TI 2010-053/3
Tinbergen Institute Discussion Paper

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Risk Attitude and Profits among Small Enterprises in Nigeria

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May, 2010

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Abstract: This paper analyses the effect of risk attitudes of firm owners on profits among micro and small enterprises (MSEs) in Lagos, Nigeria. Higher risk perceptions are shown to have a significant positive effect on profits, whereas risk propensity has a negative or no effect. Education, age, being male, and firm size are all positively related to profit, while young firms earn lower profits. Overall, the results suggest that being aware and dealing cautiously with risk leads to higher profitability.

Keywords: entrepreneurship, risk perception, risk behavior, profit, MSEs

JEL classifications codes : D12, L25, L26

Psychological classification codes: 3306, 7071, 433, 1606

1. INTRODUCTION

This paper analyses the relationship between risk attitude and profitability of MSEs (micro and small enterprises) in Lagos, Nigeria using survey data from 2008. We find that a business owner's propensity to take risk has a significant negative effect on profit but only so when risk perception is not included. The effect of risk perception on profits is significantly positive and robust, suggesting it is the *perception* of risk that matters and *not* the willingness to take risk as such. The analysis also shows that education, age and being male are positively related to profitability, as is the number of employees and the number of months the enterprise has been open during the past year. Young firms earn lower profits.

It has long been recognized that risk and uncertainty play an important role in entrepreneurship (Knight, 1921). The theoretical economic literature on small enterprise performance takes this into account by including the risk attitude of the entrepreneur (e.g. Cressy, 2006). In the psychology literature, risk attitude is often included in the analysis of enterprise success as one of the personality characteristics of the entrepreneur (e.g. Rauch & Frese, 2000). Risk attitude is indeed confirmed to be important, also in small enterprises in developing countries (Kraus et al., 2005; Rauch & Frese, 2000). There is, however, no consensus on the sign of the effect and differences persist on how risk attitude should be defined and measured. We contribute to the debate on proper measurement of risk attitude by distinguishing between risk propensity and risk perception in explaining firm performance. Our measures of risk attitude are based on the instruments of Blais and Weber (2006).

There has been extensive research into the dynamics of MSE development in developing countries. In developing countries, the micro and small enterprise[1] (MSE) sector employs a large part of the population. In southern Africa, as many as a quarter of the working age population is working in the MSE sector (Mead and Liedholm, 1998). Only around 2% of the enterprises are classified as small enterprises with 11 to 50 workers and the majority is owned and operated by a single person. MSEs are not only an important source of employment and income for many people in developing countries (Daniels, 1999; Daniels and Mead, 1998), they play an important role in nations development process as

[1] Following McPherson (1996), micro enterprises are defined as having 1 to 10 employees, and small enterprises are defined as having 11 to 50 employees.

well (Pyke and Sengenberger, 1992). The entry, growth, and exit of MSEs have been empirically analyzed, and relevant determining factors have been established (see for example; McPherson, 1996; Mead and Liedholm, 1998; Fajnzylber et al., 2006). The literature on enterprise dynamics (entry, growth, exit) in developing countries show that firm characteristics such as the age, size, location and sector in which the enterprise operates are important. In addition, personal characteristics of the owner matter, such as education, age and gender. Less is known, however, about the determinants of enterprises' success in terms of profits. In an early study, Vijverberg (1991) found no significant determinants of profits among self-employed persons in the food commerce sector in Cote d'Ivoir. More recent research by Masakure et al. (2008), on non-farm microenterprises in Ghana, confirms the results found by the literature on enterprise dynamics showing among others that size, sector and the number of months the firm was in operation during the past year determine MSEs' financial performance.

Our paper on MSEs' profits is innovative by replacing a single measure of risk attitude by including separate measures for risk taking and risk perception in household survey data in a developing country. We thus extend a small but developing literature that increases our understanding of the role of risk attitudes for small business performance. We check the robustness of our findings by trying alternative measures of risk attitude, we consider the relationship of risk attitude to other personal characteristics and we deal with complications of firms reporting loss rather than profit.

The remainder of the paper is structured as follows. Section 2 discusses the current literature. Section 3 describes the sample and gives basic statistics. Section 4 gives the core results. Section 5 discusses robustness, section 6 deals with complications of non-positive profits, section 7 concludes.

2. BACKGROUND LITERATURE

The economic literature on MSE profitability suggests that demographic characteristics of the owner and characteristics of the firm are important in determining profitability (Daniels & Mead, 1998; Fafchamps & Gabre-Madhin, 2001; Masakure et al. 2008; Vijverberg, 1991). As the profitability of the enterprise influences its growth, the literature on firm dynamics provides additional information on owner and firm characteristics which may be

important in determining MSE profitability (McPherson, 1996; Fajnzylber et al., 2006; Mead & Liedholm, 1998). Some of this economic literature also suggests a role of risk in determining firm profitability (Fajnzylber et al., 2006). The psychology literature describes the importance of risk attitude of the entrepreneur and how this relates to firm performance (e.g. Rauch & Frese, 2000; Kraus et al., 2005).

2.1 Firm Characteristics

Age of the firm is inversely related to growth (McPherson, 1996; Mead & Liedholm, 1998). Daniels and Mead (1998) find a marginally decreasing positive relation between firm age and firm profits for small enterprises in Kenya. Masakure et al. (2008) also find a positive, but not significant, relationship between firm age and profits in their full model. Mead and Liedholm (1998) show that firms are most likely to go bankrupt during the first couple of years possibly explaining the positive relation between firm age and profits.

Masakure et al. (2008) show that firm size, measured by the number of employees, is positively related to profits. Daniels and Mead (1998) make a distinction between paid and unpaid employees, and show that having paid employees is positively related to profits. However, having unpaid employees negatively affects profits. The latter they explain by the fact that unpaid workers are often family members, who are fulfilling family responsibilities and therefore have a lower marginal productivity than paid workers.

The importance of the sector in which the MSE operates for growth and profitability has been widely established (Masakure et al. 2008; Daniels & Mead, 1998; Fajnzylber et al., 2006; McPherson, 1996; Mead & Liedholm, 1998). Masakure et al. (2008), for example, find that manufacturing MSEs in Ghana perform significantly better than the MSEs in the service sector. Depending on the performance decile[2], firms in the lowest decile in the trading sector perform significantly worse than firms in the service sector, while firms in the higher deciles perform significantly better in the trading sector than in the service sector. Surprisingly, McPherson (1996) and Mead and Liedholm (1998) show that when looking across countries there is no consistent set of sectors where firms grow faster.

[2] Their performance deciles are based on profit levels, with the lowest decile containing the 10% companies with the lowest profits and the highest decile the 10% companies with the highest profits. The full model represents their total sample.

2.2 Firm owner characteristics

Demographic characteristics of the enterprise owner have been found to be relevant for enterprise growth and profitability. The importance of the age of the owner for growth is less clear. Age is neither significant nor consistently positive or negative for the different countries studied by McPherson (1996). Fajnzylber et al. (2006) do find a consistent positive result for small enterprises in Mexico, but the significance depends on the sample selection. Masakure et al. (2008) find a negative relation between profitability and the age of the owner but this result is only significant for the performance deciles 3 to 9. Daniels and Mead (1998) do not include the age of the owner in their analysis. Instead, they refer in their explanation of firm age to the life cycle of the owner, suggesting increasing profits until the age of the firm is 20 years, and thereafter decline, due to a decline in health of the owner. The suggested non-linearity of the relationship between age and profits could explain the conflicting results of the other studies.

Fafchamps and Gabre-Madhin (2001) find a strong negative relationship between female ownership and profits in both Benin and Malawi. Daniels and Mead (1998) find the same result. They suggest this could be due to lower managerial skills or due to a lower willingness to take risk by women. In addition, they refer to Downing and Daniels (1992), who suggest that women lower their risk exposure by diversifying their risks. However, the importance of gender is not confirmed by Masakure et al. (2008), who find no significant effect nor a stable positive or negative sign.

A similar argument referring to the willingness to take risks, is given by Fajnzylber et al. (2006) to explain the positive relation between being married and enterprise growth. Referring to De la Rocha (1994), they suggest that being married allows pooling the income with the spouse, reducing the overall risk. Unfortunately, the discussed studies on enterprise profitability by Masakure et al. (2008) and Daniels and Mead (1998) do not include marital status. The reference to risk taking when explaining the effect of gender and marital status on enterprise success, suggests a more general relevance of the risk attitude by the entrepreneur.

The educational level of the owner is generally seen to be positively related to growth and profitability. The result, however, is not completely robust. In Masakure et al. (2008) education is only significant for the more profitable firms in the five highest performance

deciles. Vijverberg (1991) also finds a positive but not significant relationship between owners with at least 5 years of schooling and their profitability. Parker (1995) finds, among MSEs in Kenya, that owners with at least secondary education are more likely to expand, which is confirmed in two of the five countries studied by McPherson (1996). Fajnzylber et al. (2006) also find a significantly positive relation between education and firm growth in Mexico, but this effect disappears when they change their sample to a smaller dataset and add the age of the firm and the capital stock as controlling variables. In general, a higher education level is perceived to be associated with better management skills, positively affecting profits and enterprise growth. Although one could expect a relation between education and risk taking influencing profitability of firms, this has only rarely been tested empirically .

