inflation

The figure displays inflation rates (yoy) in Thailand and the United States. Inflation is based on changes of the consumer price indices.

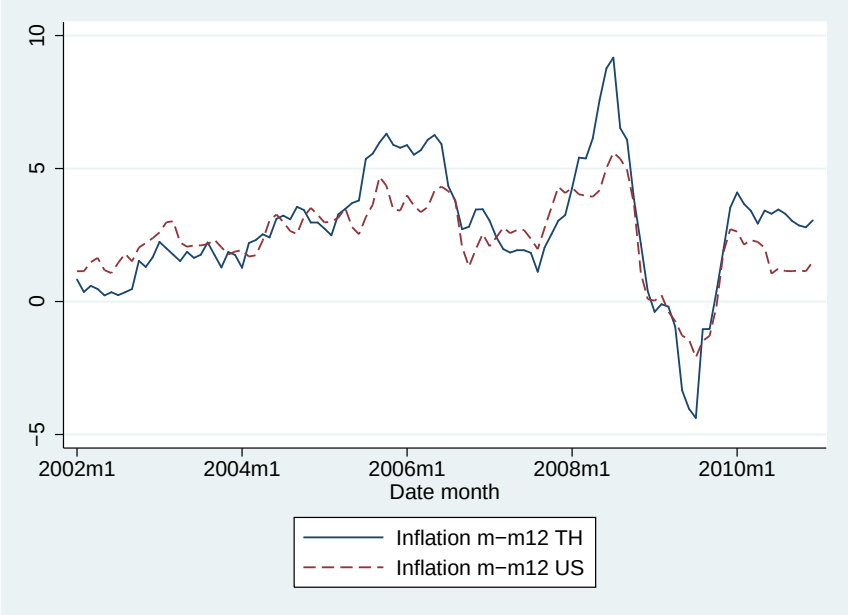

Figure 1.8: Interest rate

The figure displays 3-month interest rates (interbank offered rates) in Thailand and the United States.

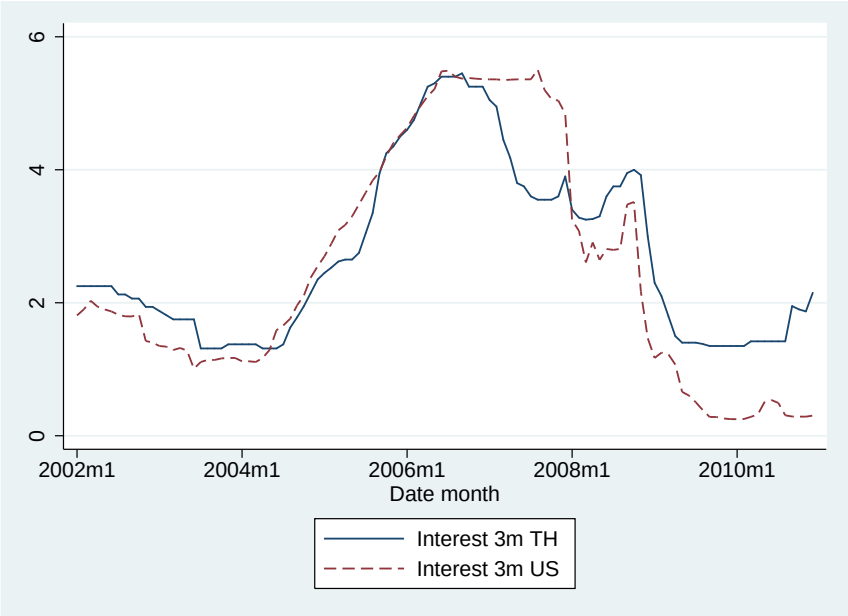

Figure 1.9: Exports

The figure displays exports in Thailand and the United States.

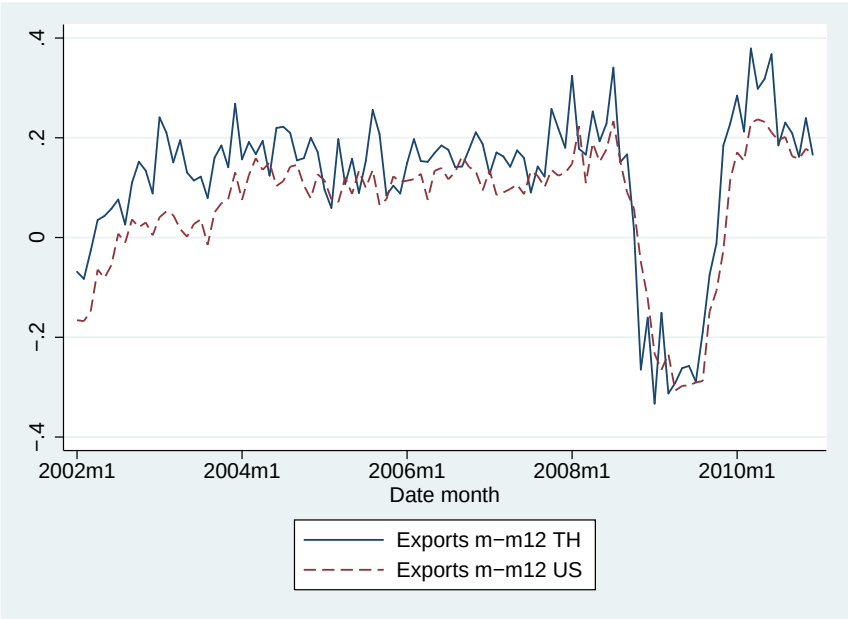

Figure 1.10: BSI survey participation in exchange rate expectation question

Count of number of the exchange rate expectations. We only consider observations, which were submitted by firms which participated 36 times at minimum.

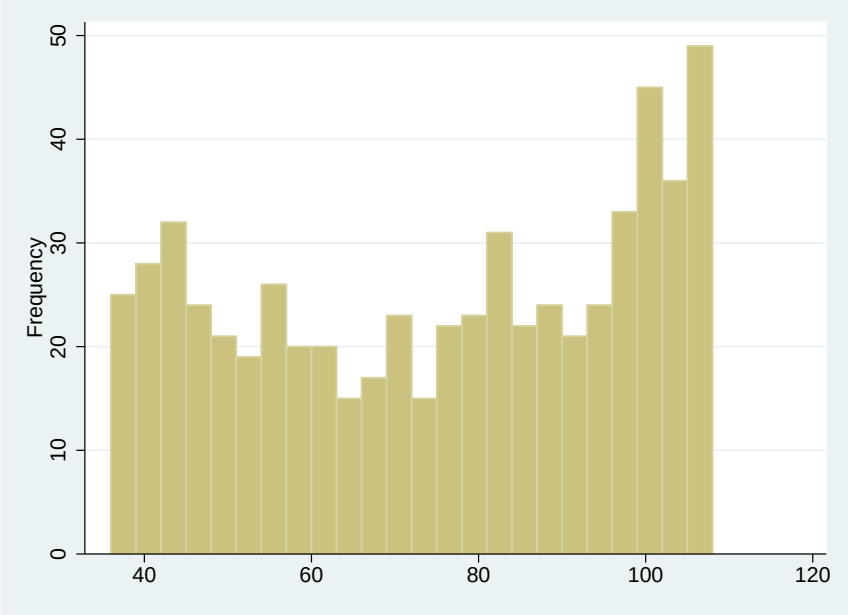

Table 1.8: Forecasting of exchange rate

Forecasting THB/USD exchange rate with exchange rate expectations. Because of the qualitative nature of exchange rate expectations we implement two dummy variables for expecting an appreciation / depreciation of THB. We only consider observations, which were submitted by firms which participated 36 times at minimum. Estimates are based on random effects, fixed effects, and pooled OLS with conventional standard errors. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1)	(2)	(3)
THB appreciation	-0.00132***	-0.00138***	-0.00132***
	(0.000326)	(0.000372)	(0.000326)
THB depreciation	0.00424***	0.00452***	0.00424***
	(0.000408)	(0.000445)	(0.000408)
Constant	-0.0101***	-0.0102***	-0.0101***
	(0.000225)	(0.000246)	(0.000225)
Observations	45,974	45,974	45,974
Number of uid	615	615	
R-sq	0.00396	0.00396	0.00396

Table 1.9: Heterogeneity of exchange rate expectation in random effects ordered probit models

We regress $\Delta s^e_{i,t} = \alpha_i + X_{i,t}\beta + \varepsilon_{i,t}$ in a random effects ordered probit regression model with conventional errors clustered on the individual level. $X_{i,t}$ includes three blocks of covariates: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals. We only consider observations, which were submitted by firms which participated 36 times at minimum. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1)	(2)	(3)	(4)
FX-S m-m (THB/USD)	7.703***			5.943***
	(0.771)			(0.833)
Prediction error (FE)	3.845***			4.202***
	(0.476)			(0.488)
FX-S m-MA(2y) (THB/USD)	6.180***			6.222***
	(0.324)			(0.414)
Interest 3m m-m differential		-0.312***		-0.318***
		(0.0657)		(0.0705)
Inflation m-m12 differential		0.134***		0.0318**
		(0.0105)		(0.0135)
Output m-m12 differential		4.554***		1.295***
		(0.341)		(0.370)
Export m-m12 differential		-2.045***		-1.425***
		(0.239)		(0.252)
Expectation interest rates lower			-0.206***	-0.0582
			(0.0342)	(0.0354)
Expectation interest rates higher			0.0949***	-0.0655**
			(0.0255)	(0.0295)
Expectation price down			-0.0185	-0.0561
			(0.0368)	(0.0375)
Expectation price up			0.0296	0.0404
			(0.0321)	(0.0327)
Expectation output down			-0.0307	-0.0202
			(0.0374)	(0.0381)
Expectation output up			-0.0772***	-0.0692**
			(0.0283)	(0.0287)
Expectation export worse			-0.0436	-0.0258
			(0.0364)	(0.0376)
Expectation export better			-0.0254	-0.0277
			(0.0313)	(0.0319)
Cut 1	-0.572***	-0.0484	-0.300***	-0.632***
	(0.0323)	(0.0360)	(0.0332)	(0.0470)
Cut 2	0.814***	1.259***	0.992***	0.760***
	(0.0324)	(0.0372)	(0.0338)	(0.0471)
rho	0.164***	0.150***	0.146***	0.166***
	(0.0159)	(0.0150)	(0.0151)	(0.0155)
Observations	12,179	12,179	12,179	12,179

Table 1.10: Heterogeneity of exchange rate expectations without restrictions on minimum participation rate

We regress $\Delta s^e_{i,t} = \alpha_i + X_{i,t}\beta + \varepsilon_{i,t}$ using a linear fixed effects regression model with standard errors clustered on the individual level. $X_{i,t}$ includes three blocks of covariates: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals. We consider observations from all firms and do not require a minimum participation rate. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1)	(2)	(3)	(4)
FX-S m-m (THB/USD)	4.256***			2.965***
	(0.256)			(0.398)
Prediction error (FE)	3.403***			2.792***
	(0.205)			(0.327)
FX-S m-MA(2y) (THB/USD)	2.830***			3.180***
	(0.154)			(0.320)
Interest 3m m-m differential		-0.165***		-0.188***
		(0.0119)		(0.0358)
Inflation m-m12 differential		0.0272***		0.0245***
		(0.00335)		(0.00841)
Output m-m12 differential		-0.408***		0.793***
		(0.0557)		(0.171)
Export m-m12 differential		-0.885***		-0.836***
		(0.0575)		(0.127)
Expectation interest rates lower			-0.106***	-0.0278
			(0.0190)	(0.0228)
Expectation interest rates higher			0.0626***	-0.0152
			(0.0180)	(0.0206)
Expectation price down			-0.00997	-0.0284
			(0.0230)	(0.0255)
Expectation price up			0.0203	0.0213
			(0.0194)	(0.0202)
Expectation output down			-0.0119	-0.0131
			(0.0203)	(0.0224)
Expectation output up			-0.0597***	-0.0490***
			(0.0158)	(0.0181)
Expectation export worse			-0.0221	0.00207
			(0.0208)	(0.0221)
Expectation export better			-0.0166	-0.0104
			(0.0178)	(0.0202)
Constant	-0.0786***	-0.129***	-0.193***	-0.0656***
	(0.00580)	(0.00462)	(0.0103)	(0.0220)
Observations	37,978	53,689	20,619	14,270
Number of uid	615	1,440	758	458
R-sq within	0.126	0.0172	0.00712	0.113
R-sq between	0.00894	5.38e-05	0.00711	0.0558
R-sq overall	0.114	0.0147	0.00694	0.104
AR(1) (F-test)	152.3	306.6	87.90	40.13
AR(1) (p-value)	0	0	0	6.91e-10
All $\alpha_i = 0$ (F-test)	7.002	4.337	3.940	4.700
All $\alpha_i = 0$ (p-value)	0	0	0	0
Breusch-Pagan (lm)	9961	10259	3665	3064
Breusch-Pagan (p-value)	0	0	0	0
Hausman test (chi2)	87.68	51.25	18.39	29.01
Hausman test (p-value)	0	1.98e-10	0.0185	0.0160

Table 1.11: Wishful thinking and exchange rate expectations without restrictions on minimum participation rate

We regress $\Delta s^e_{i,t} = \alpha_i + X_{i,t}\beta + \varepsilon_{i,t}$ in a linear fixed effects regression model with standard errors clustered on the individual level. $X_{i,t}$ includes three blocks of covariates: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals. Models are separately estimated for two groups of firms, these firms which are identified as export dependent and those which are not. We consider observations from all firms and do not require a minimum participation rate. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Non-exporter				Exporter			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FX-S m-m (THB/USD)	4.428***			3.055***	3.891***			2.185**
	(0.305)			(0.434)	(0.487)			(0.998)
Prediction error (FE)	3.216***			2.489***	3.653***			3.844***
	(0.245)			(0.349)	(0.389)			(1.013)
FX-S m-MA(2y) (THB/USD)	2.863***			3.433***	2.815***			1.555*
	(0.190)			(0.347)	(0.265)			(0.805)
Interest 3m m-m differential		-0.167***		-0.180***		-0.151***		-0.198*
		(0.0142)		(0.0380)		(0.0224)		(0.109)
Inflation m-m12 differential		0.0248***		0.0195**		0.0314***		0.0521***
		(0.00428)		(0.00925)		(0.00552)		(0.0194)
Output m-m12 differential		-0.499***		0.763***		-0.275***		0.706*
		(0.0673)		(0.190)		(0.0998)		(0.394)
Export m-m12 differential		-0.869***		-0.826***		-0.930***		-1.114***
		(0.0707)		(0.139)		(0.102)		(0.340)
Expectation interest rates lower			-0.112***	-0.0186			-0.0892	-0.0207
			(0.0215)	(0.0245)			(0.0617)	(0.0784)
Expectation interest rates higher			0.0570***	-0.0206			0.0667	-0.0191
			(0.0201)	(0.0228)			(0.0438)	(0.0493)
Expectation price down			-0.00479	-0.0207			-0.0566	-0.112*
			(0.0261)	(0.0281)			(0.0635)	(0.0673)
Expectation price up			0.0110	0.0258			0.0650	0.0172
			(0.0218)	(0.0216)			(0.0507)	(0.0623)
Expectation output down			-0.0191	-0.0128			0.0459	-0.0128
			(0.0229)	(0.0250)			(0.0472)	(0.0531)
Expectation output up			-0.0600***	-0.0384*			-0.107**	-0.184***
			(0.0177)	(0.0196)			(0.0422)	(0.0430)
Expectation export worse			-0.0193	-0.00432			-0.0327	0.0546
			(0.0237)	(0.0241)			(0.0538)	(0.0625)
Expectation export better			-0.000781	-0.00227			-0.183***	-0.0929
			(0.0196)	(0.0219)			(0.0481)	(0.0599)
Constant	-0.0835***	-0.133***	-0.197***	-0.0600**	-0.0629***	-0.130***	-0.171***	-0.0385
	(0.00725)	(0.00566)	(0.0115)	(0.0241)	(0.00991)	(0.00798)	(0.0262)	(0.0546)
Observations	25,472	34,974	16,919	12,179	11,634	15,987	2,350	1,706
Number of uid	410	785	483	356	183	436	129	89
R-sq within	0.124	0.0183	0.00677	0.112	0.130	0.0169	0.0235	0.117
R-sq between	0.0257	0.00393	0.00144	0.0398	0.000384	3.50e-05	0.0439	0.0672
R-sq overall	0.114	0.0162	0.00655	0.104	0.114	0.0145	0.0210	0.102
AR(1) (F-test)	100.7	196.5	75.92	31.65	53.80	112.5	17.95	18.30
AR(1) (p-value)	0	0	0	4.18e-08	0	0	7.30e-05	8.31e-05
All $\alpha_i = 0$ (F-test)	6.342	4.464	4.563	4.988	9.076	5.087	3.616	4.148
All $\alpha_i = 0$ (p-value)	0	0	0	0	0	0	0	0
Breusch-Pagan (lm)	5487	5306	3064	2648	4627	4957	464.9	418.3
Breusch-Pagan (p-value)	0	0	0	0	0	0	0	0
Hausman test (chi2)	23.53	25.01	13.22	24.72	na	13.31	12.11	18.20
Hausman test (p-value)	3.14e-05	5.01e-05	0.104	na	1	0.00985	0.146	0.252

Table 1.12: Heterogeneity of exchange rate expectations with a stable sample

We regress $\Delta s^e_{i,t} = \alpha_i + X_{i,t}\beta + \varepsilon_{i,t}$ using a linear fixed effects regression model with standard errors clustered on the individual level. $X_{i,t}$ includes three blocks of covariates: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals. We only consider observations for which we have the full set of observations so that the observation number does not alter between models. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1)	(2)	(3)	(4)
FX-S m-m (THB/USD)	3.895***			2.974***
	(0.377)			(0.402)
Prediction error (FE)	2.360***			2.628***
	(0.322)			(0.331)
FX-S m-MA(2y) (THB/USD)	3.341***			3.217***
	(0.295)			(0.325)
Interest 3m m-m differential		-0.186***		-0.179***
		(0.0353)		(0.0361)
Inflation m-m12 differential		0.0811***		0.0241***
		(0.00834)		(0.00854)
Output m-m12 differential		2.517***		0.756***
		(0.208)		(0.174)
Export m-m12 differential		-1.231***		-0.847***
		(0.129)		(0.129)
Expectation interest rates lower			-0.103***	-0.0194
			(0.0240)	(0.0234)
Expectation interest rates higher			0.0732***	-0.0200
			(0.0206)	(0.0208)
Expectation price down			-0.00927	-0.0302
			(0.0288)	(0.0261)
Expectation price up			0.0240	0.0240
			(0.0232)	(0.0208)
Expectation output down			-0.0194	-0.0162
			(0.0250)	(0.0227)
Expectation output up			-0.0644***	-0.0551***
			(0.0194)	(0.0183)
Expectation export worse			-0.00607	0.00305
			(0.0253)	(0.0224)
Expectation export better			-0.00712	-0.00855
			(0.0219)	(0.0207)
Constant	-0.0744***	-0.345***	-0.218***	-0.0582***
	(0.0121)	(0.0140)	(0.0120)	(0.0223)
Observations	13,885	13,885	13,885	13,885
Number of uid	445	445	445	445
R-sq within	0.103	0.0248	0.00771	0.110
R-sq between	0.0411	0.0373	0.00651	0.0544
R-sq overall	0.0938	0.0223	0.00604	0.102
AR(1) (F-test)	43.68	61.29	70.01	43.01
AR(1) (p-value)	1.37e-10	0	0	1.91e-10
All $\alpha_i = 0$ (F-test)	4.876	4.596	4.505	4.784
All $\alpha_i = 0$ (p-value)	0	0	0	0
Breusch-Pagan (lm)	3347	2883	2614	3093
Breusch-Pagan (p-value)	0	0	0	0
Hausman test (chi2)	5.983	13.96	23.60	29.05
Hausman test (p-value)	0.112	0.00741	0.00267	0.0158

Table 1.13: Wishful thinking and exchange rate expectations with a stable sample

We regress $\Delta s^e_{i,t} = \alpha_i + X_{i,t}\beta + \varepsilon_{i,t}$ in a linear fixed effects regression model with standard errors clustered on the individual level. $X_{i,t}$ includes three blocks of covariates: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals. Models are separately estimated for two groups of firms, these firms which are identified as export dependent and those which are not. We only consider observations for which we have the full set of observations so that the observation number does not alter between models. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FX-S m-m (THB/USD)	3.993***			3.055***	3.170***			2.185**
	(0.406)			(0.434)	(1.006)			(0.998)
Prediction error (FE)	2.256***			2.489***	3.126***			3.844***
	(0.340)			(0.349)	(0.990)			(1.013)
FX-S m-MA(2y) (THB/USD)	3.487***			3.433***	2.161***			1.555*
	(0.317)			(0.347)	(0.748)			(0.805)
Interest 3m m-m differential		-0.179***		-0.180***		-0.238**		-0.198*
		(0.0378)		(0.0380)		(0.0987)		(0.109)
Inflation m-m12 differential		0.0802***		0.0195**		0.0876***		0.0521***
		(0.00904)		(0.00925)		(0.0210)		(0.0194)
Output m-m12 differential		2.609***		0.763***		1.862***		0.706*
		(0.227)		(0.190)		(0.465)		(0.394)
Export m-m12 differential		-1.216***		-0.826***		-1.362***		-1.114***
		(0.138)		(0.139)		(0.364)		(0.340)
Expectation interest rates lower			-0.107***	-0.0186			-0.0714	-0.0207
			(0.0254)	(0.0245)			(0.0776)	(0.0784)
Expectation interest rates higher			0.0738***	-0.0206			0.0601	-0.0191
			(0.0223)	(0.0228)			(0.0519)	(0.0493)
Expectation price down			0.00218	-0.0207			-0.0964	-0.112*
			(0.0310)	(0.0281)			(0.0758)	(0.0673)
Expectation price up			0.0191	0.0258			0.0493	0.0172
			(0.0244)	(0.0216)			(0.0660)	(0.0623)
Expectation output down			-0.0170	-0.0128			-0.0163	-0.0128
			(0.0276)	(0.0250)			(0.0572)	(0.0531)
Expectation output up			-0.0473**	-0.0384*			-0.197***	-0.184***
			(0.0209)	(0.0196)			(0.0449)	(0.0430)
Expectation export worse			-0.0121	-0.00432			0.0256	0.0546
			(0.0278)	(0.0241)			(0.0577)	(0.0625)
Expectation export better			-0.00142	-0.00227			-0.0885	-0.0929
			(0.0232)	(0.0219)			(0.0618)	(0.0599)
Constant	-0.0710***	-0.355***	-0.227***	-0.0600**	-0.104***	-0.268***	-0.149***	-0.0385
	(0.0130)	(0.0151)	(0.0128)	(0.0241)	(0.0308)	(0.0347)	(0.0305)	(0.0546)
Observations	12,179	12,179	12,179	12,179	1,706	1,706	1,706	1,706
Number of uid	356	356	356	356	89	89	89	89
R-sq within	0.106	0.0246	0.00716	0.112	0.0802	0.0298	0.0253	0.117
R-sq between	0.0278	0.0332	5.50e-05	0.0398	0.0567	0.0627	0.00826	0.0672
R-sq overall	0.0970	0.0224	0.00539	0.104	0.0721	0.0237	0.0192	0.102
AR(1) (F-test)	34.87	49.32	55.36	31.65	10.05	14.17	20.05	18.30
AR(1) (p-value)	9.25e-09	0	0	4.18e-08	0.00253	0.000413	4.15e-05	8.31e-05
All $\alpha_i = 0$ (F-test)	5.100	4.775	4.678	4.988	4.091	4.024	3.972	4.148
All $\alpha_i = 0$ (p-value)	0	0	0	0	0	0	0	0
Breusch-Pagan (lm)	2878	2445	2226	2648	485.1	457.8	368.1	418.3
Breusch-Pagan (p-value)	0	0	0	0	0	0	0	0
Hausman test (chi2)	4.821	11.94	24.36	24.72	2.315	2.380	10.52	18.20
Hausman test (p-value)	0.185	0.0178	0.00200	0.0538	0.510	0.666	0.230	0.252

Table 1.14: Unbiasedness of exchange rate expectation in a random effects model

Test of unbiased exchange rate expectations, i.e. $\Delta s^c_{t+3} = \alpha_i + \beta \Delta s^e_{i,t+3} + \varepsilon_{it}$ with $\Delta s^e_{i,t+3}$ individual expectation of exchange rate change and Δs^c_{t+3} as the categorical change of the actual exchange rate. We categorize exchange rate changes in appreciation, unchanged, depreciation to match qualitative individual expectations. We use a variety of thresholds, which are 0.5%, 1%, 2%, 3%, 4%, 5%. If $\alpha = 0$ and $\beta = 1$ expectations are unbiased. Estimation is conducted by random effects models with clustered standard errors on the individual level. We only consider observations, which were submitted by firms which participated 36 times at minimum. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1) df3fxs_c05	(2) df3fxs_c1	(3) df3fxs_c2	(4) df3fxs_c3	(5) df3fxs_c4	(6) df3fxs_c5
FX expectation 3-month (THB/USD)	0.127***	0.0866***	0.0287***	0.0149***	0.0113***	0.00995***
	(0.00709)	(0.00638)	(0.00488)	(0.00394)	(0.00294)	(0.00218)
Constant	-0.300***	-0.273***	-0.204***	-0.127***	-0.0893***	-0.0259***
	(0.00298)	(0.00265)	(0.00200)	(0.00161)	(0.00113)	(0.000861)
Observations	45,974	45,974	45,974	45,974	45,974	45,974
Number of uid	615	615	615	615	615	615
Wald test	17003	21488	39602	65845	120987	242999
p-value	0	0	0	0	0	0

Table 1.15: Heterogeneity and wishful thinking of exchange rate expectations with alternative measures of forecasting errors

We regress $\Delta s^{e}_{i,t} = \alpha_i + X_{i,t}\beta + \varepsilon_{i,t}$ using a linear fixed effects regression model with standard errors clustered on the individual level. $X_{i,t}$ includes three blocks of covariates: (i) exchange rate movements, (ii) public fundamentals, (iii) individual expectations of fundamentals. We change the measure of forecasting errors of exchange rate expectations in the first block to errors from random effects and pooled OLS model (see Table 1.8). We only consider observations, which were submitted by firms which participated 36 times at minimum. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	All (1)	All (2)	Non-export (3)	Non-export (4)	Export (5)	Export (6)	All (7)	All (8)	Non-export (9)	Non-export (10)	Export (11)	Export (12)
FX-S m-m (THB/USD)	3.888***	2.953***	3.981***	3.043***	3.163***	2.176**	3.888***	2.953***	3.981***	3.043***	3.163***	2.176**
	(0.373)	(0.398)	(0.406)	(0.434)	(1.006)	(0.998)	(0.373)	(0.398)	(0.406)	(0.434)	(1.006)	(0.998)
Prediction error (RE)	2.526***	2.810***	2.272***	2.507***	3.136***	3.857***						
	(0.318)	(0.327)	(0.340)	(0.349)	(0.991)	(1.014)						
Prediction error (POOL)							2.526***	2.810***	2.272***	2.507***	3.136***	3.857***
							(0.318)	(0.327)	(0.340)	(0.349)	(0.991)	(1.014)
FX-S m-MA(2y) (THB/USD)	3.334***	3.171***	3.481***	3.425***	2.156***	1.548*	3.334***	3.171***	3.481***	3.425***	2.156***	1.548*
	(0.291)	(0.319)	(0.317)	(0.347)	(0.747)	(0.805)	(0.291)	(0.319)	(0.317)	(0.347)	(0.747)	(0.805)
Interest 3m m-m differential		-0.188***		-0.180***		-0.198*		-0.188***		-0.180***		-0.198*
		(0.0358)		(0.0380)		(0.109)		(0.0358)		(0.0380)		(0.109)
Inflation m-m12 differential		0.0246***		0.0196**		0.0521***		0.0246***		0.0196**		0.0521***
		(0.00841)		(0.00925)		(0.0194)		(0.00841)		(0.00925)		(0.0194)
Output m-m12 differential		0.795***		0.764***		0.707*		0.795***		0.764***		0.707*
		(0.171)		(0.190)		(0.394)		(0.171)		(0.190)		(0.394)
Export m-m12 differential		-0.837***		-0.827***		-1.115***		-0.837***		-0.827***		-1.115***
		(0.127)		(0.139)		(0.340)		(0.127)		(0.139)		(0.340)
Expectation interest rates lower		-0.0279		-0.0187		-0.0207		-0.0279		-0.0187		-0.0207
		(0.0228)		(0.0245)		(0.0784)		(0.0228)		(0.0245)		(0.0784)
Expectation interest rates higher		-0.0152		-0.0206		-0.0191		-0.0152		-0.0206		-0.0191
		(0.0206)		(0.0228)		(0.0493)		(0.0206)		(0.0228)		(0.0493)
Expectation price down		-0.0284		-0.0207		-0.113*		-0.0284		-0.0207		-0.113*
		(0.0255)		(0.0281)		(0.0673)		(0.0255)		(0.0281)		(0.0673)
Expectation price up		0.0213		0.0257		0.0171		0.0213		0.0257		0.0171
		(0.0202)		(0.0215)		(0.0623)		(0.0202)		(0.0215)		(0.0623)
Expectation output down		-0.0131		-0.0129		-0.0128		-0.0131		-0.0129		-0.0128
		(0.0224)		(0.0250)		(0.0531)		(0.0224)		(0.0250)		(0.0531)
Expectation output up		-0.0490***		-0.0384*		-0.184***		-0.0490***		-0.0384*		-0.184***
		(0.0181)		(0.0196)		(0.0430)		(0.0181)		(0.0196)		(0.0430)
Expectation export worse		0.00208		-0.00431		0.0546		0.00208		-0.00431		0.0546
		(0.0221)		(0.0241)		(0.0625)		(0.0221)		(0.0241)		(0.0625)
Expectation export better		-0.0104		-0.00224		-0.0928		-0.0104		-0.00224		-0.0928
		(0.0202)		(0.0219)		(0.0599)		(0.0202)		(0.0219)		(0.0599)
Constant	0.925***	0.934***	0.929***	0.940***	0.896***	0.961***	0.925***	0.934***	0.929***	0.940***	0.896***	0.961***
	(0.0119)	(0.0220)	(0.0130)	(0.0241)	(0.0308)	(0.0546)	(0.0119)	(0.0220)	(0.0130)	(0.0241)	(0.0308)	(0.0546)
Observations	14,270	14,270	12,179	12,179	1,706	1,706	14,270	14,270	12,179	12,179	1,706	1,706
Number of uid	458	458	356	356	89	89	458	458	356	356	89	89
R-sq within	0.106	0.113	0.107	0.112	0.0803	0.117	0.106	0.113	0.107	0.112	0.0803	0.117
R-sq between	0.0418	0.0560	0.0279	0.0400	0.0569	0.0673	0.0418	0.0560	0.0279	0.0400	0.0569	0.0673
R-sq overall	0.0963	0.104	0.0971	0.104	0.0723	0.102	0.0963	0.104	0.0971	0.104	0.0723	0.102
AR(1) (F-test)	41.76	40.12	33.24	31.64	17.61	18.29	41.76	40.12	33.24	31.64	17.61	18.29
AR(1) (p-value)	3.27e-10	6.95e-10	1.99e-08	4.20e-08	0.000109	8.33e-05	3.27e-10	6.95e-10	1.99e-08	4.20e-08	0.000109	8.33e-05
All $\alpha_i = 0$ (F-test)	4.791	4.698	5.099	4.987	4.090	4.146	4.791	4.698	5.099	4.987	4.090	4.146
All $\alpha_i = 0$ (p-value)	0	0	0	0	0	0	0	0	0	0	0	0
Breusch-Pagan (lm)	3325	3062	2876	2647	484.9	418.0	3325	3062	2876	2647	484.9	418.0
Breusch-Pagan (p-value)	0	0	0	0	0	0	0	0	0	0	0	0
Hausman test (chi2)	5.842	28.34	4.429	24.09	2.262	18.10	5.842	28.34	4.429	24.09	2.262	18.10
Hausman test (p-value)	0.120	0.0196	0.219	0.0636	0.520	0.258	0.120	0.0196	0.219	0.0636	0.520	0.258

Chapter 2

Financial Professionals' Overconfidence: Is It Experience, Function, or Attitude?[1]

[1]This chapter is based on the article by Gloede and Menkhoff (2011). Thanks go to the participants at the annual conferences of the European Financial Management Association, German Economic Association, German Finance Association, Money Macro Finance Research Group, and the Royal Economic Society, as well as the audiences of several seminars, in particular Michael Bräuninger, Jerry Coakley, Michael Frenkel, Markus Glaser, Alan Kirman, Thomas Lux, Christian Pfeifer, Winfried Pohlmeier, Michael Schröder and Philipp Sibbertsen for their helpful comments and discussion. We gratefully acknowledge very constructive comments by the editor of European Financial Management and two anonymous referees. In addition, we thank the Centre for European Economic Research (ZEW) in Mannheim, Germany, for providing the data set.

2.1 Introduction

We know from a series of, by now, "classical" studies that most people are overconfident regarding their own abilities, such as their driving performance (Svenson, 1981). Subsequent research has shown that overconfidence is not an invariant characteristic but also depends on circumstances. What is important in this respect is the feedback that people receive, which seems helpful in adjusting one's own perception. Financial markets provide frequent and precise feedback to their participants, so that overconfident behavior may be less expected here. In addition, financial markets punish overconfidence, as overconfidence reduces an investor's performance (Odean, 1998). Given the lack of research in this realm, exploring the extent of overconfidence of financial professionals and its potential determinants seems warranted.

Our study contributes to this issue and is the first one to examine determinants of the better-than-average (BTA) variant of overconfidence in the case of financial professionals. Accordingly, we need two ingredients for this study, i.e., a BTA-measure of overconfidence and the linkage of this measure to potential determinants. First, the BTA-measure of overconfidence is the difference between a professional's self-rated relative performance with respect to a reference group and the same person's true relative performance within the same reference group. This precise measure is usually not available. Second, we analyze relationships between individual forecasters' overconfidence and their demographic, (job) function and forecasting characteristics. Findings reported here enrich our understanding about the determinants of overconfidence among financial professionals, perhaps facilitating the introduction of measures for reducing overconfidence and its costly consequences.

Our research uses a sample of 105 professional forecasters who are regularly contributing to an established financial market survey in Germany. From this survey, we gather monthly forecasts for the USD/DM and (later) USD/EUR exchange rate over several years, so that we can calculate a meaningful forecasting performance. We complement this performance information with data from additional surveys conducted at the same time as the regular surveys. These supplementary surveys reveal the professionals' self-rating and further characteristics about them.

The financial professionals in this study are experienced, educated and hold senior positions in the financial industry so that the sample seems to be relevant for our purpose. Based on this sample, the BTA-measure of overconfidence shows reasonable attributes (which will be related to the literature below). First, these professionals regard themselves mostly better in their self-rating than their fellow forecasters and thus show overconfidence on average. Second, the average degree of overconfidence is moderate, which may be expected for professionals who receive frequent feedback and in a market, foreign exchange, where forecasting is particularly difficult. Third, the combination of moderate average overconfidence with substantial individual heterogeneity implies that many professionals show underconfidence. Fourth, the self-rating of financial professionals is not significantly related to the same person's performance, indicating that a correct self-rating is not easy. Fifth, our BTA-measure of overconfidence has the expected correlations to alternative measures of overconfidence and thus seems reliable.

Below we document the following determinants of overconfidence. The working experience of a professional is tentatively related to less overconfidence, suggesting that experience helps in assessing one's true performance. Also, two function-related criteria are related to less overconfidence: first, being a fund manager, which may be due to the immediate feedback that these professionals receive; and second, a heavy reliance on fundamental analysis, which may indicate these professionals' remarkable efforts in forecasting. Finally, a professional's tendency to herd in his forecasts is associated with less overconfidence. Thus, herding may be interpreted as a sign of less confidence and possibly as a rational reaction to inferior information or ability. In contrast to the relations just discussed, recent forecasting success is positively related to overconfidence, with success inducing higher self-evaluation. These patterns provide obvious lessons for financial professionals and their superiors.

This paper is structured as follows: Section 2.2 reviews the previous literature, showing that our approach is original. Section 2.3 introduces the data used. Section 2.4 details relationships between self-rating, overconfidence and performance. Section 2.5 provides the main findings from regression analyses. And Section 2.6 concludes.

2.2 Literature

The aim of this study is to analyze overconfidence of professionals in financial markets. Even though financial professionals are not the main subjects in empirical studies, we can learn about determinants of overconfidence from the finance and psychology literature which deals with overconfidence and BTA in general. A survey of the BTA literature is provided by Alicke and Govorun (2005).

Overconfidence biases are expected to ease when tasks involve frequent feedback, as is the case for financial markets (Lichtenstein and Fischhoff, 1980). The effect of training could be dampened if these biases are deeply rooted in personality (see Preston and Harris, 1965; Brehmer, 1980; Menkhoff and Nikiforow, 2009). Consequently, one should expect a lower degree of overconfidence here than elsewhere. However, the impact of feedback on behavior requires that it is asked for and understood (Kruger and Dunning, 1999). In this respect, there may be differences between various groups in financial markets: professionals in particular might use and be able to interpret the feedback they get. In contrast, non-professional participants, such as individual investors, may have lower incentives to use feedback and may have less ability to interpret it.[2]

Available studies do support the notion that there is also overconfidence in financial markets, but this evidence refers mainly to non-professionals or to financial markets in general, where non-professionals are included. Specifically, there are three kinds of studies. First, one stream of the literature relies on the theoretically-derived finding that overconfidence of financial market participants can be detected by their increased trading activity (Odean, 1998). There is ample

[2]In fact, professionals might even need a reasonable level of overconfidence to sustain their optimistic and risk loving attitude after failure, which is apparently a warranted characteristic of the financial industry (Taylor and Brown, 1988; Oberlechner and Osler, forthcoming).

evidence of "too much trading volume" in financial markets in general (e.g., Statman et al., 2006). Second, other studies use information about individual investors which is collected from their trading accounts (among others are Odean, 1999; Glaser and Weber, 2007a; Grinblatt and Keloharju, 2009). Third, overconfidence is shown in experiments simulating financial markets (e.g., Biais et al., 2005; Deaves et al., 2009). Thus, we know from these various perspectives that overconfident behavior appears in financial markets, but we know little about whether financial market professionals also show this overconfident behavior.

As professionals trade the largest volumes and have the best information among financial market participants, evidence on their behavior is of particular interest. Empirical examinations, however, lack data. The majority of studies on professionals' overconfidence approach the problem of data availability by developing proxies for overconfidence, such as late option execution (Malmendier and Tate, 2005a), press-related criteria (Malmendier and Tate, 2005b), large numbers of acquisition deals and insider deals (Doukas and Petmezas, 2007), investor size (Ekholm and Pasternack, 2007) and overweighting of private information (Friesen and Weller, 2006). The few studies on financial professionals' overconfidence which employ a direct measure of overconfidence rely on the miscalibration variant of overconfidence (e.g., Ben-David et al., 2007; Deaves et al., 2010) but not on the BTA-measure.

However, the popular miscalibration measure is not without controversy, as different ways of eliciting miscalibration can lead to conflicting results (Cesarini et al., 2006). More important, the various measures of overconfidence are not significantly related to each other. For example, miscalibration is significantly related to neither the BTA-measure (Menkhoff et al., 2006; Glaser and Weber, 2007a) nor the overconfidence measure of illusion of control, whereas BTA and illusion of control are positively related to each other (Menkhoff et al., 2006). Finally, miscalibration is not always related to high trading volume, which is an established theoretical consequence of overconfidence (pro: Deaves et al. (2009), con: Biais et al. (2005); Glaser and Weber (2007a)), whereas BTA is found to have a significant relationship to trading volume (Glaser and Weber, 2007a). In sum, a BTA-measure may provide different information than a miscalibration measure which motivates its application.

There are two studies which are particularly close to ours. First is Deaves et al. (2010), who examine overconfidence among the same group of professionals as we do because both studies rely on the same ZEW data set. In detail, however, there are many differences, such as different time periods, different samples, different financial variables (a stock index vs. foreign exchange rates) and different measures of overconfidence (miscalibration vs. BTA). The second study close to ours is Oberlechner and Osler (forthcoming), who apply a BTA-measure to foreign exchange professionals. Both studies differ in various ways, especially the subject group (foreign exchange traders vs. financial professionals), the research question, and, in particular, the performance measure, as they approximate performance by ratings of superiors and colleagues, whereas we measure "true" forecasting performance by a hit rate.

Overall, studies are rare on financial professionals' overconfidence, in particular regarding

the BTA-measure, and existing studies still lack a direct comparison of individual financial professionals' self-rating with the same person's true performance and characteristics.[3]

2.3 Data

The study builds on a unique data set which consists of individual exchange rate forecasts over several years plus information about demographic, function and forecasting characteristics of the sample's 105 financial professionals. References to data sources are given in Table 2.12.

2.3.1 The ZEW data set

The basis for our research is the individual survey data of the Financial Market Survey conducted by the ZEW in Germany. Overall, there are about 300 financial experts who are asked to participate monthly in the survey, from whom about 250 answers are received each month. Like comparable datasets (e.g., Consensus Economics London), the majority of the participants are employed in the banking sector (75%). Others work in the insurance sector (15%) or in large industrial enterprises (10%). Aggregate statistics of responses are published in financial media like Reuters or Bloomberg. A monthly publication covering the full summary statistics of the survey is also sent to the participating experts, providing aggregate feedback to them.

The surveyed financial professionals provide individual forecasts for the six months ahead exchange rate of the USD/EUR, or of the USD/DM exchange rate before December 1998. The observations range from December 1991 to October 2008. This gives us a maximum of almost 17 years of monthly data on individual expectations. The forecasts are qualitative and indicate whether the exchange rate is expected to appreciate, depreciate or stay unchanged. From these regular forecasts we retrieve average hit rates which approximate the true skill level of the forecasters (for the exact procedure see Section 2.4). To obtain a reliable and valid criterion for the true skill level, we only use observations from forecasters who participated in the survey at least 36 times (i.e., for a minimum of three years, if they participated every single month).

In addition to this, several special surveys were conducted contemporaneously with the regular monthly surveys, from which demographic and function-related characteristics were obtained (which we describe later in Section 2.3.3). Since we use personal characteristics and individual forecasts in our analysis, we want to make sure that each observation corresponds to exactly one person. We follow all changes in the contact persons and employers and only use data which refer to the very same person. This provides us with a highly consistent micro data set. The drawback is that we end up with a sample of 105 professional forecasters for whom we have complete observations (i.e., enough forecasts as well as information about their self-rating as forecasters, demographic and job information). Reassuringly, this sample does not show any

[3]This approach is not uncommon in the psychology literature though. Several studies have implemented the distinction between 'overestimation' and 'overplacement' (see Moore and Healey, 2008).

significantly different items compared to the group who are not considered due to incomplete information.

2.3.2 Measures of overconfidence

In order to test whether forecasters in the sample exhibit the same behavioral biases as other people, we perform two exercises with conventional results: we observe some overconfidence on average as other studies do, and we find that often-suggested measures of overconfidence are related to each other as in earlier studies. The original survey questions are given in Figures 2.5 and 2.6.

As a first measure of overconfidence, we take the self-rating of respondents and calculate the percentage of financial professionals who think themselves to be better than the average of their peer group. Professionals rank their forecasting performance compared to their participating peers at the ZEW survey on a range from 1 to 21, where "11" represents the average and increasing values represent increasing performance. Earlier studies suggest that there is a tendency to overrate one's own performance. This is usually interpreted as overconfidence of the group on average (Larrick et al., 2007). Recently, this has been called into question. Benoît et al. (2009) show that any fraction could rank themselves as better than average without any overconfident behavior. Our preferred BTA-measure of overconfidence accounts for this by adjusting the self-rating measure of overconfidence for the true performance. Nevertheless, when we employ the widely used aggregated measure of self-rating here, we find the traditional overconfidence pattern, namely that more than 50% of respondents rank themselves as better than or equal to the average forecaster (see Figure 2.1). Considering the large number of forecasters who give a "being average" rating, the observed level of overconfidence seems moderate (see also Glaser and Weber, 2007b). This may be fostered by three factors. First, the monthly public release of the forecasts gives professionals quite precise feedback about their performance. Second, the more abstract the task is the more overconfident individuals turn out to be (Dunning et al., 1989; Alicke et al., 1995). In the case here, forecasters form concrete expectations about real-world circumstances which may support limited overconfidence. Third, forecasters in our sample do not have an incentive to exaggerate self-rating as the forecasts are anonymous for the public so that the forecasters do not need to fear reputation losses.

In order to put overconfidence measures in perspective, we also collect data for the two other measures of overconfidence introduced in the literature section (i.e., miscalibration and illusion-of-control). With regard to the former, in the survey of October 2008, participants were asked for a 90% confidence interval for the six months ahead USD/EUR exchange rate. The mean of the 90% confidence interval stated by the forecasters is about 14 %. This can be compared to two benchmarks: first, we find that the individual confidence intervals are large enough in only 75% of cases compared to realized exchange rates six months ahead. Second, we find that the 14% mean interval width is small compared to the expected interval derived from a GARCH (1,1) model, which is 36%. All this indicates that respondents in our sample tend to

be overconfident according to a miscalibration measure. We acknowledge, of course, that this analysis is based on a one-time calibration exercise only. For the third overconfidence measure, illusion-of-control, we collected data asking the following question: "Most of the published business news does not surprise me at all."[4] Respondents answered on a scale ranging from 1 to 20 where "1" gives complete disagreement and "20" gives complete agreement. We find that 80% of respondents answer with categories 11 to 20, thus tentatively supporting the notion that they are not surprised by most news. This provides evidence for overconfidence in the sense of illusion-of-control.

In a final analysis we correlate the three measures of overconfidence introduced above to each other as well as to our BTA-measure (whose exact calculation is introduced later in Section 2.4). Table 2.1 shows that these measures are related to each other in a way that is consistent with the literature as discussed in Section 2.2: in particular, miscalibration measures are uncorrelated with our BTA-measure. All this supports the conclusion that our sample is characterized by similar behavioral biases as found in other studies, although the degree of overconfidence may be relatively small.

2.3.3 Measure of performance

We use hit rates as our measure of performance. They are calculated from the raw data as follows. First, we consider all forecasts of one person. Second, we determine exactly whether a particular forecast was right or wrong. Survey participants have a time window of about two weeks to submit their forecasts. To achieve a maximum of accuracy and consistency we use individual specific forecasting days. Specifically, we compare the forecasted change of the exchange rate to the realized exchange rate in exactly six months for each individual separately. Third, since the expectations are qualitative forecasts, usual error measures (e.g., RMSE) are not computable, necessitating the use of hit rates. For this purpose we convert the continuous exchange rate process into a discrete process which corresponds to the forecast categories of appreciation, depreciation and no change. We use information directly from the forecasters themselves. In a special survey in 2006, they state that, on average, a plus or minus 3% change of the exchange rate over six months is considered to be stable. Fourth, to incorporate the fact that the experts can choose between three alternatives, a hit rate is coded in three categories: a large deviation, a small deviation and no deviation of forecast from the true event. Large deviations are predictions which indicate the opposite direction of the actual movement, whereas small deviations are expectations which are neither a correct forecast nor a large deviation. Code values of 0-1-2 are utilized where a higher hit rate implies greater success.[5]

[4] This question has been used for this purpose before (Menkhoff et al., 2006).

[5] This performance measure has been used previously for ZEW exchange rate forecasts (e.g., Nolte et al., 2008). Details about the calculation of the hit rates are given in Table 2.13.

2.3.4 Professionals' characteristics

In order to examine potential determinants of overconfidence, the ZEW individual forecasting data have to be supplemented with detailed information about the financial professionals. We do this in three directions, addressing professionals' demographic, function-related, and forecasting characteristics.

Regarding demographic characteristics, the average professional is male, has an academic education, is middle-aged and has been working for almost 18 years in the financial industry. Descriptive statistics for the sample of 105 financial professionals are shown in the upper panel of Table 2.2. Statistics are consistent with the information provided by Deaves et al. (2010) based on the year 2003.

Regarding function characteristics the average professional holds a senior position, exercising operative and personnel responsibilities. It is most likely that he works as a fund manager (30%); another 23% work as researchers; 18% as advisors; and the remaining 29% are classified as others.[6] Forecasts are mainly the result of fundamental analysis, which has a share of 55%, whereas technical analysis and reliance on order flow analysis make up the rest (the survey question is documented in Figure 2.5). Detailed results are given in the middle panel of Table 2.2.

Regarding forecasting-related characteristics, we first report the average hit rate, which can vary between a lower bound of zero and an upper bound of two as discussed in Section 2.3.3 above. Beyond that we are interested in two possible behavioral effects: first, do recent forecasting successes lead to increased self-assessment? Second, is the financial professional inclined to herd in his forecasts?

We investigate the impact of recent forecasting success with two variables. First, in order to obtain a measure of the forecasters' recent success, we measure whether there is a significant - positive or negative - trend in the performance over the last three years, prior to asking for the respondent's self-rating. To calculate this trend over three years we use a simple Spearman rank correlation between the numbers 1 to 36 and the hit rates at these 36 points in time. The coefficient of correlation can be positive or negative, but only if it is significant at a 10% level do we take it as a trend. Then we form two dummy variables: the dummy is one for a positive (negative) trend (i.e., increasing (decreasing) success in forecasting), and zero for all other cases. Table 2.2 shows that 15% of respondents experienced a positive trend, 7% a negative trend and most respondents did not realize any trend.[7] Second, as another proxy of recent forecasting success, we calculate the average individual hit rates during the six months prior to the self-rating. In order to get six observations per person, we compare the original six month forecasts with the actual movement in the exchange rate within the first month after the forecast was made. For this procedure we adjust the no-change category according to the

[6] Such as employees in treasury departments.

[7] Alternatively, we replace the Spearman rank correlation coefficient by Kendall's tau but obtain the same signs. Results also remain qualitatively the same for variations in the time horizon.

square root formula (i.e., the six month boundary of 3% corresponds to a one month boundary of 1.22%). Our measure of recent success is the average of these newly computed recent hit rates of the last 6 months, which is the time horizon shown to be relevant by Statman et al. (2006) and others. Reassuringly, our results are robust for other time periods such as 5 or 7 months. The level of recent success as shown in the lower panel of Table 2.2 is not significantly different from the general performance.

The last variable in the lower panel of Table 2.2 provides information on potential herding behavior among forecasters. We implement as a herding measure the simple percentage share of one's monthly forecast in which the professional agrees with the market's opinion of the month before. The market opinion is approximated here by the mode of responses. To ensure a robust estimate of the market opinion, we choose the minimum participation rate to be 30, which can be important during the very early years of the survey.[8] The bottom row of the lower panel of Table 2.2 shows that about half of the time professionals conform to the market opinion.

2.4 Descriptive analysis

To review, our BTA-measure of overconfidence is defined to be the difference between self-rating and performance. We show the distribution for these two ingredients of overconfidence in the sample and how they are related to overconfidence.

In Figure 2.2 we plot the 105 forecasters' self-rating against their true performance (measured via hit rates). A relation between self-rating and performance cannot be recognized, either from graphical analysis or from the correlation coefficient (-0.0084). This result may seem a bit surprising because financial professionals receive frequent feedback about their performance and because their salary is performance-based to some degree. Consequently, one might expect that they are tentatively able to correctly self-assess their performance. However, the realized hit rates suggest that professionals cannot really forecast exchange rates very well. They may be more successful at longer horizons (Heiden et al., 2011), but they do not succeed on average at the medium term horizons used here (e.g., Ruelke et al., 2010). In sum, it seems difficult also for the individual forecaster to develop a precise relative self-assessment.

Next, we relate our BTA-measure of overconfidence to its two ingredients (as described above) and see which ingredient may be driving overconfidence.[9]. Thus in order to calculate the BTA-measure, its two ingredients should be made comparable to each other regarding their scaling. Therefore, hit rate is linearly adjusted to the same scale as self-rating. Hit rate is initially a continuous variable ranging from 0 to 2. For adjustment to the self-rating scale (from 1 to 21), we take the mean, which is 1.13, and take four standard deviations to both sides to

[8] Results are basically unchanged if we either pick another minimum participation rate or if we take the contemporaneous month.

[9] Due to the labeling of the figure in the survey question we can relate the best and worst categories of the hit rate and self-rating as well as the average to the middle category. We cannot be sure that the self-rating categories in between match the corresponding hit rate categories. The empirical approach tries to accommodate for that by estimating just three different categories instead of estimating more categories.

decide the boundaries: the lower bound is 0.548 and the upper bound is 1.727. These boundaries fully encompass the actual hit rates, which range from 0.577 to 1.510. Then, we split the defined range into equal parts from 1 to 21 so that the hit rate is now easily comparable to the self-rating. The resulting BTA-measure of overconfidence (self-rating minus transformed hit rate) has observed values between -13 and 14, which means that on an individual basis professionals can exhibit either overconfidence or underconfidence.

Figure 2.3 provides a plot of the relationship between overconfidence and the hit rate for the sample of 105 forecasters. Obviously, a better hit rate, i.e. a better forecasting performance, goes along with less overconfidence. Additionally, we provide the analogous plot for overconfidence versus self-rating. Figure 2.4 shows that forecasters are often overconfident when giving relatively positive self-assessments. In contrast, relatively underconfident forecasters tend to give pessimistic self-ratings.

2.5 Regression analysis

2.5.1 Methodology

We next seek to explain the overconfidence (or underconfidence) of the professional forecasters in our sample by a set of demographic, function-related, and forecasting characteristics. An ordinal logit model is estimated where over-/underconfidence is defined as a piecewise-defined function of the difference between self-rating and hit rate as follows:

$$OVC_i = \begin{cases} 1 & \text{if } SR_i - HR_i > 0 \\ 0 & \text{if } SR_i - HR_i = 0 \\ -1 & \text{if } SR_i - HR_i < 0 \end{cases} \tag{2.1}$$

with SR_i as self-rating and HR_i representing hit-rate, each for forecaster i. Thus, the criterion distinguishes overconfident and underconfident forecasters as well as forecasters who are neither. We observe 51% overconfident, 36% underconfident and 12% "balanced" professionals.

Using this non-linear estimation procedure reflects the nature of our data and is thus more appropriate than an ordinary least squares analysis. First, using the directional information of the difference between self-rating and transformed hit rates puts less restrictive assumptions on the data than using a cardinal criterion. In a strict sense, the self-rating scale is only well-defined at the average and at the endpoints, whereas the information about ratings between these points cannot be directly compared across persons, as an OLS analysis assumes. Second, the ordinal logit allows for the possibility that the effect on over- and underconfidence of the regressors could be asymmetric, i.e. non-linear. To control for heteroscedasticity we use robust variance estimators for all estimations.

2.5.2 Results

We estimate the level of over- / underconfidence conditional on a large number of control variables which we derive from demographic, function, and forecasting characteristics. We find that experience, function-related, and forecasting attitudes are significantly related to the level of overconfidence.

Estimation results are shown in Table 2.3. Column (1) provides the benchmark specification where all demographic, function-related and forecasting characteristics are considered. We take the results of the restricted regression in column (2) for interpretation which only uses recursively significant regressors. Additionally Table 2.4 shows marginal effects. We discuss explanatory variables by category, starting with the demographic characteristics. Note that specifications (3) and (4) in Table 2.3 reproduce specifications (1) and (2) with the only difference being the hit rate trend variables (in (1) and (2)) are replaced by a single variable indicating (six month) recent success.

(1) Demographic characteristics. Bhandari and Deaves (2006) show that demographic characteristics can indeed influence financial professionals' behavior. Among the demographic variables available for our sample, we find that experience has a significant effect, which is negatively related to overconfidence. The direction of this effect is not as obvious as it may look at the first sight. During one's career, a forecaster achieves both successes and failures. Using this information allows her to form a rational expectation about her own forecasting performance even when the true skill was unknown in the beginning. This positive learning effect of experience may be tempered by forces preventing forecasters from learning, such as confirmatory bias and self-attribution bias (Brehmer, 1980). These forces conceivably may swamp learning, leading to greater overconfidence for more experienced forecasters. These positive and negative influences of experience on overconfidence have been formalized in a multi-period model by Gervais and Odean (2001), who argue that, typically, experience supports the development of overconfidence in the early stages of one's career but then later on it will depend on the level of self-attribution bias as to whether more experience will lead to either lower or higher overconfidence. Thus, theory states that the relation between experience and overconfidence may differ between persons and may even change over time for the same person.

The evidence on an experience effect is indeed mixed. For example, Oberlechner and Osler (forthcoming) do not find a significant learning effect. Providing evidence in favor of the learning effect, Glaser and Weber (2007b) find that experienced private investors are better able to self-evaluate their portfolio returns than inexperienced investors. Our evidence shows that working experience in the financial sector is associated with reduced overconfidence at the 5% significance level. This result is independent of controlling for age, so the experience effect does not stem from just getting older.[10] In Table 2.4 we see that for an average forecaster eight more years (one standard deviation) of experience lead to a 12% lower probability of being overconfident and to a 10% higher probability of being underconfident.

[10]The effect remains if we use othogonalized variables (available on request).

Our finding on experience confronts the result of Deaves et al. (2010) in whose study experience increases overconfidence. As mentioned in the literature section both studies use the same survey, however, studies differ regarding the time period covered, the sample definitions, the financial markets covered (stocks vs. foreign exchange) and the measures of overconfidence (miscalibration vs. BTA). Because of these various differences between both studies one cannot identify a single (most important) reason for the contrary relation of experience to overconfidence. A plausible reason might to be, however, that the measures of overconfidence themselves are not positively correlated to each other so why should experience be related to them in the same way? Possibly BTA biases can be eased by experience when miscalibration cannot.

Since gender is a frequently discussed issue in the related literature (e.g., Barber and Odean, 2001), we control for gender effects. We cannot find any significant difference between the behavior of women and men. Due to the large fraction of men (92%) in our sample we do not draw any conclusion from this result.

(2) Function-related characteristics. Besides the information about demographic attributes we analyze the influence of function-related characteristics by including dummies for advisor, researcher and fund manager in the benchmark regression. Fund managers are more (less) likely to be underconfident (overconfident) by 32% than non-fund managers. This may be due to the direct feedback which fund managers receive. Among our respondents, they are the financial market participants with the clearest direct feedback and their salary is usually linked to their performance.

Besides the position dummy for fund managers, we find a significantly negative effect for the heavy use of fundamental analysis. We interpret this variable as a measure of the extent to which one uses complex analytical methods rather than simple technical rules or relying just on good luck. Former research has shown that sophistication can decrease biases (Feng and Seasholes, 2005). Nevertheless, the effect of this variable is not robust for all regressions (see specification 4 in Table 2.3).

(3) Forecasting characteristics. In the theoretical literature, overconfidence is modeled as a process of learning due to biased self-attribution (e.g. Daniel et al., 1998; Gervais and Odean, 2001): recent successes take relatively too much weight for self-evaluation (Miller and Ross, 1975). We observe both positive as well as negative trends in the forecasting performance of the last three years. If self-attribution bias is a reason for overconfidence, a positive trend in performance should be significantly related to overconfidence, while a negative trend should have no impact. Indeed, this is what we find. The dummy variable for a positive trend in the hit rate is significant for all model specifications. The analysis for the reference case of an average forecaster shows that recent success measured in this way results in a 27% higher chance of being overconfident and reduces the likelihood of being underconfident by 19%.

In narrowing the time frame for possibly biased self-attribution, one can test whether the most recent successes are also important for understanding overconfidence. Using aggregate data Statman et al. (2006) find that returns going back 6 months matter for trading volume, which

they interpret as overconfidence. We also provide support for this relationship. We estimate an adjusted model which includes the mean hit rate of the last 6 months rather than the dummy variables for positive and negative trends in the hit rate (see specifications 3 and 4 in Table 2.3). The coefficient for the new variable of recent success is significantly positive, which supports the role of self-attribution bias. Recent successes seem to generate an attitude which biases forecasters' self-evaluation positively.

Turning to the tendency to herd, we measure how much each forecaster agrees in her forecasts with the market opinion (the mode of forecasts in our sample) and interpret this as herding behavior. We observe that the more (less) the forecaster aligns his forecast with the market opinion, the less (more) overconfident (underconfident) this professional is. This could be a rational reaction to inferior information or ability. Another explanation for this relationship may focus on forecasters' risk attitude which influences both herding and overconfidence. A herding forecaster tends to rate herself quite conservatively due to high risk aversion. Theoretical studies show that, due to reputation effects, lower risk taking and more intensive herding go hand-in-hand (Hirshleifer and Thakor, 1992). Empirical evidence for this relationship is abundant, including for example Graham (1999). Therefore the relationship between herding and overconfidence may stem from the fact that they are both influenced by risk aversion. An alternative explanation for the observed link between herding and overconfidence could be driven by the performance of the market opinion. If the market opinion is a better forecast than the average of the individual forecasts, herders will show up as comparatively good forecasters. This leads ceteris paribus to our observation that herders are less overconfident. Testing this hypothesis, we calculate the hit rate of the market opinion, which is 1.39 over the whole time span. Comparing that to the average forecasting performance of 1.13, we indeed find that the market opinion is significantly better than the average hit rate of the individual forecasts. This finding supports the alternative argument that a relatively precise market opinion explains the link between herding and less overconfidence.

2.5.3 Robustness

We next report several robustness tests relating to sample selection, alternative measurement of hit rates, different threshold levels (for perceived unchanged exchange rates), various further regression models, and, finally, different transformations of hit rates.

(1) Sample selection. As we are restricted to working with a sample of 105 financial professionals out of a total of more than 300 respondents to the monthly survey, the issue of representativeness must be addressed. The main reason that the sample is so much smaller than the number of respondents is the unavoidable reliance on questionnaire responses, additional to the regular survey. These additional questionnaires are necessary to obtain information, first, about self-rating, and, second, about various demographic and function-related characteristics. A third restriction results from our requirements that only persons with at least 36 months of observations are included and more than three years of observations are necessary in order to

calculate individual trends in hit rates. Although we did manage to obtain more than 200 responses from the additional questionnaires, the combination of requirements reduces the sample to 105 professionals.

In order to test unbiasedness of this sample, we compare means between the 105 professionals included and those professionals who had to be excluded. Table 2.5 provides the results. Panel A reports comparisons for all those variables described in Tables 2.1 and 2.2 above and Panel B report comparisons for other variables of interest. Importantly, there is no single significant difference in variables' means between our sample and the group of excluded professionals.[11]

Sample selection bias could also exist due to panel attrition. This is because forecasters drop out of the sample occasionally and are replaced. To analyze the effect of the duration of panel affiliation we correlate our overconfidence measures to two measures which indicate how long a financial expert has belonged to the panel.

Neither the duration of how long an expert participated in the survey nor the number of forecasts the person gave during this time are correlated with the overconfidence measures. We conclude that our results are unlikely to be biased by panel attrition.

(2) Hit rate calculation. For our baseline estimations we use a three-variate hit rate with three codes: success, small failure, and large failure. Since we also receive the forecasts in three different outcomes, this procedure seems quite reasonable. For robustness we estimate our baseline model again, using a hit rate which distinguishes only between giving a correct and an incorrect forecast (see Table 2.7). Thereby, we obviously discriminate forecasters who make just small mistakes, but do not get the direction wrong. Despite this mistake, our results remain generally the same. Forecasters still do not get their self-rating right, which means that self-rating and performance are uncorrelated. On average, forecasters are truly overconfident. The determinants of overconfidence also remain the same. Working experience as well as the forecasting characteristics remain significant and keep their effect. The effect of being a fund manager also remains stable, whereas the effect of fundamental analysis vanishes. This underlines the low significance level of fundamental analysis in our baseline model and encourages us not to overestimate the effect of fundamental analysis.

(3) Different threshold levels. A possible shortcoming of the above analysis is its reliance on a fixed average threshold of plus or minus 3% for forecasters' perception of unchanged exchange rates. The 3%-level is chosen because it represents the mean (and median) derived from participants in the ZEW Financial Market Survey.[12] In order to address possible variation over individuals and time, we recalculate the main regressions with average levels of 2% and 4%,

[11] It would be preferable to apply a formal Heckman model to test for sample selection and correction, if necessary. However, due to the incomplete data set, there is no group of excluded professionals where we would have sufficient information to identify the model for the full sample. Trying various nested-models identification improves but the Mill's Ratio is not significant in any case. This suggests that we do not have a serious problem of sample selection.

[12] As individual survey responses are available, the individual threshold levels could be used in principle. However, the benefit in precision is limited by reduced sample size (48 persons only) and possibly time-varying threshold values which we cannot account for.

which seems appropriate since 70% of individual responses fall between these percentages. The new regressions shown in Tables 2.8 and 2.9 show that our findings are quite robust to these variations.

(4) Further regression models. Next, we implement further regression models. First, we relax our assumption of a logistic distribution of the error terms. The information criteria suggest that the logistic assumption fits our data set quite well, as the Akaike Information Criterion and Bayes Information Criterion are both fairly smaller for the ordered logit model than for an ordered probit model. Nevertheless, when we use the normal error distribution assumption, the significance levels of the parameter estimates remain the same (not shown to save space).

Second, we test for the proportional odds (also parallel regression) assumption of the ordered logit model and use alternative models which relax this assumption. A likelihood ratio test with the null hypothesis of proportional odds shows no evidence for a violation of the assumption for our data set. Testing the assumption of proportional odds for each coefficient individually, we find that a few variables violate the assumption. Therefore we relax the parallel regression assumption and estimate a partially generalized ordered logit model (see Table 2.10). This method allows us to lift the constraint for some variables and to restrict the rest. For most of the variables, the results remain the same. But the estimation suffers from a large proportion of negative-predicted probabilities, which accounts for about two-thirds for some specifications. Moreover, the estimates are blurred due to the opaque impact of some variables, an example being gender with only 7 % of the sample being female. Hence, we prefer the ordered logit model compared to the generalized ordered logit model.

Third, as a further robustness test, we introduce a model which removes the assumptions of the ordinal features of the data and estimate a multinomial regression model. For this estimation approach, the results also remain mainly the same. Since the multinomial estimation clearly violates the results of the likelihood ratio test and neglects the ordinal nature of the dependent variable, the ordered logit model is our preferred model. As an even more radical departure from our preferred estimation approach, we neglect the ordinal character of our data running an OLS regression for comparison purposes. We find that coefficient signs remain, supporting the robustness of findings, but that significance levels go down or even disappear (available on request).

(5) Different hit rate transformations. Finally, we acknowledge that the hit rate transformation we used in Section 2.4 may be questioned. As a first alternative, we replace our transformation of hit rates into 21 equal parts into a sorting of respondents into 21 quantiles (as suggested by a referee). We prefer the linear transformation as this maintains a normal distribution for hit rates, which also fits the approximately normal distribution of self-ratings (see Figure 2.1). By comparison, the transformation of hit rates into quantiles implies equal use of the full scale (i.e., a distribution which is in principle possible but not really supported by our data). Results are shown in Table 2.11 and indicate robustness of the overall findings.

However, some variables become less significant (experience and fundamental analysis) or lose significance (recent success).

In further exercises, we maintain the linear transformation of hit rates but apply different band widths. For example, when we replace the four-standard deviation band by a three-standard deviation band (in order to reduce the impact from extreme values) or by a five-standard deviation band (in order to leave room for a more extreme outcome not represented in our limited sample), we find that coefficient signs remain the same but the levels of significance go down (available on request). However, this is to be expected, as the estimation does not optimally use the variance in observations.

2.6 Conclusion

This study examines overconfidence (and underconfidence) among financial professionals. We contribute to the literature in that we combine "hard" performance information with self-rated performance and complement this with a comprehensive set of demographic, function-related and forecasting characteristics. Further, the utilization of a BTA-measure of overconfidence measure among financial professionals strikes new ground.

We find that financial professionals in our sample are overconfident on average, although the degree of overconfidence seems relatively small compared to many studies with individual investors. Moreover, we find that the positive relationship between self-rating and performance is not statistically significant, which may be a bit surprising for professionals. Consequently, overconfidence is driven by high self-ratings and low performance. Interestingly, there are also underconfident professionals who have been largely neglected in earlier research.

In an effort to understand financial professionals' over- and underrating of their own performance, we examine correlates suggested in the literature. We find that experience in the financial sector is associated with less overconfidence. Some function-related variables, such as being a fund manager and the use of fundamental analysis, are also related to less overconfidence. Finally, recent success and non-herding are observed among more overconfident financial professionals.

Overall, these intuitively plausible results contribute to our understanding of overconfidence among professionals. They also indicate ways to limit its adverse consequences: for example, reliance on more experienced professionals could be helpful in this respect, as well as giving frequent and precise feedback about performance. In addition, debiasing training may be called for. A final contribution in limiting overconfidence may lie in clearly distinguishing between forecasting performance and marketing performance, as the latter needs bold forecasts to create attraction, whereas the former may profit from moderate forecasts.

2.7 Appendix

Figure 2.1: Histogram of financial professionals' self-rating

This figure presents the distribution of financial professionals' self-rating. Self-rating is the individual response on a survey question, which we asked the financial experts in two surveys (April 2007 and October 2008): "How do you evaluate your USD/EUR-forecast compared to the average forecasting hit rate of all participants of the ZEW financial market survey?". The scale ranges from 1 to 21. The mean answer is 11.9, which is above the theoretical mean of 11.

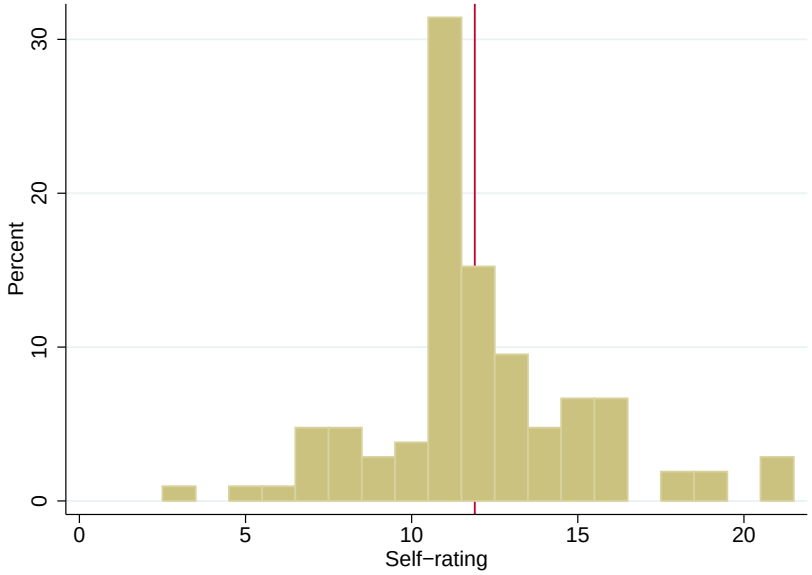

Figure 2.2: Scatter plot of self-rating and hit rate

This figure displays a scatter plot of self-rating and hit rate. Both measures relate to financial professionals' forecasting skills in foreign exchange. Self-rating is a survey item ranging from 1 to 21 and indicates whether someone believes to be above (21) or below (1) the average hit rate. Hit rate is the individual average of the survey forecasts. We code three categories, large deviation (0), small deviation (1) and no deviation (2) of forecast from the true process. Large deviations are predictions which indicate the opposite direction of the actual movement, whereas small deviations are expectations which are neither a correct forecast nor a large deviation.

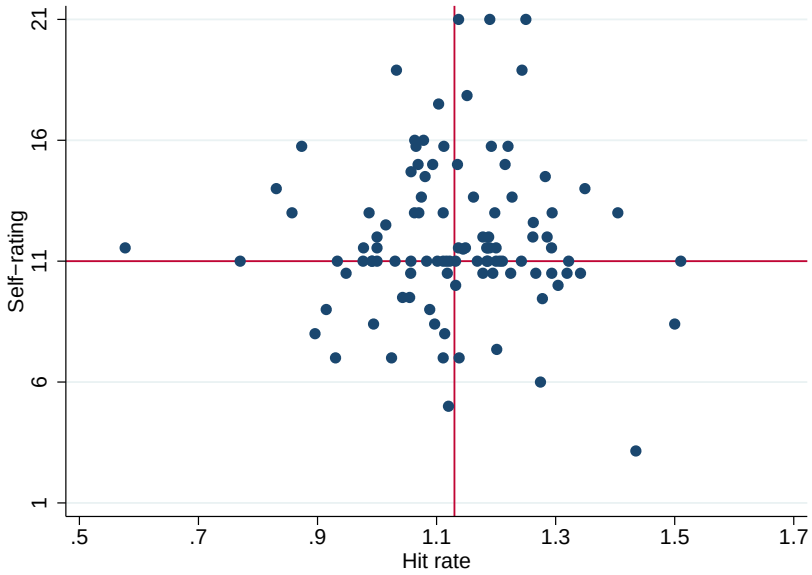

Figure 2.3: Scatter plot of overconfidence and hit rate

This figure presents the scatter plot of overconfidence and hit rate. Overconfidence is the difference between self-rating and hit rate. Self-rating is a survey item ranging from 1 to 21 and indicates whether someone believes to be above (21) or below (1) the average hit rate. Hit rate is the individual average of the survey forecasts. We code three categories, large deviation (0), small deviation (1) and no deviation (2) of forecast from the true process. Large deviations are predictions which indicate the opposite direction of the actual movement, whereas small deviations are expectations which are neither a correct forecast nor a large deviation. For the calculation of overconfidence we rescale the individual hit rate to 1 to 21 to correspond to the range of self-rating.

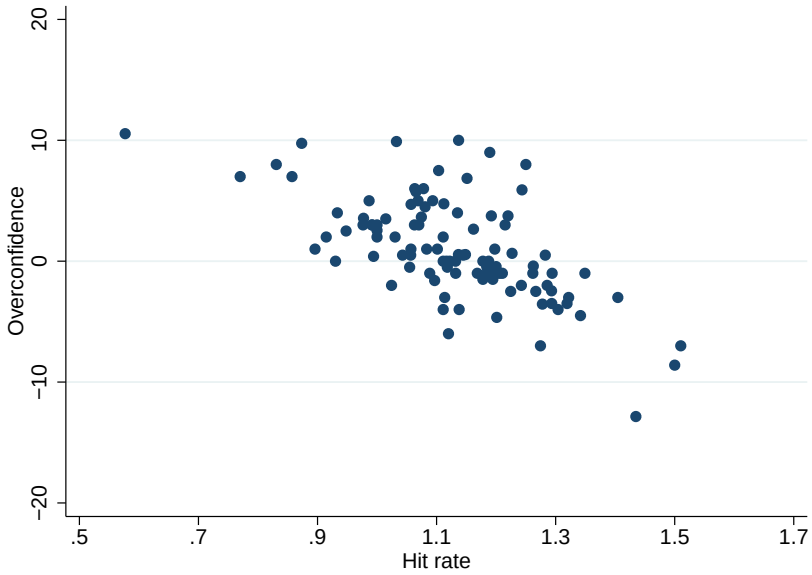

Figure 2.4: Scatter plot of overconfidence and self-rating

This figure presents the scatter lot of overconfidence and self-rating. Overconfidence is the difference between self-rating and hit rate. Self-rating is a survey item ranging from 1 to 21 and indicates whether someone believes to be above (21) or below (1) the average hit rate. Hit rate is the individual average of the survey forecasts. We code three categories, large deviation (0), small deviation (1) and no deviation (2) of forecast from the true process. Large deviations are predictions which indicate the opposite direction of the actual movement, whereas small deviations are expectations which are neither a correct forecast nor a large deviation. For the calculation of overconfidence we rescale the individual hit rate to 1 to 21 to correspond to the range of self-rating (see Section 2.4).

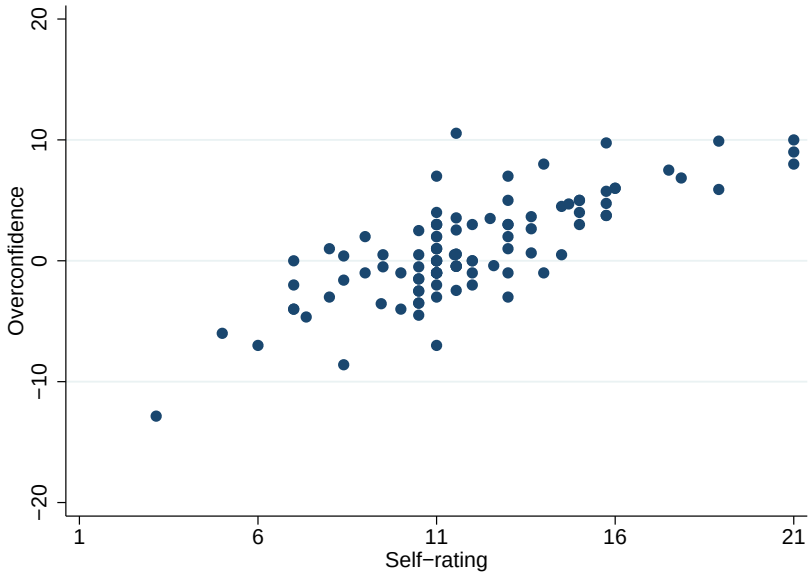

Table 2.1: Descriptive statistics of overconfidence measures

This table presents descriptive statistics on overconfidence measures of our sample, overconfidence, self-rating, miscalibration, illusion-of.control. To start with self-rating (SR), we ask the financial experts in two surveys (04/2007 and 10/2008) the following question: "How do you evaluate your USD/EUR-forecast compared to the average forecasting hit rate of all participants of the ZEW financial market survey?". The scale ranged from 1 to 21. Overconfidence (OVC) is the difference between self-rating and hit rate. Hit rate is the individual average of the survey forecasts. We code three categories, large deviation (0), small deviation (1) and no deviation (2) of forecast from the true process. Large deviations are predictions which indicate the opposite direction of the actual movement, whereas small deviations are expectations which are neither a correct forecast nor a large deviation. For the calculation of overconfidence we rescale the individual hit rate to 1 to 21 to correspond to the range of self-rating. The question for miscalibration (MISC) was an item in the survey of October 2008. Respondents gave a 90-% confidence interval for the 6-month future USD/EUR exchange rate. Miscalibration is defined here as the relative confidence interval. Illusion-of-control (IOC) was surveyed in October 2008. The information was extracted from the following question: "Most of the published business news does not surprise me at all." Respondents answered on a scale ranging from 1 to 20. We report Spearman's rank correlation coefficients and the corresponding p-values. The level of significance is denoted by *** p≤0.01, ** p≤0.05, * p≤0.1.