2.3 Risk attitude

According to economic theory, entrepreneurs who are risk averse might be willing to accept a lower return in exchange for less exposure to risk, while entrepreneurs with more appetite for risk taking might receive compensation through higher expected profits. In our setting, risk attitude may play a role in several ways. Business strategy, type of commodity to offer, pricing, all may show traces of risk attitude that end up in profitability. A fresh vegetable vendor, for example, can decide to sell a vegetable that is widely available and consumed. The possibility to buy new stock as well as the continuous demand, and the more stable price of such goods, make it a business strategy involving relatively few risks. Much more risky would be to buy and sell vegetables, which are rarely consumed, but earn a higher profit when sold, increasing the possibility that the entrepreneur is left with unsold stock that goes bad. A different strategy could be to diversify the stock into different kinds of vegetables, spreading the risks.

Even before the entrepreneur has a business, the risk attitude of the entrepreneur may be relevant in deciding in which sector to operate. Some sectors may produce returns with a higher variance than others, making them more risky to operate in. Similarly, a sector that requires a large start up investment, which can not be recouped on bankruptcy, involves additional risk of capital losses. Risk averse entrepreneurs might be less willing to start a business in those sectors.

While standard theory thus suggests that more risk averse entrepreneurs are likely to earn lower returns, the empirical literature is rather ambiguous on this issue. Looking at small enterprise owners in Southern Africa, Kraus et al. (2005) find a weak positive effect of risk taking on enterprise growth. Koop et al. (2000), also find a significant positive effect of risk taking on enterprise success among micro enterprise owners in Uganda. However, Rauch and Frese (2000) find a significant negative relationship between success and risk taking based on calculations using data from six previous articles. Similarly, Naldi et al. (2007) find a significant negative relation between risk taking and performance in Swedish family firms. The argument that returns are not determined by level of risk as such, but by the right combination of different kinds of risk, creating the right portfolio has been stressed by Cressy (2006). This suggests that more cautious entrepreneurs may earn higher profits; Duchesneau and Gartner (1990) indeed find that firms which seek to reduce risks, are more successful than firms that do not.

2.4 Risk perception and risk propensity

When looking at the risk attitude of the entrepreneur a distinction has been made between *risk perception* and *risk propensity*. Risk propensity is defined as a tendency to take risky actions, where people with a high-risk propensity are more likely to engage in risky behavior. Risk perception measures how risky the decision is perceived by the entrepreneur, where a higher risk perception leads c.p. to less risky behavior. The distinction recognizes that decision makers often perceive risks differently from what they actually are and that they do not act in the traditional 'rational' way (Kahneman & Tversky, 1979). In their theoretical model of decision making, Sitkin and Pablo (1992) include both the risk perception and the risk propensity. The propensity to take risk is in their view partly determined by the risk preference of the decision maker. They suggest that the risk propensity of a decision maker influences his/her perception of the risks involved. In an experimental setting, Sitkin and Weingart (1995) indeed show that risk perception completely mediates the effect of risk propensity on risky decision making behavior, suggesting that the risk propensity has no direct effect on decision making and that the risk propensity has a causal effect on the perception of risk. Sjoberg (2000) gives a similar argument and shows that in addition risk perception is determined by attitude, or affect.

However, in a later empirical analysis based on the Sitkin and Pablo (1992) model, Forlani and Mullins (2000) provide evidence that risk propensity has no effect on risk perception, and that risk propensity does have a direct effect on decision making. The argument by Sjoberg (2000) that attitude has an effect on perception is supported by the literature on emotion. However, as the definition of risk propensity used in this paper is not exactly the same as Sjoberg's (2000) attitude measure, it is unlikely that our measure of risk propensity can be equated with an affective state[3].

Risk propensity cq risk aversion have been shown to differ between socioeconomic characteristics. Common results are that females are less likely to take risks; risk propensity declines with age, is positively related to parental education and is negatively related to being married (e.g. Hartog et al., 2002; Dohmen et al., 2005; Ding et al., 2009). Culture also has an impact on risk attitude (Hsee and Weber, 1999). Dohmen et al. (2005) and Ding et al. (2009) moreover show that risk taking is domain dependent, which means that individuals have different propensities to take risks over different domain, e.g. the financial, social and health domain. This result has also been found by Blais and Weber (2006), for both risk taking and risk perception. In order to fully analyze the effect of the risk attitude on enterprise profitability, both the risk propensity and the risk perception measure are therefore included; our measures are based in the financial domain.

Including the perception of risks by decision makers can therefore explain business decisions which might not be explained by their risk propensity. A decision maker who has a low propensity to take risk, and faces a decision which s/he perceives as low on risk, may chose such an option, even though the option in reality is very risky. Without the inclusion of the risk perception by the decision maker, the choice for the option with high risk would be unexpected. Absence of risk perception in the analysis on MSE performance could be an explanation of the ambiguity of the sign and significance of the effect of risk taking on enterprise success found in the empirical literature.

[3] The recognition of the importance of perceptions in decision making has led to a wide literature on explaining risk perception. Simon et al. (1999) argue that individuals differ in perception of risk due to cognitive biases, arising through the application of cognitive heuristics and simplifying strategies in decision making. More recent is the recognition of the role of emotions, or affect, in shaping perceptions and decision making (Damasio, 1994; Loewenstein et al., 2001; Sjoberg, 2007; Slovic et al., 2007).

3. DATA

We use data from a household survey among market persons in Lagos, the financial capital of Nigeria. Out of 59 markets, 16 markets have been randomly selected, stratified by area, selected with a probability proportional to size. From each of these sixteen markets, individual market persons were randomly selected, and they and their household members have been interviewed. The survey covers a wide variety of topics including personal demographics, enterprise characteristics and an assessment of risk attitude. This paper focuses exclusively on the enterprise owner and his or her enterprise. There is complete data on 782 market persons and their market enterprise, of which 545 have a positive profit. This number is much less than the 1,973 market persons that have been interviewed, mainly due to missing observations on costs and revenue questions. It is a well established fact that respondents are less inclined to answer these questions because they are afraid the information will be used for tax purposes (see e.g. Daniels and Mead, 1998). The profit of the enterprise is calculated by subtracting the yearly costs from the yearly revenues. The most extreme profit values, more than four standard deviations higher or lower than the mean, are dropped. In our core analysis, we will only use observations with positive profits; the initial argument was our choice of the semi-log specification for the regression equation, but investigation of robustness for non-positive profits revealed complications that we deal with in a separate section. Despite these limitations, there is no significant difference for the main variables used, between the subsample and the full sample, except for the variable 'how many months open during the past 12 months'. This suggests that the small sample can be taken as representative for the full sample.

Table 1 gives an overview of the respondents´ socioeconomic and market enterprise characteristics. The average age of the respondents is 41 years, 51% is female, and 50% has had only primary education or less. The mean annual profit level is about 357,000 Naira or 3,025 US dollars (the distribution of ln profits (for the sample with positive profits only), and transformed profits (for the sample with positive and negative profits) is given in Figure A.1 in appendix A). The number of years the respondent has had his/her market enterprise ranges from 0 to 60, with an average of 12 years. Most enterprises are small; the average number of hired employees is 0.3. Almost 14% of the enterprises trade in ready-

made cloths, while 32% trade in foodstuffs and 38% trade in other items. Tailoring and other service enterprises cover 7% and 9% respectively.

Table 1: Sample description

	Positive profits, n = 545				Positive and negative profits, n = 782			
	Mean	St. Dev	Min	Max	Mean	St. Dev	Min	Max
Profit (Naira*)	356,935	1,106,717	200	15,400,000	43,454	1,463,525	-15,200,000	15,400,000
Ln (Profit)	11.73	1.42	5.30	16.55	-	-	-	-
Sector								
Trade cloths	14%				15%			
Tailoring	7%				7%			
Trade foodstuff	32%				31%			
Other services	9%				9%			
Other trade	38%				38%			
Firm characteristics								
Number of hired employees	0.31	1.05	0	15	0.33	1.00	0	15
Firm age (years)	12	9	0	60	11	9	0	60
Young firms (≤ 2 years)	12%				13%			
Months open	11.6	1.4	2	12	11.5	1.7	1	12
Demographic characteristic of the owner								
Male	49%				50%			
Married	66%				66%			
Age	41	12	18	80	40	11	18	80
Education								
Less than primary education	14%				14%			
Primary education completed	36%				36%			
Secondary education completed	36%				34%			
Tertiary education completed	15%				16%			

* During the time of the survey, July-August 2008, 118 Naira was equivalent to 1 USD.

Risk attitude measurement

The survey contains two psychometric scales for risk attitude, one for risk propensity and one for risk perception. Both scales contain six items and focus on the financial domain. The scales, and their six items, were based on the instruments developed and extensively tested in western countries by Blais and Weber (2006) but have been adjusted to the African context. For the risk propensity scale, respondents indicate on a 7-step Likert scale how likely they are to engage in six different kinds of risky behavior. The response categories range from 'Extremely unlikely' to 'Extremely likely'. The risk perception scale asks for the same six choices, how risky the respondent thinks that behavior is. The scale

ranges from 'Not at all risky' to 'Extremely risky'. Two of the six items ask about betting a day's income on a sporting event and on a high stake card game respectively, the other four items ask about investing 10% of the respondent's annual income in a new farming technology, in stocks, in a wonderbank scheme[4] and in a new business venture. The original items 'betting a day's income at the horse races' and 'investing in a moderate growth mutual fund' by Blais and Weber (2006) have been replaced by 'investing in a wonderbank' and 'investing in a new farming technology' to make the questions compatible with the local context. Figure A.2 in appendix A contains the exact format and formulation of the six items and the Likert scales; distributions of the reported answers to each item are given in figure A.3 and A.4.