							Correlation			
	N	Mean	Median	Std. Dev.	Min	Max		OVC	SR	MISC	IOC
							Corr. coeff	1			
Overconfidence	105	1.13	0.55	4.14	-12.85	10	N	71			
							p-value	.			
							Corr. coeff	0.7704	1		
Self-rating	105	11.91	11	3.15	3.15	21	N	71	71		
							p-value	0***	.		
							Corr. coeff	-0.0446	-0.0444	1	
Miscalibration	74	0.14	0.14	0.07	0.04	0.33	N	71	71	71	
							p-value	0.712	0.7131	.	
							Corr. coeff	0.2623	0.3124	-0.1398	1
Illusion-of-control	73	13.47	14	3.75	4	20	N	71	71	71	71
							p-value	0.0271**	0.008***	0.245	.

Table 2.2: Descriptive statistics of financial experts' characteristics

This table shows descriptive statistics on demographic, job, and forecasting characteristics of our financial professionals. Age and work experience in financial sector are measured in years. Fundamental analysis is the self-reported degree (in %) of how much fundamental analysis is used for creating the exchange rate expectation. Hit rate measures the individual average hit rate over the observation period, where the individual hit rate at a time point codes the forecasting performance in no deviation (2), small deviation (1), and large deviation (0). Positive (negative) trend in hit rate is a dummy variable for a significant positive (negative) trend in the forecasting performance over the last three years. Recent success is the individual average hit rate of 1-month forecasts over the last 6 months. Herding (in %) measures how often a forecaster expects the exchange rate to change in the same direction as the market expected the period before. We refer to market by using the mode of all participating forecasters. Dummy variables are denoted by "†".

	N	Mean	Std.Dev.	Min.	Max.
Demographic characteristics					
Male†	105	0.92	0.27	0	1
Academic education†	105	0.76	0.43	0	1
Age	105	44.56	8.11	28.5	64.54
Work experience in fin. sector	105	17.69	8.78	2.5	43.04
Job characteristics					
Operative responsibilities†	105	0.78	0.42	0	1
Personnel responsibilities†	105	0.50	0.50	0	1
Advisor†	105	0.18	0.39	0	1
Fund manager†	105	0.30	0.46	0	1
Researcher†	105	0.23	0.42	0	1
Fundamental analysis	105	55.05	22.41	0	100
Forecasting characteristics					
Hit rate	105	1.13	0.14	0.58	1.51
Positive trend in hit rate†	105	0.15	0.36	0	1
Negative trend in hit rate†	105	0.07	0.25	0	1
Recent success	105	1.18	0.43	0	2
Herding	105	51.42	18.54	1.02	92.08

Table 2.3: Ordered logit estimation results for overconfidence

This table presents regression results of financial professionals' characteristics on the level of overconfidence. Overconfidence (OVC) is the difference between self-rating and hit rate. Age and work experience in financial sector are measured in years. Fundamental analysis is the self-reported degree (in %) of how much fundamental analysis is used for creating the exchange rate expectation. Positive (negative) trend in hit rate is a dummy variable for a significant positive (negative) trend in the forecasting performance over the last three years. Recent success is the individual average hit rate of 1-month forecasts over the last 6 months. Herding (in %) measures how often a forecaster expects the exchange rate to change in the same direction as the market expected the period before. We refer to market by using the mode of all participating forecasters. Dummy variables are denoted by "†". The level of significance is denoted by *** p≤0.01, ** p≤0.05, * p≤0.1. We report p-values in parenthesis for which we use robust standard errors.

Specification	(1)	(2)	(3)	(4)
Male†	0.436		0.194	
	(0.668)		(0.847)	
Academic education†	-0.249		-0.153	
	(0.682)		(0.787)	
Age	0.0389		0.0464	
	(0.494)		(0.391)	
Work experience in fin. sector	-0.0880*	-0.0578**	-0.0903*	-0.0546**
	(0.100)	(0.0192)	(0.0728)	(0.0285)
Operative responsibility†	0.0546		-0.158	
	(0.940)		(0.829)	
Personnel responsibility†	-0.476		-0.438	
	(0.271)		(0.343)	
Advisor†	0.127		0.0999	
	(0.852)		(0.890)	
Fund Manager†	-1.240**	-1.384***	-1.156**	-1.097***
	(0.0337)	(0.00235)	(0.0329)	(0.00764)
Researcher†	1.023		0.588	
	(0.167)		(0.468)	
Fundamental analysis	-0.0197*	-0.0165*	-0.0152*	
	(0.0517)	(0.0964)	(0.0801)	
Positive trend in hit rate†	1.318*	1.352*		
	(0.0965)	(0.0552)		
Negative trend in hit rate†	-0.763			
	(0.419)			
Recent success			0.814	0.874*
			(0.127)	(0.0519)
Herding	-0.0394***	-0.0305**	-0.0406***	-0.0314**
	(0.00346)	(0.0176)	(0.00369)	(0.0129)
Cut 1	-3.611*	-4.399***	-2.667	-2.554**
	(0.0976)	(0.000168)	(0.185)	(0.0132)
Cut 2	-2.969	-3.785***	-2.035	-1.950**
	(0.168)	(0.000733)	(0.306)	(0.0488)
Pseudo-R2	0.134	0.108	0.121	0.0935
N	105	105	105	105

Table 2.4: Effects of a marginal/discrete change in the ordered logit regression model

This table displays the change of the level of overconfidence for a marginal/discrete change of the regressors in the fitted ordered logit model. Overconfidence is measured as the difference between self-rating and hit rate. UNC (OVC) corresponds to forecasters who are underconfident (overconfident) and NN to forecasters who are neither nor. The marginal effects are calculated for a change of one standard deviation for the reference case of an average forecaster, i.e. with a working experience of 18 years, about 55 % fundamental analysis usage, herding to the extent of 51 % and who is neither a fund manager nor has a positive trend in the hit rate. The effect for the dummy variables is a discrete change from 0 to 1, denoted by "†".

	UNC	NN	OVC
Work experience in fin. sector	0.1039	0.0197	-0.1236
Fund manager†	0.3296	-0.0085	-0.3212
Fundamental analysis	0.0757	0.0145	-0.0901
Positive trend in hit rate†	-0.1935	-0.0723	0.2658
Herding†	0.1156	0.0219	-0.1374
$P(y\|x)$	28.85	13.96	57.19
$P(y)$	36.19	12.38	51.43

Table 2.5: Test of different samples

This table displays results of mean comparison tests. Categorical variables are marked by †. We test for differences by χ^2 test statistic and report Fisher's exact p-value. For metric variables we use the t-test. For all variables we report the respective observation number of the sample we use in the analysis and the observations which are neglected in the analysis. Age and work experience in financial sector are measured in years. Fundamental analysis is the self-reported degree (in %) of how much fundamental analysis is used for creating the exchange rate expectation. Hit rate measures the individual average hit rate over the observation period, where the individual hit rate at a time point codes the forecasting performance in no deviation (2), small deviation (1), and large deviation (0). The alternative hit rate uses is defined as the binary variable for right (1) and wrong (0) forecasts. Positive (negative) trend in hit rate is a dummy variable for a significant positive (negative) trend in the forecasting performance over the last three years. Recent success is the individual average hit rate of 1-month forecasts over the last 6 months. Herding (in %) measures how often a forecaster expects the exchange rate to change in the same direction as the market expected the period before. We refer to market by using the mode of all participating forecasters. The self-rating is a survey item ranging from 1 to 21 and indicates whether someone believes to be above (21) or below (1) the average hit rate. Overconfidence (OVC) is the difference between self-rating and hit rate. For the calculation of overconfidence we rescale the individual hit rate to 1 to 21 to correspond to the range of self-rating. The question for miscalibration (MISC) was an item in the survey of October 2008. Respondents gave a 90-% confidence interval for the 6-month future USD/EUR exchange rate. Miscalibration is defined here as the relative confidence interval. Illusion-of-control (IOC) was surveyed in October 2008. The information was extracted from the following question: "Most of the published business news does not surprise me at all." Respondents answered on a scale ranging from 1 to 20. Threshold for fx change is the self-reported appreciation (depreciation) of the exchange rate which corresponds to a change in the qualitative forecast.

Variable	test-statistic	p-value	N (total)	N (in-sample)	N (out-of-sample)
		Panel A			
Male†	0.232	0.622	253	105	148
Academic education†	0.023	1.000	214	105	109
Age	0.996	0.320	202	105	97
Work experience in fin. sector	-0.148	0.882	171	105	66
Operative responsibility†	2.862	0.105	212	105	107
Personnel responsibility†	1.763	0.212	209	105	104
Advisor†	0.718	0.462	220	105	115
Fund manager†	2.669	0.122	220	105	115
Researcher†	1.401	0.307	220	105	115
Fundamental analysis	1.535	0.126	221	105	116
Hit rate	-0.899	0.370	229	105	124
Alternative hit rate	0.905	0.366	229	105	124
Positive trend in hit rate†	1.580	0.230	228	105	123
Negative trend in hit rate†	0.404	0.626	228	105	123
Recent success	0.387	0.699	222	105	117
Herding	1.076	0.283	231	105	126
		Panel B			
Overconfidence†	0.472	0.812	195	105	90
Overconfidence (altern. hit rate)†	2.622	0.278	195	105	90
Self-rating	-0.675	0.500	234	105	129
Miscalibration	-0.154	0.878	164	74	90
Illusion-of-control	-1.621	0.107	162	73	89
Threshold for FX change	1.141	0.257	98	48	50

Table 2.6: Effect of panel attrition

This table presents the effect of panel attrition on the mean level of overconfidence. We approximate the effect by correlating measures of affiliation to the ZEW panel and overconfidence measures. We report Spearman's rank correlation coefficients and the corresponding p-values. The level of significance is denoted by *** p≤0.01, ** p≤0.05, * p≤0.1. We use two measures for the time span of panel affiliation, the number of forecasts during the affiliation and the time span in which a forecaster belongs to the panel (spellduration). The self-rating is a survey item ranging from 1 to 21 and indicates whether someone believes to be above (21) or below (1) the average hit rate. Overconfidence (OVC) is the difference between self-rating and hit rate. Hit rate is the individual average of the survey forecasts. We code three categories, large deviation (0), small deviation (1) and no deviation (2) of forecast from the true process. For the calculation of overconfidence we rescale the individual hit rate to 1 to 21 to correspond to the range of self-rating. The question for miscalibration (MISC) was an item in the survey of October 2008. Respondents gave a 90-% confidence interval for the 6-month future USD/EUR exchange rate. Miscalibration is defined here as the relative confidence interval. Illusion-of-control (IOC) was surveyed in October 2008. The information was extracted from the following question: "Most of the published business news does not surprise me at all." Respondents answered on a scale ranging from 1 to 20.

		SR	MISC	IOC	OVC
Number of forecasts	Corr. coeff.	0.0438	-0.1461	-0.0487	0.0534
	p-value	0.657	0.2142	0.6826	0.5883
	N	105	74	73	105
Spellduration	Corr. coeff.	0.1015	-0.0657	-0.0601	0.1459
	p-value	0.3027	0.5781	0.6133	0.1375
	N	105	74	73	105

Table 2.7: Ordered logit estimation results for overconfidence with alternative hit rate

This table displays regression results of financial professionals' characteristics on the level of overconfidence. Variables referring to hit rate use an alternative coding of right (1) / wrong (0) forecast as a hit rate. Overconfidence (OVC) is the difference between self-rating and hit rate. Age and work experience in financial sector are measured in years. Fundamental analysis is the self-reported degree (in %) of how much fundamental analysis is used for creating the exchange rate expectation. Positive (negative) trend in hit rate is a dummy variable for a significant positive (negative) trend in the forecasting performance over the last three years. Recent success is the individual average hit rate of 1-month forecasts over the last 6 months. Herding (in %) measures how often a forecaster expects the exchange rate to change in the same direction as the market expected the period before. We refer to market by using the mode of all participating forecasters. Dummy variables are denoted by "†". The level of significance is denoted by *** p≤0.01, ** p≤0.05, * p≤0.1. We report p-values in parenthesis for which we use robust standard errors.

Specification	(1)	(2)	(3)	(4)
Male	-0.186		-1.087	
	(0.835)		(0.331)	
Academic education	0.307		0.491	
	(0.583)		(0.377)	
Age	0.0429		0.0839	
	(0.499)		(0.163)	
Work experience in fin. sector	-0.0971	-0.0674***	-0.109*	-0.0483**
	(0.120)	(0.00520)	(0.0600)	(0.0190)
Operative responsibility	0.577		0.367	
	(0.388)		(0.573)	
Personnel responsibility	-0.716		-0.700	
	(0.137)		(0.150)	
Advisor	0.719		0.570	
	(0.336)		(0.415)	
Fund Manager	-0.352	-0.608	-0.668	-0.813*
	(0.564)	(0.175)	(0.245)	(0.0796)
Researcher	1.673**		0.516	
	(0.0236)		(0.419)	
Fundamental analysis	-0.00345	-0.00169	0.0107	
	(0.755)	(0.866)	(0.300)	
Positive trend in hit rate	2.582**	2.551**		
	(0.0260)	(0.0200)		
Negative trend in hit rate	1.063			
	(0.355)			
Recent success			1.041	1.374*
			(0.212)	(0.0559)
Herding	-0.0509***	-0.0371***	-0.0493***	-0.0383***
	(0.00291)	(0.00841)	(0.000822)	(0.00218)
Cut 1	-2.732	-4.007***	-1.159	-3.207***
	(0.213)	(0.000128)	(0.578)	(0.000131)
Cut 2	-2.008	-3.350***	-0.456	-2.548***
	(0.363)	(0.00138)	(0.828)	(0.00202)
Pseudo-R2	0.196	0.141	0.132	0.0901
N	105	105	105	105

Table 2.8: Ordered logit results for overconfidence for smaller threshold

This table presents regression results of financial professionals' characteristics on the level of overconfidence. Despite in the base line model we use a threshold of 2% rather than 3% to mark a change of the foreign exchange rate. Overconfidence (OVC) is the difference between self-rating and hit rate. Age and work experience in financial sector are measured in years. Fundamental analysis is the self-reported degree (in %) of how much fundamental analysis is used for creating the exchange rate expectation. Positive (negative) trend in hit rate is a dummy variable for a significant positive (negative) trend in the forecasting performance over the last three years. Recent success is the individual average hit rate of 1-month forecasts over the last 6 months. Herding (in %) measures how often a forecaster expects the exchange rate to change in the same direction as the market expected the period before. We refer to market by using the mode of all participating forecasters. Dummy variables are denoted by "†". The level of significance is denoted by *** p≤0.01, ** p≤0.05, * p≤0.1. We report p-values in parenthesis for which we use robust standard errors.

Specification	(1)	(2)	(3)	(4)
Male	0.798		0.184	
	(0.459)		(0.852)	
Academic education	-0.470		-0.292	
	(0.433)		(0.597)	
Age	0.0548		0.0520	
	(0.354)		(0.311)	
Work experience in fin. sector	-0.113**	-0.0634**	-0.0949**	-0.0524**
	(0.0432)	(0.0152)	(0.0448)	(0.0296)
Operative responsibility	0.151		0.120	
	(0.842)		(0.872)	
Personnel responsibility	-0.354		-0.272	
	(0.455)		(0.569)	
Advisor	0.438		0.228	
	(0.571)		(0.760)	
Fund Manager	-0.931*	-1.244***	-0.984*	-0.985**
	(0.0830)	(0.00514)	(0.0537)	(0.0219)
Researcher	1.425		0.853	
	(0.100)		(0.321)	
Fundamental analysis	-0.0199**	-0.0155	-0.0152*	
	(0.0363)	(0.100)	(0.0720)	
Positive trend in hit rate	2.015***	1.720***		
	(0.00103)	(0.00128)		
Negative trend in hit rate	-0.136			
	(0.888)			
Recent success			0.576	0.698
			(0.278)	(0.137)
Herding	-0.0527***	-0.0386***	-0.0433***	-0.0331***
	(0.00224)	(0.00254)	(0.00273)	(0.00466)
Cut 1	-3.318	-4.704***	-2.555	-2.721***
	(0.143)	(0.000286)	(0.179)	(0.00870)
Cut 2	-2.959	-4.364***	-2.218	-2.397**
	(0.188)	(0.000564)	(0.241)	(0.0190)
Pseudo-R2	0.160	0.129	0.116	0.0899
N	105	105	105	105

Table 2.9: Ordered logit results for overconfidence for larger threshold

This table shows regression results of financial professionals' characteristics on the level of overconfidence. Despite in the base line model we use a threshold of 4% rather than 3% to mark a change of the foreign exchange rate. Overconfidence (OVC) is the difference between self-rating and hit rate. Age and work experience in financial sector are measured in years. Fundamental analysis is the self-reported degree (in %) of how much fundamental analysis is used for creating the exchange rate expectation. Positive (negative) trend in hit rate is a dummy variable for a significant positive (negative) trend in the forecasting performance over the last three years. Recent success is the individual average hit rate of 1-month forecasts over the last 6 months. Herding (in %) measures how often a forecaster expects the exchange rate to change in the same direction as the market expected the period before. We refer to market by using the mode of all participating forecasters. Dummy variables are denoted by "†". The level of significance is denoted by *** p≤0.01, ** p≤0.05, * p≤0.1. We report p-values in parenthesis for which we use robust standard errors.

Specification	(1)	(2)	(3)	(4)
Male	0.818		0.479	
	(0.409)		(0.637)	
Academic education	-0.248		-0.224	
	(0.672)		(0.679)	
Age	0.00690		0.0243	
	(0.900)		(0.634)	
Work experience in fin. sector	-0.0550	-0.0427*	-0.0635	-0.0501**
	(0.290)	(0.0713)	(0.189)	(0.0429)
Operative responsibility	0.224		-0.0235	
	(0.780)		(0.977)	
Personnel responsibility	-0.485		-0.512	
	(0.269)		(0.266)	
Advisor	0.135		0.0178	
	(0.826)		(0.979)	
Fund Manager	-1.186**	-1.340***	-1.207**	-1.141***
	(0.0423)	(0.00416)	(0.0279)	(0.00579)
Researcher	1.528*		1.232	
	(0.0847)		(0.190)	
Fundamental analysis	-0.0210**	-0.0156	-0.0180**	
	(0.0372)	(0.110)	(0.0474)	
Positive trend in hit rate	1.432	1.470*		
	(0.192)	(0.0973)		
Negative trend in hit rate	-1.022			
	(0.295)			
Recent success			0.543	0.713*
			(0.282)	(0.0843)
Herding	-0.0345**	-0.0241*	-0.0387***	-0.0270**
	(0.0212)	(0.0531)	(0.00644)	(0.0258)
Cut 1	-3.855*	-3.879***	-3.320	-2.551**
	(0.0692)	(0.000586)	(0.103)	(0.0148)
Cut 2	-3.240	-3.309***	-2.721	-1.992**
	(0.122)	(0.00231)	(0.175)	(0.0486)
Pseudo-R2	0.145	0.104	0.127	0.0861
N	105	105	105	105

Table 2.10: Generalized ordered logit estimation results for overconfidence

This table presents regression results of financial professionals' characteristics on the level of overconfidence. Coefficients are restricted to meet the assumption of proportional odds in that way so that the final model best fits the data. Coefficients give the impact between the respective category and the base outcome (overconfident). Overconfidence (OVC) is the difference between self-rating and hit rate. Dummy variables are denoted by "†". The level of significance is denoted by *** p≤0.01, ** p≤0.05, * p≤0.1. We report p-values in parenthesis for which we use robust standard errors.

Specification	(1)		(2)		(3)		(4)	
	UNC	NN	UNC	NN	UNC	NN	UNC	NN
Male	17.32***	-15.75***			18.14***	-16.84***		
	(0)	(0)			(0)	(0)		
Academic education	5.556**	-2.541**			3.428**	-2.649***		
	(0.0226)	(0.0229)			(0.0102)	(0.00480)		
Age	-0.636**	0.136			-0.335*	0.119		
	(0.0388)	(0.428)			(0.0677)	(0.313)		
Work experience in fin. sector	0.598**	-0.202	-0.0474*	-0.0474*	0.280*	-0.257**	-0.0578**	-0.0578**
	(0.0336)	(0.206)	(0.0765)	(0.0765)	(0.0813)	(0.0231)	(0.0240)	(0.0240)
Operative responsibility	2.067*	-1.142			3.236**	-2.063*		
	(0.0586)	(0.148)			(0.0287)	(0.0605)		
Personnel responsibility	-0.493	-0.493			-1.173*	-1.173*		
	(0.405)	(0.405)			(0.0601)	(0.0601)		
Advisor	-2.330*	1.328			-1.768*	1.751**		
	(0.0755)	(0.119)			(0.0592)	(0.0352)		
Fund Manager	-0.977	-0.977	-1.247***	-1.247***	-2.025***	-2.025***	-1.265***	-1.265***
	(0.197)	(0.197)	(0.00785)	(0.00785)	(0.00313)	(0.00313)	(0.00319)	(0.00319)
Researcher	0.511	0.511			2.622*	-1.587		
	(0.454)	(0.454)			(0.0636)	(0.237)		
Fundamental analysis	-0.0334**	-0.000866	-0.0161	-0.0161	-0.0484**	0.00827	-0.0134	-0.0134
	(0.0188)	(0.952)	(0.123)	(0.123)	(0.0282)	(0.585)	(0.127)	(0.127)
Positive trend in hit rate	-21.55***	17.01***	-16.49***	16.33***				
	(0)	(0)	(0)	(0)				
Negative trend in hit rate	1.885	-1.245						
	(0.213)	(0.285)						
Recent success					-0.543	3.330***	0.943**	0.943**
					(0.643)	(0.00194)	(0.0353)	(0.0353)
Herding	-0.0387**	-0.0387**	-0.0333**	-0.0333**	-0.0145	-0.0929***	-0.0331***	-0.0331***
	(0.0377)	(0.0377)	(0.0162)	(0.0162)	(0.503)	(0.00137)	(0.00859)	(0.00859)
Constant	-1.847	18.93***	4.339***	3.653***	-8.856	22.26***	3.400***	2.787**
	(0.814)	(4.56e-06)	(0.000718)	(0.00295)	(0.183)	(1.58e-10)	(0.00324)	(0.0122)
Pseudo-R2	0.431	0.431	0.195	0.195	0.418	0.418	0.104	0.104
N	105	105	105	105	105	105	105	105

Table 2.11: Ordered logit estimation results for overconfidence (transformation of hit rate by quantiles)
This table presents regression results of financial professionals' characteristics on the level of overconfidence. Overconfidence (OVC) is the difference between self-rating and hit rate. Hit rate is the individual average of the survey forecasts. We code three categories, large deviation (0), small deviation (1) and no deviation (2) of forecast from the true process. Large deviations are predictions which indicate the opposite direction of the actual movement, whereas small deviations are expectations which are neither a correct forecast nor a large deviation. For the calculation of overconfidence we rescale the individual hit rate to 1 to 21 to correspond to the range of self-rating. Instead of using 21 equal intervals (as in the benchmark framework) we employ 21 quantiles. Dummy variables are denoted by "†". The level of significance is denoted by *** p≤0.01, ** p≤0.05, * p≤0.1. We report p-values in parenthesis for which we use robust standard errors.

Specification	(1)	(2)	(3)	(4)
Male	1.369		0.488	
	(0.170)		(0.616)	
Academic education	-1.969***		-1.608**	
	(0.00754)		(0.0108)	
Age	0.0393		0.0501	
	(0.546)		(0.324)	
Working experience in fin. sector	-0.111*	-0.0246	-0.0915*	-0.0378
	(0.0885)	(0.289)	(0.0690)	(0.101)
Operative responsibility	0.543		0.237	
	(0.502)		(0.753)	
Personnel responsibility	0.440		0.132	
	(0.430)		(0.795)	
Advisor	-0.799		-0.935	
	(0.300)		(0.210)	
Fund Manager	-1.911***	-1.588***	-1.841***	-1.590***
	(0.00239)	(0.00177)	(0.00197)	(0.00106)
Researcher	1.934*		1.479	
	(0.0881)		(0.169)	
Fundamental analysis	-0.0247**	-0.0113	-0.0159	
	(0.0411)	(0.247)	(0.117)	
Positive trend in hit rate	17.48***	15.71***		
	(0)	(0)		
Negative trend in hit rate	-1.908			
	(0.118)			
Recent success			0.479	0.541
			(0.449)	(0.257)
Herding	-0.0462***	-0.0321**	-0.0483***	-0.0354***
	(0.00947)	(0.0298)	(0.00242)	(0.00983)
Cut 1	-4.264*	-3.432***	-3.661*	-2.809**
	(0.0811)	(0.00359)	(0.0670)	(0.0126)
Cut 2	-4.136*	-3.327***	-3.553*	-2.712**
	(0.0918)	(0.00445)	(0.0758)	(0.0151)
Observations	105	105	105	105
Pseudo-R2	0.311	0.203	0.202	0.129

Figure 2.5: Survey question 2007, April

This figure displays the exact wording of the survey questions. US-Dollar/Euro forecasts

1) "How relevant are the following sources of information for your decisions/forecasts (please spend 100 % in total): [ ] % fundamental forecasts (economic and political factors); [ ] % technical analysis (charts, quantitative methods); [ ] % flows (who does what, which orders are in the market)."
2) "How good do you rate yourself compared to a random forecast?" The respondent was supposed to answer on a scale ranging with 21 categories. The lowest category was labeled with "significantly worse", the middle category with "equally", the best category with "significantly better".
3) "How good do you rate yourself compared to the average forecast of the forecaster panel?" The respondent was supposed to answer on a scale ranging with 21 categories. The lowest category was labeled with "significantly worse", the middle category with "equally", the best category with "significantly better".

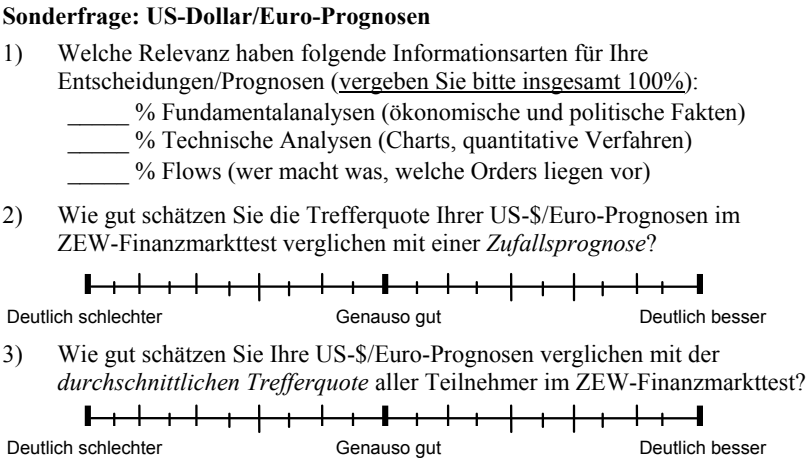

Figure 2.6: Survey question 2008, October

This figure displays the exact wording of the survey questions. Exchange rate expectations

1) "Please estimate the USD/EUR exchange rate in 6 months. Please give a range where you expect the exchange rate to be with 90% probability; Lower bound [ ]; Present rate [ ]; Upper bound [ ]."
2) "Most of the published business news does not surprise me at all." Respondents answered on a scale, which was labeled from 1 to 20. The lowest value was labeled with "completely disagree", highest value was labeled with "completely agree".
3) "How good do you rate yourself compared to the average forecast of the forecaster panel?" The respondent was supposed to answer on a scale which was labeled from 1 to 21. The lowest category was labeled with "significantly worse", the middle category with "equally", the best category with "significantly better".

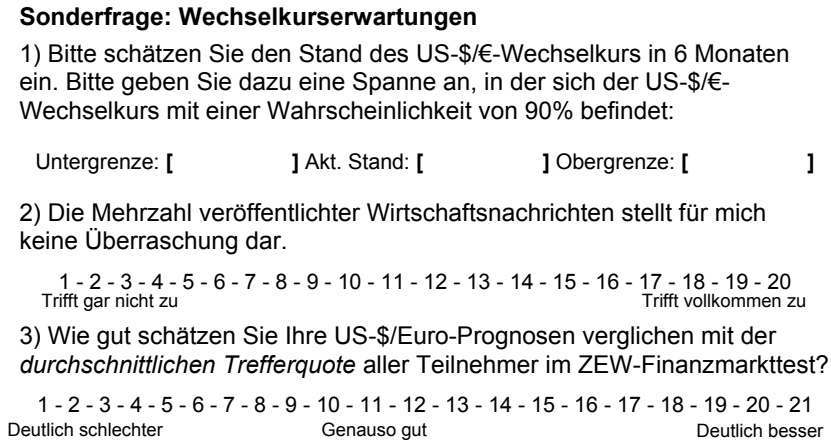

Table 2.12: Data sources

This table lists all data sources, which are used in the paper. The exchange rate data originates from the Deutsche Bundesbank, resp. WM/Reuters (accessed via Datastream). All other data is provided by the ZEW from their Financial Market Survey. This survey elicits individual foreign exchange expectations. On top of the regular survey we ask at particular times for additional information. This information includes demographic and job characteristics, three measures from which we derive the level of overconfidence as well as threshold values about what is believed to be an fx change. † The number of observations gives the gross number of respondents. This number does not necessarily equate to the number of observation which we use in our analysis since we clean the original data for inconsistencies.

Data	Source	Date	Observations†
Exchange rate of the USD/DEM	Deutsche Bundesbank	December, 1 1991 to December, 31 1998	na
Exchange rate of the USD/EUR	Datastream	January, 1 1999 to October, 31 2008	na
Expectations of the USD/EUR	ZEW Financial Market Survey	December 1991 to October 2008	na
Demographic characteristics	ZEW Financial Market Survey	September 2003, October 2006	257 (240)
Instruments of fx analysis	ZEW Financial Market Survey	January 2004, April 2007	287 (275)
Better-than-average	ZEW Financial Market Survey	July 2004, October 2008	275 (214)
Miscalibration, illusion-of-control	ZEW Financial Market Survey	October 2008	214
Threshold values of fx change	ZEW Financial Market Survey	August 1997, January 2006	201 (123)

Table 2.13: Calculation of hit rates

This table presents the method to compute the hit rates. Hit rates express the performance of exchange rate forecasts. In our study we use monthly forecasts, f_{it}, of the EUR/USD (resp. DEM/USD) exchange rate, S_t. The forecasts are directional forecasts six months ahead. The expectation building process can be described as a piece-wise defined function.

$$f_{it}(EUR/USD) = \begin{cases} 1 & \text{if } \frac{E_{it}[S_{t+6m}-S_t]}{S_t} > \varepsilon \\ 2 & \text{if } \varepsilon >= \frac{E_{it}[S_{t+6m}-S_t]}{S_t} >= -\varepsilon \\ 3 & \text{if } -\varepsilon > \frac{E_{it}[S_{t+6m}-S_t]}{S_t} \end{cases} \tag{2.2}$$

The forecast, f, taking the value one represents an expected appreciation of the USD, 2 equates to a sideways motion, and 3 means an expected USD depreciation relativ to the EUR. ε represents the threshold which corresponds to the deviation of the exchange rate which is believed to be a no change by the forecasters. We know from a survey of the forecaster panel that on average the forecaster associates a change of the exchange rate smaller than 3% with no change in the foreign exchange rate.
Using this information we model a directional times series of foreign exchange changes, d_t.

$$d_t(EUR/USD) = \begin{cases} 1 & \text{if } \frac{S_{t+6m}-S_t}{S_t} > 3\% \\ 2 & \text{if } 3\% >= \frac{S_{t+6m}-S_t}{S_t} >= -3\% \\ 3 & \text{if } -3\% > \frac{S_{t+6m}-S_t}{S_t} \end{cases} \tag{2.3}$$

Wishing to calculate a precise forecasting performance measure we employ an approach which acknowledges that the experts can choose between three options. A hit rate is coded in three categories: Large deviations are predictions which indicate the opposite direction of the actual movement, whereas small deviations are expectations which are neither a correct forecast nor a large deviation. The code values are 0-1-2 in a way that a higher hit rate is better. This performance measure has been used already earlier for ZEW exchange rate forecasts (e.g. Nolte et al., 2008). Using the series of directional exchange rate changes, d_t, and the individual forecasts, f_{it}, we calculate individual hit rates.

$$HR_{it} = \begin{cases} 0 & \text{if } |F_{it} - D_t| = 2 \\ 1 & \text{if } |F_{it} - D_t| = 1 \\ 2 & \text{if } |F_{it} - D_t| = 0 \end{cases} \tag{2.4}$$

Calculating the mean over the time for each expert we obtain a precise measure of the true performance of the experts for our analysis. This performance indicator is enhanced by two precautionary measures which we want to emphasize here. First, we consider all forecasts of one person. Second, we exactly determine whether the forecast was right or wrong. In this respect, the survey participants have a time window of about two weeks to submit their forecasts. To achieve a maximum of accuracy and consistency we use individual forecasting days, i.e. we compare the forecasted change of the exchange rate to the realized exchange rate in exactly six months for each individual separately.

Chapter 3

Identification of the Effectiveness of Central Banks' Foreign Exchange Interventions[1]

[1]Thanks go to Marcel Fratzscher, Lukas Menkhoff, and Lucio Sarno for input and helpful discussions as well as participants of the ECB-IPA economic seminar for their comments.

3.1 Introduction

Foreign exchange interventions of central banks are a common policy instrument in order to affect the level of the exchange rate. Today, they are used particularly often by central banks of emerging market economies (for a review of studies on these countries see Menkhoff, forthcoming). However, the effectiveness of foreign exchange interventions is subject to debate when interventions are sterilized. Previous works argue about both, the effectiveness of interventions as well as relevant channels of transmission. Identification of the effect of foreign exchange intervention is exacerbated for two reasons: (i) confounding factors might contemporaneously affect the exchange rate, and (ii) reverse causality could be present between foreign exchange interventions and exchange rates. Among the disputed transmission channels are a portfolio balance channel, a signalling channel, and a coordination channel.

This paper proposes avenues to contribute to the ongoing discussion in three dimensions: (i) reviewing three success criteria to measure the effectiveness of foreign exchange interventions in affecting the exchange rate, (ii) proposing strategies of identification, (iii) surveying transmission channels and their identification. The methodologies which are discussed here are based on panel data for the lack of cross-country studies in previous literature. However, all approaches can also be applied to a country study utilizing time series data.

Foreign exchange interventions can be considered effective if it reaches its policy targets. Commonly used targets are affecting the level of the exchange rate, easing the speed of appreciation/depreciation, smoothing exchange rate volatility, and/or building up international reserve buffers (Neely, 2001, 2008; Adler and Tovar, 2011). I focus on measuring the effectiveness of foreign exchange interventions in affecting the exchange rate. More specifically, I consider a foreign exchange intervention to be effective if it results in a significant change of the exchange rate, a directional change of the exchange rate, or if it achieves to ease the speed of appreciation/depreciation.[2]

As noted above, the identification of a causal relationship might be exacerbated due to confounding unobserved factors and reverse causality. With respect to the former, I propose two solutions: first, including other exchange rate determinants in order to control for contemporaneous exchange rate shocks which might mask the actual effect of the foreign exchange intervention; second, i.e. a measure of the hypothetical exchange rate development which would have occurred, had the intervention not taken place. Regarding the issue of reverse causality, estimating the central bank intervention function might disentangle the joint effects of past exchange rate movement, the likelihood and amount of foreign exchange intervention, and future exchange rates have on exchange rates. Factors that render the identification of foreign exchange interventions' effectiveness easier are higher frequency of analysis, larger size of interventions, concerted interventions, and floating exchange rate regimes.

For the identification of the transmission channels, information about two additional variables

[2]There are many studies analyzing other targets of foreign exchange interventions, such as exchange rate volatility (for a detailled literature review, see e.g. Edison, 1993; Sarno and Taylor, 2001; Menkhoff, 2010).

is useful: public information about the intervention and foreign exchange order flow. The former provides information about market participants' knowledge about the intervention. If participants do not know anything about the intervention, the signalling channel cannot be effective. On the other hand, if agents know about the intervention, but the actual intervention is not conducted (so-called unrequited interventions), a portfolio balance channel cannot be in place. The second variable, order flow, provides useful information with respect to the market reaction when interventions occur. If market agents react to an intervention by changing their trades in the same direction as the intervention, the coordination channel prevails.

I explain the different measures of success in Section 3.2. In a consecutive step, I propose strategies to identify the causal effect of interventions on exchange rates, which is explained in greater detail in Section 3.3. The next Section 3.4 surveys the different transmission channels trough which interventions could be effective. The penultimate section (Section 3.5) briefly summarizes other aspects of foreign exchange interventions which are of interest for the analysis, such as intervention size and exchange rate regime. Section 3.6 concludes.

3.2 Success measures

I distinguish three different measures of success: (i) a significant change of the exchange rate in the desired direction, (ii) a change of direction of the exchange rate, and (iii) an easing in the speed of appreciation/depreciation. The threshold for a successful intervention decreases in the order of the discussion.

3.2.1 Effect on exchange rate changes

A first success criterion is the effect of foreign exchange intervention on the exchange rate (see for example Adler and Tovar, 2011).

$$\Delta s_{i,t} = \alpha_0 + \alpha_1 IA_{i,t} + \alpha_2 X_{i,t} + \varepsilon_{i,t} \tag{3.1}$$

$\Delta s_{i,t}$ corresponds to the logarithmic difference between exchange rate at time t and the previous exchange rate at $t-1$. $IA_{i,t}$ is the signed amount of the intervention at time t and $X_{i,t}$ represents other covariates which might explain the change of the exchange rate apart from the intervention. The intervention variable takes positive values when measuring purchases of the foreign currency and negative values for sales of the foreign currency. The exchange rate is quoted in price notation of the foreign currency. A successful intervention would be associated with an estimated $\widehat{\alpha_2}$ that is significantly positive. This means that the central bank purchases foreign assets and sells its domestic currency. For a successful intervention, the foreign currency must appreciate which corresponds to an increase in the exchange rate. Note that the analysis might be biased due to other factors affecting the exchange rate change. One could control for

that by including other control variables X in the regression. The selection of feasible covariates is described jointly with the issue of endogeneity in the next section, 2.3.

3.2.2 Change in exchange rate direction

Another success measure for foreign exchange interventions is a change in the direction of the exchange rate (cf. Humpage, 1999). Compared to the previous measure, this criterion decreases the requirements which characterize a successful intervention.

$$D^{+/-}(\Delta s_{i,t}) = \alpha_0 + \alpha_1 IA_{i,t} + \alpha_2 X_{i,t} + \varepsilon_{i,t} \tag{3.2}$$

with $D^{+/-}(\Delta s_{i,t})$ defined as the success criterion. This means that the dummy variable takes the value one if the exchange rate is altered in the desired direction, and zero otherwise.

$$D^{+/-}(\Delta s_{i,t}) = \begin{cases} 1 & \text{if } \Delta s_{i,t} > 0 \& IA_{i,t} > 0 \\ 1 & \text{if } \Delta s_{i,t} < 0 \& IA_{i,t} < 0 \\ 0 & \text{if } \Delta s_{i,t} \geq 0 \& IA_{i,t} < 0 \\ 0 & \text{if } \Delta s_{i,t} \leq 0 \& IA_{i,t} > 0 \end{cases} \tag{3.3}$$

A successful intervention would infer that the coefficient on $IA_{i,t}$, again, is significantly positive. Compared to the methodology used above, this kind of analysis has the advantage that noise, resulting from other factors which are not included in the covariates X, can be avoided.

3.2.3 An easing in the speed of appreciation/depreciation

The last measure of success is the possibility of a reduction in the speed of appreciation of the domestic currency. Taken into account that many central banks react to large appreciation trends with interventions in order to smoothen exchange rate fluctuations, a success could also be measured as a reduction in the speed of appreciation/depreciation (cf. Adler and Tovar, 2011).

$$\Delta\Delta s_{i,t} = \alpha_0 + \alpha_1 IA_{i,t} + \alpha_2 X_{i,t} + \varepsilon_{i,t} \tag{3.4}$$

Note that for this measure the left-hand side variable is the second difference of the exchange rate. It is obviously the success criterion with the lowest threshold for finding foreign exchange interventions to be effective. The criterion does not require the exchange rate to change the direction nor to change by a significant amount, it is only the reduction in the speed of appreciation or depreciation which is interpreted as a statistically significant success.

3.3 Identification of the effect

Basically, two issues might arise when trying to identify a causal relationship between exchange rates and interventions. First, other confounding factors might also affect the exchange rate and thereby spur the effect of the intervention. Second, central banks reacting to exchange rate changes might induce reverse causality. The first issue is addressed by including other exchange rate shocks or computing a counterfactual of the exchange rate. The latter is taken care of by modeling the central bank's reaction function.

3.3.1 Controlling for other confounding exchange rate shocks

When we analyze the success of a foreign exchange intervention, we face the typical problems related to identification of a treatment effect. The foreign exchange intervention is a policy event and we analyze its effect on the exchange rate. However, exchange rates are asset prices which depend on many, perhaps time-varying, factors (Bacchetta and Wincoop, 2004). If the other exchange rate determinants change at the same time as the intervention takes place, the change of the exchange rate cannot be attributed solely to the intervention treatment, but also to changes in the other determinants. Including potential drivers of the exchange rate as covariates $X_{i,t}$ in the regression enables us to identify the effect of the intervention. In general, the idea behind including covariates is to capture all other shocks which affect exchange rate changes. The selection of covariates depends on the frequency of analysis. For daily exchange rate changes other factors come into mind than for monthly changes. For example, for daily changes the four factors of Levich and Pojarliev (2008) and Fratzscher (2009) are potentially good candidates. Further, one might also want to use other macro exchange rate shocks, such as changes in the VIX or TED-spread. On a monthly frequency, traditional exchange rate determinants seem to be more appropriate, e.g. interest rates, inflation rates, growth, exports, money etc. (e.g. Sarno and Valente, 2009).

3.3.2 Exchange rate counterfactual

A direct attempt to obtain a counterfactual of the exchange rate would be to estimate it directly (for a variant of this idea see e.g. Fatum and Hutchison, 2010). This approach has the advantage that not all other shocks that took place around the intervention date have to be controlled for. Controlling for those shocks might be potentially impossible, anyway, since many of them might not be observable. Based on a restricted sample where no interventions take place, an out-of-sample prediction can be made which serves as counterfactual.[3]

$$\Delta s_{i,t} = \alpha_0 + \alpha_1 X_{i,t} + \varepsilon_{i,t} \forall t : IA_{i,t} = 0 \tag{3.5}$$

[3]This approach is closely related to the event study approach which has met increasing interest during the last years (for a survey see Neely, 2005).

Note that $\widehat{\Delta s_{i,t}}$ is estimated not only for the time periods t, where no intervention took place, but also for the intervention dates.

$$\Delta s_{i,t} - \widehat{\Delta s_{i,t}} = \alpha_0 + \alpha_1 IA_{i,t} + \varepsilon_{i,t} \tag{3.6}$$

Two issues are crucial in this procedure. First, since the counterfactual is an out-of-sample prediction of the exchange rate, the predictive quality of the implemented exchange rate model has to be very high. Otherwise, the predicted counterfactual is not meaningful at all. One indicator for the feasibility of the model could be a large out-of-sample R^2, for example. However, the success probability to obtain a high R^2 for out-of-sample exchange rate predictions might be small since many studies show the limitations of exchange rate models (for two benchmark studies see Meese and Rogoff, 1983; Cheung et al., 2005). Again, the frequency of exchange rate changes might be crucial as for example daily changes might be easier to estimate than long term forecasts. Second, choosing the correct event window around the intervention dates is essential. The exchange rate model as well as the predicted counterfactual should not be affected by the intervention. So, on the one hand side there has to be a sufficient time difference between the actual intervention date and the dates which serve for the estimation of the counterfactual. On the other hand side, event windows are defined to be not overlapping. This becomes more and more difficult for longer event windows.

3.3.3 The central bank's reaction function and unexpected interventions

The aforementioned endogeneity bias is stems from the fact that central banks react to past exchange rate developments with their interventions. Consequently, it is not clear whether an intervention causes an exchange rate change or whether it is the exchange rate change that triggers the intervention. One avenue to address this issue is to estimate a central bank's reaction function (Almekinders and Eijffinger, 1996; Adler and Tovar, 2011).[4]

$$IA_{i,t} = \alpha_0 + \alpha_1 Z_{i,t} + \nu_{i,t} \text{if} IA_{i,t} \neq 0 \tag{3.7}$$

For all dates, on which interventions took place, a reaction function has to be estimated. Predicted residuals $\widehat{\nu_{i,t}}$ are used to calculate a series of unexpected interventions.

$$IA^u_{i,t} = \begin{cases} \widehat{\nu_{i,t}} & \text{if } IA_{i,t} > 0 \\ 0 & \text{if } \Delta s_{i,t} < 0 \& IA_{i,t} < 0 \end{cases} \tag{3.8}$$

$$\Delta s_{i,t} = \beta_0 + \beta_1 IA^u_{i,t} + \alpha_2 X_{i,t} + \varepsilon_{i,t} \tag{3.9}$$

[4]Several studies have analyzed the foreign exchange intervention reaction function of central banks independently from effectiveness Kim and Sheen (e.g. 2002); Frenkel et al. (e.g. 2004b); Ito and Yabu (e.g. 2007)

In combination with the other solutions described above, i.e. including covariates X in the regression model, it is challenging to distinguish between factors X and Z. However, this is necessary for identification. Eventually, there seems to be a trade-off between addressing the issue of confounding factors and avoiding reverse causality.

3.3.4 Frequency of analysis

While the approaches described above have to be adapted to the frequency of the analysis, we can note that with increasing frequency a causal relationship is more easily identified. Problems related to treatment identification and reverse causality arise because of other confounding factors and are due to the reaction of central banks on the exchange rate. With increasing frequency, the effect is more easily identified. First, for short term horizons, exchange rate models perform significantly better (Cheung et al., 2005). Second, central banks react to large swings of the exchange rate, but do not target daily exchange rate changes (Neely, 2001; Canales-Kriljenko et al., 2003). Therefore, analyzing daily changes in the exchange rate should not be affected by reverse causality since it is not the daily change but rather long term swings which trigger interventions.

3.4 Transmission channels

The following subsections provide an introduction to the transmission channels of foreign exchange interventions as well as approaches to identify these channels empirically.

3.4.1 Theoretical transmission channels

In general foreign exchange interventions can be separated in sterilized and non-sterilized interventions. For the latter, the effect is rarely disputed. If a central bank buys foreign currency and pays for it by issuing new domestic currency, national interest rates might decrease and the depreciation effect of the exchange rate is evident. In the case of sterilization, however, the central bank would offset the increase in the amount of domestic currency by monetary policy operations. Consequently, interest rates are likely to remain stable. Thus, the effectiveness of interventions in this situation is not as clear-cut. Sarno and Taylor (2001) distinguish between three channels through which sterilized interventions might still have an effect: a portfolio balance channel, a signalling channel, and a coordination channel.

The portfolio balance channel assumes domestic and foreign assets to be perfect substitutes. Continuing the example from above, assume that the central bank has conducted a sterilized purchase of foreign assets. Due to the sterilization, the composition of assets must be different. Since interest rates are unchanged, this must be accompanied by a a change in the exchange rate so that investors are willing to hold a larger share of domestic assets in their portfolios. As a result, the foreign price of a domestic asset falls (cf. Branson and Henderson, 1985)

The second channel is the so-called signalling channel (Mussa, 1981). The signalling channel backs on the commitment signal of a central bank in purchasing domestic or foreign assets. Assume a central bank intervenes in the foreign exchange market and purchases foreign assets, which will then be in the central bank's balance sheet. If the intervention was not successful or if the central bank decides to conduct a restrictive monetary policy in the future (which will then create appreciation pressure on the domestic currency), foreign assets on the central bank's balance sheet will loose in value. Thus, in conducting foreign market operations, the central bank can credibly commit itself to a certain policy and signal this to market participants.

The third and last channel is a coordination channel (Taylor, 1995). It builds upon the idea that central banks hold information that is superior to the information of other market participants. Imagine a situation in which the foreign exchange rate is misaligned and far away from its fundamental value, but only the central bank is aware of this misalignment. Foreign exchange interventions of the central bank could be used to signal the misalignment to the market. It is the analysis of the emerging order flow that leads market participants back to equilibrium. In this setting, the central bank is nothing but a market maker who creates a tipping point and forms a new mean reverting trend.[5]

3.4.2 Identification of transmission channels

There are several approaches to identify the aforementioned channels. Using the same order as before, I first explain the portfolio balance channel, followed by the signalling channel, and conclude with a discussion of the coordination channel.

Portfolio balance channel. Fatum (2010) differentiates between the portfolio balance and signalling channel by analyzing Japanese interventions. His approach uses the zero lower bound of the Japanese monetary policy together with news paper reports of interventions. Since the BOJ sets its interest rates close to zero, by purchasing foreign currency it cannot signal further interest rate changes. As an additional control Fatum (2010) utilizes interventions reports in the media to disentangle the effect between signalling and portfolio balance channel. He concludes that the latter was more prevalent in the Japanese case.

Signalling channel. The distinction of interventions in hidden and public ones allows us to identify the signalling channel. Note that both secret and public interventions are regularly conducted. As a number of studies show, there are differences between the reported interventions and the actual interventions (cf. Klein, 1993; Frenkel et al., 2004a; Galati et al., 2005; Chang, 2006; Fischer, 2006).[6] In general, four types of interventions can be distinguished: (i) announced interventions, (ii) expected, but not conducted interventions, (iii) hidden interventions, (iv) announced, but not conducted (unrequited) interventions (Dominguez and Panthaki, 2007).

[5]Related to the coordination channel, Girardin and Lyons (2008) speak of a damping channel, which means that intervention order flow crowds out the effect of regular order flow.

[6]Results for the FED, SNB, BOJ show that 45-90% of interventions are reported, and 60-100 % of reports are correct. The larger the interventions, the more likely it is that they are reported. Further, precision also increases over time. The results differ quite a lot between countries with SNB being most transparent in its announcements.

Prerequisite for any analysis in this direction is the availability of both, actual intervention data as well as reports on these interventions.

Several studies analyze the reasons for central banks to intervene either secretly or publicly. In general, public announcement of interventions have virtuous effects in themselves if they clarify the reasoning of the intervention (Beine et al., 2009). That is why central banks make use of this feature either to camouflage interventions or to announce them. The determinants of secret or public interventions are analyzed by Beine and Bernal (2007). The authors find two sets of reasons for central banks to opt for secrecy: first, the likelihood of detection, and, second internal motivations, such as targeting internal foreign exchange intervention thresholds. Beine and Lecourt (2004) conclude that concerted interventions are more likely to be public. Barnett and Ozerturk (2007) provide complementary evidence in a theoretical framework.

Dominguez and Panthaki (2007) study unrequited announcements of interventions, i.e. interventions that are announced but not executed afterwards. Obviously, the estimated effect relies solely on the signalling channel, which is found to be significantly positive. A paper by Fratzscher (2008) analyzes oral foreign exchange interventions of central banks, for example "hawkish" comments with respect to the alignment of the exchange rate. The study finds a significant success for foreign exchange interventions over the short to medium run.

Coordination channel. For a review of the literature on coordination, see e.g. the literature survey by Menkhoff (2010). Evans and Lyons (2005) are the first to implement order flow for the analysis of foreign exchange interventions. Analyzing the impact of ordinary order flow, they show the benchmark impact for any secret foreign exchange intervention as such kind of interventions should not differ from other ordinary order flow. Utilizing an hourly DEM/USD data set, the authors find a price impact of 0.44% from a billion USD order flow. The study of Girardin and Lyons (2008) goes one step further by analyzing the link between regular order flow and intervention order flow. Although the authors find no significant evidence for neither a coordination, nor a damping channel, they do find that intervention order flow impacts prices even when controlling for other order flows. Another route to address the presence of a coordination channel is to implement a structural model (Reitz and Taylor, 2008), where the impact of order flow is linked to changes in fundamentals. The study finds evidence for both the coordination channel as well as for the effectiveness of interventions.

3.5 Various features of foreign exchange interventions

Central bank interventions in currency markets are subject to a range of circumstances and design options. I list some of the crucial differences which are expected to be important for the effectiveness of interventions.

3.5.1 Size of interventions

Interventions vary in their size, which often depends on currency market size. For example, the size of interventions in the CAD or AUD is far smaller than the size of interventions needed in order to influence a large market, such as the JPY/USD market. The analysis of interventions in a panel setting across countries has to take this into account by scaling interventions with a market size factor. Two approximations come into mind, GDP and currency turnover.

GDP is a standard measure for the size of an economy. Even though it is likely to be closely related to the size of asset markets, three distortions might arise. First, GDP measures the economic development of a country which can be different from currency market size. Second, offshore centers which have large financial transactions as a result of their business model are not very well represented by GDP, as it is the case in e.g. Singapore or Hong Kong. Third, safe haven currencies could also be decoupled from the GDP of its country of origin. The best example is the Swiss Franc which has been highly demanded since 2010 due to its role as a safe haven currency.

Thus, currency turnover is probably a more precise measure for the size of a currency market. As the foreign exchange market is a large over-the-counter market there is no such thing as a single source for market turnover of a particular currency or a currency pair. A potential data source is provided by the BIS "Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity" (BIS, 2010). This survey estimates the size of currency turnover, but is available only in a three year frequency.

To be effective in terms of the portfolio balance channel, an intervention must be sizeable in the sense that it must notably change the allocation in investors' portfolios. A correct measurement of the intervention size is thus essential. Exemplary evidence can be attributed to Chaboud and Humpage (2005) who find that the large, infrequent interventions of the Bank of Japan are particularly effective.[7]

3.5.2 Concerted interventions

Interventions can be conducted jointly by more than one central bank, i.e. a concerted intervention, or by an individual central bank. An example for an important concerted intervention is the G-7 intervention in the beginning of 2011 in the aftermath of the Japanese Tsunami.

Interventions are likely to be more effective when performed concertedly for two reasons. First, the size of the intervention is probably larger if more central banks are involved in the intervention. This argument utilizes the portfolio balance channel as the larger size of the interventions might reallocate portfolios (see the section above on the portfolio balance channel). Second, concerted interventions give a stronger signal to investors because more central banks show the commitment to a particular monetary stance in the future.

[7] Interestingly, the size and frequency of intervention can also be used to identify a causal effect of interventions (Kearns and Rigobon, 2005).

Humpage (1999) and Fatum (2002), for example, find that coordinated interventions are more effective than unilateral ones.

3.5.3 Exchange rate regimes

A last feature of interventions, which is of importance for their effectiveness, is the corresponding exchange rate regime. For free floaters the exchange rate can fluctuate without any exchange rate band. Thus, an intervention is completely exogenous or a reaction to an exogenous news event. In contrast, central banks in a fixed or peg regime give themselves a policy band and therefore have to intervene once the exchange rate approaches the edges of the target band. In the model of Krugman (1991) there is the so-called smooth pasting effect, which means that the exchange rate clusters close to the edges of the band. An identification of the intervention effect on the exchange rate is therefore exacerbated. Melvin et al. (2009) analyze the crawling exchange rate regime of Russia and find a stabilizing effect of interventions on volatility and price.

3.6 Conclusion

Foreign exchange interventions of central banks are a common policy instrument in order to affect the level of the exchange rate. Today this measure is used particularly often in emerging market economies. However, the effectiveness of foreign exchange interventions is disputable when interventions are sterilized. This paper surveys success measures of foreign exchange intervention effectiveness and reviews strategies for identification and related issues, such as the relevant size of interventions and exchange rate regimes.

Intervention effectiveness can be measured as a significant change of the exchange rate, a directional change, or a reduction in the speed of appreciation/depreciation. Particular attention has to be paid to the identification of a causal relationship due to the presence of unobserved, confounding factors and reverse causality. The solutions that are proposed in this paper entail either to control for other confounding exchange rate shocks and / or to compute a counterfactual of the exchange rate from tranquil periods in order to cope with the first issue. For the latter challenge I propose to estimate the unexpected component of interventions via a central bank's reaction function. Previous evidence suggests that identification problems decrease with increasing frequency of the analysis.

Chapter 4

Local Financial Development and Household Welfare: Microevidence from Thai Households[1]

[1]This chapter is based on the paper by Gloede and Rungruxsirivorn (2012). Thanks go to the participants in the annual conferences of the German Economic Society (VfS), the Research Committee on Development Economics of the German Economic Association (AEL)/ University Meets Microfinance, the Society of the Study of Emerging Markets (SSEM) and several university seminars. We are particularly indebted to Thorsten Beck, Martin Brown, Bernd Hardeweg, Kenneth Harttgen, Tobias Lechtenfeld, Lukas Menkhoff, Matthias Schündeln, Eva Terberger, Hermann Waibel, Andreas Wagener, and Frank Westermann for their helpful comments. Financial support by the German Research Foundation (DFG) is gratefully acknowledged.

4.1 Introduction

A large set of studies has examined the link between financial development and economic development on the macro level. Most of the empirical studies find that financial development leads to larger economic growth.[2] We use this finding from the macro literature as the initial motivation of our analysis at the micro level. If financial development increases economic growth at the macro level, then it should have some impact at the micro level, too. In particular, we ask the following question: does financial sector development improve household welfare? Thus, our aim is to see whether the relationship, which can be found at the macro level, also applies at the micro level. We expect to learn more about how household welfare is linked to financial sector development and the channel of impact. Hence, we contribute to the discussion about the relationship between financial development and welfare, which is measured by household investment and consumption.

In order to conduct our analysis, we use a unique comprehensive data set. We estimate the impact of financial development on about 2,200 Thai households, for which we have detailed information relating to their household and village characteristics. Our data set is also particularly rich in financial data, such as household lending, borrowing, denials of credit etc. To obtain a measure of financial development, we use this information in the estimation framework of Guiso et al. (2004). The approach estimates coefficients of district dummies in a regression of credit constraints on a large set of household and regional characteristics. For our baseline indicator, we follow the original approach and use a dummy to indicate credit rationing, i.e. whether a household receives the full amount of credit demanded. For robustness checks we use the expected time to get a fixed amount of credit as an approximation of credit constraints. The estimated coefficients of district dummy variables indicate whether a household in a particular district is more or less likely to face credit constraints. The lower the likelihood of credit constraints, the more financially developed the district is. Both versions of credit constraints seem to be appropriate for the financial market in rural Thailand.

Our results at the household level confirm that financial development does contribute to higher welfare. The detailed analysis shows that financial development leads to higher investment. Household's investment is 55% larger in the financially best developed district compared to the least developed district. The profitability of investment reassuringly remains of a similar magnitude. The results regarding the effect of financial development on household consumption also show a positive impact but do not support the beneficial role of financial development to the same extent as they do for investment. Financial development improves consumption levels by enabling households to spend more money through credit financing. In this context, financial development increases the possibilities of financing consumption. When it comes to the role of finance as a risk coping mechanism, financial development is not capable of substituting savings as a coping instrument. The effect of financial development on consumption smoothing is limited throughout. Given our results, the main transmission channel between financial development

[2]For recent counter-evidence see Demetriades and James (2011).

and household welfare seems to be through investment.

Our study contributes to combine three streams of literature: (i) studies on the welfare effects of financial development at the macro level, (ii) specific studies of the welfare impacts of microfinance institutions at the micro level, (iii) works on access to credit. The first stream of literature looks back on a long tradition. It has been a stylized fact that income growth correlates with an accumulation of financial assets (Gurley and Shaw, 1967). Proceeding papers focusing on the causal direction of finance and growth (e.g. King and Levine, 1993) tend to observe the effect running from finance to growth.[3] In terms of persistence, the relationship between financial development and real economic activity is rather over the long term horizon (Darrat et al., 2006). Other studies turn the focus on the link between financial development and growth related issues, like financial system structure (for a survey see Demirgüç-Kunt and Levine, 1996), institutional settings (Demirgüç-Kunt and Maksimovic, 1998; Graff, 2003), child work (Dehejia and Gatti, 2005), and poverty (Jalilian and Kirkpatrick, 2005). Part of this stream of literature is covered by Chantapong (2006). Since she focuses on Thailand, we mimic her in using the Northeast of the country as our area of interest. However, Chantapong (2006) is more closely related to the macro literature than our study, which is visible in three dimensions: geographical level, measurement, and methodology. First, the study covers all Thai provinces, whereas our work focuses on the households of three provinces with local financial development on the district level. Second, we address the household decisions of investment and consumption as well as local financial development as access to credit. In contrast, Chantapong (2006) analyzes GDP per capita and financial development, which is measured as the macro aggregate of deposits, credits, and number of bank branches. Third, Chantapong (2006) implements VAR and Granger causality tests as the tool to address the research question of finance and growth. She finds a positive relationship between growth and finance, which is bidirectional in terms of Granger causality.

The second area of literature focuses on a particular part of the financial system, microfinance institutions. These programs have attracted particular interest as ways to overcome poverty. Several studies evaluate microfinance programs (Amin et al., 2003; Burgess et al., 2005; Menkhoff and Rungruxsirivorn, 2011). Nevertheless, the role of financial development for household development in general, rather than microfinance in particular, has not been addressed.

Thirdly, our research is also related to the works on access to credit. There are various studies on the impact of access to finance at the firm level as well as at the household level (Fafchamps and Schündeln, 2010; Beck and Demirguc-Kunt, 2008). Access to credit and the financial market in general is the basis of our indicator of financial development. As mentioned above, we follow Guiso et al. (2004) by using access to credit as a financial development indicator. This is the basis for our subsequent analysis of the welfare effects on the household.

Thailand provides an interesting case for studying this issue for various reasons. First the

[3] A study arguing for a negative effect is Ram (1999).

Thai financial markets are highly separated from one another because of the geographical distance between them, so that individuals cannot access financial markets or engage in the informal arrangements other than the local ones. Second there are differences in financial conditions across provinces, districts or even villages. The differences in local financial markets have well described in earlier studies on the Thai rural financial markets by Siamwalla et al. (1990) and Townsend (1995b). Our paper also documents the differences in financial settings between districts when we construct an indicator of local financial development. Finally, rural households live in an environment characterized by low access to financial services, a high incidence of risks and income shocks, so that access to financial market is still important to their investment decisions, consumption and welfare.

The paper is structured as follows. Section 4.2 presents the data set and provides some descriptive statistics. Section 4.3 derives our indicators of financial development. Section 4.4 provides the analysis of the relationship between financial development and the household welfare indicators. Section 4.5 deals with robustness issues and Section 4.6 summarizes the paper and provides our conclusion.

4.2 Data set and summary statistics

The following sections introduce the data set (Section 4.2.1) and deliver some descriptive statistics on the data (Section 4.2.2).

4.2.1 Data collection

The data used in this study originates from the project "Impact of shocks on the vulnerability to poverty: consequences for development of emerging Southeast Asian economies", funded by the German Research Foundation (DFG FOR 756). An initial cross-sectional survey was carried out in the northeastern region of Thailand between April and June 2007. The northeastern region is deliberately chosen as it is considered to be the poorest region in Thailand. Three provinces are then selected, namely Buri Ram, Ubon Ratchatani and Nakhon Phanom.

Households are chosen following a three-stage stratified sampling procedure where provinces are constituted strata and the primary sampling units (PSU) are sub-districts. Within each of the three provinces, sub-districts are first randomly selected with probability proportional to size by a systematic sample from a list ordered by population density.[4] Within each sub-district, two villages are chosen at random. Finally, within each village, 10 households are randomly selected. This results in a total of 2,186 households taken from 220 villages in 110 sub-districts (45 districts) of the three provinces. Details on the sample selection of this survey are explained by Hardeweg et al. (2007).

[4]It is important to cover the whole range of geographical regions for our analysis of local financial development since financial services can differ drastically between rural and urban areas. Population-proportional sampling ensures proportional coverage of densely (peri-urban) and less densely populated (rural) areas.

The survey includes information on household demographics, occupation, health status, education, agricultural activities, off-farm employment activities, household businesses, income, expenditures, assets, borrowing, lending, savings, remittances and public transfers in the one-year period of May 2006-April 2007. Detailed information on borrowing activities including credit denials and credit defaults are also covered and constitute the basis of our indicator of financial development.

Secondary data on economic development indicators at the district level, e.g. number of schools, factory plants, and others were extracted from the Department of the Provincial Administration's District Statistics and the Provincial Cooperative Offices' Cooperative Statistics.

4.2.2 Descriptive statistics

Table 4.1 gives summary statistics of the key variables for the households of our sample. Panel A covers the main demographic figures. The average family size is 3.98 persons or 2.23 in adult equivalent units.[5] About 1.3 children live in each household. The majority of the households are male-headed but female-headed households are not uncommon. About 27 percent of Thai households have a female head. 78% of household heads are married. The average household head is of advanced age but still economically active. The average age of the household head is 55 years. The educational level of these households is low. The average year of schooling for the head of household is only 5 years. The monthly consumption expenditure for the average household is 6,552 THB, which is about 400 US-Dollars in purchasing power. More than half of the households had to cut their consumption due to the consequences of a shock.

Household business and finance statistics are captured in Panel B. Household occupations are classified into six groups according to the main occupation of the head of household. These groups are farm households, wage earners in the informal sector, wage earners in the formal sector, government officials, business owners and the group of the economically inactive, which includes unemployed and retired citizens. The most common occupation is farming, followed by the "economically inactive" group - of which a large proportion of about 70% is found to be the elderly. The average monthly income of a household is nearly 7,400 THB (445 PP-USD) during the period covered by the survey. As households of different size and composition have different needs, we use equivalence scales to adjust household income. Household income per adult equivalent is about 3,400 THB (205 PP-USD). We note that household income is composed of income from four sources: net income from farming, net income from household business, wage labor income and other non-labor income such as land rent, but exclude remittances and transfers. We exclude the latter two because we aim for an income aggregate before any coping strategy is taken into account. The value of assets which is owned by the average household amounts to 1,000,000 Baht (61,000 PP-USD). As to the type of assets, land and housing constitute the main assets of rural households, accounting for about 70 percent of

[5] We use the OECD-modified scale by Haagenars et al. (1994) which treats the household head with full weight, each additional adult with 0.5 weight and each child with 0.3 weight.

household assets. Next in importance to land are household durable assets, e.g. motor vehicles or equipment, which are used in agricultural production and households' businesses. Savings, livestock and stored crops are included in the aggregate but are negligible in size. The significance of land and housing is confirmed by the large fraction of land owners, which is about 90%. Turning our attention to the primary income source, farming, we find that the average area used for crop production is about 3 hectares. Average expenditures for farming total 18,500 THB (1,100 PP-USD). These investments yield revenues of 48,500 THB (3,000 PP-USD). Moving to the incidence of credit rationing about 10 percent of the households report credit rationing. The observed default rate is low as only 2 percent of the households state that they have defaulted on loans during the reference period. The incidence of late repayment is somewhat higher. About 6 percent of the households report arrears on loan payments.

Thailand is geographically divided into six regions and 76 provinces. Each province is divided into districts, which in turn are divided into sub-districts and then villages. Each province has one capital district which is the most developed area in the province. Panel C of Table 4.1 presents the basic characteristics of the sample districts. Clearly, these districts are heterogeneous, consisting of both economically more and less developed regions. Around a quarter of the districts are municipal districts. There are about four schools and one university on average in the district where a household resides. Needless to say, schools are relatively evenly distributed whereas universities are clustered in particular districts and most districts do not have a university at all. The average district in which a household resides has about one shopping mall and about 17 factory plants.

4.3 Indicator of financial development

Starting from household and financial data at the household and village level, we estimate an indicator of *local* financial development in 45 districts from the northeastern region of Thailand. This approach is used by Guiso et al. (2004); they estimate local financial development in developed Italy. They propose that a region is financially less developed if ceteris paribus credit denials in the same region are large. Following their approach we employ a linear probability model and regress a dummy to indicate credit rationing (CR) on household and village characteristics (X) as well as on regional dummy variables for each district (Z):

$$CR = X\beta + Z\gamma + \varepsilon \tag{4.1}$$

We measure credit rationing via a survey item which asks the households to memorize any credit application where no credit was granted or they received less than the full amount they applied for. We retrieve both, the amount which was initially asked for (C_{Demand}) as well as the allocated amount (C_{Supply}). From this information we create a dummy variable (CR) if a household does not get the full amount. For the case of credit rationing we refrain from using detailed credit information because of two reasons. With this definition we follow the methodology of

Guiso et al. (2004) because of two reasons. First, since we retrieve the information retrospectively from the demand side we do not consider the actual percentage share and instead use the original dummy variable approach. Second, from an econometrical point of view we do not have enough information for all credit constraint categories to identify all variables in our estimation of financial development. This is quite natural as credit constraints are not highly common.

$$CR = \begin{cases} 0 & \text{if } C_{Demand} = C_{Supply} > 0 \\ 1 & \text{if } C_{Demand} < C_{Supply} = 0 \end{cases} \tag{4.2}$$

The coefficient of the regional dummies represents the probability that a household in a certain district faces ceteris paribus more credit constraints. To obtain an estimate of the ability of the financial market to provide credit, we control in two dimensions. First, we control for various household characteristics which possibly influence the ability of a household to successfully apply for a loan. Second, we account for differing credit demands in different districts. To rule out such distortions, we focus on a sub-sample which captures credit demand, i.e. all households who have ever borrowed or have outstanding loans or have ever experienced credit denials.

For robustness checks we estimate a second local financial development indicator with a different approximation for credit constraints, which is credit processing. This indicator is represented by the self judgment of a household about how long it needs to obtain a loan in a standardized amount of 5,000 THB, which corresponds to 300 US-dollar in purchasing power. The days needed to retrieve the money, provided all other characteristics remain constant, shows the efficiency and performance of the financial sector in accomplishing its function of credit provision.

For our further analysis of investment and consumption we will use a normalization of the dummy coefficient γ of region k. The normalized indicator is:

$$findev_k = 1 - \frac{\gamma_k}{max[\gamma]} \tag{4.3}$$

Findev lies between 0 and 1. The larger *findev* is, the more financially developed the district is.

This local approach is suitable for the financial situation of rural Thai households as the Thai financial market in general has not been fully integrated. Households in rural areas, in particular, might have difficulties borrowing when they do not have a branch in their district. This argument is supported by several specific features of the Thai financial market. First, the subject of our study are small rural households whose major lending institutions are the BAAC[6] and the village funds[7]. Both financial institutions operate inside every district. There is a branch

[6]The Bank of Agriculture and Agricultural Cooperatives (BAAC) is a state-owned bank established in 1966 and remains one of the main suppliers of household loans in Thailand. Among all banks, private and public, BAAC has the largest number of branches.

[7]In 2001, the Thai government introduced a microfinance program called "Village Funds." Following the spirit

of the BAAC in nearly every district capital and the village funds program provides finance at the village level and holds money stock at the BAAC. Second, beyond this Thailand-specific evidence, several studies find that the proximity to banking institutions still matters, even for developed financial markets (e.g. Petersen and Rajan, 2002; Haselmann et al., 2009). These studies find that regionalism matters especially for small firms (who are not able to borrow at different branches) and public banks. Following these arguments we address the local differences in supply and demand for credit in rural Thailand.

Following the local concept of financial markets, the next step is to define the market, i.e. the regional entity in which borrowers and lenders of the same market are located. We assume that the 45 districts in our 3 provinces constitute separate financial markets. This seems to be the most feasible approximation of the real financial markets for four reasons. First, as mentioned above the major lending institutions are the BAAC and the village funds. The BAAC has one branch per district. For the majority of districts the branch is located in the district capital. This is the result of the BAAC's ongoing policy to expand and decentralize its banking operations from the provincial to the district level (BAAC, 2004). Credit allocation is predominantly effected within the branch district. Executives of the different branches are authorized to determine their own credit policies within the BAAC policy framework. The village fund, which is set up in every village, is exclusively available for the residents of a given village and not for residents living in other villages. As the funds are settled via the BAAC branch network, having an account at the local BAAC is mandatory in many cases. Second, we ask households how long they have to travel to get to the next banking institution. Their average answer is 22 minutes. This journey time is typically not sufficient to travel out of a district, even by car or motorcycle. Third, the next largest and smallest regional entities are provinces and sub-districts. Since our sample spans only three provinces but more than 100 sub-districts, it is obvious that taking these entities as the local market is economically and statistically not feasible. An alternative approach would involve an aggregation of districts to artificial regional entities. We refrain from aggregating districts, since this decision is ultimately an arbitrary decision. We tried several rigorous algorithms to combine districts but none proved to be unique. Our results show that districts are indeed relatively heterogeneous (cf. Figure 4.1 and Figure 4.2). Fourthly, whether districts span a local financial market is a matter of empirical results. If this procedure works well the district dummy variables in our regression are significant and can substantially explain credit denial. Table 4.2 presents the regression results.

Household characteristics correlate with credit constraints in the expected direction. Two aspects deserve to be highlighted. First, asset endowment transpires to be a major determinant for facing credit constraints which is plausible due to its role as collateral. Second, past credit history matters for new credit applications. Increasing the fraction of late payments by 10% raises the probability of a credit application being rejected by 1.5%. For a 20% larger percentage of defaulted loans to total loans the time needed to obtain a loan increases by about one

of other microfinance programs, the main objective of the village funds is to improve access to credit for the poor and for this reason has a large outreach.

day. These results fit the business practice of progressive lending, i.e. releasing funds gradually in increasing amounts after due payment (Karlan and Morduch, 2010). Moreover, the result emphasizes the importance of controlling for rational reasons for credit constraints and overlending.

The normalized financial development indicators range from 0 to 1. We employ a Wald test to challenge the hypothesis of joint zero influence of all district dummy variables. The null is rejected on the 1% significance level for both credit constraint indicators. Out of 45 of the district dummies, 28 district dummies are individually significantly different from zero at least at the 10% level for the indicator of credit rationing. For the indicator of credit processing, as many as 43 of the 45 district dummies transpire to be significant at the 10% level. Figure 4.1 and Figure 4.2 show the maps of the survey areas and the pattern of financial development across the survey areas. As noted above, neighboring regions rarely exhibit the same degree of financial development, which makes us confident that districts are the appropriate regional entities. Both measures evaluate the degree of financial development of equal districts qualitatively the same. The highly significant correlation of 0.65 supports the strong relationship further.

We end with two indicators of local financial development in Thailand. These indicators are based on the degree of credit rationing and the efficiency of credit processing. The former will be used in the upcoming analysis and the latter will be used for robustness checks.

4.4 The relationship between financial development and household welfare

Financial development means that the financial sector improves in accomplishing its functions. Consequently, financial development can affect household welfare in various ways and in many outcomes. We wish to address two aspects of household welfare which can be affected by financial development: investment and consumption, the first affecting households' welfare ex ante of income generation, the latter ex post.

From a theoretical point of view, the aggregate effect of financial development on households is not clear-cut. A higher amount of credit also increases the risk of failing, which is well known in corporate finance as the leverage risk (e.g. Castanias, 1983). On the other hand, however, there are potential benefits to be had from developing the financial sector as it can then better accomplish its functions.

One function of the financial sector is to provide access to savings and credit markets and, in doing so, allocate capital more efficiently (e.g. Mishkin, 2009). Hence, at the household level, financial development could allow the poor to take advantage of profitable investment opportunities (Eswaran and Kotwal, 1990). These investment opportunities tend to be indivisible and may be difficult to finance out of current household income but could provide a higher income in the future. Better access to financial services could endow the poor with sufficient funds to invest in these productive assets. If the additional funds are effectively used the productivity of the household should remain the same. If financial development leads to an excess of funds

non-efficient investment decisions could be financed, which again would lead to higher financial risk and instability.

Households in developing economies also use credit for consumption purposes and to increase their transient expenditures (e.g. Johnston and Morduch, 2008). Increased consumption levels mean higher household welfare. Furthermore, not only the level but also the variation in consumption is relevant for household welfare. Smoothing the variation in consumption is desired by households (Townsend, 1995a). The consequence of large variations in consumption can be a fall in consumption levels below the poverty line which could lead to other detrimental outcomes, such as persistent hunger, disease, early school-leaving and so on. Thus, credit has the potential to help insure consumption streams against shocks and is able to enhance household welfare in this respect (Townsend, 1995a). This refers to the function of credit as a risk coping mechanism. Thus, financial development is able to reduce households' vulnerability and increase consumption levels. To summarize, we test two theories behind the link between financial development and consumption, the financing consumption argument and the risk coping argument. We will differentiate in our analysis between both arguments and test them separately by distinguishing between credit users and non-users. If financial development impacts the level of consumption only for users of credit, we take this as a signal for the financing consumption argument. These households use credit to finance their consumption via loans. If financial development affects consumption levels also for non-users the risk-coping argument might be supported. Households in financially developed districts do not need to save ex ante since they can rely on credits as a risk coping strategy (as a substitute to savings). If they are hit by a shock they have sufficient access to funds from the financial sector. Ex ante of a shock this is equivalent to an option value of access to finance. This argument is further examined by a direct analysis of consumption smoothing, i.e. whether a household in a financially developed district is able to smooth consumption better by using credit.

We are aware of the potential endogeneity bias from reverse causality in a regression of financial development and economic welfare as it is addressed in the literature (for a survey see Beck, 2009). Reverse causality might also play for our indicator of financial development, which is based on credit rejections and time to get a credit, respectively. Unlike the situation of cross-country studies, we cannot fall back on a large time series for instruments as King and Levine (1993) are able to. Our data set is particularly rich in the cross-section but restricts us to using a single wave. The consequences of the cross-sectional nature of the data is that past values are not available as instruments. Other instruments used in Guiso et al. (2004) are also not available. The problem of endogeneity cannot be fully resolved but is mitigated by the following approach. First, we directly control for the usually unobserved variables which might cause endogeneity bias. Since we analyze welfare at the household level and financial development, we can use indicators for economic development as controls. These variables include average income per capita of the district, a dummy for municipal districts, as well as the number of schools, universities, shopping malls, and factory plants in the district. Second, these controls for economic development are from the year previous to the survey. As long as these variables

are time-variant, individual investment and consumption should not matter for the aggregate economic indicators. Third, it is quite unlikely that a single household's welfare is able to affect financial development at the local level. We start by analyzing investment (Section 4.4.1) and proceed with consumption in Section 4.4.2.

4.4.1 Investment

In this section we analyze the relationship between households' investments and financial development. As a measure of investment activity, we focus on expenses for agricultural machines and inputs. Most of these expenditures are in the form of machines, fertilizers, pesticides and seedlings. Expenses for agricultural production are risky. Outcomes are not known at the time when the investment decisions have to be made. A well developed financial market would be able to provide sufficient funds to enable these productive investments. Households' expenditures on crop production is a particularly good indicator. First, agriculture is the most important source of income for our sample households; nearly 85% of the households are involved in arable agriculture. Second, returns are received within a one-year period. As we have to rely on a single wave of data, the economic significance of a long run variable like household assets is doubtable.

Table 4.3 shows four specifications for the OLS regression of crop expenditures on financial development plus control variables for household and business characteristics and economic development indicators in three enhanced specifications. Standard errors are adjusted for the cluster level of districts to allow an unbiased estimate of the standard error of the financial development indicator (cf. Moulton, 1986).