Following Blais and Weber (2006), the six items are combined to create a single new variable (for the distribution of the constructed variable, see figure A.5 in appendix A). The mean of the six items forms a proxy for the respondents' actual risk attitude, because each item measures part of the risk attitude of the respondent. The risk propensity variable which includes all six items has a mean of 3.29, indicating that on average respondents perceived that they were 'Somewhat unlikely' to engage in the risky activities. From the risk perception variable (mean 4.57) it follows that respondents on average perceived the activities as between 'Moderately risky' and 'Risky'. These results are similar to those found by Blais and Weber (2006) among the English and French groups of individuals.

Table 2: Correlation of the risk propensity and risk perception scale

Risk propensity	(1)	(2)	(3)	(4)	(5)	(6)
(1) Betting on card game	-					
(2) Invest in new business	-0.02	-				
(3) Betting on sporting event	0.57	-0.03	-			
(4) Investing in stocks	0.07	0.41	0.11	-		
(5) Invest in wonderbank	0.35	0.03	0.33	0.06	-	
(6) Invest in new farming technology	0.15	0.27	0.11	0.30	0.19	-
Risk perception	(1)	(2)	(3)	(4)	(5)	(6)
(1) Betting on card game	-					
(2) Invest in new business	-0.08	-				
(3) Betting on sporting event	0.52	0.00	-			
(4) Investing in stocks	-0.04	0.38	0.05	-		
(5) Invest in wonderbank	0.45	0.04	0.37	0.03	-	
(6) Invest in new farming technology	0.03	0.23	0.12	0.26	0.18	-

[4] A type of ponzi scheme popular in Nigeria.

The internal reliability of the scale depends on the correlation between the individual items. Table 2 shows the correlation between the risk propensity and risk perception items. There is a clear positive correlation between the two betting items and 'investing in a wonderbank', as well as among the other three investment items. The low correlation between the two groups suggests it might be better to separate the two groups and create a variable that measures the propensity to bet and the propensity to invest[5].

A measure for the internal reliability of the two scales is given by computing the Cronbach's alpha. In table 3, both the Cronbach alphas and the inter-item covariances are given. Including all six items, Cronbach's alpha is 0.58 for the risk propensity scale and 0.54 for the risk perception scale. That is lower than the alphas found by Blais and Weber (2006), who for the risk propensity scale obtain 0.83 for the English group and 0.77 for the French group and for the risk perception scale 0.83 and 0.68 respectively. Only including the three investment items results in slightly higher values for Cronbach's alpha, of 0.59 and 0.55 for the risk propensity and risk perception respectively, while the values are much more acceptable for the three betting items with 0.70 and 0.68 respectively. The lower alphas in our data compared to Blais and Weber (2006) could indicate that the items are less applicable in the developing country setting, despite an attempt to adjust the items accordingly.

The high Cronbach alphas for the betting measure suggest it is a better choice. However, as the propensity and risk perception of betting by itself are not thought to have a direct effect on profits, and betting is not the subject of this paper, this measure will not be used. Instead, the three investment items are used to create the risk propensity and risk perception measure that will be used in the remainder of this paper. In addition, the regression results are also available in the appendix for the risk propensity and risk perception variable including all six items, as it creates two variables that give a broader measure of risk propensity and risk perception, and makes the results comparable to Blais and Weber (2006).

[5] Factor analysis on the risk propensity and risk perception items also supports the creation of a separate betting and investment measure. Creating the risk propensity variables using the rank order instead of the normal response value, however, is no improvement as it's Cronbach's alphas are very low, favoring the original scales. See Appendix B.1-3.

Table 3: Internal reliability risk propensity and risk perception measures

	Average interitem covariance	Cronbach's alpha†	Mean	St. Dev	Min	Max	Obs
All six items (betting and investment)							
Risk propensity	0.72	0.58	3.29	1.12	1.00	3.67	539
Risk perception	0.56	0.54	4.57	1.02	1.00	7.00	544
Three betting items							
Risk propensity	1.26	0.68	1.98	1.37	1.00	7.00	539
Risk perception	1.21	0.70	5.83	1.31	1.00	7.00	544
Three investment items							
Risk propensity	1.52	0.59	4.59	1.61	1.00	7.00	545
Risk perception	1.19	0.55	3.31	1.47	1.00	7.00	545

† Scale reliability coefficient.

4. ESTIMATION

4.1 Regression model

The following function is estimated with OLS:

$$\ln(\text{Profit}) = \alpha_0 + \alpha_j R_j + \alpha_r F_r + \alpha_q O_q + \varepsilon \quad (1)$$

in which *R* is a vector of the two risk measures, i.e. risk propensity and risk perception, *F* is a vector including the sector dummies and other firm characteristics and *O* is a vector with all the personal characteristics of the owner. All estimations are performed with clustering at market level and with robust standard errors.

As discussed above, risk propensity and risk perception are thought to be interdependent. This relation is confirmed by the high correlation between the two variables (r=-0.58, p=0.000). When both variables are included in the regression analyses, this could create multicollinearity, leading to less efficient, and thereby, less significant results. In order to circumvent the multicollinearity, two additional regressions are reported, each including only one of the two risk attitude measures.

4.2 Effects of controls

Table 4 presents the estimation results for firms' profit. Column (1) includes the risk propensity in addition to the firm and owner characteristics. Column (2) includes the risk perception instead and column (3) includes both measures of risk attitude. For completeness, column (4) shows the estimation results excluding both risk measures.

The number of employed workers in the MSE is positively related to profits, with an increase in profits of 13% per additional employee in the full model in column (3). Young firms are significantly less profitable than older firms, with a lower profit level of at least 52%, suggesting there could be a strong increase in profits during the first couple of years of the enterprise operation, no doubt at least partially a consequence of selectivity. The number of months an enterprise was open during the past 12 months is highly significant and positively related to profits. A direct effect on annual profits is obvious. Firms that stay open more often, possibly also have lower unit costs as they can spread the fixed costs over more days. Staying open more often may increase the customer loyalty and satisfaction, which could positively affect the profitability of the enterprise. Reverse causality may also apply, as firms may open longer if expected profits are higher.

All sectors generate less profit than the omitted sector 'trade in clothing'. The significance of the effects differs between the sectors and specification of the estimation. While the dummy for the food sector is not significant, the dummy variable for tailoring and other trade are highly significant. The biggest effect is found with enterprises in the tailoring sector. They earn 78% lower profits than the enterprises trading in clothing.

The effects of the education dummies are all highly significant and increasing in size over the education level attained. It shows that having tertiary education increases profits by over 130% compared to entrepreneurs with less than primary education. It suggests that entrepreneurs with a higher level of education have better managerial skills, resulting in higher profits. Human capital clearly pays off. Even though age squared is not significant, the negative sign and the size of the coefficient are as expected in combination with the positive and weakly significant effect of age itself. The full model (3), estimates that the profits increase with age at a marginally diminishing rate until the age of 58, after which

the profits decrease at increasing rate.[6] The increasing profit over the age could be due to a learning effect or to selectivity. As suggested by Daniels and Mead (1998) the decline after the age of 58 may be due to decreased health status at old age.

Table 4: Multiple OLS regressions on ln(Profit) with financial investment risk measures[7]

	(1)		(2)		(3)		(4)	
	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.
Risk propensity	-0.071 *	(0.037)	-		-0.001	(0.045)	-	
Risk perception	-		0.129 ***	(0.039)	0.129 ***	(0.048)	-	
Tailoring	-0.776 ***	(0.267)	-0.779 ***	(0.265)	-0.778 ***	(0.266)	-0.808 ***	(0.267)
Trade foodstuff	-0.217	(0.184)	-0.249	(0.183)	-0.249	(0.184)	-0.211	(0.185)
Other services	-0.445 *	(0.249)	-0.492 **	(0.247)	-0.492 **	(0.248)	-0.480 *	(0.249)
Other trade	-0.469 **	(0.183)	-0.499 ***	(0.182)	-0.499 ***	(0.183)	-0.486 ***	(0.184)
Number of workers	0.144 ***	(0.055)	0.131 **	(0.055)	0.131 **	(0.055)	0.140 **	(0.055)
Young firm (≤ 2 years)	-0.520 ***	(0.198)	-0.553 ***	(0.195)	-0.553 ***	(0.197)	-0.566 ***	(0.197)
Months open	0.131 ***	(0.043)	0.118 ***	(0.043)	0.118 ***	(0.043)	0.134 ***	(0.043)
Male	0.511 ***	(0.124)	0.517 ***	(0.123)	0.518 ***	(0.123)	0.486 ***	(0.123)
Married	-0.074	(0.130)	-0.061	(0.129)	-0.062	(0.130)	-0.069	(0.131)
Age	0.058 *	(0.035)	0.059 *	(0.035)	0.059 *	(0.035)	0.054	(0.035)
Age^2	0.000	(0.000)	-0.001	(0.000)	-0.001	(0.000)	0.000	(0.000)
Primary completed	0.537 ***	(0.196)	0.515 ***	(0.194)	0.516 ***	(0.195)	0.513 ***	(0.196)
Secondary completed	0.814 ***	(0.207)	0.810 ***	(0.205)	0.810 ***	(0.205)	0.794 ***	(0.207)
Tertiary completed	1.363 ***	(0.235)	1.322 ***	(0.232)	1.322 ***	(0.234)	1.312 ***	(0.234)
Constant	8.534 ***	(0.905)	7.955 ***	(0.898)	7.958 ***	(0.925)	8.310 ***	(0.900)
R-squared	0.170		0.181		0.181		0.164	
Observations	545		545		545		545	

*, ** and *** represent significance at the 10%, 5% and 1% level respectively. The omitted sector dummy is 'trade in clothing' and the omitted education dummy is 'less than primary completed'.

The effect of marital status on profitability is not significant, even when excluding both risk measures from the specification (see column 4). Gender does have a highly significant and large effect on profits, with males earning about 50% higher profits than females. This is similar to the results found by Daniels and Mead (1998). They explain higher profits by suggesting that women are less willing to take risks, trading a lower level of risk exposure for lower profits. The regression results show that the propensity to take risk is actually negatively related to profit, and the perception of risk is positively related to profit. The higher willingness to take risks by males, supported by the statistical models in section 4,

[6] Calculated by solving $f'(X) = 0$ given $f(X) = 0.059X - 0.0005X^2$, where X is the age of the entrepreneur, and f(X) the effect of age on profits.

[7] Appendix C, Table C.1 contains the same four models but estimated with the six item financial risk measures.

can therefore not explain their higher profit level. In fact, when excluding the measures of risk attitude, the effect of gender on profits is underestimated. There should thus be a different explanation for the higher profits earned by males such as more managerial knowledge or better access to credits, but the current data cannot tests these suggestions.

The results of our regression analyses are in line with those found in the literature: positive effects of firm age, entrepreneur's age and education, number of employees, a negative effect of gender (female), substantial sector effects. The effect of the controls barely varies across columns.

4.3 The effect of risk attitudes on profitability

Explaining profit by risk attitude, most of the empirical literature only includes a measure of willingness to take risk in the analysis. The measure of risk propensity is similar to such measures. If we only include risk propensity (column (1) of table 4), we find a significant though weakly negative effect on profits. This confirms the results found by Rauch and Frese (2000) and Naldi et al. (2007) that willingness to take risk has a negative impact on firm performance. The second column shows the estimation with the risk perception as measure for risk attitude instead. Entrepreneurs who perceive higher risks in the financial domain earn significantly higher profits. An increase in the risk perception by the entrepreneur with one standard deviation (1.47, see Table 3) increases the profits by almost 19%. This positive result is in line with Duchesneau and Gartner (1990) who find that firms which seek to reduce risks are more successful. When both measures are included in the regression analysis, the sign of both measures remains the same. However, risk propensity becomes insignificant. This is similar to Sitkin and Weingart (1995). The reduction in significance when including risk perception suggests that risk perception mediates the effect of risk propensity on profits, indicating that risk propensity affects risk perception, and not so much the other way around (cf Sitkin and Weingart (1995) and Sitkin and Pablo (1992)).

5. ROBUSTNESS, CAUSALITY AND SELECTIVITY

In our regressions, we have based our measure of risk attitude on the three investment items out of the six items in the financial domain. As an alternative, one might use the

mean score on the three betting items (card game, sporting event, wonderbank), with its favorable Cronbach alpha score (Section 3). We could also use the mean score on all six variables. Table 5 shows that our results are best with the investment variables, confirming our preference for this measure as motivated in section 3. If we use the gambling measures, no coefficient is significant, if we combine investment and gambling, the results are diluted somewhat. Note that our results on the risk attitude measures are not affected by including or excluding control variables.

Correlation, as we know, does not spell causation. The effects of the age of the entrepreneur and of the firm may be the consequence of selective survival, but that problem can only be tackled with longitudinal data (and besides, is not at the heart of our present interest). The other control variables may interact with risk attitudes and here we can extend our analysis a little. Table 6a explains risk propensity by socioeconomic characteristics based on OLS regressions. In column (1) to (3), signs of the effects confirm familiar findings, as in Hartog et al. (2002) and Dohmen et al. (2005) and are stable over the different specifications. Also, the significance of gender and tertiary education level appear robust. The estimated models (1) – (3) have a low R-squared, similar to those found by Hartog et al. (2002) and Dohmen et al. (2005). Adding the risk perception as explanatory variable, reported in column (4), increases the R-squared from 0.073 to 0.387. Causality may go both ways here, although the literature stresses the effect of propensity on perception. The coefficient is highly significant, and leaves the significance of the other variables intact. This suggests that males have a higher propensity to take risks than females, even when corrected for the lower perception of risk by males. Note however that due to reverse causality the size of the risk perception coefficient is likely to have been overestimated. Risk propensity is higher for graduates of tertiary education, even after controlling for risk perception; causality of this effect of course has not been established, as indeed education may teach how to deal with risk and thus reduce risk aversion, but conversely, risk aversion may affect educational choice (Levhari and Weiss, 1974; Hartog and Diaz Serrano, 2007). Replacing the risk measures by the six item based measures gives similar results with respect to the sign and significance of the main variables.[8]

[8] Appendix C, table C.2a-b, contain all four model specifications for the six item and betting measures for both the risk propensity and the risk perception estimations.

Table 5: Regression coefficients for different risk propensity and perception measures

Ln(Profit)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.
Risk propensity (investment)	-0.070		0.001				-0.008			
	(0.044)		(0.056)				(0.051)			
Risk perception (investment)		0.127 ***	0.128 **				0.123 **			
		(0.043)	(0.055)				(0.054)			
Risk propensity (gambling)				0.023		0.037	0.041			
				(0.048)		(0.057)	(0.048)			
Risk perception (gambling)					0.009	0.028	0.023			
					(0.053)	(0.063)	(0.049)			
Risk propensity (investment+gambling)								-0.054		0.014
								(0.064)		(0.087)
Risk perception (investment+gambling)									0.141 **	0.148
									(0.068)	(0.090)
R-squared	0.170	0.181	0.181	0.165	0.164	0.165	0.182	0.166	0.174	0.174
Observations	538	538	538	538	538	538	538	538	538	538

Note that we controlled for sectors, number of workers, young firms, # of months open, gender, marital status, age, age2, and completed education level.

The coefficients below are obtained without controlling for other variables

Ln(Profit)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.	coeff.
Risk propensity (investment)	-0.048		0.038				0.04			
	(0.062)		(0.080)				(0.070)			
Risk perception (investment)		0.134 ***	0.159 **				0.16 ***			
		(0.047)	(0.063)				(0.057)			
Risk propensity (gambling)				-0.006		0.000	-0.007			
				(0.071)		(0.078)	(0.062)			
Risk perception (gambling)					0.012	0.012	-0.006			
					(0.074)	(0.081)	(0.068)			
Risk propensity (investment+gambling)								-0.052		0.021
								(0.099)		(0.124)
Risk perception (investment+gambling)									0.151 *	0.163
									(0.090)	(0.110)
R-squared	0.003	0.02	0.021	0.000	0.000	0.000	0.021	0.002	0.012	0.012
Observations	598	598	598	598	598	598	598	598	598	598

Std. dev between brackets.

Table 6b shows the multiple OLS regressions for explaining risk perception. Now we find barely any significant effect. Estimations (1) to (3) show that only gender is significantly related to risk perception therein the first specification, with males perceiving less risk. As suggested by Sitkin and Pablo (1992), risk propensity is highly significant in model (4). Contrary to the suggestion by Fajnzaylber et al. (2006), entrepreneurs who are married do not show a higher willingness to take risks. In both the risk propensity and the risk perception regressions, the effect of being married is never significantly different from zero. Risk perception is clearly less tightly related to our explanatory variables than risk propensity.

As risk attitudes affect choices, one may presume a link between risk attitude and actual risk experienced. With heterogeneous risk attitudes the relationship is not trivial and as always depends on supply and demand conditions (see Berkhout et al., 2010). Generally, an efficient assignment would have less risk averse individuals take on the more risky activities. But as discussed above, those with higher risk perception may take more precautions to cope with risk and may end up with lower variability in results and higher average results.

6. NON-POSITIVE PROFITS

In the analyses so far, we have only used observations where profits are positive. We did so because, in line with convention, we use the logarithm of profit as dependent variable, to estimate regression coefficients as relative effects. To include observations with non-positive profits, one might augment all profits by a sufficient amount to guarantee a positive value, or use profits as a percentage of revenues instead of log profits. Both alternatives turned out to be problematic.

In Table 7, we distinguish two datasets: restricted, with positive profits only ("+", in the table) and unrestricted, including non-positive profits (and indicated "+/-" in the table). Columns 1 to 4 give regression results for transformed profits (augmented by the largest loss observed in our dataset) and for profits as a share of revenues. Using transformed profits or profit share destroys our results: virtually no variable has significant effect.