The variable of major interest is the financial development indicator. We include the indicator as well as an interaction effect with a dummy for credit demand, i.e. the dummy equals one if a household ever borrowed or was ever denied credit. The reason to analyze the interaction effect is to differentiate between the effect of financial development on households that actually use the better financial environment and those that do not. The latter could already benefit from the option value of a better financial system. If credit is known to be sufficiently available, in cases of a bad outcome, households are not forced to withhold funds for adverse effects.

The results show that our financial development indicator does not provide such an option value as the coefficient of financial development is not significantly different from zero. However, financial development does help firms to increase their investments if they actually make use of the better financial development. Moving from the least to the best developed district, investment for credit users increases by about 60%.

When we use further controls for household characteristics the effect remains stable. Further inclusion of business characteristics comes along with a dramatic increase in the R^2 from 5% to 30% but we maintain the same magnitude of the effect of financial development. In specification 4 we also include proxies for the economic development at the local level. Consideration of these variables is important to observe an unbiased effect of financial development on investment. In

fact, we find no large increase in the explained variation of investment. The R^2 remains at the same level, at about 36%. The reported coefficient on financial development suffers a minor drop to 55%. Eventually, the investment level between the financially most developed district and the least developed district is about 55%, which is economically significant.

A further issue is then whether these investments are productively used (shown for example by Rizov, 2004). By contrast, Hovakimian (2011) shows that firms are more efficient when facing larger financial constraints. To scrutinize this hypothesis we consider two tests. We repeat our regressions for the investment revenues (Table 4.4) and the investment profitability (Table 4.5), which are defined as the gross revenues from farming and the net profits as percentage of investment, i.e. the return on investment, from farming respectively.

The effect of financial development on investment revenues is significantly different from zero for those households which actually use credit. This finding corresponds to the former findings for investment expenditure. Among the other controls which are significantly different from zero are land size and household size, which is plausible. The more agricultural land and the more family members are available the more resources are invested in farming. For the economic interpretation of the effect of financial development we turn straight to specification 4 , which includes all the controls. We find that investment revenues differ between the financially most and least developed districts by about 47%. This is somewhat smaller than the effect on investment expenditure, which is 55%. Meaning that the discrepancy between districts can reach as much as 50% the effect of financial development on investment is economically significant. One might speculate that this validates the finding of Hovakimian (2011). Farmers living in financially better developed districts are less effective in their activities. The results of the investment profitability regressions do not support this finding further. Neither the coefficient on financial development itself nor the effect of the interaction effect with credit demand is significantly different from zero.

Ultimately, we show that financial development significantly increases investment to an economically meaningful extent. The results on revenues and profitability point to the conclusion that productivity does not change with financial development.

4.4.2 Consumption

Consumption is an important factor of household welfare. Both the level and variability of consumption affect the welfare of the household. In the following section we scrutinize the effect of financial development on consumption expenditure (level effect) and consumption smoothing (volatility effect), which is defined as the ability of a household to smooth consumption in the event of an income shortfall. This focuses on the ex post transmission channel of financial development on household welfare.

The data set for the consumption level includes detailed information on items of consumption expenditure, like rice, durables, alcohol and so forth. We combine those in an overall aggregate of consumption expenditure.

Table 4.6 presents four specifications for the OLS regression of (log) consumption expenditures on financial development plus control variables for household and business characteristics and economic development indicators in three enhanced specifications. We use standard errors clustered on the district.

The regression results predict consumption in the expected manner. Consumption levels are the highest for large households and households with a high income.

The effect of financial development supports the hypothesis of financing consumption and rejects the hypothesis of financial development as an instrument of consumption insurance.

The effect of financial development on consumption levels for a non-user of credit is statistically and economically significant and *negative*. Living in the financially most developed district rather than the least developed causes 70% less consumption in specification 1. Using more controls and gaining more explanatory power, this effect decreases to about 25%, but it is still individually significant. Hence, financial market development seems to be a potential source of adverse shocks which might decrease households' consumption level. Financially well developed regions are likely to be more prone to shocks than less developed regions, holding economic development constant. This evidently negates the hypothesis that financial development is an instrument for risk coping.

In contrast, financial development is able to finance consumption. If the household actually uses credit, the consumption level is about 15% larger. Households which do borrow use their credit to increase their consumption level as it is observed by Johnston and Morduch (2008). The overall effect is somewhat unclear. Reducing the number of controls (and losing explanatory power therewith) turns the effect to negative values. Ultimately, it is not clear whether households can increase their consumption levels by better access to credit.

To scrutinize this question we turn the discussion to the variability of consumption, i.e. consumption smoothing. We have detailed information about the shock history of the households. Hence we are able to measure consumption smoothing directly. Given a past shock, a household can better cope with shocks if it does not have to cut consumption afterwards. The effect of financial markets seems to be of potential relevance. Better access to credit could help households to maintain their consumption levels after a shock, i.e. ensure low consumption variability or, put differently, smooth consumption. The variable consumption smoothing is a dummy variable taking a value of one if a household informs not having to cut consumption in the event of negative income shock.

Table 4.7 presents the four specifications of the probit model for a cut in consumption on financial development. Reported standard errors are clustered at the district level.

We find a significant negative effect of financial development on the probability to cut consumption after a shock. Moving from the financially least to the best developed district decreases the probability of cutting consumption by 25%.[8] Hence we find a positive option value of finan-

[8]Marginal effect of a discrete change calculated at the sample mean. For computation issues of marginal effects with interaction effects refer to Greene (2008).

cial development for consumption smoothing. This positive effect is blurred if a household needs to use credit as a shock coping mechanism. The probability to cut consumption if a household uses credit and moves from the financially least to the best developed district decreases to about 8%. The burden of debt might be the driving force which causes the adverse effect. Income turns out to be another important determinant of consumption smoothing. The amount of available income determines primarily the ability to rely on own resources to cope with a shock.

Summarizing the effect of financial development on consumption, the results tend to support the importance of financial development but not to the same degree as they do for investment. Financial development helps to transitorily increase consumption levels. The role of financial development as a risk coping instrument is ambiguous. There is no option value of financial development on the level of consumption. Consumption smoothing gains from a positive option value of financial development, which is (partially) offset by the debt burden households have to carry when actually taking a credit.

4.5 Robustness

To provide robustness to our results we include several specifications and control for a large range of variables, in particular for economic development. In this section we wish to replace the financial development indicator of credit rationing with the above mentioned indicator of efficient credit processing. As described above the indicator is based on a regression which explains the time needed to obtain a standardized amount of credit. The coefficients on the district dummies serve as input for the Guiso-type indicator (compare Section 4.3). Using the complementary indicator, our main story remains robust.

Financial development significantly increases investment to an economically meaningful extent (Table 4.9). In addition, revenues benefit to a significant extent from financial development (Table 4.10). Even though the effect on revenues is larger than the effect on expenditures, we maintain the result from before. Profitability does not change significantly for changes in the financial development (Table 4.11). Referring to the results of Hovakimian (2011), this is good news. Profitability does not drop, not even for less financial constraints.

Our results on consumption remain stable. Consumption can be increased by taking credit in a financially developed district. We find a no-option value of financial development at the consumption level, which supports the non-finding of the risk coping argument. For our robustness check, the overall effect on consumption level even tends to be negative (Table 4.12). The negative impression of the effect on consumption is underlined by the results on consumption smoothing (Table 4.13). The former positive option value on consumption smoothing drops by one half and is therefore no longer significant. Using credit increases debt service and leads to a higher probability of cutting consumption after a shock.

4.6 Conclusion

In recent years, many studies have examined the effect of financial development on economic growth, financial system structure and other issues at the macro level. We turn the discussion to the household level by measuring the relationship between financial development and two indicators of household welfare: investment and consumption.

Using a new micro-household survey for Thailand we contribute to a more holistic understanding of the link between financial development and economic welfare. Hence our study bridges the gap between three streams of literature, studies of the welfare effects of financial development at the macro level, the program evaluations of microfinance programs, and the literature on access to finance.

Applying the method of Guiso et al. (2004), we derive a measure of local financial development. The framework runs a regression of credit constraints on a large set of household and regional characteristics, including district dummies. We derive a normalized financial development indicator from these coefficients. Like Guiso et al. (2004) we use a dummy for households which are credit rationed. Additionally we check the robustness of our results by using an alternative measure of efficient credit processing, i.e. the time needed to obtain a fixed amount of credit. Both indicators transpire to be quite feasible for the financial market in rural Thailand.

Overall, we find a generally positive effect of financial development on investment. Especially when households actually use credits they can increase their investment to a meaningful extent. Reassuringly, this is not accompanied by a decrease in profitability, as could be expected. Rather, profitability remains constant. The results for consumption tend to be ambiguous. Financial development can transitorily increase consumption. However, there is no clear evidence on a better risk coping effect. The positive effects of financial development on consumption are (partially) offset by the burden of debt and the structural vulnerability of the sector. The main transmission channel between financial development and household welfare seems to work through investments.

Regarding the policy agenda, our results suggest that financial development is beneficial to increase household welfare ex ante. Households can increase their welfare in a financially developed environment due to larger amounts of investment and a transitory increase in consumption levels. However, the effect of financial development on welfare enhancement ex post, i.e. consumption smoothing, is ambiguous. As our paper focuses only on one aspect of financial development, namely getting easier credit, this implies that the existing credit facilities are not very effective as a consumption insurance mechanism. Promotion of complimentary financial instruments such as crop insurance or social protection program needs to be considered in order to improve household welfare ex post.

Given the current emphasis on financial development and poverty reduction on the policy agendas of many developing countries, our results serve to provide evidence of the positive effects of financial development on household welfare. Such evidence provides a basis to undertake more

detailed investigations regarding which specific financial development measures can be set up as effective instruments for achieving a reduction in poverty and minimizing vulnerability.

4.7 Appendix

Figure 4.1: Map of financial development indicator (credit rationing)

The figure shows a map of each of the three sample provinces, Buri Ram, Ubon Ratchathani, Nakhon Phanom. Coloring is according to the nine quintiles of the financial development indicator (credit rationing).

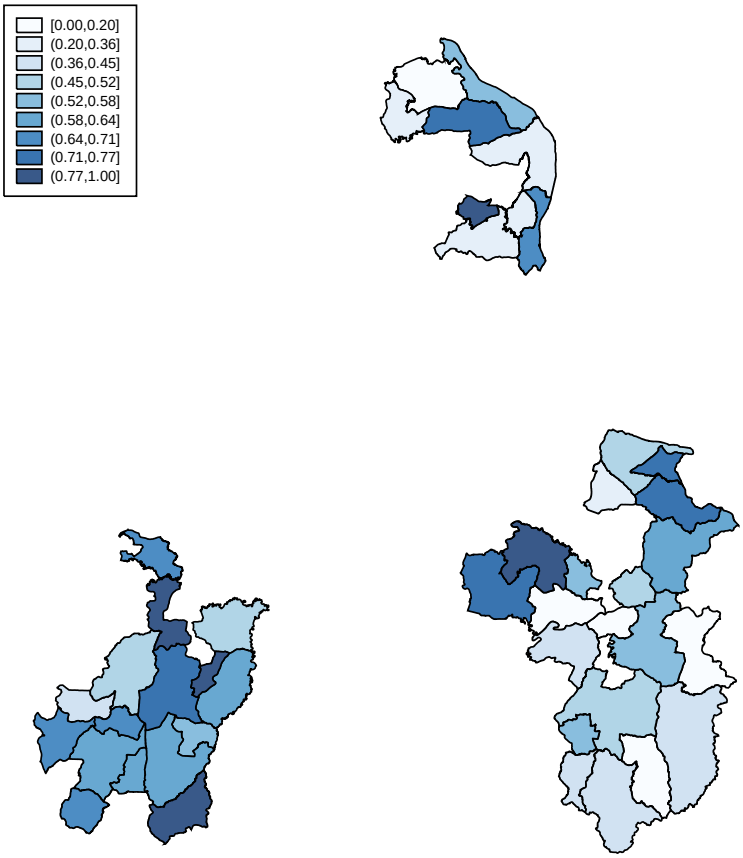

Figure 4.2: Map of financial development indicator (credit processing)

The figure shows a map of each of the three sample provinces, Buri Ram, Ubon Ratchathani, Nakhon Phanom. Coloring is according to the nine quintiles of the financial development indicator (credit processing).

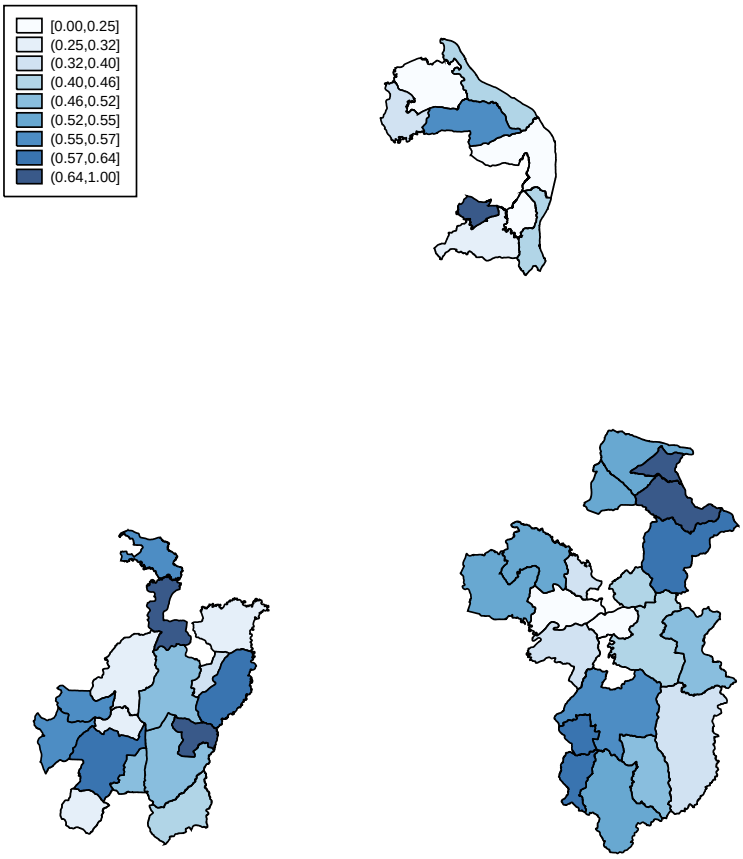

Table 4.1: Descriptive statistics
All currencies are in Thai Baht if not specified otherwise. † denotes dummy variables.

Variable	Observations	Mean	SD	Minimum	Maximum
Panel A: Household					
Household size	2186	3.98	1.73	0	17
Household size (in adult equivalents)	2186	2.230787	0.7191713	1	7.2
Number of children	2186	1.30	1.11	0	9
Female†	2186	0.27	0.44	0	1
Married†	2186	0.78	0.42	0	1
Age of household head	2186	54.64	13.36	23	104
Years of schooling of household head	2186	4.96	2.41	1	18
Consumption (monthly)	2186	6552.23	7212.56	111.5	201003.3
Cut consumption after shock†	708	0.53	0.50	0	1
Panel B: Business and household finance					
Unemployed †	2186	0.15	0.36	0	1
Farmer†	2186	0.62	0.49	0	1
Informal worker†	2186	0.09	0.28	0	1
Formal worker†	2186	0.03	0.18	0	1
Government official†	2186	0.04	0.19	0	1
Business/store owner†	2186	0.08	0.26	0	1
Earned net income	2186	7418.81	16215.28	-40061.72	305342.6
Earned net income per adult equivalent	2186	3412.13	7614.53	-21129.95	145401.2
Household assets (in 100,000 THB)	2186	10.15	16.46	0.0094899	412.0102
Land owner†	2186	0.87	0.34	0	1
Land (agr. purpose, in ha)	1806	2.88	2.57	0.00039	23.2
Input cost of crops	1806	18619.71	31099.87	0	464000
Revenues from crops	1806	48737.53	101191.6	0	2440000
Return on investment (in %)	1746	219.13	264.56	-99.30	2300
Credit rationing †	2186	0.096	0.29	0	1
Defaulted loans/loans outstanding	2186	0.019	0.12	0	1
Late loan payment/loans outstanding	2186	0.06	0.20	0	1
Panel C: Economy					
Municipal district†	2186	0.26	0.44	0	1
Number of schools	2166	3.99	2.34	1	9
Number of universities	2166	0.87	2.01	0	8
Number of shopping malls	2166	1.28	2.37	0	10
Number of factory plants	2166	17.02	72.17	0	352
Panel D: Financial Development					
Financial development indicator (credit rationing)	2186	0.53	0.21	0	1
Financial development indicator (credit processing)	2186	0.46	0.16	0	1

Table 4.2: Estimation of financial development

We regress a dummy for not receiving the full amount of credit (credit rationing) and the time a household needs to obtain a loan of 5,000 THB (credit processing) on a range of household characteristics and district dummies. Equations were estimated by a least squares model acknowledging the survey design. The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Financial development indicator	Credit rationing (1)	Credit processing (2)
Household size (in adult equivalents)	7.51e-05	0.172
	(0.0140)	(0.322)
Number of children	0.000201	-0.151
	(0.00815)	(0.215)
Female†	-0.00644	-0.476
	(0.0233)	(0.436)
Married†	-0.0229	0.185
	(0.0235)	(0.594)
Age of household head	-0.000417	0.00326
	(0.000841)	(0.0156)
Years of schooling of household head	0.000168	-0.0121
	(0.00359)	(0.0649)
Farmer†	0.00256	-0.302
	(0.0290)	(0.585)
Informal worker†	0.0715	-0.534
	(0.0460)	(0.727)
Formal worker†	-0.00433	-0.990
	(0.0536)	(1.008)
Government official†	-0.0228	-0.317
	(0.0473)	(1.067)
Business/store owner†	0.0409	-1.081
	(0.0371)	(0.705)
Earned net income per adult equivalent	-1.18e-06	-3.26e-05
	(9.51e-07)	(2.77e-05)
Household assets per adult equivalent	-0.00348**	-0.0798*
	(0.00137)	(0.0420)
Household assets per adult equivalent squared	1.71e-05**	0.000629*
	(7.47e-06)	(0.000368)
Defaulted loans/loans outstanding	0.112	4.927**
	(0.0807)	(1.934)
Late loan payment/loans outstanding	0.152***	-0.955
	(0.0476)	(0.650)
Number of households in village	0.000160	0.000148
	(0.000101)	(0.00224)
Number of self-employed activities in village	-0.00624**	0.0276
	(0.00299)	(0.0663)
District dummies	Yes	Yes
H_0: All district dummies = 0	4.433	4.461
Prob > F	4.00e-08	3.55e-08
Observations	2,186	2,185
Observations sub-sample	1778	1777
R-squared	0.179	0.303

Table 4.3: Impact of financial development on log investment expenditures
Regression of input cost of crops on household and district characteristics. Equations were estimated by a least squares model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit rationing)	0.154	0.200	0.334	0.195
	(0.329)	(0.315)	(0.250)	(0.211)
Interaction: credit demand† * financial development	0.438***	0.440***	0.305**	0.360***
	(0.153)	(0.153)	(0.146)	(0.128)
Household size (in adult equivalents)		0.315***	0.0962**	0.0816**
		(0.0512)	(0.0362)	(0.0373)
Number of children		-0.118***	-0.0542**	-0.0523**
		(0.0334)	(0.0243)	(0.0245)
Female†		-0.188**	-0.0860	-0.0974
		(0.0924)	(0.0828)	(0.0825)
Married†		0.00853	-0.0312	-0.0351
		(0.108)	(0.0932)	(0.0932)
Age of household head		0.00166	0.000228	0.000562
		(0.00285)	(0.00240)	(0.00238)
Years of schooling of household head		0.00140	0.00289	0.00618
		(0.0127)	(0.0133)	(0.0123)
Farmer†			0.106	0.0970
			(0.0834)	(0.0815)
Informal worker†			-0.336*	-0.375*
			(0.194)	(0.194)
Formal worker†			0.0437	0.0200
			(0.154)	(0.157)
Government official†			-0.00459	-0.0118
			(0.151)	(0.147)
Business/store owner†			-0.172	-0.177
			(0.158)	(0.160)
Log earned net income (monthly)			2.25e-07	6.03e-08
			(2.50e-06)	(2.50e-06)
Household assets (in 100,000 THB)			0.00267	0.00234
			(0.00264)	(0.00258)
Land owner†			-0.0355	-0.0203
			(0.0648)	(0.0658)
Land (agr. purpose, in ha)			0.228***	0.230***
			(0.0148)	(0.0153)
Defaulted loans/loans outstanding			-0.0448	-0.0408
			(0.276)	(0.278)
Late loan payment/loans outstanding			0.0377	0.0512
			(0.122)	(0.121)
Municipal district†				0.00255
				(0.0953)
Number of schools				0.0116
				(0.0177)
Number of universities				0.0501***
				(0.0145)
Number of shopping malls				0.0139
				(0.0331)
Number of factory plants				-0.00126*
				(0.000667)
Constant	9.039***	8.387***	8.159***	8.120***
	(0.159)	(0.251)	(0.257)	(0.251)
Observations	1,757	1,757	1,757	1,740
R2 adjusted	0.0158	0.0502	0.354	0.360

Table 4.4: Impact of financial development on log investment revenues
Regression of revenues from crop production on household and district characteristics. Equations were estimated by a least squares model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit rationing)	-0.198	-0.0692	0.0592	0.00886
	(0.331)	(0.298)	(0.199)	(0.216)
Interaction: credit demand† * financial development	0.586***	0.538***	0.450***	0.462***
	(0.138)	(0.128)	(0.120)	(0.118)
Household size (in adult equivalents)		0.458***	0.200***	0.200***
		(0.0622)	(0.0385)	(0.0407)
Number of children		-0.164***	-0.0799***	-0.0795***
		(0.0360)	(0.0235)	(0.0236)
Female†		-0.274***	-0.153**	-0.154**
		(0.0881)	(0.0696)	(0.0702)
Married†		0.0995	0.0453	0.0421
		(0.0999)	(0.0761)	(0.0775)
Age of household head		-0.00247	-0.00354	-0.00329
		(0.00280)	(0.00262)	(0.00264)
Years of schooling of household head		-0.00198	-0.00788	-0.00698
		(0.0141)	(0.0149)	(0.0151)
Farmer†			0.215**	0.225**
			(0.0997)	(0.101)
Informal worker†			-0.473**	-0.470**
			(0.180)	(0.182)
Formal worker†			-0.161	-0.144
			(0.164)	(0.170)
Government official†			0.216	0.233
			(0.173)	(0.171)
Business/store owner†			-0.405**	-0.383**
			(0.169)	(0.172)
Log earned net income (monthly)			1.04e-05***	1.04e-05***
			(3.54e-06)	(3.63e-06)
Household assets (in 100,000 THB)			-0.000526	-0.000453
			(0.00201)	(0.00208)
Land owner†			0.0423	0.0469
			(0.0802)	(0.0816)
Land (agr. purpose, in ha)			0.230***	0.230***
			(0.0176)	(0.0185)
Defaulted loans/loans outstanding			-0.307	-0.296
			(0.228)	(0.228)
Late loan payment/loans outstanding			-0.121	-0.112
			(0.117)	(0.119)
Municipal district†				0.0208
				(0.113)
Number of schools				-0.00460
				(0.0178)
Number of universities				0.0240*
				(0.0122)
Number of shopping malls				-0.0137
				(0.0251)
Number of factory plants				-0.000218
				(0.000487)
Constant	10.05***	9.297***	8.976***	8.979***
	(0.188)	(0.293)	(0.300)	(0.310)
Observations	1,775	1,775	1,775	1,757
R2 adjusted	0.0128	0.0782	0.406	0.404

Table 4.5: Impact of financial development on investment profitability
Regression of return of investment of crop production on household and district characteristics. Equations were estimated by a least squares model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit rationing)	-86.80	-78.60	-81.66	-51.92
	(56.26)	(57.83)	(58.08)	(55.92)
Interaction: credit demand† * financial development	9.008	3.965	10.22	-4.487
	(36.19)	(36.35)	(35.33)	(31.48)
Household size (in adult equivalents)		25.49*	14.26	18.21
		(13.54)	(12.72)	(12.27)
Number of children		-13.83	-9.685	-10.14
		(9.228)	(8.418)	(8.446)
Female†		-13.64	-14.41	-12.29
		(22.26)	(21.76)	(21.17)
Married†		10.57	18.60	18.06
		(25.98)	(25.82)	(25.86)
Age of household head		-0.696	-0.813	-0.869
		(0.653)	(0.720)	(0.703)
Years of schooling of household head		2.033	-1.596	-2.391
		(3.727)	(3.528)	(3.473)
Farmer†			-28.64	-24.06
			(25.53)	(25.67)
Informal worker†			-70.42	-57.20
			(44.43)	(43.78)
Formal worker†			-51.86	-41.86
			(44.32)	(43.56)
Government official†			20.65	26.30
			(42.51)	(42.56)
Business/store owner†			-91.37**	-86.00**
			(42.95)	(42.60)
Log earned net income (monthly)			0.00319***	0.00322***
			(0.000878)	(0.000861)
Household assets (in 100,000 THB)			-0.684	-0.570
			(0.619)	(0.600)
Land owner†			-4.582	-9.282
			(27.17)	(27.61)
Land (agr. purpose, in ha)			-0.136	-0.886
			(3.050)	(3.078)
Defaulted loans/loans outstanding			-60.56	-60.73
			(68.55)	(69.54)
Late loan payment/loans outstanding			1.973	-0.162
			(48.82)	(48.42)
Municipal district†				-6.385
				(32.35)
Number of schools				-5.189
				(4.717)
Number of universities				-8.262*
				(4.883)
Number of shopping malls				-5.278
				(10.85)
Number of factory plants				0.283
				(0.215)
Constant	261.6***	241.5***	298.8***	318.5***
	(27.07)	(59.90)	(81.71)	(79.42)
Observations	1,746	1,746	1,746	1,729
R2 adjusted	0.00241	0.00441	0.0308	0.0372

Table 4.6: Impact of financial development on log consumption expenditures
Regression of consumption expenditures on household and district characteristics. Equations were estimated by a least squares model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit rationing)	-0.695***	-0.432**	-0.257*	-0.249*
	(0.208)	(0.179)	(0.146)	(0.135)
Interaction: credit demand† * financial development	0.573***	0.385***	0.376***	0.398***
	(0.0958)	(0.0787)	(0.0935)	(0.0877)
Household size (in adult equivalents)		0.380***	0.254***	0.246***
		(0.0224)	(0.0255)	(0.0278)
Number of children		-0.0555***	-0.0221	-0.0223
		(0.0146)	(0.0160)	(0.0165)
Female†		0.00797	-0.0209	-0.0349
		(0.0439)	(0.0438)	(0.0431)
Married†		0.0406	0.00157	-0.00712
		(0.0484)	(0.0510)	(0.0510)
Age of household head		-0.00652***	-0.00812***	-0.00856***
		(0.00158)	(0.00161)	(0.00156)
Years of schooling of household head		0.0687***	0.0217***	0.0206**
		(0.00705)	(0.00794)	(0.00818)
Farmer†			-0.108**	-0.124**
			(0.0506)	(0.0503)
Informal worker†			-0.0867	-0.122*
			(0.0645)	(0.0664)
Formal worker†			0.136*	0.0985
			(0.0795)	(0.0757)
Government official†			0.185*	0.176*
			(0.0931)	(0.0968)
Business/store owner†			0.159**	0.146*
			(0.0786)	(0.0808)
Log earned net income (monthly)			5.20e-06***	5.17e-06***
			(1.36e-06)	(1.37e-06)
Household assets (in 100,000 THB)			0.0103**	0.00981**
			(0.00391)	(0.00381)
Land owner†			0.0205	0.0187
			(0.0422)	(0.0397)
Land (agr. purpose, in ha)			0.0246***	0.0266***
			(0.00850)	(0.00866)
Defaulted loans/loans outstanding			0.198	0.192
			(0.173)	(0.172)
Late loan payment/loans outstanding			0.138*	0.139*
			(0.0816)	(0.0825)
Municipal district†				-0.0430
				(0.0689)
Number of schools				0.0156
				(0.0111)
Number of universities				0.00866
				(0.0101)
Number of shopping malls				0.0206
				(0.0162)
Number of factory plants				-5.73e-05
				(0.000314)
Constant	8.600***	7.749***	8.057***	8.040***
	(0.104)	(0.155)	(0.172)	(0.172)
Observations	2,186	2,186	1,806	1,788
R2 adjusted	0.0270	0.169	0.206	0.208

Table 4.7: Impact of financial development on consumption smoothing
Regression of a dummy (=1 if household still has to cut consumption after shock) on household and district characteristics. Equations were estimated by a probit model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit rationing)	-0.530**	-0.540**	-0.680***	-0.669**
	(0.215)	(0.222)	(0.261)	(0.290)
Interaction: financial coping instrument† * financial development	0.475***	0.451***	0.466***	0.471***
	(0.130)	(0.129)	(0.165)	(0.169)
Household size (in adult equivalents)		-0.0447	-0.117	-0.117
		(0.0831)	(0.105)	(0.106)
Number of children		0.00143	0.0172	0.0178
		(0.0524)	(0.0602)	(0.0608)
Female†		0.266*	0.193	0.180
		(0.157)	(0.194)	(0.198)
Married†		0.246	0.0913	0.0648
		(0.186)	(0.226)	(0.229)
Age of household head		-0.00311	-0.000193	-0.00107
		(0.00422)	(0.00497)	(0.00511)
Years of schooling of household head		-0.0134	0.0179	0.0162
		(0.0279)	(0.0341)	(0.0340)
Farmer†			0.151	0.148
			(0.210)	(0.215)
Informal worker†			-0.267	-0.281
			(0.282)	(0.286)
Formal worker†			-0.417	-0.428
			(0.359)	(0.360)
Government official†			0.123	0.116
			(0.370)	(0.370)
Business/store owner†			0.480*	0.472*
			(0.275)	(0.281)
Log earned net income (monthly)			-1.28e-05*	-1.27e-05*
			(7.18e-06)	(7.39e-06)
Household assets (in 100,000 THB)			-0.00556*	-0.00554*
			(0.00305)	(0.00318)
Land owner†			-0.0196	0.00128
			(0.168)	(0.174)
Land (agr. purpose, in ha)			-0.0114	-0.0129
			(0.0162)	(0.0177)
Defaulted loans/loans outstanding			1.060*	1.054*
			(0.541)	(0.539)
Late loan payment/loans outstanding			-0.141	-0.133
			(0.221)	(0.224)
Municipal district†				-0.00305
				(0.238)
Number of schools				0.00500
				(0.0318)
Number of universities				-0.0126
				(0.0387)
Number of shopping malls				-0.00137
				(0.0392)
Number of factory plants				0.000311
				(0.000691)
Constant	0.223**	0.301	0.429	0.476
	(0.106)	(0.458)	(0.572)	(0.570)
Observations	708	708	609	605

Table 4.8: Variable description

Variable	Description
Household size	Head count of nucleus household members. A household member is a person living in the household for at least half of the last year.
Household size (in adult equivalents)	Number of adult equivalent household members. A household member is a person living in the household for at least half of the last year. Adult equivalents are calculated using the methodology of Haagenars et al. (1994) which treats the household head with full weight, each additional adult with 0.5 weight and each child with 0.3 weight.
Number of children	Number of children.
Female	Dummy variable for females. Takes the value 1 for females and 0 otherwise.
Married	Dummy variable for being married. Takes the value 1 for married and 0 otherwise.
Age of household head	Age in years of household head. Household head is defined by the household and is usually the response person for the survey interview.
Years of schooling of household head	Education in years of household head. Household head is defined by the household and is usually the response person for the survey interview.
Consumption	Average monthly consumption in THB for the last 12 months.
Cut consumption after shock	Dummy variable indicating if consumption is reduced after a shock. Takes the value 1 for cut and 0 elsewise. Self reported information by the household.
Unemployed	Dummy variable for being unemployed. Takes the value 1 for being unemployed and 0 otherwise. Targets the economically inactive, i.e. elderly, people incapable of working, and people on job search.
Self-employed	Dummy variable for being self-employed. Takes the value 1 for self-employed and 0 otherwise.
Farmer	Dummy variable for being farmer. Takes the value 1 for farmer and 0 otherwise.
Informal worker	Dummy variable for working as informal worker. Takes the value 1 for being an informal worker and 0 otherwise.
Formal worker	Dummy variable for working as formal worker. Takes the value 1 for being an formal worker and 0 otherwise.
Government official	Dummy variable for being a government official. Takes the value 1 for being an government official and 0 otherwise.
Business/store owner	Dummy variable for being business/store owner. Takes the value 1 for being a business/store owner and 0 otherwise.
Earned net income	Earned net income consists of four sources of income groups net of costs: Net income from farming, net income from household business, wage labor income and other non-labor income such as land rent. To measure earned income we exclude all remittances and transfers.
Investment expenditures	Gross investment expenditures for farming. For regression analysis we use investments in logarithmic form.
Investment revenues	Gross investment revenues from farming. For regression analysis we use revenues in logarithmic form.
Investment profitability	Return on investment (in %) from farming activity.
Household assets	All household assets, e.g. land property, house, machinery, agricultural stocks, savings, valuables etc.
Land owner	Dummy variable for being a land owner.
Land (agr. purpose)	Size of land area used for agricultural purposes measured in ha.
Defaulted loans/loans outstanding	Ratio of defaulted loans to loans which are still outstanding.
Late loan repayment/loans outstanding	Ratio of outstanding loans to loans which are still outstanding.
Municipal district	Dummy for a household living in a municipal district.
Number of schools	Number of schools in the district in which the household resides.
Number of universities	Number of universities in the district in which the household resides.
Number of shopping malls	Number of shopping malls in the district in which the household resides.
Number of factory plants	Number of factory plants in the district in which the household resides.

Table 4.9: Impact of financial development on log investment expenditures
Regression of input cost of crops on household and district characteristics. Equations were estimated by a least squares model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit processing)	0.0262	0.0219	-0.0926	-0.213
	(0.339)	(0.340)	(0.290)	(0.268)
Interaction: credit demand† * financial development	0.556***	0.560***	0.392**	0.466***
	(0.173)	(0.176)	(0.176)	(0.151)
Household size (in adult equivalents)		0.303***	0.0838**	0.0715*
		(0.0486)	(0.0344)	(0.0360)
Number of children		-0.115***	-0.0501**	-0.0497**
		(0.0327)	(0.0235)	(0.0239)
Female†		-0.177*	-0.0803	-0.0837
		(0.0916)	(0.0845)	(0.0825)
Married†		0.0136	-0.0237	-0.0238
		(0.109)	(0.0944)	(0.0929)
Age of household head		0.00218	0.00100	0.00138
		(0.00276)	(0.00233)	(0.00228)
Years of schooling of household head		0.00240	0.00588	0.00954
		(0.0128)	(0.0134)	(0.0125)
Farmer†			0.105	0.0973
			(0.0843)	(0.0813)
Informal worker†			-0.351*	-0.379*
			(0.194)	(0.192)
Formal worker†			0.0638	0.0513
			(0.153)	(0.157)
Government official†			-0.0238	-0.0230
			(0.151)	(0.147)
Business/store owner†			-0.186	-0.187
			(0.166)	(0.165)
Log earned net income (monthly)			1.93e-07	7.05e-08
			(2.74e-06)	(2.69e-06)
Household assets (in 100,000 THB)			0.00267	0.00247
			(0.00258)	(0.00258)
Land owner†			-0.0615	-0.0377
			(0.0652)	(0.0656)
Land (agr. purpose, in ha)			0.226***	0.228***
			(0.0153)	(0.0159)
Defaulted loans/loans outstanding			-0.0343	-0.0270
			(0.280)	(0.283)
Late loan payment/loans outstanding			0.0350	0.0484
			(0.124)	(0.124)
Municipal district†				-0.0307
				(0.105)
Number of schools				0.0172
				(0.0200)
Number of universities				0.0602***
				(0.0166)
Number of shopping malls				0.0146
				(0.0366)
Number of factory plants				-0.00183***
				(0.000660)
Constant	9.086***	8.444***	8.353***	8.253***
	(0.157)	(0.249)	(0.271)	(0.261)
Observations	1,757	1,757	1,757	1,740
R2 adjusted	0.0134	0.0459	0.344	0.354

Table 4.10: Impact of financial development on log investment revenues
Regression of revenues from crop production on household and district characteristics. Equations were estimated by a least squares model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit processing)	0.167	0.223	0.0694	0.0443
	(0.258)	(0.247)	(0.233)	(0.231)
Interaction: credit demand† * financial development	0.729***	0.664***	0.561***	0.581***
	(0.165)	(0.152)	(0.154)	(0.151)
Household size (in adult equivalents)		0.454***	0.195***	0.194***
		(0.0605)	(0.0383)	(0.0407)
Number of children		-0.164***	-0.0787***	-0.0785***
		(0.0362)	(0.0236)	(0.0236)
Female†		-0.257***	-0.143**	-0.143**
		(0.0838)	(0.0692)	(0.0691)
Married†		0.0976	0.0467	0.0442
		(0.0992)	(0.0760)	(0.0769)
Age of household head		-0.00243	-0.00322	-0.00297
		(0.00280)	(0.00254)	(0.00257)
Years of schooling of household head		-0.00356	-0.00770	-0.00664
		(0.0138)	(0.0150)	(0.0150)
Farmer†			0.211**	0.219**
			(0.100)	(0.102)
Informal worker†			-0.475**	-0.473**
			(0.185)	(0.184)
Formal worker†			-0.147	-0.133
			(0.163)	(0.169)
Government official†			0.188	0.206
			(0.175)	(0.172)
Business/store owner†			-0.417**	-0.393**
			(0.171)	(0.172)
Log earned net income (monthly)			1.07e-05***	1.07e-05***
			(3.66e-06)	(3.73e-06)
Household assets (in 100,000 THB)			-0.000435	-0.000338
			(0.00199)	(0.00205)
Land owner†			0.0302	0.0394
			(0.0792)	(0.0798)
Land (agr. purpose, in ha)			0.227***	0.227***
			(0.0178)	(0.0185)
Defaulted loans/loans outstanding			-0.284	-0.272
			(0.234)	(0.234)
Late loan payment/loans outstanding			-0.115	-0.104
			(0.119)	(0.121)
Municipal district†				0.0193
				(0.0992)
Number of schools				-0.00474
				(0.0181)
Number of universities				0.0354**
				(0.0134)
Number of shopping malls				-0.0157
				(0.0268)
Number of factory plants				-0.000407
				(0.000533)
Constant	9.842***	9.150***	8.967***	8.946***
	(0.115)	(0.250)	(0.305)	(0.313)
Observations	1,775	1,775	1,775	1,757
R2 adjusted	0.0248	0.0878	0.407	0.406

Table 4.11: Impact of financial development on investment profitability
Regression of return on investment of crop production on household and district characteristics. Equations were estimated by a least squares model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit processing)	51.46	57.44	56.73	86.44
	(75.01)	(74.53)	(71.28)	(71.54)
Interaction: credit demand† * financial development	-5.982	-12.96	-3.776	-22.44
	(42.86)	(43.10)	(41.63)	(35.94)
Household size (in adult equivalents)		28.26**	16.94	20.04
		(13.38)	(12.48)	(12.02)
Number of children		-14.97	-10.79	-10.78
		(9.267)	(8.400)	(8.382)
Female†		-13.34	-14.12	-14.19
		(22.26)	(21.72)	(21.62)
Married†		8.301	16.45	14.94
		(26.15)	(25.84)	(25.82)
Age of household head		-0.867	-0.983	-1.049
		(0.634)	(0.698)	(0.687)
Years of schooling of household head		1.243	-2.463	-3.304
		(3.590)	(3.351)	(3.377)
Farmer†			-28.97	-24.97
			(25.41)	(25.33)
Informal worker†			-66.16	-56.22
			(45.35)	(44.25)
Formal worker†			-54.24	-48.02
			(43.14)	(42.35)
Government official†			20.26	23.87
			(42.34)	(42.79)
Business/store owner†			-89.11**	-84.75*
			(43.94)	(42.94)
Log earned net income (monthly)			0.00325***	0.00326***
			(0.000859)	(0.000834)
Household assets (in 100,000 THB)			-0.680	-0.584
			(0.629)	(0.600)
Land owner†			-0.430	-6.656
			(27.36)	(27.38)
Land (agr. purpose, in ha)			-0.255	-0.987
			(3.231)	(3.147)
Defaulted loans/loans outstanding			-58.24	-59.03
			(68.36)	(69.45)
Late loan payment/loans outstanding			4.344	2.735
			(48.40)	(48.42)
Municipal district†				3.035
				(31.45)
Number of schools				-6.812
				(4.864)
Number of universities				-8.755
				(5.789)
Number of shopping malls				-5.969
				(11.17)
Number of factory plants				0.409*
				(0.207)
Constant	197.6***	189.7***	241.3***	273.3***
	(31.10)	(62.55)	(86.75)	(84.78)
Observations	1,746	1,746	1,746	1,729
R2 adjusted	0.000375	0.00204	0.0288	0.0373

Table 4.12: Impact of financial development on log consumption expenditures
Regression of consumption expenditures on household and district characteristics. Equations were estimated by a least squares model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit processing)	-1.143***	-0.895***	-0.710***	-0.730***
	(0.252)	(0.202)	(0.140)	(0.130)
Interaction: credit demand† * financial development	0.754***	0.524***	0.506***	0.536***
	(0.113)	(0.0932)	(0.102)	(0.0922)
Household size (in adult equivalents)		0.374***	0.248***	0.241***
		(0.0218)	(0.0251)	(0.0278)
Number of children		-0.0536***	-0.0196	-0.0204
		(0.0148)	(0.0162)	(0.0168)
Female†		0.00668	-0.0225	-0.0303
		(0.0449)	(0.0443)	(0.0443)
Married†		0.0498	0.00969	0.00434
		(0.0475)	(0.0514)	(0.0512)
Age of household head		-0.00622***	-0.00770***	-0.00805***
		(0.00150)	(0.00160)	(0.00156)
Years of schooling of household head		0.0696***	0.0241***	0.0233**
		(0.00709)	(0.00857)	(0.00865)
Farmer†			-0.112**	-0.127**
			(0.0514)	(0.0513)
Informal worker†			-0.0984	-0.127*
			(0.0667)	(0.0677)
Formal worker†			0.138*	0.111
			(0.0748)	(0.0739)
Government official†			0.183*	0.176*
			(0.0950)	(0.0979)
Business/store owner†			0.151*	0.137
			(0.0800)	(0.0819)
Log earned net income (monthly)			5.02e-06***	5.04e-06***
			(1.33e-06)	(1.34e-06)
Household assets (in 100,000 THB)			0.0103**	0.00986**
			(0.00385)	(0.00381)
Land owner†			0.0151	0.0140
			(0.0422)	(0.0386)
Land (agr. purpose, in ha)			0.0253***	0.0269***
			(0.00848)	(0.00865)
Defaulted loans/loans outstanding			0.190	0.186
			(0.175)	(0.175)
Late loan payment/loans outstanding			0.133	0.131
			(0.0824)	(0.0825)
Municipal district†				-0.0724
				(0.0554)
Number of schools				0.0207*
				(0.0112)
Number of universities				0.00736
				(0.0104)
Number of shopping malls				0.0238
				(0.0171)
Number of factory plants				-0.000355
				(0.000336)
Constant	8.717***	7.880***	8.197***	8.166***
	(0.0971)	(0.157)	(0.161)	(0.158)
Observations	2,186	2,186	1,806	1,788
R2 adjusted	0.0352	0.177	0.210	0.212

Table 4.13: Impact of financial development on consumption smoothing
Regression of a dummy (=1 if household still has to cut consumption after shock) on household and district characteristics. Equations were estimated by a probit model using clustered standard errors (district level). The omitted category for occupation is unemployed/retired. The level of significance is denoted by *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses. † denotes dummy variables.