Table 6: Multiple OLS regressions on Risk propensity and Risk perception

Risk propensity	(1) base		(2) including control variables		(3) including asset index		(4) including risk perception	
	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.
Risk perception	-		-		-		-0.618 ***	(0.040)
Male	0.491 ***	(0.135)	0.398 ***	(0.143)	0.413 ***	(0.141)	0.282 **	(0.117)
Married	-0.055	(0.149)	-0.056	(0.155)	-0.093	(0.155)	-0.185	(0.126)
Age	0.001	(0.007)	0.001	(0.007)	0.002	(0.007)	0.003	(0.006)
Primary completed	0.387	(0.243)	0.403	(0.245)	0.322	(0.254)	0.279	(0.203)
Secondary completed	0.422	(0.257)	0.392	(0.259)	0.295	(0.265)	0.190	(0.212)
Tertiary completed	0.931 ***	(0.266)	0.823 ***	(0.291)	0.617 **	(0.311)	0.553 **	(0.263)
Control variables†								
Household assets index	-		-		0.207 ***	(0.069)	0.105 *	(0.063)
Per capita consumption (e-7)	-		3.972 *	(2.397)	-		-	
# household members	-		0.018	(0.038)	-0.005	(0.036)	0.043	(0.026)
Lends	-		0.296 *	(0.169)	0.268	(0.169)	0.245 *	(0.142)
Has credit	-		0.114	(0.187)	0.076	(0.184)	0.081	(0.157)
Savings (e-6)			0.282	(0.522)	0.194	(0.499)	0.246	(0.367)
Constant	3.920 ***	(0.406)	3.731 ***	(0.440)	3.206 ***	(0.466)	5.621 ***	(0.407)
R-squared	0.049		0.058		0.073		0.387	
Observations	545		527		530		530	

Risk perception	(1) base		(2) including control variables		(3) including asset index		(4) including risk perception	
	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.
Risk propensity	-		-		-		-0.548 ***	(0.041)
Male	-0.263 **	(0.126)	-0.205	(0.134)	-0.211	(0.133)	0.015	(0.114)
Married	-0.074	(0.146)	-0.176	(0.154)	-0.148	(0.154)	-0.200	(0.125)
Age	0.005	(0.007)	0.002	(0.007)	0.001	(0.007)	0.002	(0.005)
Primary completed	-0.070	(0.229)	-0.143	(0.231)	-0.069	(0.237)	0.108	(0.189)
Secondary completed	-0.191	(0.236)	-0.244	(0.240)	-0.170	(0.246)	-0.008	(0.196)
Tertiary completed	-0.182	(0.253)	-0.320	(0.274)	-0.103	(0.286)	0.235	(0.241)
Control variables†								
Household assets index	-		-		-0.165 **	(0.067)	-0.052	(0.060)
Per capita consumption (e-7)	-		0.346	(2.624)	-		-	
# household members	-		0.074 **	(0.036)	0.077 **	(0.034)	0.074 ***	(0.025)
Lends	-		-0.057	(0.157)	-0.037	(0.155)	0.109	(0.131)
Has credit	-		-0.044	(0.172)	0.008	(0.171)	0.049	(0.146)
Savings (e-6)			0.001	(0.355)	0.084	(0.351)	0.191	(0.233)
Constant	3.416 ***	(0.379)	3.364 ***	(0.414)	3.909 ***	(0.445)	5.666 ***	(0.382)
R-squared	0.014		0.022		0.035		0.362	
Observations	545		527		530		530	

† The household assets index is a sum of a number of items including e.g. TVs, computers and watches, Lends is a dummy with 1 = someone in the household has lend money to someone outside of the household in the past 12 months, Has credit is a dummy with 1 = someone in the household bought on credit or had outstanding credit in past 12 months and Savings is the total value of the respondent's individual savings. The lower number of observations is due to 3 missing observations on consumption, 4 on lending and 12 on credit.

*, ** and *** represent significance at the 10%, 5% and 1% level respectively.

Table 7a: Explaining profits, costs, revenues for positive profit observations only and both positive and negative

	(1) Transformed ln Profit		(2) Transformed ln Profit		(3) Profitshare		(4) Profitshare		(5) ln Costs		(6) ln Costs		(7) ln Costs + dummy Loss		(8) ln Costs + dum. Loss & Trust	
	+		+/-		+		+/-		+		+/-		+/-		+/-	
	coeff.	st.dev	coeff.	st.dev	coeff.	st.dev	coeff.	st.dev	coeff.	st.dev	coeff.	st.dev	coeff.	st.dev	coeff.	st.dev
Risk propensity (investment)	0.001	(0.002)	0.007	(0.005)	0.007	(0.015)	0.120	(0.223)	-0.052	(0.096)	-0.064	(0.078)	-0.027	(0.086)	-0.013	(0.085)
Risk perception (investment)	0.005 **	(0.002)	0.006	(0.004)	-0.026 *	(0.013)	0.186	(0.159)	0.276 **	(0.105)	0.209 **	(0.090)	0.232 ***	(0.084)	0.234 ***	(0.080)
Tailoring	-0.013 ***	(0.004)	-0.004	(0.009)	0.022	(0.056)	0.268	(0.221)	-0.808 ***	(0.250)	-0.934 ***	(0.305)	-0.926 ***	(0.249)	-0.905 ***	(0.252)
Trade foodstuff	0.002	(0.006)	-0.001	(0.010)	0.023	(0.058)	-0.391	(0.447)	-0.536	(0.345)	-0.454	(0.309)	-0.404	(0.286)	-0.378	(0.277)
Other services	0.003	(0.011)	-0.069	(0.068)	0.004	(0.054)	0.078	(0.870)	-0.598 **	(0.281)	-0.736 **	(0.286)	-0.692 **	(0.262)	-0.831 ***	(0.264)
Other trade	-0.006	(0.004)	-0.004	(0.008)	0.045	(0.045)	-0.437	(0.259)	-0.811 **	(0.341)	-0.692 **	(0.303)	-0.696 **	(0.271)	-0.696 ***	(0.247)
Number of workers	0.008 *	(0.005)	0.010	(0.009)	-0.037 ***	(0.012)	-0.089	(0.398)	0.340 ***	(0.070)	0.346 ***	(0.083)	0.321 ***	(0.065)	0.329 ***	(0.069)
Young firm	-0.009 **	(0.004)	-0.013	(0.008)	-0.136 **	(0.052)	-0.745	(0.183)	0.360	(0.351)	0.305	(0.284)	0.233	(0.253)	0.129	(0.244)
Months per year open	0.001	(0.001)	-0.002	(0.002)	0.001	(0.009)	0.191	(0.319)	0.102 *	(0.051)	0.110 ***	(0.032)	0.144 ***	(0.027)	0.132 ***	(0.032)
Male	0.009 **	(0.004)	-0.011	(0.013)	-0.001	(0.033)	-0.309	(0.436)	0.611 *	(0.344)	0.611 *	(0.352)	0.571 **	(0.283)	0.614 **	(0.243)
Married	0.003	(0.004)	0.000	(0.005)	-0.019	(0.033)	0.003	(0.987)	-0.016	(0.203)	-0.052	(0.173)	-0.068	(0.148)	-0.059	(0.144)
Age	0.000	(0.001)	-0.002	(0.002)	-0.003	(0.007)	-0.110	(0.102)	0.089 ***	(0.032)	0.079 **	(0.032)	0.074 ***	(0.026)	0.089 ***	(0.027)
Age^2	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.001 *	(0.086)	-0.001 **	(0.000)	-0.001 **	(0.000)	-0.001 **	(0.000)	-0.001 ***	(0.000)
Primary completed	0.016 ***	(0.006)	0.001	(0.009)	0.045	(0.037)	0.106	(0.825)	0.268	(0.194)	0.157	(0.187)	0.181	(0.172)	0.118	(0.178)
Secondary completed	0.018 ***	(0.006)	0.006	(0.008)	0.061	(0.050)	0.369	(0.552)	0.430	(0.267)	0.186	(0.240)	0.300	(0.211)	0.217	(0.206)
Tertiary completed	0.034 ***	(0.013)	-0.032	(0.041)	0.089	(0.072)	0.101	(0.872)	0.894 ***	(0.306)	0.735 ***	(0.267)	0.679 ***	(0.217)	0.647 ***	(0.214)
Negative profits	-	-	-	-	-	-	-	-	-	-	-	-	1.538 ***	(0.292)	0.475	(0.515)
Trust indicator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-0.251	(0.256)
Trust*negative profits	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.497 *	(0.282)
Constant	16.492 ***	(0.016)	16.564 ***	(0.054)	0.620 **	(0.258)	-1.479	(0.566)	7.128 ***	(1.402)	8.252 ***	(1.069)	7.189 ***	(1.031)	7.544 ***	(0.843)
R-squared	0.094		0.020		0.071		0.025		0.189		0.152		0.297		0.314	
Observations	545		781		545		777		545		782		782		724	

Table 7b: Explaining profits, costs, revenues for positive profit observations only and both positive and negative

	(9) ln Revenues			(10) ln Revenues			(11) ln Revenues + dummy Loss			(12) ln Revenues + Loss & Trust			(13) Simultaneous ln Costs & ln Revenues				
	+			+/-			+/-			+/-			+/-				
	coeff.		st.dev	coeff.		st.dev	coeff.		st.dev	coeff.		st.dev	coeff.		st.dev	coeff.		st.dev
Risk propensity (investment)	-0.011		(0.060)	0.016		(0.071)	-0.002		(0.064)	0.003		(0.064)	-0.027		(0.044)	-0.002		(0.034)
Risk perception (investment)	0.187	***	(0.063)	0.202	***	(0.060)	0.191	***	(0.059)	0.179	***	(0.054)	0.232	***	(0.046)	0.191	***	(0.035)
Tailoring	-0.718	***	(0.175)	-0.757	***	(0.165)	-0.761	***	(0.170)	-0.756	***	(0.172)	-0.926	***	(0.256)	-0.761	***	(0.197)
Trade foodstuff	-0.215		(0.219)	-0.198		(0.222)	-0.222		(0.199)	-0.214		(0.190)	-0.404	**	(0.179)	-0.222		(0.138)
Other services	-0.468	**	(0.219)	-0.619	***	(0.214)	-0.640	***	(0.189)	-0.668	***	(0.210)	-0.692	***	(0.241)	-0.640	***	(0.186)
Other trade	-0.532	**	(0.253)	-0.583	***	(0.206)	-0.581	***	(0.192)	-0.565	***	(0.175)	-0.696	***	(0.173)	-0.581	***	(0.134)
Number of workers	0.222	***	(0.048)	0.224	***	(0.050)	0.235	***	(0.053)	0.244	***	(0.058)	0.321	***	(0.057)	0.235	***	(0.044)
Young firm	-0.103		(0.224)	-0.057		(0.191)	-0.023		(0.184)	-0.074		(0.200)	0.233		(0.182)	-0.023		(0.141)
Months per year open	0.126	***	(0.045)	0.251	***	(0.053)	0.235	***	(0.042)	0.212	***	(0.043)	0.144	***	(0.035)	0.235	***	(0.027)
Male	0.503	**	(0.214)	0.447	***	(0.158)	0.466	**	(0.177)	0.527	***	(0.156)	0.571	***	(0.122)	0.466	***	(0.094)
Married	-0.022		(0.121)	-0.067		(0.111)	-0.059		(0.106)	-0.030		(0.106)	-0.068		(0.129)	-0.059		(0.099)
Age	0.075	***	(0.025)	0.055	**	(0.023)	0.058	***	(0.021)	0.061	***	(0.023)	0.074	**	(0.034)	0.058	**	(0.026)
Age^2	-0.001	**	(0.000)	-0.001	**	(0.000)	-0.001	**	(0.000)	-0.001	**	(0.000)	-0.001	**	(0.000)	-0.001	**	(0.000)
Primary completed	0.391	**	(0.146)	0.311	**	(0.148)	0.299	**	(0.145)	0.241		(0.158)	0.181		(0.187)	0.299	**	(0.144)
Secondary completed	0.658	***	(0.141)	0.531	***	(0.162)	0.476	***	(0.136)	0.389	***	(0.132)	0.300		(0.196)	0.476	***	(0.151)
Tertiary completed	1.057	***	(0.215)	0.707	***	(0.204)	0.734	***	(0.183)	0.679	***	(0.186)	0.679	***	(0.221)	0.734	***	(0.170)
Negative profits	-		-	-		-	-0.739	***	(0.181)	-1.803	***	(0.327)	-		-	-		-
Trust indicator	-		-	-		-	-		-	-0.154		(0.152)	-		-	-		-
Trust*negative profits	-		-	-		-	-		-	0.499	***	(0.168)	-		-	-		-
Constant	8.287	***	(0.890)	7.130	***	(0.904)	7.641	***	(0.804)	8.200	***	(0.788)	1.538	***	(0.121)	-0.739	***	(0.093)
R-squared	0.231			0.235			0.291			0.314			0.297			0.291		
Observations	545			782			782			724			782			782		

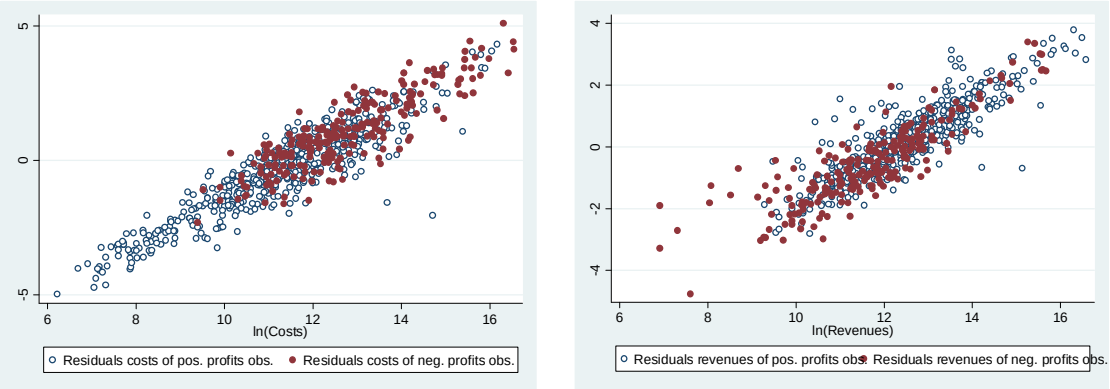
However, if we apply the profit transformation and estimate on the restricted sample, risk perception is significant and risk propensity is not, as before, suggesting that it is not the transformation per se that destroys the results (although we still loose some significant effects among the controls). In columns 5 to 13, we present separate regressions for cost and benefits. In terms of significance levels, the regressions for cost and for revenue separately perform fairly well, both on the restricted and the unrestricted samples. The effects of risk propensity and risk perception are robust between the two samples, both for costs and for revenues. In regressions 7 and 11, we added a dummy for observations where profits are non-positive. It turns out that reported costs are significantly higher and revenues are significantly lower. This is not a trivial result: as the regression coefficients barely change when the positive profit dummy is included, the dummy coefficient points to an unobserved variable that is uncorrelated with the observed variables.

A possible explanation might be that some respondents suspect that survey results will be reported to government authorities and that they will somehow have to pay a price, perhaps in the form of taxes, license fees or corruptions charges (although actually the fear for higher taxes would be misplaced, as there are neither sales taxes nor profit taxes). We interacted the dummy for operating at a loss with a dummy for trust (from the question *How much of the time do you in general trust the government to do what is right?* the response categories *Most of the time* and *Just about always*, are combined). We now find that among those who report a loss, those who trust government have both 50% higher costs, and 50% higher revenue. Thus, we cannot conclude that among those who report a loss, those who do not trust government will underreport profits by inflating cost and deflating revenue (remember that we calculate profits by subtracting reported costs from reported revenues).

We have plotted the residuals of the regressions for cost and revenues (regressions (6) and (10)) against cost (revenues), identifying firms with positive and firms with non-positive profits (open and solid dots respectively). Figure 1 shows that the residuals are increasing in both costs and revenues. Figure 1a shows that the residuals for the cost regression exhibit a similar pattern in both samples (except for an upward shift of the positive-profits scatter: among firms with a positive profit, the lowest bound of observed cost is higher). Figure 1b shows that scatters differ between the two samples: among firms

reporting a loss (solid dots) the residuals at low revenues are smaller (closer to zero) than extrapolation of the scatter would suggest. However, we are unable to put a label on this unobserved effect; eliminating the low end of the sample (ln Revenues below 10) does not improve our regression results substantially. A simultaneous estimation of costs and revenues (13) reveals that the error terms from both equations correlate at 0.7, but that exhausts what we are able to discover about the structure of the measurement errors.

Figure 1a-b. Residuals from regressions (6) and (10) Table 7 against costs and revenues



We have hit upon a common data problem in developing countries: a correct measurement of profit among entrepreneurs in developing countries is difficult. Several studies find a low correlation between self-estimated profits and profits calculated by subtracting the costs from the revenues. In addition, a larger share of the MSEs earns negative profits when profits are calculated rather than self-estimated (e.g Vijverberg, 1991; Daniels, 2001; De Mel et al. 2009). Clearly, the majority of MSEs do not keep financial records, which makes costs and revenues recalls imprecise. De Mel et al. (2009) suggest that entrepreneurs also tend to overstate costs and underreport revenues. In two surveys among MSEs in Sri-Lanka De Mel et al. (2009) show that entrepreneurs themselves indicate that small firms tend to overstate expenses and underreport revenues: (45-54% and 60-86% of the owners respectively). A large part of overstating of costs they attribute to business expenditures that are used for home consumption, but also firm inputs that were

handed out as gifts. Among the reasons for underreporting revenues were fear of taxes, fear of robbery, lack of trust in the interviewer, and the anticipation of some financial benefit.

Looking at the results for the risk attitude variables in explaining costs and revenues, we see that our basic conclusion is supported. Risk propensity has no effect on costs or revenues; risk perception has significant positive effect on costs and revenues in all specifications. Remarkably, the effect is quite stable across specifications and about equal in magnitude for both costs and revenues. This suggests that risk perception has some sort of a scale effect: business owners with higher risk perception operate their business at larger financial volume.