Specification	(1)	(2)	(3)	(4)
Financial development indicator (credit processing)	-0.322	-0.317	-0.359	-0.290
	(0.349)	(0.341)	(0.371)	(0.379)
Interaction: financial coping instrument† * financial development	0.558***	0.526***	0.544***	0.550***
	(0.167)	(0.166)	(0.207)	(0.211)
Household size (in adult equivalents)		-0.0219	-0.0883	-0.0918
		(0.0804)	(0.102)	(0.103)
Number of children		-0.00722	0.00532	0.00750
		(0.0518)	(0.0604)	(0.0608)
Female†		0.261*	0.190	0.161
		(0.155)	(0.188)	(0.194)
Married†		0.231	0.0741	0.0397
		(0.184)	(0.223)	(0.228)
Age of household head		-0.00362	-0.00134	-0.00247
		(0.00428)	(0.00505)	(0.00504)
Years of schooling of household head		-0.0141	0.0151	0.0120
		(0.0271)	(0.0331)	(0.0331)
Farmer†			0.140	0.130
			(0.210)	(0.213)
Informal worker†			-0.260	-0.290
			(0.280)	(0.285)
Formal worker†			-0.462	-0.491
			(0.366)	(0.359)
Government official†			0.146	0.140
			(0.369)	(0.367)
Business/store owner†			0.472*	0.464*
			(0.274)	(0.280)
Log earned net income (monthly)			-1.28e-05*	-1.31e-05*
			(7.19e-06)	(7.47e-06)
Household assets (in 100,000 THB)			-0.00536**	-0.00553*
			(0.00265)	(0.00297)
Land owner†			0.0162	0.0327
			(0.164)	(0.171)
Land (agr. purpose, in ha)			-0.0100	-0.0112
			(0.0154)	(0.0170)
Defaulted loans/loans outstanding			1.059*	1.058*
			(0.548)	(0.542)
Late loan payment/loans outstanding			-0.151	-0.142
			(0.225)	(0.228)
Municipal district†				0.0254
				(0.222)
Number of schools				-0.00302
				(0.0334)
Number of universities				-0.0146
				(0.0365)
Number of shopping malls				-0.00385
				(0.0358)
Number of factory plants				0.000901
				(0.000582)
Constant	0.0975	0.174	0.254	0.346
	(0.152)	(0.473)	(0.579)	(0.588)
Observations	708	708	609	605

Chapter 5

Shocks and Individual Risk Attitude: Evidence from Thailand and Vietnam[1]

[1]This chapter is based on a revised version of the paper by Gloede et al. (2011). Thanks go to participants of the International ESA Conference, Annual Conference of the German Economic Association (VfS), and the Annual International Conference of the Research Committee on Development Economics (AEL) of the German Economic Association (VfS) and participants of research seminars, in particular Berit Gerritzen, Bernd Hardeweg, Olaf Hübler, Peter Moffatt, Holger Strulik, Andreas Wagener. We gratefully acknowledge financial support from the German Research Foundation (DFG FOR 756).

5.1 Introduction

Behavior towards risk is of undisputed relevance for understanding economic behavior in general and economic development in particular. Accordingly, much effort has been invested in examining risk attitudes. For convenience, risk attitudes are often assumed to be an invariant personal characteristic. However, this is not fully true. Even though the individual risk attitude has a clear person-specific root, it is also time-varying due to (changing) socio-demographic circumstances. Such living circumstances are particularly volatile in developing countries and thus deserve careful attention. Several studies consider such circumstances and their influence on risk attitude but it seems fair to say that empirical coverage of possibly important determinants could be more complete. Accordingly, our research contributes to filling this gap by examining the influence of a wide range of shocks on risk attitude. This analysis is missing so far to the best of our knowledge.

Our investigation is based on a standard household survey which is conducted in rural provinces of Northeast Thailand and Vietnam in 2010. This survey covers more than 2,000 households in each country and is representative for the rural population in these areas. The survey contains a standard item revealing the risk attitude of respondents which has been used in many studies before (see Dohmen et al. (2011), Hardeweg et al. (2013 forthcoming), and references there). Due to the survey structure, the response towards this item can be easily related to other characteristics of participating individuals. We find the expected relationships between risk attitude and its determinants, such that older people or those with lower income respond in a more risk-averse way. These relations are similar in Thailand and Vietnam. Whereas this indicates an influence from living circumstances (e.g. income) on risk attitude already, our main focus is on the role of shocks on risk attitude.

The underlying data set is rich in its coverage of shocks because it is designed to analyze the vulnerability of relatively poor rural households in Northeast Thailand and Vietnam. We rely on detailed information which households give about shocks that have happened to them over a two years period proceeding the survey. Due to the detailed reporting of shocks we can categorize shocks in various dimensions in order to examine which kinds of shocks may be more relevant. In addition to just taking the number of shocks that a household was exposed to, we categorize shocks in four ways: (i) high impact shocks vs. low and medium impact shocks (according to self-classification by households), (ii) idiosyncratic vs. covariate shocks, (iii) expected vs. unexpected shocks, and (iv) positive vs. negative shock surprises.

It is our main result that we find a robust relation between unwanted shocks and higher risk aversion. This relation is maintained with or without control variables and holds for both countries. In detail, regarding shock categories we receive four findings: first, it is not the sheer number of shocks that is important but rather the number of high impact shocks that seems to influence risk attitude. Second, with respect to idiosyncratic vs. covariate shocks, both kinds of shocks may be important, the former more in Vietnam, the latter more in Thailand. Third, and in line with theoretical reasoning, only unexpected shocks matter. Fourth: the survey considers

due to its purpose only unwanted shocks. But the comparison between expected and realized shocks allows measuring positive or negative surprises, i.e. less or more unwanted shocks than expected. We find that negative surprises have more influence on risk attitude.

In order to demonstrate the relevance of these determinants of risk attitude we show that our measure of risk attitude is meaningful in the sense that it can predict risk-related behavior to some degree. This opens the door to the often mentioned vicious cycles in development, where negative shocks reduce risk taking and the latter reduces expected outcomes etc. (e.g. Lipton (1968), Dercon (2008), Yesuf and Bluffstone (2009)). Moreover, the measures of risk attitude and shocks seem quite reliable: the survey measure of individual risk attitude is validated by an experiment revealing risk aversion. The shocks can largely be substituted by vulnerability (which is approximated as perceived income volatility of the household). This measure should be and is indeed highly correlated with the occurrence of shocks. As a final note we would like to mention that we are restricted to a cross-sectional analysis here because the expectation of shocks and the risk experiment for Vietnam are only available for the wave conducted in 2010.

Our study fits into a line of studies examining risk attitudes in developing countries. Starting with the pioneering experimental work of Binswanger (1980, 1981), several authors have reproduced and extended the elicitation of risk aversion (Cardenas and Carpenter, 2008). Our approach differs from anonymous experiments because it considers various socio-demographic control variables (Tanaka et al., 2010). There are a few studies where the relation between changing circumstances and risk attitude is analyzed, in particular Humphrey and Verschoor (2004) and Yesuf and Bluffstone (2009) who find that reduced wealth is related to more risk aversion. This is in line with evidence from advanced economies, such as Guiso and Paiella (2008) who find a role for declining wealth and uninsurable risk to generate higher risk aversion or Malmendier and Nagel (2011) who find that exposure to macroeconomic risk leads to less financial risk taking. Although these related studies clearly motivate our research, we are not aware of any study (in developing countries) where a broad set of shocks is examined comprehensively in its relation to risk attitude.

The paper proceeds in the following steps: Section 5.2 introduces the data and describes risk attitudes. Section 5.3 informs about the households' perspective on shocks and provides several measures of shock classification. Determinants of risk attitudes and in particular the role of shocks in explaining risk attitudes are the focus in Section 5.4. Section 5.5 indicates the usefulness of risk attitude in predicting real world behavior and provides some robustness tests, including an experimental validation of the survey item. Section 5.6 concludes.

5.2 Data collection and descriptive statistics

This section summarizes the data collection process (Section 5.2.1), describes typical characteristics of rural households in Thailand and Vietnam (Section 5.2.2) and then describes the response to our survey item measure of risk attitude in both countries (Section 5.2.3).

5.2.1 Data collection

The data we use originates from the project "Impact of shocks on the vulnerability to poverty: consequences for development of emerging Southeast Asian economies", funded by the German Research Foundation (FOR 756). Primary data was collected during a survey which was carried out in three provinces in the Northeast region of Thailand and three provinces across Vietnam between April and June 2010. The countries are deliberately chosen: they are similar to one another regarding their size and as well as their development level, in particular in rural areas (whereas the central region in Thailand stands out due to high income per capita). By contrast, the two countries have different cultural and institutional backgrounds. Thailand is a Buddhist country (more than 90% of the population) following largely traditional open market policies with limited state interference. Vietnam, however, is characterized by the absence of important religious groups (about 80% of the population say to be atheists) and by several decades of a conventional socialist planned economy. Although the economy has been somewhat liberalized during the last 20 years, state enterprizes and state interferences are still common and more important than in Thailand. In each country three provinces are selected, namely Buri Ram, Ubon Ratchatani, Nakhon Phanom in Thailand and Ha Tinh, Thua Thien Hue, Dak Lak in Vietnam.

The household selection process follows a three-stage stratified sampling procedure where provinces are constituting strata and the primary sampling units (PSU) are sub-districts. Within each of the three provinces, we exclude the urban area around the provincial capital city and confine the sample to the remaining rural areas. Within these areas, sub-districts are randomly selected using population density weights. Within each sub-district, two villages are chosen at random, in which 10 households are randomly selected each. There are in total 4,381 households from 440 villages in 220 sub-districts of the six provinces. Overall, the sampled households are representative for the rural areas in the six provinces.

The survey itself is a typical household survey, covering many areas of interest. These include rich information on household demographics, various aspects of social and economic behavior and in particular items addressing risk attitudes and risk behavior. In the following section we describe the information which relates to our analysis which respect to the households (Section 5.2.2) as well as with respect to the risk attitude measure (Section 5.2.3).

5.2.2 Descriptive statistics of the household sample

Due to the relative poverty of Northeastern Thailand and the discrepancy compared to the booming region of Central Thailand, parts of the local workforce migrate into urban areas and in particular towards the economic center. This is reflected in the household characteristics (see Table 5.1)[2]. Respondents are on average 52 years old[3], mostly women (share of 60%),

[2]A description of all variables can also be found in the Table 5.6

[3]We exclude respondents aged below 18 and above 80 to make sure they are capable to understand the questions. Due to this prevention measure the sample size decreases by 80 observations (about 2% of the sample).

below 1.60 meter tall and their annual household income is on average about 9,000 PPP-US-Dollar. Income translates into about 300 PPP-US-Dollar per person and month as family size is roughly four persons. Respondents experienced slightly more than five years of school education because during their youth the minimum school time was four years. The family situation is still traditional as people aged beyond 50 years will usually be grandparents, so that often three generations live in one household, although in various combinations. 83% of respondents are married. As a complementing information, we ask about people's degree of optimism. Overall, they are rather more than less optimistic with a value of 0.44 on a scale from minus two to two.

This table with descriptive statistics contains further variables which may need some more explanation. The variable "general risk attitude" is our survey item measuring risk attitude and is scaled from zero to 10, representing decreasing risk aversion. Accordingly, a mean value of 4.66 is located slightly towards the lower end of the scale, which indicates some degree of risk aversion on average. Regarding the behavior towards risk, 9% of respondents are self-employed which is riskier than being employed. Due to the rural area under review their occupation is in most cases related to the agricultural sector. We do observe another kind of risky behavior, i.e. buying lottery tickets. About half of the households purchase tickets, spending on average about 45 USD-PPP per year.

The variable "minimum acceptable offer" informs about the decisions participants make at a standard risk experiment which we describe in more detail in the robustness part of this paper. This experiment was conducted in one province only, which explains the lower number of observations. Finally, the variable "income volatility perceived" gives the subjective expectations of respondents on a scale from one to three, indicating low to high fluctuations. People seem to feel exposed to fluctuations, as they classify themselves at 1.77. This high level of income insecurity is tentatively justified, as dramatic shocks occurred during the years 2008 to 2010 and incomes fluctuated indeed highly when compared to the experience of households in advanced economies.

In summary, sample characteristics in Thailand show traditional rural households in an emerging economy where some brain drain to urban areas occurs and where vulnerability of living conditions is high. We now compare this to our sample from Vietnam.

The situation of Vietnamese rural households is somewhat different from the Thai households. The last column in Table 5.1 indicates mostly statistically significant differences between both samples. However, this result is more a statistical than an economically meaningful difference, driven by the large samples. Nevertheless, there are some patterns which may be interesting for the understanding of differences in risk attitudes.

Regarding personal characteristics of respondents, Vietnamese are four years younger than Thai, less often female (48%) and have about the same body height as Thais. Measured in PPP-terms their household income is lower than in Thailand. Most important may be the better education as they have on average two years longer schooling than their Thai counterparts. By contrast, the share of married respondents and the optimism expressed are very similar to

Thailand.

The degree of risk aversion is slightly higher than in Thailand as can be consistently seen from the lower means of "general risk attitude" and "minimum acceptable offer". The share of self-employed is very similar to Thailand, whereas lottery tickets play a very much smaller role. The latter holds for the purchase of lottery tickets as well as for the expenses made. Finally, Vietnamese respondents perceive their income fluctuations to be lower than Thai respondents.

Overall, there are some differences between Thailand and Vietnam which justify to view the two samples as being independent from each other (i.e. both samples not being drawn from the same population). Thus, it is even more interesting to see whether and how characteristics found in both countries are related to risk attitudes.

5.2.3 Risk attitudes in Thailand and Vietnam

The risk attitudes of respondents are surveyed by the simple question whether they are fully prepared to take risk or whether they avoid taking risk. The exact formulation is given in Figure 5.1 and follows the German Socio-Economic Panel Study (SOEP) which has been using this question (Dohmen et al., 2011). Respondents classify themselves on a scale between zero and 10 so that category five represents the middle category. Due to the kind of question asked and due to the qualitative nature of the scale, the category with label five (middle category) does not represent risk neutrality. However, it is obvious that the larger the number of an answer, i.e. the weaker the tendency towards avoiding risk, the lower this respondent's degree of risk aversion.

The description of all responses is shown in Figure 5.1, giving the distribution of responses to the 11 categories. The mass of responses is on the left hand side of the figure, indicating that people tend towards risk avoidance. This holds for Thailand and for Vietnam. The spikes in the histograms at the extreme values and at the middle category are expected for rating scales in general and show up for both countries. However, the share of responses at category five for Thailand seems to be unusually high and deserves further attention in the later course of this research.

When comparing the two distributions of the risk attitude for Thailand and Vietnam the two-sample Wilcoxon rank-sum test finds a significantly higher rank for Thailand than for Vietnam (z-value 6.401, p-value 0.000): on average Thais are less risk-averse than Vietnamese.

5.3 Shocks in Thailand and Vietnam

We survey the past shock experience of each household. We implement a dual strategy to cover all shocks of the household. First, we ask the household about the three largest shocks in the last two years. This pull procedure enables us to detect the self-reported most important shocks without any restriction on the kind of shocks. Second, in a push strategy we ask the household

for shocks in specific areas. This approach ensures that we collect shocks also in categories which the household is not aware of in the first place.[4] Overall, we are trustful to collect the full set of shocks which occurred to the household.

Table 5.13 displays all shocks separated by shock category and country. Detailed information about each shock is gathered and allows us to make aggregate analysis in different dimensions. Here, we focus on the total number of shocks, the areas in which shocks occur, the impact severity of shocks, idiosyncratic vs. covariate shocks, unexpected shocks, and positive vs. negative shock surprises. Table 5.2 provides a country comparison of the shock dimensions which are mentioned above.

Shock categories. The aggregate number of shocks within the past two years before our survey amounts in Thailand to 1.2 shocks. In Vietnam the total number of shocks is fairly higher with 1.9 shocks, which is significantly different from the figure in Thailand. The total number of shocks can be divided into demographic, social, agricultural, and economic shocks. For the sake of conciseness we analyze shocks on these coarse categories even though information is available on more detailed categories.[5] We summarize shocks of household members leaving or joining the household as demographic shocks. The number of social shocks is the aggregate of shocks which occur to the household with respect to social life, e.g. ceremonies, law suits, remittances. As the majority of households is at least partly engaged in agricultural activities agricultural shocks account for most of the shocks which are reported by the households. Particularly in Vietnam more than half of the shocks are agricultural shocks. Only the economic shock category contains more shocks in Thailand than in Vietnam; when in Thailand 0.2 shocks occurred in the reference period Vietnamese households suffered only by half as many shocks (0.1).

Shock impact. From our survey we also receive information on how respondents estimate the severity of the shock impact on their household. Answers are coded as: no, low, medium, or high impact. For both countries we observe that households perceive reported shocks mostly as high impact shocks. In fact, the average number of shocks increases as the reported severity of shocks becomes larger. The finding shows that respondents recall shocks more often when they are severe or when she perceives them as affecting the household particularly hard. For all categories but the category of no impact the average shock number is larger in Vietnam than in Thailand.

Idiosyncratic vs. covariate shocks. To differentiate between idiosyncratic and covariate shocks we ask the respondent to estimate the impact of the particular household shock on others. Answer choices are no other household, some other households, or most other households in village, district, province, or country. We code shocks of the first two categories as idiosyncratic shocks and the last four as covariate. Our questionnaire is designed to accommodate this breakup of the six categories in the two groups of idiosyncratic and covariate shocks. In both countries answers resemble two thirds of shocks as being idiosyncratic and one third of all shocks as

[4] In both approaches the household is able to name shocks which are not covered in the default category list of shocks.

[5] More detailed shock categories are summarized in Table 5.13.

covariate shocks.

Shock expectation. For the calculation of the index of unexpected shocks we need two components: the number of actual shocks and an estimate of the expected number of shocks. The first is based on the information described above. For the latter we use some information from the previous wave of our household survey, in which we ask the household about its shock expectation in each of the given shock categories.[6] A table of summary statistics of the shock expectations is given in the Table 5.14. Specifically, respondents are asked to give their expectation of the number of shock occurrences in the following five years. The number of expected shocks is surveyed as an ordinal variable with the categories, zero, one, two, three, four, five, and six or more shocks.

Most of the expected shock events are related to agricultural shocks. Especially Vietnamese households seem to expect many shocks in this area. Storm and and flooding seem to be relatively Vietnamese specific risks. Crop pests and droughts appear to be relatively pronounced in both countries. For Thai households also economic risks play a big role. This might stem from the fact that in our sample Thais more often are engaged in non-agricultural business activities than Vietnamese. With respect to social and demographic risks money spent for ceremonies and illness of household members belong to the most frequently expected shocks.

Unexpected shocks. To measure shock surprises we use two methodologies, a regression approach and computation of ordinary differences of actual minus expected shocks. For the first method we regress the number of shocks $NSHOCK$ of each household i in each category j on a number of dummy variables of shock expectations $NSHOCK^e$, i.e. a dummy for one expected shock, two expected shocks, ..., six or more expected shocks and a constant α. We run regressions separately for each category as the number of shocks between different categories appears to be systematically different with respect to size and nature. The expected effects of a household member becoming ill once might be different from the occurrence of one drought in size and kind of impact.

$$NSHOCK_{i,j} = \alpha_j + \sum_{k=0}^{6} \beta_{j,k} NSHOCK^e_{i,j,k} + \varepsilon_{i,j} \tag{5.1}$$

The regression results are presented in the Table 5.16. From those regressions we obtain the predicted residuals $\hat{\varepsilon_{i,j}}$ as they represent the conditionally unexpected shocks in our survey for each category. In the further analysis we compute the mean of those predicted residuals over all categories for each household. We consider all categories M for which we have non-missing shock expectations of the household. Eventually, this figure forms our unexpected shock index $USI(\varepsilon)$:

[6]Expected shocks are not available for four categories: death of household member, supporting others, education, unable to pay back loan. Asking for the likelihood of the death of a beloved household member does not yield meaningful results since superstitious believes are widespread in Thailand and Vietnam. The other three categories had not been in the default list of shocks of the previous wave and were introduced as new items as they appeared to be meaningful and feasible in size.

$$\forall i: \; USI(\varepsilon) = \frac{\sum_{j=1}^{M} \widehat{\varepsilon_{i,j}}}{M} \tag{5.2}$$

Note that by definition the mean over all households in each category is zero, because it is the mean of predicted residuals. Thus, the mean over all categories for each household might be close to zero but does not need to be identical because of differences in averaging. In Thailand the unexpected shock index is marginally less than zero (-0.009), whereas in Vietnam it is fairly larger than zero (0.012). The difference of both means between the two countries is significant. It is notable that the Vietnamese index shows a higher standard deviation (0.067) than the Thai index (0.050).

We implement a second approach by utilizing simple differences between the number of actual shocks and the number of expected shocks.

$$\delta_{i,j} = NSHOCK_{i,j} - 2\frac{NSHOCK^{e}_{i,j}}{5} \tag{5.3}$$

The difference is the number of expected shocks (from the last two years) minus the expectation, which was formed two years prior to the survey date, of how many shocks would occur in the next five years. Thus, the two reference periods are not congruent but overlap by two years. That is why we derive from the expected number of shocks in the next five years the number of shocks which are expected in the next two years. We assume that the households form uniform expectations of shock occurrence over time and divide the expected number of shocks linearly by years, i.e. we divide by five and multiply by two.

For the differences approach we observe means substantially different from zero as the approach does not adjust the differences to be unbiased on average (which the regression approach above does). We would like to remark that the data format in which we survey expected shocks is not the number of expected shocks as such. As the number of expected shocks is given in categories of one, two, three, four, five, six or more shocks we need to assume a numeric value for the last and highest category. We take the value to be 6. Since the shock surprises, i.e. the differences, are in general rather negative taking an even higher value for the last expected shock category would imply to calculate even more negatively biased differences.

Analogous to the regression procedure we calculate mean differences for each household i over shock category j to form our unexpected shock index $USI(\delta)$[7]:

$$\forall i: \; USI(\delta) = \frac{\sum_{j=1}^{M} \widehat{\delta_{i,j}}}{M} \tag{5.4}$$

In our second approach, Thai respondents still exhibit a negative total (-0.193) but are outreached by the Vietnamese mean of -0.217, which is statistically different from the other. In this version of the unexpected shock index far more households show a negative sign which

[7]We standardize the index for comparison of the impact on risk attitude across shock surprise indicators.

means that the number of actual shocks lies below the expected number of shocks. As discussed above the major reason might originate from the approach as the residuals are not adjusted to balance on average (as it is done for the regression approach).

When we compare both approaches we find that they are significantly positively correlated with a correlation coefficient of about 0.37 for TH and 0.36 for VN. This finding is supported by the graphical display of both indices in Figure 5.3.

Negative vs. positive shock surprises. To scrutinize the effect of shock surprises we also split up the unexpected shock index in positive and negative shock surprises. Negative shock surprises means that the household suffered from more shocks than it had been expected. Positive surprises in contrast imply an actual shock number which is lower than the number of shocks which was expected. From a theoretical perspective we would except some kind of loss aversion, i.e. a more pronounced reaction from negative shock surprises than from positive shock surprises.

To separate the two effects we split the index in two subindices of negative (positive) shock surprises which are the same as the original index for positive (negative) values of the residuals (or difference respectively) and zero otherwise.[8]

$$USI^{+} = \begin{cases} USI & \text{if } USI < 0 \\ 0 & \text{if } USI \geq 0 \end{cases} \tag{5.5}$$

$$USI^{-} = \begin{cases} USI & \text{if } USI > 0 \\ 0 & \text{if } USI \leq 0 \end{cases} \tag{5.6}$$

5.4 Determinants of risk attitudes in Thailand and Vietnam

In the following we analyze the determinants of general risk attitudes measured by the survey item described above. We introduce our empirical approach in Section 5.4.1 which is succeeded by the analysis of the determinants of risk attitudes (Section 5.4.2). In a consecutive step we challenge the hypothesis of stable general risk attitudes in the presence of shocks and estimate the impact of particular shock approximations on risk attitude (Section 5.4.3).

5.4.1 Empirical approach

In explaining the individual risk attitude we rely on a set of standard variables. These include demographic, socio-economic and subjective variables which are potential determinants of risk attitudes. Our baseline sample for general risk attitude consists of 2,068 observations in Thailand

[8]Note that we use the words positive and negative shock surprises in a normative way, i.e. the household benefits from positive shock surprises (less shocks than expected) and suffers from negative shock surprises (more shocks than expected).

and 2,048 in Vietnam. In general, we estimate the two countries separately as we regard Vietnam as an out-of-sample case where we can test whether findings for Thailand are robust across countries.

We use an interval regression estimator and bootstrapped standard errors to take care of the nature of data, characterized by interval scaling and by the non-normal distribution.

5.4.2 Determinants of risk attitudes

Results for Thailand. We proceed with the regression approach in several steps. As a starting point, specification (1) in Table 5.3 uses three potentially meaningful variables which can all be seen to an overwhelming degree as exogenous, i.e. the gender of respondents, their age and height (see Dohmen et al., 2011). We find that older respondents are more risk-averse than younger ones, whereas gender and height does not play a significant role.

In a next step we examine relations between three further socio-economic variables and risk attitude. It is to be expected that higher income is related to more willingness of risk taking, either because higher income provides some cushion against adverse outcomes or because a reverse channel plays a role, i.e. that people with higher willingness to take risk will end up with higher income. The second variable is education, where better education enables respondents to get higher income (see the earlier variable) and to be better able to cope with risk (e.g. by better understanding impact of risk, risk distribution or correlation etc.). Third, being married leads sometimes to more risk-averse behavior because these people feel also responsible for others, in particular children. However, another linkage of being married to risk could be that the fact of a marriage provides an element of income and risk diversification which may allow accepting more risk. The empirical outcome is shown in specification (2), indicating that higher income and better education are associated with less risk aversion, whereas the positive coefficient sign for being married is statistically insignificant.

In another step we also analyze a subjective variable, i.e. the degree of optimism. More optimism is expected being tentatively related to less risk aversion. The coefficient sign shown in specification (3) is indeed positive as expected but insignificant.

Finally, putting all variables in one regression leads to the result shown as specification (4): the determinants of age and income remain significant, whereas the variable education has a much smaller coefficient which turns statistically insignificant. Overall, the explanatory power of the demographic, socio-economic and subjective variables considered here is quite limited for the case of Thailand. This result is to some degree in line with other studies which explicitly emphasize this outcome, such as Guiso and Paiella (2008). However, the R^2 is low and we test below whether this may be related to some noise from undecided respondents.

Median answers. In order to address the surprisingly high share of responses to the median category five, i.e. more than 40% of responses (see Figure 5.1), we propose three different approaches. First, we hypothesize that responses to category five may represent undecided re-

spondents which nevertheless give an answer. An answer at the median response category may ensure a face saving situation and may avoid an embarrassing situation where either respondents had to confess their undecidedness or where interviewers might not be able to address respondents' concerns adequately. If this hypothesis is true, we expect no distortion due to undecided respondents but rather an increase of noise. Thus, the regressions are repeated but respondents answering with category five are excluded from the sample. This reduces the new sample to 1,205 persons. Estimates are provided in Table 5.17. The results confirm the former findings (Table 5.3) as all variables keep their sign and remain largely significant. It is revealing, however, that the R^2 of all regressions is about 50% higher, supporting the notion that undecided respondents increase noise. We conclude that the category-five respondents indeed do not distort the structure of findings but contribute to more noise which supports the hypothesis of undecided respondents.

Second, we hypothesize that some respondents may have had problems fully understanding the meaning of this survey item and that they therefore answered with category five. This might distort our analysis if category-five respondents differ from others, e.g. in that these respondents actually have lower cognitive ability and at the same time a higher degree of risk aversion (Dohmen et al., 2010; Hsu et al., 2005) which is masked by their category-five responses. In order to test whether understanding may play a role in the choice of category five, we group our sample into three sub-samples according to respondents' degree of education. The results, which are displayed in Table 5.18, show indeed that explained variance increases for the two better educated groups, indicating that answers of the less educated increase noise in the data. Reassuringly, however, the structure of the three regressions is qualitatively the same, i.e. the estimated coefficient signs remain stable. The only exception occurs in the medium subsample where income variability seems to pick up a level effect and thus leads to the "wrong" sign at the income variable.

Third, in order to understand possible motivations of category-five responses in a more comprehensive way, we compare personal characteristics of respondents answering category five with other respondents (see Table 5.19). Especially young and badly educated are likely to chose the middle category of the rating scale. This underlines the two earlier explanations that less decided younger and less educated respondents may choose category five and thus contribute to noisy data.

Overall findings on the median responses indicate a limitation to the feasibility of the survey item but do not overrule the general conclusion that the survey item is reliable to illicit risk preferences. To be on the safe side, we have rerun all examinations on the predictive ability of risk attitudes for behavior towards risk (Section 5.5.1) by excluding the median category and get qualitatively unchanged results (Table 5.20).

The use of survey items in practical field work would profit from their "universal" appropriateness. As a simple test of the general usefulness of this item, we repeat the exercise from Thailand in another country, i.e. Vietnam. We confirm that the survey based measure of risk

attitude is plausibly linked to many correlates. In some contrast to Thailand there exist more statistically significant relationships.

Results for Vietnam. Starting with specification (5) in Table 5.3 in parallel specification (1) for Thailand, we get a result that is different from Thailand as the age coefficient is insignificant whereas the effect from height is strong. The explanatory power of this first specification is as low as in Thailand.

When we analyze the three socio-economic variables in specification (6) we get very similar results as in Thailand but coefficients are larger and the dummy variable for being married becomes significant. Accordingly, explanatory power of this regression is comparatively good. Also the optimism variable in specification (7) provides a significant result. Putting all variables into one regression, specification (8) shows that formerly significant variables keep their sign and significance with one remarkable exception, namely age. Age becomes significant but with an unexpected positive sign. Why should older people in Vietnam accept more risk, different from standard results and different from the parallel examination in Thailand? There may be two explanations: first, the estimate might be weakly identified for age groups at the borders, i.e. very young and old respondents. Second, it could be an effect from the Vietnam war. We address this issue in the following.

Age effect. To address the unexpected sign of the age effect we plot the relationship in Figure 5.4. Age has a clear hump-shaped pattern with a peak for the 50-year-old cohort. We link this pattern to the Vietnam War. People facing war times are subject to fundamental risks which seems to shift their calibration of riskiness so that they appear as more risk loving when compared to people without war experiences (Fearon, 1995).

Furthermore, it is meaningful that the age cohorts which are very young are not very well covered by the sample. This might introduce more noise to the data set. Analyzing the isolated effect of age graphically for the cohorts aged 45 or older yields the traditional negative slope of the effect.

5.4.3 Shocks and risk attitudes

This section reports our main results with respect to various kinds of shocks influence risk attitude. In order to do so we analyze whether and in which way the consideration or earlier shocks, as described in Section 5.3, contributes to explaining individual risk attitude. Basically, the respective shock item is added to the set of determinants of "general risk attitude" used before (see results in Table 5.3). Therefore, we present results on the four categories of shocks introduced, i.e. impact of shocks, idiosyncratic vs. covariate shocks, unexpected shocks and negative vs. positive shock surprises.[9]

Shock impact. Our first examination addresses the question of whether the severity of shocks has an impact on risk attitudes. Therefore, we rely on respondents who classify the

[9]Regression results for all individual shock categories are reported in Table 5.15.

severity of shocks that happened to them as having no, low, medium and high impact. We find that the "non-high" impact shocks do not have a significant coefficient if added to the standard determinants of individual risk attitude; this is shown in Table 5.4, column (1) for Thailand and in column (6) for Vietnam, respectively. However, if we focus on the high impact shocks, which represent the slight majority of all shocks mentioned in both countries, we find that the occurrence of these shocks has indeed a statistically significant coefficient: the experience of unwanted shocks tends to increase individual risk aversion. This finding is robust throughout various specifications which we show in Table 5.4.

In specification (2) we show the "number of high impact shocks" as the single determinant in explaining risk attitude and see the negative coefficient, although not yet at a statistically significant level. In specification (3) we add three variables which are typically regarded as largely exogenous with respect to risk attitude (see Section 5.4.2). Sex, age and height have the expected coefficient signs, although only "age" is statistically significant. Reassuringly, the shock variable also turns now significant. In specification (4) we use another set of three socio-demographic variables, showing that higher income and better education tend to reduce risk aversion. However, the coefficient of the shock variable becomes somewhat smaller leading to insignificance again. Specification (5) shows the relation of risk attitude with "optimism" which has the expected sign but does not explain much. Finally, specification (6) considers all variables used in the earlier regressions and fully confirms earlier relations: all significant variables keep sign and significance, the shock variables become significant again. Interestingly, these relations are also very similar to the ones shown in Table 5.3 above, i.e. without the shock variable.

In a next step we are interested to learn whether this finding also holds for another case which is here the sample from Vietnam. As for the case of Thailand we show several specifications. Specification (8) is identical to specification (2) and includes the shock variable only. The coefficient has the same sign but is larger than in Thailand and is statistically highly significant. Including the three "exogenous" variables in specification (9) does not change the coefficient on the shock variable much but further increases the R^2 of the regression. When including the full set of variables, as shown in specification (10), we get a very similar result as shown in Table 5.3 above, i.e., without the shock variable. Estimated coefficients have the same signs, are significant in the same cases and the shock variable has the expected significant coefficient. Overall, this indicates that the occurrence of high impact shocks tends to increase risk aversion. This effect is stronger in Vietnam than in Thailand and is in both countries largely unaffected by the consideration of various control variables.

Idiosyncratic vs. covariate shocks. The following examinations explore whether it matters for the influence of shocks on risk attitude that they occur in an idiosyncratic or covariate way. We know from the descriptive statistics (Table 5.1) that idiosyncratic shocks hit households about twice as often as covariate shocks and that this ratio applies to both countries, even though the self-stated number of shocks is higher in Vietnam than in Thailand. When we put both kinds of shocks into our standard regression framework we see in Table 5.5 that results differ between Thailand and Vietnam. Whatever particular specification we choose,

in Thailand the importance of covariate shocks dominates, whereas in Vietnam idiosyncratic shocks seem to matter much more. This difference cannot be due to differences in the number of shocks. However, institutional circumstances differ between the two countries: Thailand has a more market-oriented economy so that market shocks occur more often relative to other shock types (and in absolute numbers even more often than in Vietnam); moreover, they are less counterbalanced by state intervention. On the other hand, idiosyncratic shocks are very often health shocks which are largely covered by a very cheap public health system. In Vietnam, on the contrary, the state still regulates and dampens market fluctuations more than in Thailand, whereas effective health provisions are less reliable and accessible than in Thailand.

Unexpected shocks. Theoretically one may expect that fulfilled expectations will not lead to changing behavior whereas surprises, i.e. events that have not been expected, may change behavior. This is the logic behind our examination of the relevance of unexpected shocks. In doing so we rely on our measure of unexpected shocks which was introduced in Section 5.3 and is the residual after matching the number of shock expectations in each shock category per household with respective shock realizations. Due to calculation method of this measure it is roughly calibrated to be zero on average across households, so that unexpected shocks can be tentatively captured. It seems that this measure of unexplained shocks has the expected effect on risk attitude in Thailand and is robust to various control variables. The sign of the shock coefficient is also up to expectations in Vietnam, however, the coefficient is much smaller and in most specifications statistically insignificant. In particular the inclusion of an "optimism" variable makes the shock variable unimportant, indicating that optimism counterbalances unexplained shocks.