7. CONCLUSION

This paper aims to explain the variation in profits among micro and small enterprises (MSEs) in the financial capital of Nigeria. In particular, the role of entrepreneurs' risk attitude has been addressed in explaining differences in profitability between MSEs. New in this study is the inclusion of both risk propensity and risk perception as a measure of risk attitude, the latter specifically a measure from the psychological literature.

The analyses show that the propensity to take risk is negatively related to profits. When including risk perception, however, the risk propensity no longer has any significant effect. Instead, the *perception* of risk appears to be the most important risk attitude characteristic, with a positive effect on profit. Entrepreneurs who have a higher perception of the financial risks, earn higher profits. As both their costs and their revenues are higher, they appear to operate their business at larger financial scale.

Considering only firms with positive profits, the effects of other firm characteristics, such as the number of employees, the sector in which the enterprise operates, the number of months the enterprise has been open in the past year and owner characteristics such as education, age and gender are all significant and in line with expectation and previous literature. There is also a large difference in profitability between sectors. As found by most previous studies, males have a higher earnings profile compared to their female counterparts. It has been suggested in the literature that this difference can be explained by the higher level of risk taking by males. However, as risk propensity has a negative effect on profits, this cannot explain the difference. The higher profits by males can neither be

explained by their lower perception of risks compared with females, as men have lower risk perception yet risk perception has a positive effect on profits. Although several control variables loose significance if we include firms with non-positive profits in the regression analysis, our conclusions on the effects of risk perception and risk propensity are not sensitive to including or excluding non-positive profits in explaining costs and revenues. However, as already noted in the available literature, the measurement of profits of small business firms in a informal setting is problematic.

ACKNOWLEDGEMENTS

The authors are grateful to all colleagues and parties involved accomplishing the unique data used in this paper: The Health Insurance Fund (HIF), The Dutch Ministry of Foreign Affairs, the PharmAccess Foundation, the Academic Medical Center - Center for Poverty related Communicable Diseases (CPCD), the Lagos University Teaching Hospital (LUTH), and the Amsterdam Institute for International Development (AIID).

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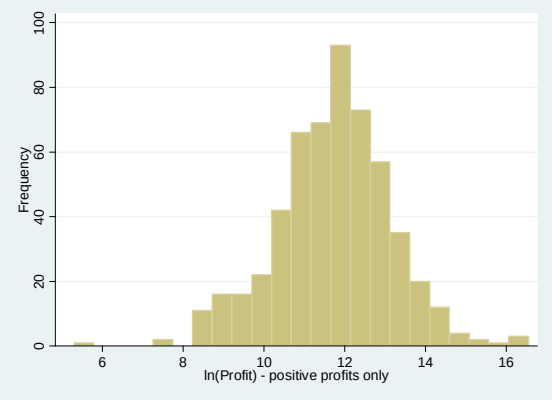
Appendix A: Figures

Figure A.1: Distribution of ln(Profits), n = 545 and ln(Transformed profits) n = 782.



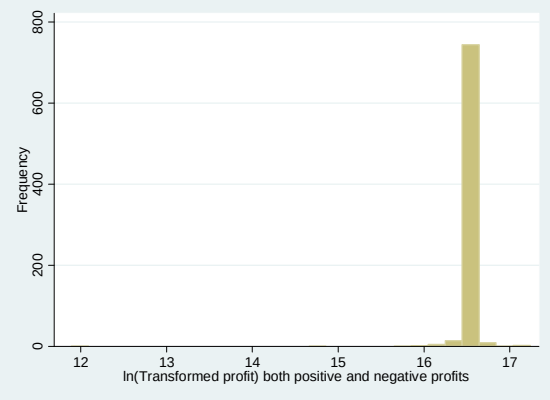


Figure A.2: Assessment of risk propensity and perception in the questionnaires

I will now present you with a number of activities. We would like you to indicate how likely you would engage in that activity if you were faced with such a situation. You can choose on a range between Extremely unlikely to Extremely likely that you would engage in the activity. You can indicate this on scale of 1 to 7 by pointing on this card [SHOW FIRST CARD].

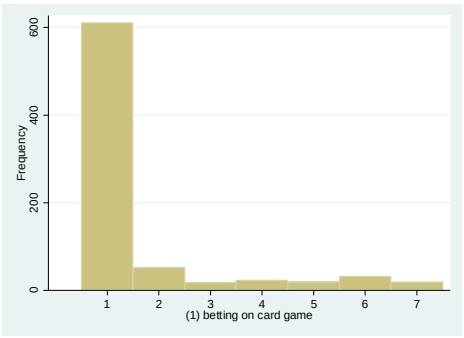
(10.24) How likely are you to engage in the following financial activities? CIRCLE FOR EACH ACTIVITY THE NUMBER THAT APPLIES		Risk Taking							
		1 Extremely unlikely	2 Moderatel y unlikely	3 Somewhat unlikely	4 Not sure	5 Somewhat likely	6 Moderatel y likely	7 Extremely likely	
1 Betting a day's income at a high-stake card game, such as poker	Extremely unlikely	1	2	3	4	5	6	7	Extremely likely
2 Investing 10% of your annual income (which is equal to XXXX) in a new business venture	Extremely unlikely	1	2	3	4	5	6	7	Extremely likely
3 Betting a day's income on the outcome of a sporting event, such as soccer	Extremely unlikely	1	2	3	4	5	6	7	Extremely likely
4 Investing 10% of your annual income (which is equal to XXXX) in stocks	Extremely unlikely	1	2	3	4	5	6	7	Extremely likely
5 Investing 10% of your annual income (which is equal to XXXX) in a wonderbank or other scheme that promise you a very high return on savings	Extremely unlikely	1	2	3	4	5	6	7	Extremely likely
6 Investing 10% of your annual income (which is equal to XXXX) in a new farming technology	Extremely unlikely	1	2	3	4	5	6	7	Extremely likely

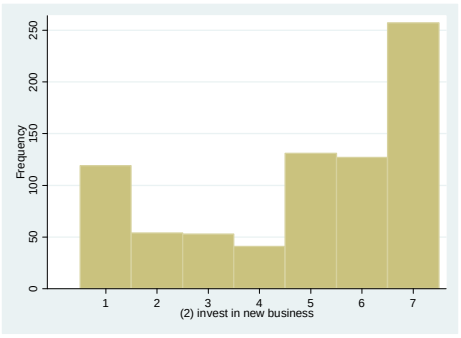
Again I will present you with the same activities. This time I would like you to indicate how risky you think the activity is. You can choose between Not at all risky to Extremely risky". You can indicate this on scale of 1 to 7 by pointing on this card [SHOW SECOND CARD]"

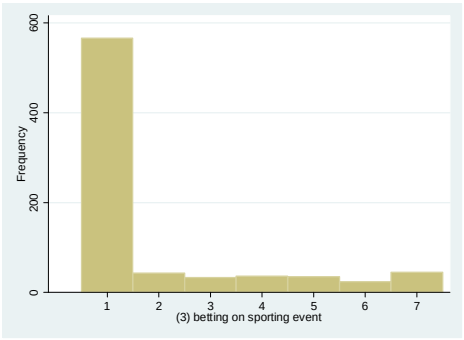
(10.26) How risky do you percieve the following financial activities to be? CIRCLE FOR EACH ACTIVITY THE NUMBER THAT APPLIES		Risk Perception							
		1 Not at all Risky	2 Slightly Risky	3 Somewhat Risky	4 Moderatel y Risky	5 Risky	6 Very Risky	7 Extremely Risky	
1 Betting a day's income at a high-stake card game, such as poker	Not at all Risky	1	2	3	4	5	6	7	Extremely Risky
2 Investing 10% of your annual income (which is equal to XXXX) in a new business venture	Not at all Risky	1	2	3	4	5	6	7	Extremely Risky
3 Betting a day's income on the outcome of a sporting event, such as soccer	Not at all Risky	1	2	3	4	5	6	7	Extremely Risky
4 Investing 10% of your annual income (which is equal to XXXX) in stocks	Not at all Risky	1	2	3	4	5	6	7	Extremely Risky
5 Investing 10% of your annual income (which is equal to XXXX) in a wonderbank or other scheme that promise you a very high return on savings	Not at all Risky	1	2	3	4	5	6	7	Extremely Risky
6 Investing 10% of your annual income (which is equal to XXXX) in a new farming technology	Not at all Risky	1	2	3	4	5	6	7	Extremely Risky

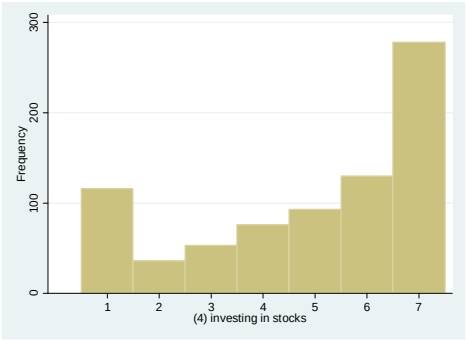
'XXXX' in (2), (4), (6), and (7) was determined based on an income assessment in the income module of the questionnaires

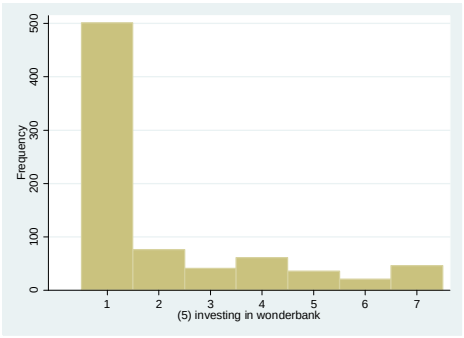
Figure A.3: Frequency distribution of answers provided to the risk propensity scales per item (full sample – 782 observations)