Negative vs. positive shock surprises. In another step we scrutinize the effect of unexpected shocks by disaggregating our index in negative and positive shock surprises as explained in Section 5.3 above. Table 5.7 displays the regression results.

Overall, we expect for both parts of the index a negative sign as larger values of the positive/negative shock surprise index correspond to more unexpected shocks. If households were more averse to negative surprises we would expect a larger coefficient for negative surprises than for positive ones. Since we standardize both indices we are able to compare the coefficients directly.

Indeed, we find a significantly negative sign for the shock surprise indices. However, the results differ between the two countries when comparing positive and negative surprises. In Thailand negative shock surprises play a major role in determining the effect of shock surprises on risk attitudes. In contrast, Vietnamese results are driven by positive surprises which is somewhat unexpected ex ante. At a closer look the Vietnamese result is based on the larger fraction of positive shock surprises. The prevalence of positive shock surprises is larger than the prevalence of negative shock surprises. Vietnamese respondents expect far more shocks than Thai households as reported above.

5.5 Robustness

The following section challenges the findings on risk attitudes. First, we relate risk attitudes to actual risk behavior, i.e. the decision to be self-employed and the purchase of lottery tickets. Second, we validate the survey based measure with the evidence of an incentivized experiment. Third, we validate the importance of the shock effect on risk attitudes by an alternative measure for shocks.

5.5.1 Risk behavior

After having described the similarities and differences between risk attitudes in Thailand and Vietnam we turn the focus to the predictive ability of the risk attitude measure for the respondents' risk behavior. Risk attitudes are shown to be a major determinant for decisions under risk (e.g. Dohmen et al., 2011). To test the predictive ability of the risk attitude measure in Thailand and Vietnam we correlate this measure with risk behavior of the respondents in two directions, i.e. the decision to be self-employed, and about buying lottery tickets (see Hardeweg et al., 2013 forthcoming). For both countries risk attitude turns out to be a meaningful predictor of risk behavior, with results being more pronounced in Thailand than in Vietnam.

Self-employment. Entrepreneurship is a prominent example of risk behavior (see Knight, 1916). Running a business incorporates the responsibility for decisions in a risky environment. Cash flows in business are not certain and will typically fluctuate more than for a position as employee. We are aware that the decision for being self-employed and (lower) risk aversion are interrelated: willingness to take risk is an obvious precondition for becoming self-employed but possibly enforced self-employment may lead to lower risk aversion, too - self-employment is a matter of supply and demand (Caliendo et al., 2009). Since we cannot clearly identify causality we interpret results conservatively as correlates.

We implement a probit model to estimate the correlation between risk attitude and the probability of being self-employed. Bootstrapped standard errors are used to account for non-normality. Table 5.8 displays the marginal effects at the mean of the respective covariate. Risk attitudes are significantly related to self-employment. In terms of explained variance the evidence for Thailand is much stronger than for Vietnam. In the following we discuss the detailed results by country.

In Thailand risk attitudes alone explain about 3% of variance in self-employment. For a marginal increase of risk aversion the probability to be an entrepreneur increases by 1%. The effect is highly significant and robust for all specifications. Even when we use the full set of controls the marginal effect stays with 0.95% close to 1%. In the full specification (3) we explain about 12% of the variance. We conclude that risk attitude is a major determinant of being self-employed.

For Vietnam we find similar results. Risk attitude is significantly correlated with self-employment, although less so than in Thailand. Increasing risk attitude by a marginal change is

associated with an increase in the probability of being self-employed by 0.8%. The effect remains the same when we include a few more controls. Adding the full set of controls the effect drops to 0.6%. In terms of explained variance risk attitude is still an important determinant in Vietnam. Risk attitude alone explains 1.8% whereas the full set of explanatory variables accounts for 11%.

In summary, the survey item on general risk attitude predicts the decision of being self-employed - if we accept this possible influence here (being aware of reverse causality) - to quite some extent. For Thailand, the relation between survey item and self-employment is consistently close for all specifications, but for Vietnam this relation is always weaker.

Lottery ticket purchase. Participation in lotteries is obviously a risky decision. Lottery buyers spend money hoping for an uncertain lottery win despite a reasonable amount of money which is to put at stake upfront. Hence the purchase of lottery tickets is seen as a social behavior which is a good indicator for a small degree of risk aversion. The relationship is studied in numerous works (see for an overview on state lotteries Clotfelter and Cook, 1990).

Our survey measures the purchase of lottery tickets for the total household, i.e. costs for lotteries are included in the total household budget. Thus, the link between the respondent and the purchase of tickets is not perfect as other members of the household may be responsible for this expenditure. Nevertheless, most respondents are the household head, who is defined as being responsible for the household expenditures. Even when the household head is not playing herself she will typically agree that part of the household income is spent for buying lottery tickets so we expect a relation between respondents characteristics and lottery ticket purchase. Another concern often discussed in the context of rural household data is the lack of precision in data (Fisher et al., 2010). To give a conservative estimate of the effect of risk attitude on playing lotteries, we focus on the decision to buy lottery tickets. Additional examinations explaining expenditures for lottery tickets are given in Table 5.21) and are in support of the evidence presented here.

We estimate a probit regression of the effect of risk attitude on buying lottery tickets. Standard errors are bootstrapped and results are presented in Table 5.9. Risk attitude is significantly correlated to lottery ticket purchase and is a major predictor in Thailand. This also holds when we use various sets of control variables as indicated by specifications (2) and (3) in Table 5.9. Throughout these modifications the marginal effect remains remarkably stable; a marginal increase in risk attitude of one unit results in about 2.4% higher probability of buying a lottery ticket. With these features risk attitude turns out to be the dominant predictor for lottery expenditures in Thailand.

Whereas 55% of households in Thailand buy lottery tickets, this share is very low in Vietnam with 4% as other forms of risk gambles and bets prevail. Accordingly, the result for Vietnam is not strong: economically the coefficient on the general risk attitude variable is just one tenth of the Thai case but is still statistically significant.

In summary, the survey item on the general risk attitude predicts the decision of lottery ticket purchase surprisingly well, if considered that we have to link individual risk attitude with

the behavior of various persons in a household. As in the earlier cases, the predictive power is higher in Thailand than in Vietnam.

5.5.2 Experimental validation of risk attitudes

This section informs about additional examinations supporting the usefulness of the survey-based measure of risk attitude. In the following we compare the survey item to an experimental measure of risk attitude on a sub-sample for which the experimental data is available.[10]

We validate the survey-based results on risk attitudes by a highly incentivized Holt & Laury-type experiment (Holt and Laury, 2002). The design of this experiment closely follows Dohmen et al. (2011) and several further studies which repeat this experiment with different groups and for various purposes. Basically, respondents make 20 decisions between a safe payoff and a lottery, where the lottery is unchanged but the safe payoff increases steadily from decision to decision.

In Thailand, for example, the safe payoff starts at 0 Baht and increases by 20 Baht per decision, i.e. it goes up to 380 Baht, whereas the lottery is a 50% chance of winning 600 Baht, i.e. the expected value is 300 Baht. Due to this design and the ordering of choices, respondents will sooner or later start preferring a safe amount: most respondents start preferring the lottery with an expected value of 300 Baht against a safe payoff of 0, 20 or 40 Baht but will prefer a safe payoff of say 300 Baht or more compared to an expected lottery value of 300 Baht. Accordingly, individual risk attitude is characterized by the specific decision where respondents start preferring the safe amount. In order to support consistent and reliable decision making, respondents are informed ex ante that one of the 20 decisions will be randomly selected and played afterwards with real money (more details in Hardeweg et al., 2013 forthcoming). The money at stake is quite high as an expected lottery value of 300 Baht is about a two day full salary for a "regular" worker in rural Northeast Thailand. Monetary incentives in Vietnam are also in local currency and are equal to Thailand regarding their incentive. Holt (1986) proofs that this random lottery incentive mechanism (RLIM) has feasible attributes.

The histogram of minimum preferred safe payoffs, characterizing risk attitude, is shown for both countries in Figure 5.2. It becomes obvious that most responses tend towards the left and almost all are at or below row 16, i.e. in Thailand the safe amount of 300 Baht. That implies that most respondents are risk-averse as expected, a few are risk neutral (at row 16) and only a share of about 15% in Thailand and 10% in Vietnam is risk loving. This outcome makes sense and fits to the outcomes of earlier studies. Perhaps striking is the large fraction of respondents who chose nil as a certain pay-off. We interpret this behavior as rational high risk aversion

[10] As another approach in testing the validity of our results we are fortunately able to compare results for Thailand over time. Hardeweg et al. (2013 forthcoming) have followed basically the same approach as we do, however, for Thailand only. They use an earlier wave of the same survey, so that we really provide an out-of-sample test by using the wave of 2010. We realize that results are qualitatively the same across both waves. This applies to descriptive statistics as well as to regressions.

which is due to the random lottery incentive mechanism.[11] However, we are interested in the relation of the survey item on risk attitude and this experiment. Therefore, it is reassuring that both measures are positively correlated. The Spearman rank correlation coefficient between both measures is 0.30 in Thailand and 0.14 in Vietnam. Both coefficients are significant at the 1% confidence level.

In order to examine the relation between the survey measure and the experimental measure on risk attitude in more detail, we use the survey item as right hand side variable in explaining the experiment outcome. In a first step, we just relate the two measures in the above used standard procedure of interval regressions and in further steps we add more control variables. As Table 5.10 shows, the survey item of general risk attitude has a quite consistent explanatory power in determining the experimental outcome.

In Thailand, the respective coefficient is highly significant in specification (1), though its size decreases a bit when adding more variables. Nevertheless, the result is consistent and largely significant. Outcomes in Vietnam are even clearer, as the coefficient is larger and through all specifications highly statistically significant.

In summary, we conclude that the experiment tentatively validates the findings of the survey based measure.

5.5.3 Validation of shock effect

To scrutinize the effect of shocks on general risk attitude we approach the research question from another direction. Vulnerability as a dynamic poverty concept is often defined as the likelihood to fall below a poverty line, which is commonly measured as a certain level of consumption. Adverse shocks to household income and consumption play a crucial role in this probability. We approximate these adverse shocks in the following by employing the self-perceived income volatility of the household. Specifically, we ask how much does the household income fluctuate. Answers are coded on an ordinal scale whether income fluctuates "not at all", "a bit", or "a lot".

The question validates our previous findings in two dimensions. First, it is highly correlated with all shock indicators. The correlation coefficients are all statistically highly significant and vary between 0.0642 for the number of covariate shocks and 0.1382 for the number of high impact shocks.

Second, income volatility is also negatively related to general risk attitude and so are the other shock indicators are, see Table 5.11.

[11] Cox et al. (2011) show that the random lottery incentive mechanism (RLIM) involves cross-task contamination. Already other papers raise doubts on the validity of the mechanism (Harrison, 1994). We believe this to be one reason for the high share of nil as certain pay-off. Respondents perceive already the RLIM as a game where they draw one number out of the bag which will eventually give them a reasonably high pay-off. So they opt for playing the game, but do not want to take more risks than those which are already involved in the RLIM, i.e. drawing the card to determine the pay-off game.

Furthermore, we stress the effect of unexpected shocks in a second approach to compute unexpected shocks. Instead of the regression approach we report here the results for the unexpected shocks measured via the difference method (for an explanations see Section 5.3). The results remain stable for the aggregate shock surprise index as well as for the disaggregated shock indices of positive and negative shock surprises.

5.6 Conclusion

This research addresses a question of great importance for practical purposes in development research and policy: if we want to reveal risk attitudes of individuals, are responses to a simple survey item sufficiently reliable? Our angle in examining reliability is to conduct comparative research across Thailand and Vietnam. As we build on earlier work in Thailand by Hardeweg et al. (2013 forthcoming) our contribution can be seen in this respect as an out-of-sample test. We focus on the comparison between both countries but we also report robustness of findings over time within Thailand. All this provides our first finding that the survey item is a useful proxy of risk attitude. This is supported by three facts: the survey item is plausibly related to similar socio-demographic characteristics of respondents in both countries, the survey item helps explaining behavior towards risk in different environments and the survey response is reliable, evidenced by its close relation to an experimental measure of risk attitude and by its stability over time (available for Thailand only).

In comparing the outcome across both countries, we receive our second finding, that is major differences in responses. Despite the overall similarity in the direction of responses, the size of coefficients is very different across countries: first, the survey item in Vietnam can be explained much better by socio-economic variables. If one interprets this fact as indication for the usefulness of the measure, one will be disappointed by a second difference across countries. We find that risk attitude in Vietnam predicts behavior much less than in Thailand. This second difference suggests that the survey item works better in Thailand, possibly because it captures behavior towards risk that is independent from socio-economic influences. In this sense the survey item may be the better measure in Thailand. Overall, we learn that a survey item can perform differently across countries, a lesson being supported by strong regional effects in both countries.

As a final finding, independent from the cross-country comparison, we have included a measure of household vulnerability as control variable in our regressions and see that it tentatively helps explaining risk attitude and risk behavior. Living in more vulnerable circumstances is obviously related to more risk-averse attitude and behavior, possibly because these persons cannot afford to take risk.

Overall, we are glad to report that a simple survey item is helpful in understanding behavior towards risk. However, results in Vietnam are much weaker than in Thailand and thus warn about just spreading such a measure across countries. We rather conclude that further experimentation with survey items and experimental design are highly welcome.

5.7 Appendix

Table 5.1: Descriptive statistics of variables by country

The table presents summary and inference statistics by country. Dummy variables are denoted by †. We test for differences in the mean of both countries with Fisher's exact test, Wilcoxon-Mann-Whitney rank-sum test, or a t-test. Respective p-values are presented in the last column. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%). The definition of variables is discussed in Table 5.12.

	Thailand					Vietnam					
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Difference
Female†	2068	0.595	0.491	0	1	2048	0.490	0.500	0	1	0.000***
Age (years)	2068	52.122	12.504	18	80	2048	47.737	13.177	18	80	0.0000***
Height (meters)	2068	1.584	0.080	1.06	1.85	2048	1.579	0.073	1.05	1.85	0.0710*
Income (1000 USD-PPP)	2068	9.080	16.506	-147	512	2048	5.941	7.597	-85	145	0.0000***
Education (years)	1994	5.377	2.705	1	17	1843	7.398	2.955	1	17	0.0000***
Married†	2068	0.829	0.376	0	1	2048	0.852	0.356	0	1	0.055*
Optimism	2064	0.442	0.810	-2	2	1986	0.438	0.638	-2	2	0.9171
General risk attitude	2068	4.663	2.557	0	10	2048	4.157	2.751	0	10	0.0000***
Minimum acceptable offer (row)	896	9.259	6.158	1	21	687	8.373	5.386	1	21	0.0320**
Income volatility perceived	2068	1.776	0.657	1	3	2044	1.519	0.582	1	3	0.0000***
Self-employed†	2064	0.091	0.287	0	1	2042	0.100	0.300	0	1	0.313
Lottery purchases (USD-PPP)	1875	45.311	70.039	0	276	2044	1.526	13.526	0	283.8	0.0000***
Buyer of lottery tickets†	1875	0.548	0.498	0	1	2044	0.040	0.196	0	1	0.000***

Figure 5.1: Histogram of general risk attitude by country

General risk attitude is a survey item which asks the following question: "Are you generally a person who is fully prepared to take risks or do you try to avoid taking risk? (Please choose a number on a scale from 0 to 10)". The answer is given on a labeled scale, which ranges from 0 (unwilling to take risk) to 10 (fully prepared to take risks).

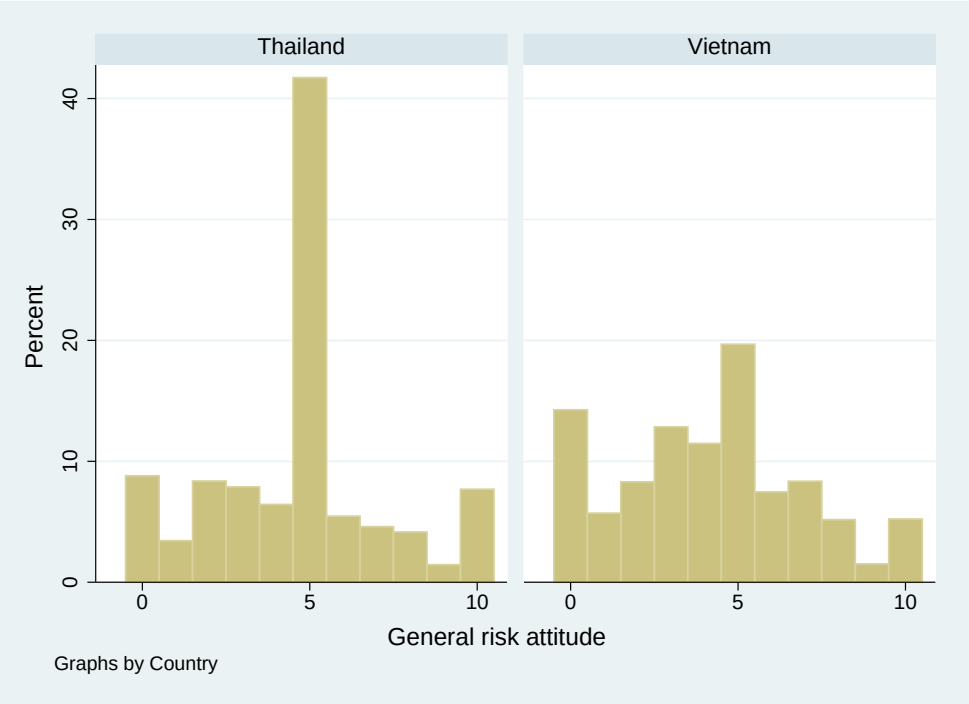

Table 5.2: Descriptive statistics of shock dimensions by country

The table summarizes the number of shocks which have occurred to the household since 2008. Shocks are disaggregated in impact size, idiosyncratic vs. covariate, expected vs. unexpected shocks, and negative vs. positive shock surprises. Differences across both countries are tested by t-tests, the last column reports the respective p-values. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand					Vietnam					
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Difference
Number of shocks	2068	1.235	1.369	0	9	2048	1.876	1.594	0	10	0.0000***
Number of shocks (demographic)	2068	0.261	0.494	0	4	2048	0.409	0.626	0	5	0.0000***
Number of shocks (social)	2068	0.235	0.510	0	3	2048	0.337	0.603	0	4	0.0000***
Number of shocks (agricultural)	2068	0.535	0.808	0	5	2048	1.010	1.068	0	6	0.0000***
Number of shocks (economic)	2068	0.205	0.498	0	4	2048	0.121	0.400	0	3	0.0000***
Number of no impact shocks	2068	0.033	0.188	0	2	2048	0.008	0.091	0	1	0.0000***
Number of low impact shocks	2068	0.094	0.342	0	3	2048	0.135	0.420	0	4	0.0006***
Number of medium impact shocks	2068	0.439	0.818	0	6	2048	0.770	0.992	0	6	0.0000***
Number of high impact shocks	2068	0.669	1.012	0	6	2048	0.957	1.156	0	8	0.0000***
Number of idiosyncratic shocks	2068	0.802	1.079	0	8	2048	1.237	1.201	0	6	0.0000***
Number of covariate shocks	2068	0.428	0.844	0	7	2048	0.633	0.960	0	7	0.0000***
Unexpected shock index (mean of residuals)	2068	-0.009	0.050	-0.079	0.282	2048	0.012	0.067	-0.104	0.772	0.0000***
Negative shock surprises (residuals)	2068	0.016	0.034	0	0.282	2048	0.030	0.053	0	0.772	0.0000***
Positive shock surprises (residuals)	2068	-0.025	0.024	-0.079	0	2048	-0.018	0.023	-0.104	0	0.0000***
Unexpected shock index (mean of differences)	2068	-0.193	0.174	-1.244	0.296	2048	-0.217	0.168	-1.044	0.222	0.0000***
Negative shock surprises (differences)	2068	0.004	0.020	0.000	0.296	2048	0.004	0.020	0.000	0.222	0.4309
Positive shock surprises (differences)	2068	-0.197	0.168	-1.244	0	2048	-0.220	0.162	-1.044	0	0.0000***

Table 5.3: Determinants of general risk attitude

Interval regression of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand				Vietnam			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female†	-0.216			-0.200	-0.0942			0.0945
	(0.139)			(0.147)	(0.146)			(0.150)
Age (years)	-0.0233***			-0.0201***	0.000449			0.0166***
	(0.00462)			(0.00555)	(0.00464)			(0.00535)
Height (meters)	1.088			0.813	4.733***			2.458**
	(0.930)			(0.917)	(1.047)			(1.081)
Income (1000 USD-PPP)		0.00950***		0.00969***		0.0462***		0.0348***
		(0.00341)		(0.00342)		(0.0122)		(0.0115)
Education (years)		0.0821***		0.0424*		0.138***		0.111***
		(0.0215)		(0.0239)		(0.0217)		(0.0226)
Married†		0.176		0.0202		0.910***		0.861***
		(0.158)		(0.164)		(0.187)		(0.194)
Optimism			0.0387	-0.0385			1.109***	0.924***
			(0.0733)	(0.0729)			(0.0906)	(0.104)
Constant	4.785***	4.508***	5.150***	4.743***	-2.794	2.714***	4.217***	-2.079
	(1.570)	(0.189)	(0.0654)	(1.544)	(1.745)	(0.235)	(0.0750)	(1.796)
lnsigma	0.924***	0.924***	0.932***	0.920***	0.997***	0.972***	0.966***	0.941***
	(0.0160)	(0.0160)	(0.0157)	(0.0164)	(0.0141)	(0.0146)	(0.0144)	(0.0159)
Observations	2,068	1,994	2,064	1,990	2,048	1,843	1,986	1,787
McKelvey & Zavoina's R^2	0.0159	0.0142	0.000152	0.0227	0.0189	0.0612	0.0677	0.108

Table 5.4: Determinants of general risk attitude and number of high impact shocks

Interval regression of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Number of no impact shocks	-0.151					-0.656				
	(0.290)					(0.632)				
Number of low impact shocks	-0.170					0.512***				
	(0.176)					(0.132)				
Number of medium impact shocks	-0.0638					0.0555				
	(0.0717)					(0.0559)				
Number of high impact shocks	-0.0925	-0.0998*	-0.0901	-0.0893	-0.0998*	-0.253***	-0.244***	-0.231***	-0.216***	-0.193***
	(0.0580)	(0.0575)	(0.0587)	(0.0559)	(0.0574)	(0.0548)	(0.0548)	(0.0546)	(0.0528)	(0.0559)
Female†		-0.218			-0.203		-0.0798			0.112
		(0.138)			(0.147)		(0.145)			(0.150)
Age (years)		-0.0236***			-0.0206***		-0.000311			0.0160***
		(0.00462)			(0.00556)		(0.00462)			(0.00532)
Height (meters)		1.069			0.807		4.571***			2.408**
		(0.929)			(0.920)		(1.041)			(1.085)
Income (1000 USD-PPP)			0.00952***		0.00975***			0.0416***		0.0314***
			(0.00345)		(0.00346)			(0.0122)		(0.0117)
Education (years)			0.0809***		0.0404*			0.136***		0.110***
			(0.0215)		(0.0240)			(0.0218)		(0.0226)
Married†			0.175		0.0175			0.894***		0.855***
			(0.158)		(0.165)			(0.185)		(0.193)
Optimism				0.0324	-0.0466				1.074***	0.897***
				(0.0737)	(0.0733)				(0.0904)	(0.102)
Constant	5.274***	4.896***	4.574***	5.212***	4.863***	4.792***	-2.276	2.991***	4.440***	-1.746
	(0.0712)	(1.569)	(0.195)	(0.0753)	(1.549)	(0.0998)	(1.734)	(0.249)	(0.0942)	(1.804)
lnsigma	0.931***	0.923***	0.924***	0.931***	0.919***	0.996***	0.991***	0.967***	0.962***	0.937***
	(0.0158)	(0.0160)	(0.0159)	(0.0157)	(0.0163)	(0.0138)	(0.0141)	(0.0147)	(0.0145)	(0.0160)
Observations	2,068	2,068	1,994	2,064	1,990	2,048	2,048	1,843	1,986	1,787
McKelvey & Zavoina's R^2	0.00252	0.0175	0.0155	0.00142	0.0243	0.0194	0.0294	0.0707	0.0760	0.115

Table 5.5: Determinants of general risk attitude and number of idiosyncratic vs. covariate shocks

Interval regression of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Number of idiosyncratic shocks (std.)	-0.0484	-0.0637	-0.0567	-0.0490	-0.0671	-0.177***	-0.171***	-0.201***	-0.132**	-0.159***
	(0.0674)	(0.0670)	(0.0685)	(0.0645)	(0.0646)	(0.0585)	(0.0584)	(0.0562)	(0.0566)	(0.0572)
Number of covariate shocks (std.)	-0.155***	-0.164***	-0.163**	-0.151**	-0.171***	0.0541	0.0682	0.0505	0.0782	0.0874
	(0.0597)	(0.0603)	(0.0647)	(0.0623)	(0.0655)	(0.0504)	(0.0500)	(0.0532)	(0.0513)	(0.0555)
Female†		-0.242*			-0.227		-0.0659			0.124
		(0.138)			(0.147)		(0.147)			(0.151)
Age (years)		-0.0239***			-0.0210***		0.000238			0.0166***
		(0.00462)			(0.00558)		(0.00463)			(0.00535)
Height (meters)		0.981			0.708		4.846***			2.593**
		(0.928)			(0.915)		(1.049)			(1.080)
Income (1000 USD-PPP)			0.00947***		0.00971***			0.0439***		0.0334***
			(0.00343)		(0.00342)			(0.0121)		(0.0116)
Education (years)			0.0795***		0.0387			0.138***		0.111***
			(0.0214)		(0.0240)			(0.0218)		(0.0227)
Married†			0.186		0.0256			0.904***		0.853***
			(0.159)		(0.165)			(0.186)		(0.194)
Optimism				0.0331	-0.0463				1.099***	0.911***
				(0.0736)	(0.0735)				(0.0905)	(0.103)
Constant	5.138***	4.971***	4.486***	5.127***	4.960***	4.685***	-2.951*	2.770***	4.238***	-2.259
	(0.0587)	(1.566)	(0.190)	(0.0668)	(1.541)	(0.0637)	(1.748)	(0.237)	(0.0777)	(1.792)
lnsigma	0.930***	0.922***	0.922***	0.930***	0.918***	1.004***	0.994***	0.969***	0.964***	0.938***
	(0.0159)	(0.0161)	(0.0159)	(0.0157)	(0.0164)	(0.0137)	(0.0141)	(0.0146)	(0.0144)	(0.0159)
Observations	2,068	2,068	1,994	2,064	1,990	2,048	2,048	1,843	1,986	1,787
McKelvey & Zavoina's R^2	0.00355	0.0200	0.0183	0.00353	0.0272	0.00476	0.0235	0.0672	0.0709	0.113

Table 5.6: Determinants of general risk attitude and unexpected shocks

Interval regression of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Unexpected shock index residuals (std.)	-0.161**	-0.178**	-0.174**	-0.159**	-0.187***	-0.0744	-0.0645	-0.0849*	-0.0164	-0.0253
	(0.0700)	(0.0706)	(0.0730)	(0.0703)	(0.0721)	(0.0502)	(0.0500)	(0.0501)	(0.0471)	(0.0498)
Female†		-0.234*			-0.218		-0.0917			0.0977
		(0.138)			(0.146)		(0.146)			(0.151)
Age (years)		-0.0241***			-0.0210***		9.25e-05			0.0165***
		(0.00463)			(0.00557)		(0.00464)			(0.00535)
Height (meters)		0.968			0.693		4.713***			2.456**
		(0.931)			(0.919)		(1.047)			(1.082)
Income (1000 USD-PPP)			0.00938***		0.00962***			0.0448***		0.0344***
			(0.00342)		(0.00340)			(0.0121)		(0.0116)
Education (years)			0.0816***		0.0406*			0.138***		0.111***
			(0.0214)		(0.0239)			(0.0217)		(0.0226)
Married†			0.184		0.0252			0.922***		0.866***
			(0.159)		(0.165)			(0.186)		(0.194)
Optimism				0.0362	-0.0436				1.106***	0.919***
				(0.0735)	(0.0734)				(0.0910)	(0.103)
Constant	5.137***	4.995***	4.476***	5.124***	4.969***	4.670***	-2.735	2.728***	4.221***	-2.068
	(0.0581)	(1.571)	(0.191)	(0.0664)	(1.545)	(0.0626)	(1.746)	(0.236)	(0.0772)	(1.797)
lnsigma	0.931***	0.922***	0.923***	0.931***	0.918***	1.006***	0.996***	0.972***	0.966***	0.941***
	(0.0158)	(0.0160)	(0.0159)	(0.0157)	(0.0164)	(0.0137)	(0.0141)	(0.0146)	(0.0144)	(0.0159)
Observations	2,068	2,068	1,994	2,064	1,990	2,048	2,048	1,843	1,986	1,787
McKelvey & Zavoina's R^2	0.00286	0.0194	0.0176	0.00295	0.0265	0.000925	0.0196	0.0624	0.0677	0.109

Table 5.7: Determinants of general risk attitude and negative/positive shock surprises

Interval regression of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Negative shock surprises (std.)	-0.236**	-0.257***	-0.249**	-0.242**	-0.270***	0.0623	0.0780*	0.0285	0.111**	0.0806*
	(0.0946)	(0.0968)	(0.101)	(0.0976)	(0.0970)	(0.0471)	(0.0462)	(0.0468)	(0.0493)	(0.0465)
Positive shock surprises (std.)	0.0347	0.0351	0.0331	0.0413	0.0381	-0.230***	-0.240***	-0.197***	-0.216***	-0.187**
	(0.0653)	(0.0648)	(0.0649)	(0.0633)	(0.0634)	(0.0750)	(0.0739)	(0.0745)	(0.0723)	(0.0736)
Female†		-0.233*			-0.218		-0.106			0.0861
		(0.138)			(0.146)		(0.146)			(0.150)
Age (years)		-0.0243***			-0.0213***		-0.000517			0.0160***
		(0.00462)			(0.00558)		(0.00460)			(0.00530)
Height (meters)		0.948			0.669		4.739***			2.492**
		(0.928)			(0.916)		(1.047)			(1.080)
Income (1000 USD-PPP)			0.00948***		0.00974***			0.0437***		0.0332***
			(0.00339)		(0.00338)			(0.0121)		(0.0116)
Education (years)			0.0814***		0.0398*			0.137***		0.110***
			(0.0213)		(0.0238)			(0.0217)		(0.0226)
Married†			0.190		0.0314			0.928***		0.862***
			(0.159)		(0.165)			(0.186)		(0.193)
Optimism				0.0385	-0.0422				1.104***	0.919***
				(0.0734)	(0.0733)				(0.0907)	(0.103)
Constant	5.138***	5.041***	4.474***	5.125***	5.022***	4.681***	-2.730	2.747***	4.233***	-2.062
	(0.0582)	(1.564)	(0.191)	(0.0661)	(1.540)	(0.0631)	(1.743)	(0.237)	(0.0776)	(1.793)
lnsigma	0.930***	0.922***	0.922***	0.930***	0.917***	1.003***	0.994***	0.970***	0.963***	0.938***
	(0.0159)	(0.0161)	(0.0161)	(0.0158)	(0.0164)	(0.0136)	(0.0140)	(0.0146)	(0.0143)	(0.0158)
Observations	2,068	2,068	1,994	2,064	1,990	2,048	2,048	1,843	1,986	1,787
McKelvey & Zavoina's R^2	0.00418	0.0209	0.0191	0.00444	0.0283	0.00554	0.0248	0.0655	0.0728	0.112

Table 5.8: Determinants of self-employment

Probit regression of being self-employed. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Marginal effects at the mean are displayed. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
General risk attitude	0.0112***	0.00993***	0.0101***	0.0112***	0.00950***	0.00848***	0.00851***	0.00623**	0.00746***	0.00642**
	(0.00228)	(0.00228)	(0.00229)	(0.00225)	(0.00233)	(0.00247)	(0.00238)	(0.00283)	(0.00255)	(0.00283)
Female†		0.0158			0.0114		0.107***			0.0982***
		(0.0147)			(0.0148)		(0.0175)			(0.0194)
Age (years)		-0.00204***			-0.00178***		-0.000765			-0.00112*
		(0.000487)			(0.000567)		(0.000489)			(0.000582)
Height (meters)		0.117			0.0640		0.475***			0.364***
		(0.0886)			(0.0889)		(0.110)			(0.127)
Income (1000 USD-PPP)			0.00282***		0.00273***			0.00400***		0.00336**
			(0.000612)		(0.000663)			(0.00150)		(0.00145)
Education (years)			0.00313		-0.000421			-0.000521		-0.000542
			(0.00215)		(0.00240)			(0.00229)		(0.00233)
Married†			0.000248		-0.0104			-0.00894		0.000315
			(0.0170)		(0.0192)			(0.0233)		(0.0212)
Optimism				0.0244***	0.0105				0.0194*	0.00933
				(0.00789)	(0.00797)				(0.0117)	(0.0115)
Observations	2,064	2,064	1,990	2,060	1,986	2,042	2,042	1,837	1,980	1,781
McKelvey & Zavoina's R^2	0.0317	0.0634	0.0922	0.0477	0.116	0.0179	0.0923	0.0421	0.0245	0.110

Table 5.9: Determinants of lottery buyer

Probit regression of being a lottery buyer. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Marginal effects at the mean are displayed. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
General risk attitude	0.0237***	0.0219***	0.0206***	0.0240***	0.0195***	0.00379***	0.00331**	0.00268*	0.00383***	0.00262
	(0.00461)	(0.00464)	(0.00474)	(0.00453)	(0.00484)	(0.00139)	(0.00137)	(0.00157)	(0.00148)	(0.00161)
Female†		0.0150			0.0101		0.0159			0.0157
		(0.0284)			(0.0294)		(0.0101)			(0.0115)
Age (years)		-0.00378***			-0.00526***		-0.000176			-0.000470
		(0.000976)			(0.00115)		(0.000332)			(0.000381)
Height (meters)		0.0336			0.0126		0.191***			0.172**
		(0.170)			(0.181)		(0.0701)			(0.0801)
Income (1000 USD-PPP)			0.000326		0.000635			7.49e-05		1.48e-05
			(0.00110)		(0.00109)			(0.000554)		(0.000518)
Education (years)			-0.000863		-0.0116**			0.000601		-1.35e-05
			(0.00454)		(0.00527)			(0.00174)		(0.00170)
Married†			0.0580*		0.0340			0.0194		0.0186
			(0.0319)		(0.0351)			(0.0119)		(0.0132)
Optimism				0.00142	-0.00954				-0.00246	-0.00227
				(0.0142)	(0.0157)				(0.00761)	(0.00798)
Observations	1,875	1,875	1,804	1,871	1,800	2,044	2,044	1,840	1,982	1,784
McKelvey & Zavoina's R^2	0.0228	0.0377	0.0209	0.0234	0.0423	0.0150	0.0356	0.0194	0.0137	0.0399

Figure 5.2: Histogram of minimum acceptable offer by country

We elicit risk preferences in a field experiment. Details for the experimental design are discussed in Section 5.5.2.

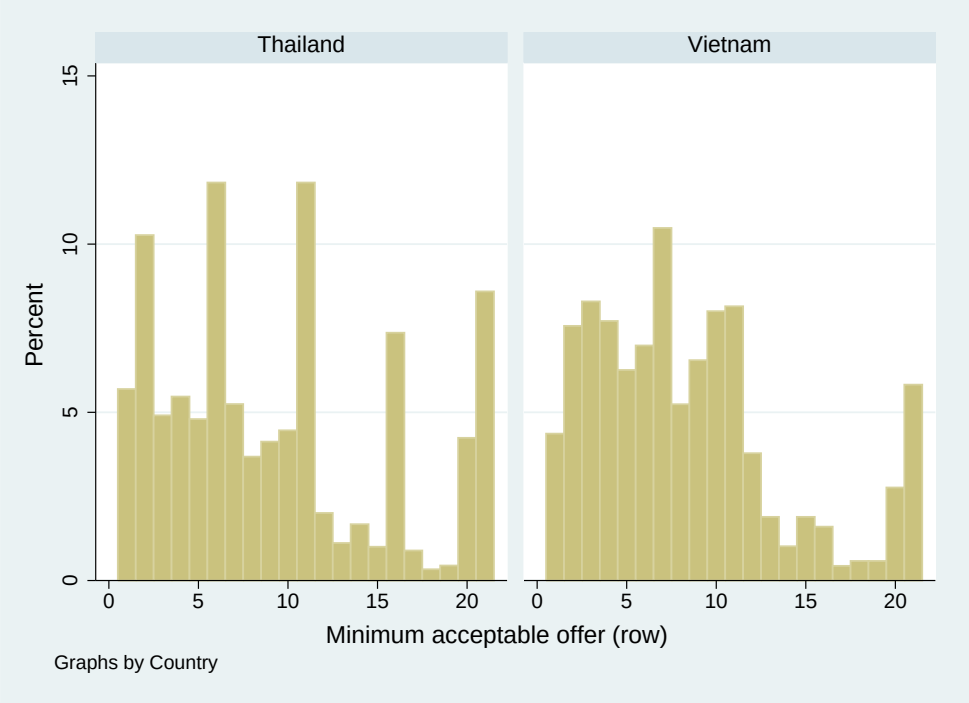

Table 5.10: Determinants of minimum acceptable offer

Interval regression of minimum acceptable offer (mao). Larger values of mao correspond to higher levels of risk lovingness. Dummy variables are denoted by †. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
General risk attitude	0.269***	0.198**	0.271***	0.261***	0.211***	0.518***	0.499***	0.364***	0.458***	0.316***
	(0.0795)	(0.0807)	(0.0799)	(0.0797)	(0.0813)	(0.0830)	(0.0830)	(0.0919)	(0.0882)	(0.0983)
Female†		-0.0277			-0.120		0.123			-0.306
		(0.507)			(0.525)		(0.498)			(0.554)
Age (years)		-0.0631***			-0.0604***		-0.0156			-0.00680
		(0.0171)			(0.0199)		(0.0162)			(0.0196)
Height (meters)		1.588			1.277		7.736**			5.465
		(2.974)			(2.950)		(3.360)			(3.743)
Income (1000 USD-PPP)			-0.000889		-0.000607			0.0623*		0.0497
			(0.0139)		(0.0143)			(0.0328)		(0.0343)
Education (years)			0.110		-0.00655			0.247***		0.242***
			(0.0792)		(0.0869)			(0.0707)		(0.0727)
Married†			-0.423		-0.803			-0.263		-0.632
			(0.565)		(0.587)			(0.732)		(0.742)
Optimism				0.440	0.198				0.661**	0.443
				(0.302)	(0.293)				(0.332)	(0.382)
Constant	8.417***	9.550*	8.187***	8.255***	10.53**	7.269***	-4.360	5.972***	7.274***	-1.831
	(0.449)	(5.154)	(0.726)	(0.463)	(5.160)	(0.308)	(5.652)	(0.806)	(0.305)	(6.369)
lnsigma	1.810***	1.802***	1.810***	1.809***	1.803***	1.646***	1.641***	1.650***	1.650***	1.652***
	(0.0183)	(0.0186)	(0.0194)	(0.0185)	(0.0200)	(0.0291)	(0.0289)	(0.0297)	(0.0290)	(0.0286)
Observations	896	896	878	896	878	687	687	607	663	585
McKelvey & Zavoina's R^2	0.0124	0.0285	0.0167	0.0150	0.0293	0.0684	0.0782	0.0780	0.0680	0.0835

Table 5.11: Determinants of general risk attitude and income volatility

Interval regression of general risk attitude, measured on risk attitude survey measure. The highest category is estimated as an open interval, the lowest as a closed interval. Standard errors are bootstraped. Dummy variables are denoted by †. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand				Vietnam					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Income volatility	-0.0405	-0.0905	-0.0220	-0.0330	-0.0639	-1.377***	-1.356***	-1.146***	-1.136***	-0.935***
	(0.0892)	(0.0887)	(0.0859)	(0.0879)	(0.0917)	(0.0978)	(0.0983)	(0.112)	(0.102)	(0.117)
Female†		-0.221			-0.204		-0.181			0.0327
		(0.139)			(0.147)		(0.145)			(0.159)
Age (years)		-0.0239***			-0.0206***		-0.00488			0.0102*
		(0.00463)			(0.00561)		(0.00463)			(0.00523)
Height (meters)		1.069			0.808		3.644***			2.298**
		(0.930)			(0.917)		(1.003)			(1.080)
Income (1000 USD-PPP)			0.00944***		0.00954***			0.0309***		0.0247**
			(0.00343)		(0.00343)			(0.0106)		(0.0108)
Education (years)			0.0820***		0.0412*			0.111***		0.0884***
			(0.0215)		(0.0240)			(0.0210)		(0.0220)
Married†			0.177		0.0205			0.878***		0.799***
			(0.158)		(0.164)			(0.188)		(0.188)
Optimism				0.0371	-0.0424				0.853***	0.742***
				(0.0733)	(0.0729)				(0.0918)	(0.101)
Constant	5.235***	5.008***	4.547***	5.209***	4.905***	6.747***	1.282	4.745***	6.049***	0.271
	(0.166)	(1.588)	(0.249)	(0.169)	(1.576)	(0.167)	(1.724)	(0.331)	(0.182)	(1.827)
lnsigma	0.932***	0.924***	0.924***	0.932***	0.920***	0.961***	0.952***	0.942***	0.936***	0.922***
	(0.0159)	(0.0161)	(0.0160)	(0.0157)	(0.0164)	(0.0145)	(0.0148)	(0.0158)	(0.0149)	(0.0161)
Observations	2,068	2,068	1,994	2,064	1,990	2,044	2,044	1,841	1,983	1,786
McKelvey & Zavoina's R^2	0.000110	0.0165	0.0143	0.000225	0.0229	0.0860	0.101	0.116	0.122	0.142

Table 5.12: Variable description

Variable	Description
Female	Dummy variable for females. Takes the value 1 for females and 0 elsewise.
Age	Age in years.
Height	Height in meters.
Income (1000 USD-PPP)	Total net household income in the perdiod from May, 2009 to April, 2010, including net earnings from farming, business, farm and off-farm employment, lending, saving, remittances and public transfers.
Education	Education in years.
Married	Dummy variable for being married. Takes the value 1 for married and 0 elsewise.
Optimism	Expectation for the personal future in the next year on a rating scale. which distinguishes 5 categories from -2 (pessimistic) to +2 (optimistic).
General risk attitude	General risk attitude is a survey item which asks the respondent "Are you generally a person who is fully prepared to take risks or do you avoid taking risks? Please choose a number on a scale from 0 (unwilling to take risk) to 10 (fully prepared to take risks)"
Minimum acceptable offer	Minimum acceptable offer refers to the chosen offer in a Holt & Laury-type experiment (Holt and Laury, 2002). Respondents choose between a risky and a certain pay-off in 20 setups. The smallest certain payoff which is preferred to playing the lottery is called minimum acceptable offer. I.e. larger values correspond to more risk lovingness. Here the outcome x_i corresponds to the n-th certain offer.
Income volatility perceived	Perceived degree to which income fluctuates. Answers are coded on an ordinal scale whether income fluctuates "not at all", "a bit", or "a lot".
Self-employed	Dummy variable for being self-employed. Takes the value 1 for self-employed and 0 elsewise.
Lottery purchases (USD-PPP)	Total amount of household expenses for lotteries between May 2009 and April 2010
Buyer of lottery tickets	Dummy variable for living in a household which buys lottery tickets. Takes the value 1 for buying and 0 elsewise.

Table 5.13: Detailed shock categories by country

This table shows descriptive statistics of shocks as we survey and cluster them in detailed categories. We sum up the total number of all shocks in each category to broad shock categories, which are demographic, social, agricultural, and economic shocks as well as to the total number of shocks. Differences across both countries are tested by t-tests, the last column reports the respective p-values. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand					Vietnam					
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Difference
Number of shocks (demographic)	2068	0.261	0.494	0	4	2048	0.409	0.626	0	5	0.0000***
Number of shocks (death of household member)	2068	0.044	0.207	0	2	2048	0.041	0.207	0	2	0.5905
Number of shocks (household member left the household)	2068	0.020	0.141	0	1	2048	0.024	0.156	0	2	0.4354
Number of shocks (illness of household member)	2068	0.183	0.405	0	3	2048	0.332	0.534	0	3	0.0000***
Number of shocks (person joined the household)	2068	0.014	0.116	0	1	2048	0.012	0.110	0	1	0.7047
Number of shocks (social)	2068	0.235	0.510	0	3	2048	0.337	0.603	0	4	0.0000***
Number of shocks (accident)	2068	0.083	0.295	0	3	2048	0.082	0.289	0	3	0.8580
Number of shocks (conflict with neighbours in the village)	2068	0.009	0.100	0	2	2048	0.006	0.076	0	1	0.2316
Number of shocks (education)	2068	0.001	0.038	0	1	2048	0.002	0.049	0	1	0.4707
Number of shocks (HH was cheated)	2068	0.015	0.120	0	1	2048	0.021	0.158	0	3	0.1099
Number of shocks (household Damage)	2068	0.014	0.122	0	2	2048	0.053	0.229	0	2	0.0000***
Number of shocks (law suit)	2068	0.016	0.131	0	2	2048	0.004	0.062	0	1	0.0001***
Number of shocks (money spent for ceremony in the household)	2068	0.072	0.262	0	2	2048	0.102	0.324	0	3	0.0011***
Number of shocks (relatives/friends stopped sending money)	2068	0.005	0.073	0	1	2048	0.002	0.044	0	1	0.0732*
Number of shocks (supporting others)	2068	0.003	0.054	0	1	2048	0.000	0.022	0	1	0.0603*
Number of shocks (theft)	2068	0.016	0.127	0	1	2048	0.064	0.252	0	2	0.0000***
Number of shocks (agricultural)	2068	0.535	0.808	0	5	2048	1.010	1.068	0	6	0.0000***
Number of shocks (crop pests)	2068	0.110	0.318	0	2	2048	0.145	0.367	0	3	0.0014***
Number of shocks (drought)	2068	0.252	0.447	0	2	2048	0.161	0.378	0	2	0.0000***
Number of shocks (flooding of agricultural land)	2068	0.103	0.311	0	2	2048	0.186	0.416	0	3	0.0000***
Number of shocks (landslide, erosion)	2068	0.001	0.031	0	1	2048	0.015	0.120	0	1	0.0000***
Number of shocks (livestock disease)	2068	0.019	0.136	0	1	2048	0.234	0.463	0	3	0.0000***
Number of shocks (snow/ice rain)	2068	0.007	0.082	0	1	2048	0.005	0.073	0	1	0.5637
Number of shocks (storage pests, incl. rats)	2068	0.018	0.134	0	1	2048	0.009	0.098	0	2	0.0091***
Number of shocks (storm)	2068	0.012	0.107	0	1	2048	0.209	0.415	0	2	0.0000***
Number of shocks (unusually heavy rainfall)	2068	0.012	0.109	0	1	2048	0.047	0.215	0	2	0.0000***
Number of shocks (economic)	2068	0.205	0.498	0	4	2048	0.121	0.400	0	3	0.0000***
Number of shocks (change in market regulations)	2068	0.005	0.069	0	1	2048	0.001	0.038	0	1	0.0540*
Number of shocks (collapse of business)	2068	0.004	0.066	0	1	2048	0.015	0.126	0	2	0.0006***
Number of shocks (job loss, agricultural)	2068	0.005	0.069	0	1	2048	0.003	0.054	0	1	0.3260
Number of shocks (job loss, non-agricultural)	2068	0.017	0.131	0	1	2048	0.015	0.126	0	2	0.5707
Number of shocks (strong decrease of prices for output)	2068	0.054	0.228	0	2	2048	0.048	0.216	0	2	0.3997
Number of shocks (strong increase of interest rate on loans)	2068	0.016	0.129	0	2	2048	0.010	0.098	0	1	0.0839*
Number of shocks (strong increase of prices for input)	2068	0.103	0.309	0	2	2048	0.028	0.167	0	2	0.0000***
Number of shocks (unable to pay back loan)	2068	0.000	0.022	0	1	2048	0.000	0.022	0	1	0.9945
Number of shocks	2068	1.235	1.369	0	9	2048	1.876	1.594	0	10	0.0000***

Table 5.14: Detailed categories of expected shocks by country

This table displays all categories of expected shock events as we survey and categorize them. Expected shocks are the expectation of the household in 2008 how many shocks will occur in the next 5 years. We do not know the expectations of the distribution within the next 5 years. Differences across both countries are tested by Wilcoxon rank-sum test, the last column reports the respective p-values. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand					Vietnam					
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Difference
Expected shocks: Household member left the household	2054	0.236	0.532	0	5	2021	0.344	0.685	0	5	0.0000***
Expected shocks: Illness of household member	2055	2.473	2.093	0	6	1993	2.403	2.131	0	6	0.1844
Expected shocks: Person joined the household	2066	0.219	0.540	0	5	2023	0.270	0.600	0	5	0.0018***
Expected shocks: Accident	2062	0.631	1.271	0	6	1886	0.065	0.327	0	6	0.0000***
Expected shocks: Conflict with neighbours in the village	2066	0.068	0.497	0	6	1992	0.012	0.169	0	5	0.0000***
Expected shocks: HH was cheated	2066	0.110	0.611	0	6	1925	0.022	0.291	0	6	0.0000***
Expected shocks: Household damage	2068	0.193	0.739	0	6	1978	0.327	0.825	0	6	0.0000***
Expected shocks: Law suit	2065	0.053	0.360	0	6	1963	0.003	0.055	0	1	0.0000***
Expected shocks: Money spent for ceremony in the household	2063	0.556	1.105	0	6	2000	1.118	2.057	0	6	0.2897
Expected shocks: Relatives/friends stopped sending money	2068	0.180	0.875	0	6	2001	0.066	0.564	0	6	0.0000***
Expected shocks: Theft	2067	0.150	0.706	0	6	1954	0.179	0.817	0	6	0.7809
Expected shocks: Crop pests	2068	1.412	2.098	0	6	2011	2.717	2.342	0	6	0.0000***
Expected shocks: Drought	2063	1.829	1.966	0	6	2016	1.715	1.996	0	6	0.0508*
Expected shocks: Flooding of agricultural land	2067	0.727	1.562	0	6	2017	2.089	2.270	0	6	0.0000***
Expected shocks: Landslide, erosion	2065	0.045	0.412	0	6	2013	0.153	0.772	0	6	0.0000***
Expected shocks: Livestock disease	2065	0.451	1.314	0	6	1990	1.530	1.909	0	6	0.0000***
Expected shocks: Snow/ice rain	2060	0.317	1.052	0	6	1975	0.268	1.014	0	6	0.0005***
Expected shocks: Storage pests, incl. rats	2067	0.683	1.695	0	6	1938	0.182	0.814	0	6	0.0000***
Expected shocks: Storm	2068	0.771	1.582	0	6	2006	2.345	2.431	0	6	0.0000***
Expected shocks: Unusually heavy rainfall	2065	0.519	1.287	0	6	2010	1.185	1.920	0	6	0.0000***
Expected shocks: Change in market regulations	2064	0.334	1.251	0	6	1887	0.323	1.119	0	6	0.0943*
Expected shocks: Collapse of business	2067	0.051	0.380	0	6	1944	0.041	0.346	0	6	0.0388**
Expected shocks: Job loss, agricultural	2067	0.077	0.521	0	6	2006	0.032	0.316	0	5	0.0000***
Expected shocks: Job loss, non-agricultural	2068	0.183	0.755	0	6	1993	0.031	0.297	0	5	0.0000***
Expected shocks: Strong decrease of prices for output	2063	0.756	1.638	0	6	1929	0.221	0.818	0	6	0.0000***
Expected shocks: Strong increase of interest rate on loans	2066	0.333	1.077	0	6	1958	0.351	0.888	0	6	0.0004***
Expected shocks: Strong increase of prices for input	2060	2.629	2.455	0	6	1918	1.231	1.920	0	6	0.0000***

Table 5.15: Determinants of general risk attitude and shocks by detailed shock categories

The table displays the estimated coefficients of the number of shocks in a particular category on general risk attitude. We implement an interval regression model by country with and without other control variables. Controls include gender, age, height, education, income, marital status, and optimism. Smaller values of general risk attitude correspond with larger levels of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

Variables	Thailand		Vietnam	
Number of shocks (illness of household member)	0.107	0.0960	-0.588***	-0.462***
Number of shocks (death of household member)	0.0520	0.166	-0.879***	-0.867***
Number of shocks (household member left the household)	0.0276	-0.0451	-0.937***	-0.987***
Number of shocks (person joined the household)	-0.564	-0.568	0.692	0.626
Number of shocks (money spent for ceremony in the household)	0.147	0.0864	0.267	0.0761
Number of shocks (household Damage)	0.221	0.145	-0.0568	0.328
Number of shocks (theft)	-0.376	-0.345	0.350	0.332
Number of shocks (conflict with neighbours in the village)	0.115	0.218	-0.0739	0.299
Number of shocks (relatives/friends stopped sending money)	-1.855*	-1.581	1.095	2.149**
Number of shocks (flooding of agricultural land)	0.185	0.190	-0.0270	0.00116
Number of shocks (drought)	-0.517***	-0.519***	-0.491***	-0.364**
Number of shocks (unusually heavy rainfall)	0.503	0.665	-0.150	-0.256
Number of shocks (crop pests)	-0.427**	-0.450**	0.0385	0.0875
Number of shocks (storage pests, incl. rats)	-1.024**	-0.972**	0.664	0.854
Number of shocks (livestock disease)	-0.572	-0.610	0.0864	0.105
Number of shocks (landslide, erosion)	-2.166	-2.492	0.0439	0.856**
Number of shocks (collapse of business)	-0.666	-0.750	0.927**	0.958*
Number of shocks (unable to pay back loan)	0.337***	0.510***	0.844***	2.880***
Number of shocks (strong increase of interest rate on loans)	0.728	0.859*	-0.0573	0.0370
Number of shocks (strong decrease of prices for output)	0.265	0.149	0.899***	0.342
Number of shocks (strong increase of prices for input)	-0.429**	-0.558***	0.959***	0.674**
Number of shocks (change in market regulations)	-0.968	-1.188	0.844	0.0226
Number of shocks (accident)	0.00493	-0.118	-0.229	-0.156
Number of shocks (education)	0.00322	-0.321	-2.162***	-2.195***
Number of shocks (supporting others)	0.338	0.314	-1.157***	-1.533***
Number of shocks (law suit)	-0.0439	0.0414	-0.157	-0.0401
Number of shocks (HH was cheated)	0.578	0.603	0.805**	0.352
Number of shocks (storm)	-0.376	-0.469	-0.176	-0.0386
Number of shocks (snow/ice rain)	-1.099*	-1.049	0.391	0.473
Number of shocks (job loss, agricultural)	0.439	0.664	-1.996***	-1.976**
Number of shocks (job loss, non-agricultural)	-0.0815	-0.215	0.0350	0.0105
Controls	No	Yes	No	Yes

Table 5.16: Estimation of shock surprises (regression approach)

Least squares regression of number of shocks in wave 3 on expected shocks in wave 2 by shock category. Expected shocks are measured by 5 dummy variables indicating an expectation of 1, 2, 3, 4, 5, or 6 and more shocks. The baseline category is zero expected shocks. We use the predicted residuals for the computation of the shock surprise index.

Number of shocks...	Exp. shocks = 1	Exp. shocks = 2	Exp. shocks = 3	Exp. shocks = 4	Exp. shocks = 5	Exp. shocks $\geq$ 6	Const.	N	R^2
Illness of household member	0.0768***	0.0986***	0.145***	0.0795	0.151***	0.172***	0.168***	4,137	0.016
HH member left the household	0.0164***	0.00432	0.0313	-0.0187	-0.0187		0.0187***	4,162	0.002
Person joined the household	0.00766	0.00489	-0.0115	-0.0115	-0.0115		0.0115***	4,178	0.001
Money spent for ceremony in the HH	0.0273**	0.0178	0.0260	0.0260	0.0365	0.0584***	0.0740***	4,151	0.003
Household Damage	0.0284***	0.109***	0.110***	0.173**	-0.00997	0.116*	0.0266***	4,135	0.013
Theft	0.0765***	0.0465*	0.00619	-0.0355	-0.00606	0.224***	0.0355***	4,109	0.013
Conflict with neighbours in the village	0.0210	-0.00761	-0.00761	-0.00761	-0.00761	-0.00761	0.00761***	4,146	0.001
Relatives/friends stopped sending money	0.0164*	-0.00325	-0.00325	-0.00325	-0.00325	0.0190**	0.00325***	4,157	0.002
Flooding of agricultural land	0.104***	0.150***	0.187***	0.113***	0.211***	0.155***	0.0779***	4,172	0.056
Drought	0.101***	0.146***	0.115***	0.0756	0.164***	0.0459	0.130***	4,166	0.029
Unusually heavy rainfall	-0.00298	-0.00924	0.0131	0.0335	-0.0109	0.00765	0.0290***	4,161	0.001
Crop pests	0.0524**	0.0637***	0.0581**	0.0206	0.0249*	0.0593***	0.104***	4,164	0.005
Storage pests, incl. rats	-0.00489	0.0155	-0.0130	-0.0130	-0.00493	0.00781	0.0130***	4,091	0.000
Livestock disease	0.0730***	0.153***	0.173***	0.130*	0.123***	0.103***	0.0841***	4,141	0.031
Landslide, erosion	0.0520***	0.0419**	0.112***	-0.00572	0.0675***	-0.00572	0.00572***	4,163	0.018
Collapse of business	0.00540	-0.00952	-0.00952	-0.00952	-0.00952	-0.00952	0.00952***	4,094	0.000
Strong increase of interest rate on loans	0.0121	0.0220***	0.0561***	-0.00966	0.0121	0.101***	0.00966***	4,106	0.008
Strong decrease of prices for output	0.0318*	0.0697***	0.0117	0.0665	0.0182	-0.00114	0.0446***	4,074	0.005
Strong increase of prices for input	-0.0107	-0.0384**	0.00284	-0.0422	0.0352***	0.00274	0.0607***	4,061	0.007
Change in market regulations	-0.00352	-0.00352	-0.00352	-0.00352	-0.00352	-0.00352	0.00352***	4,033	0.000
Accident	0.0373***	0.0492**	0.0494	-0.0726	0.0403	0.00852	0.0726***	4,035	0.003
Law suit	0.0400***	0.157***			-0.00917	-0.00917	0.00917***	4,115	0.009
HH was cheated	0.0179	0.0199	-0.0172		-0.0172	0.0939**	0.0172***	4,078	0.001
Storm	0.0141	0.0439*	0.167***	0.195***	0.144***	0.0512***	0.0695***	4,162	0.037
Snow/ice rain	-0.00644	0.00327	-0.00644	-0.00644	-0.00644	-0.00644	0.00644***	4,118	0.001
Job loss, agricultural	0.0180**	-0.00369	-0.00369	-0.00369	-0.00369	-0.00369	0.00369***	4,159	0.001
Job loss, non-agricultural	0.00677	0.0133	0.0514	-0.0153	-0.0153	-0.0153	0.0153***	4,146	0.001

Figure 5.3: Scatter plot of shock surprise index by country

Scatter plot of both versions of shock surprise index, regression vs. difference approach.

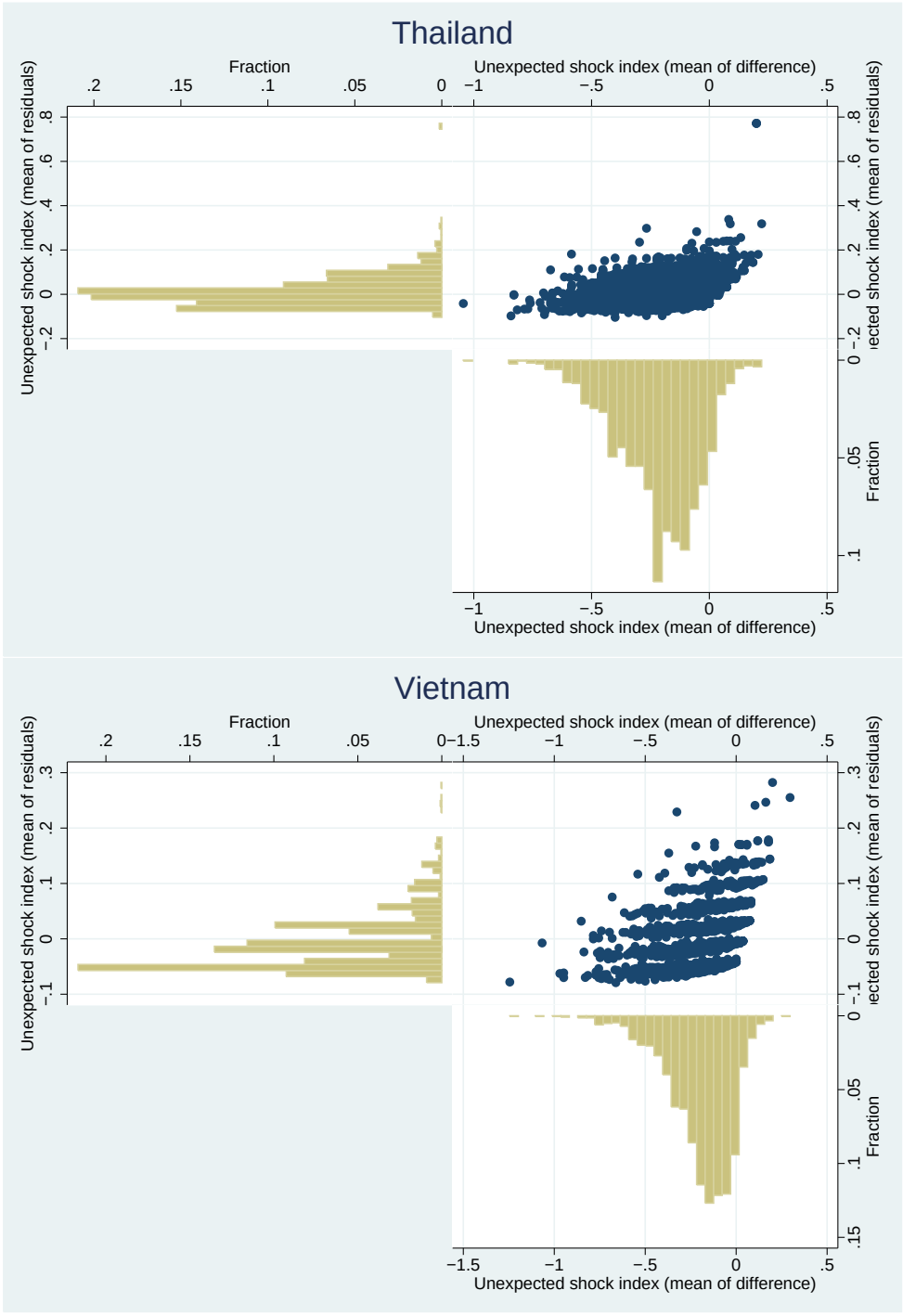

Table 5.17: Determinants of general risk attitude in TH excluding GRA middle response

Interval regression of general risk attitude excluding responses for the middle category of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

VARIABLES	(1)	(2)	(3)	(4)
Female†	-0.317			-0.282
	(0.239)			(0.248)
Age (years)	-0.0356***			-0.0300***
	(0.00761)			(0.00887)
Height (meters)	1.631			1.328
	(1.475)			(1.487)
Income (1000 USD-PPP)		0.0125		0.0131*
		(0.00760)		(0.00753)
Education (years)		0.139***		0.0827**
		(0.0355)		(0.0388)
Married†		0.288		0.0412
		(0.269)		(0.275)
Optimism			0.0546	-0.0810
			(0.114)	(0.122)
Constant	4.400*	3.837***	4.905***	4.021
	(2.523)	(0.306)	(0.110)	(2.591)
lnsigma	1.187***	1.191***	1.198***	1.184***
	(0.0139)	(0.0139)	(0.0137)	(0.0147)
Observations	1,205	1,153	1,203	1,151
McKelvey & Zavoina's R^2	0.0235	0.0230	0.000185	0.0350

Table 5.18: Determinants of general risk attitude in TH by education level

Interval regression of general risk attitude excluding responses for the middle category of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Education level (0-4 yr)				Education level (5-6 yr)				Education level (>7 yr)			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Female†	-0.105			-0.0933	-0.528*			-0.593*	-0.212			-0.128
	(0.161)			(0.179)	(0.283)			(0.334)	(0.348)			(0.399)
Age (years)	-0.0255***			-0.0292***	-0.0162			-0.0117	-0.0156			-0.00883
	(0.00738)			(0.00756)	(0.0111)			(0.0183)	(0.0102)			(0.0143)
Height (meters)	0.584			0.352	0.0791			-0.0452	3.326*			3.600*
	(1.095)			(1.143)	(1.791)			(2.024)	(1.884)			(2.140)
Income (1000 USD-PPP)		0.0112		0.0113		7.83e-05		-0.000579		0.0127*		0.0109
		(0.00777)		(0.00779)		(0.00583)		(0.00562)		(0.00711)		(0.00742)
Education (years)		0.164		0.158		-0.196		-0.176		0.0331		0.0442
		(0.164)		(0.162)		(1.123)		(1.113)		(0.0716)		(0.0707)
Married†		0.223		0.0710		-0.0884		-0.0734		-0.0577		-0.0995
		(0.189)		(0.202)		(0.537)		(0.529)		(0.370)		(0.355)
Optimism			-0.0411	-0.0832			0.00158	0.0784			0.0366	0.0763
			(0.0846)	(0.0869)			(0.151)	(0.176)			(0.165)	(0.173)
Constant	5.614***	4.124***	5.028***	5.480***	6.121**	6.548	5.186***	7.317	1.021	5.207***	5.468***	-0.227
	(1.842)	(0.656)	(0.0764)	(2.001)	(3.041)	(6.688)	(0.149)	(7.595)	(3.217)	(0.841)	(0.164)	(3.795)
lnsigma	0.930***	0.931***	0.935***	0.925***	0.915***	0.916***	0.922***	0.909***	0.913***	0.901***	0.927***	0.891***
	(1.842)	(0.656)	(0.0764)	(2.001)	(3.041)	(6.688)	(0.149)	(7.595)	(3.217)	(0.841)	(0.164)	(3.795)
Observations	1,367	1,293	1,363	1,289	485	411	485	411	364	290	364	290
McKelvey & Zavoina's R^2	0.0108	0.00804	0.000176	0.0200	0.0137	0.000213	2.51e-07	0.0127	0.0271	0.0110	0.000131	0.0303

Table 5.19: Sample comparison in TH for GRA middle responses vs. others

Comparison of personal characteristics of the group of middle responses versus other responses. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	N[GRA=5]					N[GRA≠5]					
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Difference
Female†	1205	0.605	0.489	0	1	863	0.582	0.494	0	1	0.296
Age (years)	1205	52.473	12.839	18	80	863	51.633	12.013	21	80	0.1318
Height (meters)	1205	1.583	0.083	1.06	1.8	863	1.585	0.077	1.2	1.85	0.6921
Income (1000 USD-PPP)	1205	9.026	18.697	-147	512	863	9.157	12.847	-17	183	0.8581
Assets (1000 PPP-USD)	1204	5.530	9.215	0	87	862	5.962	10.073	0	91	0.3121
Education (years)	1153	5.484	2.829	1	17	841	5.231	2.519	1	17	0.0389**
Married†	1205	0.823	0.382	0	1	863	0.838	0.369	0	1	0.407
Optimism	1203	0.431	0.827	-2	2	861	0.458	0.786	-2	2	0.6539

Table 5.20: Risk behavior and general risk attitude in TH excluding GRA middle responses

Regression of risk behavior on general risk attitude excluding responses for the middle category of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Self-employment					Lottery buyer				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
General risk attitude	0.0107***	0.00976***	0.00904***	0.0107***	0.00859***	0.0222***	0.0202***	0.0189***	0.0225***	0.0180***
	(0.00238)	(0.00235)	(0.00224)	(0.00229)	(0.00216)	(0.00473)	(0.00481)	(0.00494)	(0.00468)	(0.00494)
Female†		0.0390**			0.0314*		0.0228			0.0213
		(0.0169)			(0.0170)		(0.0380)			(0.0397)
Age (years)		-0.00136**			-0.00103		-0.00436***			-0.00539***
		(0.000628)			(0.000746)		(0.00125)			(0.00146)
Height (meters)		0.158			0.0830		0.0652			0.0420
		(0.105)			(0.105)		(0.235)			(0.225)
Income (1000 USD-PPP)			0.00355***		0.00345***			0.000710		0.000811
			(0.000717)		(0.000724)			(0.00160)		(0.00166)
Education (years)			0.00288		0.00108			0.000603		-0.0109
			(0.00247)		(0.00287)			(0.00571)		(0.00669)
Married†			0.0133		0.0127			0.0653		0.0436
			(0.0201)		(0.0208)			(0.0416)		(0.0444)
Optimism				0.0227**	0.00392				0.0269	0.0170
				(0.00959)	(0.00987)				(0.0186)	(0.0201)
Observations	1,203	1,203	1,151	1,201	1,149	1,095	1,095	1,043	1,093	1,041
McKelvey & Zavoina's R^2	0.0533	0.0831	0.152	0.0693	0.170	0.0328	0.0533	0.0302	0.0367	0.0577

Figure 5.4: Histogram of general risk attitude and age in VN

General risk attitude is a survey item which asks the following question: "Are you generally a person who is fully prepared to take risks or do you try to avoid taking risk? (Please choose a number on a scale from 0 to 10)". The answer is given on a labeled scale, which ranges from 0 (unwilling to take risk) to 10 (fully prepared to take risks).

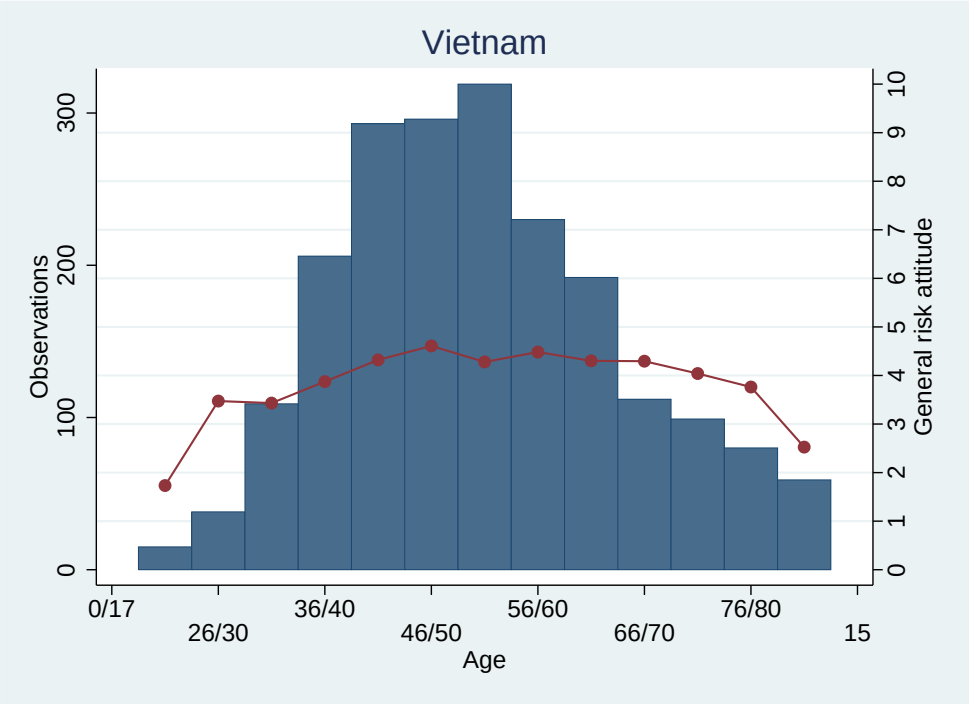

Table 5.21: Determinants of lottery expenditures

Least squares regression of lottery expenditures, bootstrapped standard errors are in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%). Dummy variables are denoted by †.

	Thailand					Vietnam				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
General risk attitude	3.767***	3.486***	3.447***	3.767***	3.323***	0.363***	0.348***	0.276**	0.408***	0.315**
	(0.613)	(0.623)	(0.636)	(0.614)	(0.655)	(0.124)	(0.129)	(0.118)	(0.139)	(0.138)
Female†		-1.280			-0.288		1.395*			1.808*
		(3.915)			(4.034)		(0.804)			(0.957)
Age (years)		-0.428***			-0.337**		-0.00258			-0.00124
		(0.130)			(0.152)		(0.0140)			(0.0149)
Height (meters)		24.35			14.24		10.25**			9.686*
		(23.61)			(23.76)		(4.553)			(5.741)
Income (1000 USD-PPP)			0.237		0.229			-0.0114		-0.0111
			(0.153)		(0.155)			(0.0275)		(0.0307)
Education (years)			0.933		0.0997			0.188		0.193
			(0.678)		(0.785)			(0.180)		(0.199)
Married†			10.83***		8.116**			1.135***		1.469***
			(3.878)		(3.987)			(0.308)		(0.533)
Optimism				4.847***	2.986				-0.654	-0.756
				(1.870)	(2.015)				(0.578)	(0.666)
Constant	28.04***	13.85	14.05***	26.08***	15.28	0.0174	-16.68**	-1.917	0.148	-18.17**
	(3.034)	(40.22)	(5.184)	(3.032)	(40.78)	(0.350)	(7.748)	(1.396)	(0.378)	(8.692)
Observations	1,875	1,875	1,804	1,871	1,800	2,044	2,044	1,840	1,982	1,784
Adjusted R-squared	0.018	0.024	0.022	0.021	0.024	0.005	0.006	0.004	0.005	0.006

Table 5.22: Determinants of general risk attitude and unexpected shocks (difference approach)

Interval regression of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Unexpected shock index differences (std.)	-0.130**	-0.107*	-0.122**	-0.134**	-0.108**	-0.294***	-0.307***	-0.268***	-0.232***	-0.225***
	(0.0572)	(0.0572)	(0.0543)	(0.0538)	(0.0545)	(0.0620)	(0.0619)	(0.0642)	(0.0588)	(0.0622)
Female†		-0.208			-0.192		-0.0634			0.126
		(0.138)			(0.147)		(0.145)			(0.150)
Age (years)		-0.0230***			-0.0195***		-0.000165			0.0160***
		(0.00461)			(0.00552)		(0.00459)			(0.00534)
Height (meters)		0.992			0.721		4.997***			2.713**
		(0.931)			(0.921)		(1.038)			(1.076)
Income (1000 USD-PPP)			0.00938***		0.00959***			0.0462***		0.0349***
			(0.00338)		(0.00340)			(0.0123)		(0.0116)
Education (years)			0.0836***		0.0450*			0.136***		0.110***
			(0.0215)		(0.0238)			(0.0217)		(0.0225)
Married†			0.157		0.0105			0.912***		0.863***
			(0.158)		(0.164)			(0.187)		(0.193)
Optimism				0.0398	-0.0364				1.081***	0.896***
				(0.0733)	(0.0730)				(0.0908)	(0.103)
Constant	5.172***	4.923***	4.525***	5.158***	4.856***	4.636***	-3.219*	2.703***	4.209***	-2.472
	(0.0547)	(1.571)	(0.189)	(0.0649)	(1.547)	(0.0604)	(1.732)	(0.235)	(0.0742)	(1.791)
lnsigma	0.931***	0.923***	0.923***	0.931***	0.919***	1.001***	0.991***	0.967***	0.962***	0.937***
	(0.0158)	(0.0160)	(0.0160)	(0.0157)	(0.0163)	(0.0137)	(0.0141)	(0.0147)	(0.0144)	(0.0159)
Observations	2,068	2,068	1,994	2,064	1,990	2,048	2,048	1,843	1,986	1,787
McKelvey & Zavoina's R^2	0.00268	0.0177	0.0166	0.00302	0.0245	0.0111	0.0309	0.0706	0.0746	0.115

Table 5.23: Determinants of general risk attitude and negative/positive shock surprises (difference approach)

Interval regression of general risk attitude. Smaller values of general risk attitude correspond with a larger degree of risk aversion. Dummy variables are denoted by †. Standard errors are bootstraped and reported in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

			Thailand					Vietnam		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Negative shock surprises (std.)	-0.0996	-0.112*	-0.0981	-0.0988	-0.108*	0.0464	0.0756	0.0467	0.0819*	0.0836*
	(0.0627)	(0.0634)	(0.0658)	(0.0633)	(0.0635)	(0.0481)	(0.0473)	(0.0527)	(0.0474)	(0.0479)
Positive shock surprises (std.)	-0.0950	-0.0677	-0.0878	-0.0999*	-0.0697	-0.316***	-0.340***	-0.289***	-0.267***	-0.260***
	(0.0588)	(0.0586)	(0.0562)	(0.0553)	(0.0551)	(0.0650)	(0.0651)	(0.0673)	(0.0629)	(0.0653)
Female†		-0.213			-0.198		-0.0613			0.122
		(0.138)			(0.147)		(0.145)			(0.150)
Age (years)		-0.0234***			-0.0200***		0.000114			0.0163***
		(0.00460)			(0.00554)		(0.00460)			(0.00534)
Height (meters)		0.986			0.717		5.124***			2.790***
		(0.931)			(0.920)		(1.033)			(1.073)
Income (1000 USD-PPP)			0.00934***		0.00956***			0.0468***		0.0356***
			(0.00338)		(0.00340)			(0.0124)		(0.0117)
Education (years)			0.0837***		0.0442*			0.136***		0.110***
			(0.0215)		(0.0238)			(0.0217)		(0.0225)
Married†			0.159		0.00958			0.909***		0.857***
			(0.159)		(0.165)			(0.187)		(0.194)
Optimism				0.0386	-0.0389				1.085***	0.898***
				(0.0735)	(0.0729)				(0.0906)	(0.103)
Constant	5.169***	4.953***	4.521***	5.156***	4.895***	4.627***	-3.444**	2.694***	4.199***	-2.613
	(0.0547)	(1.570)	(0.190)	(0.0650)	(1.544)	(0.0607)	(1.725)	(0.236)	(0.0741)	(1.786)
lnsigma	0.930***	0.923***	0.923***	0.930***	0.918***	1.000***	0.990***	0.967***	0.962***	0.936***
	(0.0158)	(0.0160)	(0.0160)	(0.0157)	(0.0163)	(0.0137)	(0.0142)	(0.0146)	(0.0145)	(0.0159)
Observations	2,068	2,068	1,994	2,064	1,990	2,048	2,048	1,843	1,986	1,787
McKelvey & Zavoina's R^2	0.00376	0.0192	0.0177	0.00407	0.0259	0.0119	0.0325	0.0714	0.0762	0.117

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