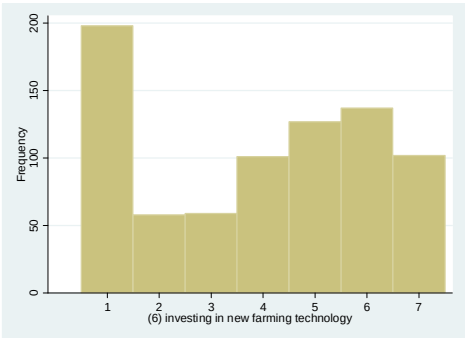
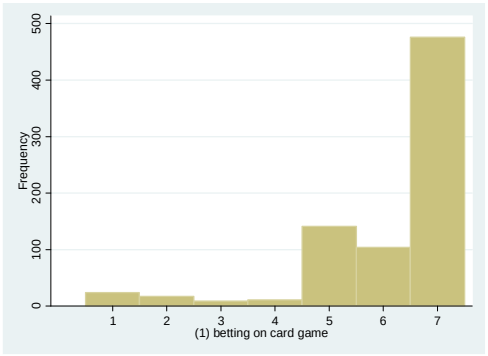
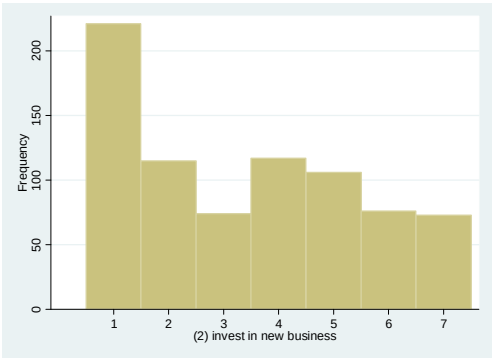
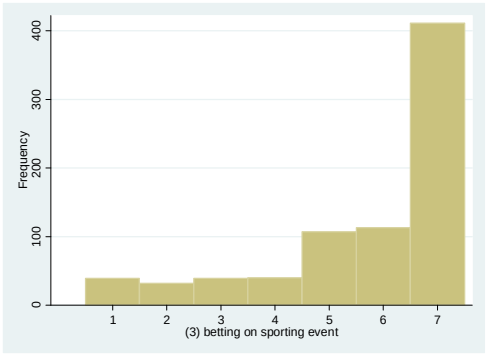
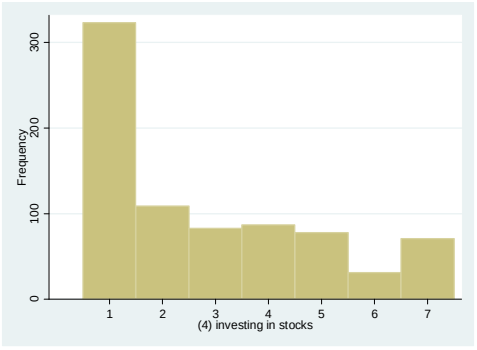


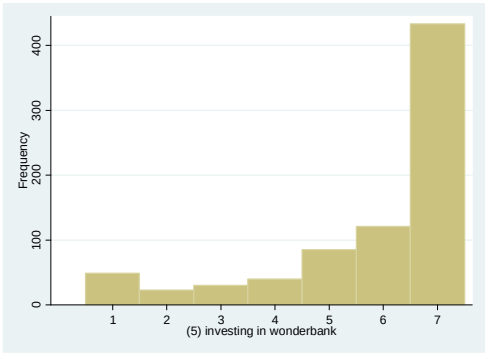
Figure A.4: Frequency distribution of answers provided to the risk perception scales per item (full sample – 782 observations)











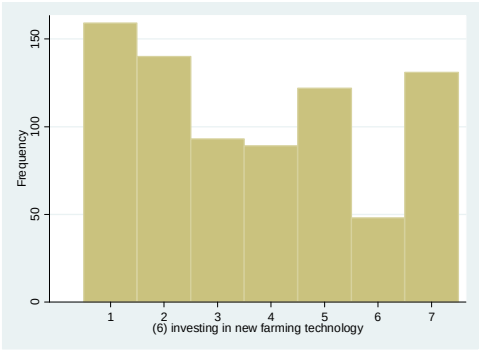
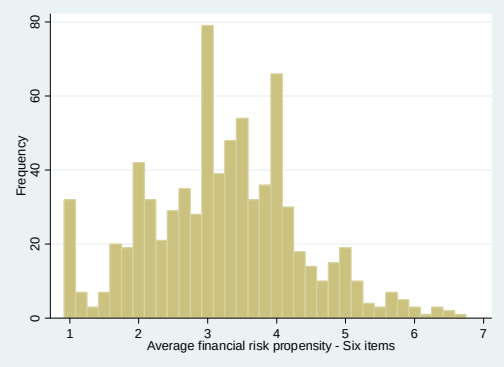
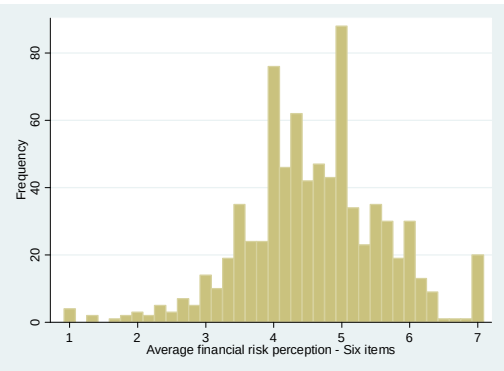


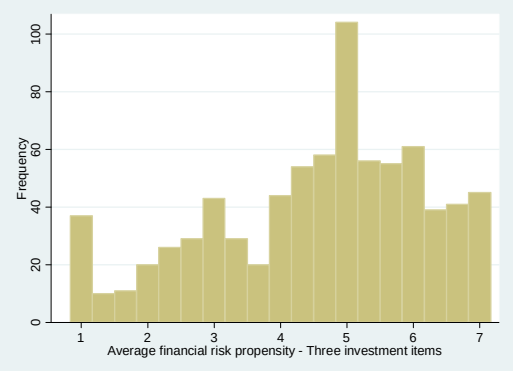
Figure A.5: Distribution of average risk propensity (top) and average risk perception (bottom) , (full sample – 782 observations)

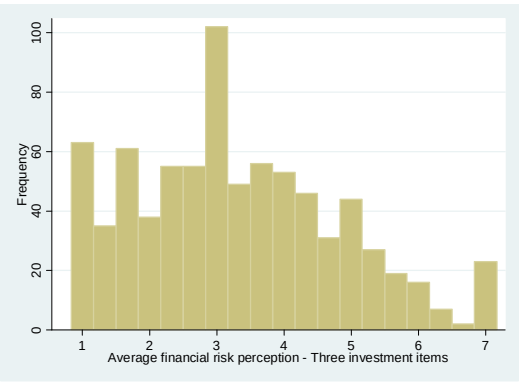
Six items risk measures





Three investment items risk measures





Appendix B: Tables factor loadings and correlation of the rank ordering

Table B.1: Factor loadings risk propensity

	Factor 1	Factor 2	Uniqueness
(1) Betting on card game	0.635	-0.261	0.528
(2) Invest in new business	0.194	0.531	0.681
(3) Betting on sporting event	0.627	-0.252	0.543
(4) Investing in stocks	0.320	0.485	0.663
(5) Invest in wonderbank	0.461	-0.113	0.775
(6) Invest in new farming technology	0.353	0.334	0.764

Table B.2: Factor loadings risk perception

	Factor 1	Factor 2	Uniqueness
(1) Betting on card game	0.668	-0.193	0.516
(2) Invest in new business	0.038	0.532	0.715
(3) Betting on sporting event	0.637	-0.045	0.592
(4) Investing in stocks	0.081	0.531	0.711
(5) Invest in wonderbank	0.582	0.020	0.661
(6) Invest in new farming technology	0.201	0.415	0.788

Table B.3: Correlation of the rank ordering of the risk propensity (six items)

	(1)	(2)	(3)	(4)	(5)	(6)
(1) Betting on card game	-					
(2) Invest in new business	-0.15	-				
(3) Betting on sporting event	0.22	-0.25	-			
(4) Investing in stocks	-0.19	0.10	-0.08	-		
(5) Invest in wonderbank	0.07	-0.17	0.05	-0.14	-	
(6) Invest in new farming technology	-0.11	0.04	-0.11	0.04	-0.01	-

Appendix C: Regression results for six item measures

Table C.1: Multiple OLS regressions on ln(Profit) with six item risk measures

	(1)		(2)		(3)		(4)	
	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.
Risk propensity	-0.053	(0.053)	-		0.014	(0.061)	-	
Risk perception	-		0.140 **	(0.057)	0.148 **	(0.065)	-	
Tailoring	-0.785 ***	(0.270)	-0.778 ***	(0.266)	-0.783 ***	(0.269)	-0.808 ***	(0.267)
Trade foodstuff	-0.202	(0.187)	-0.223	(0.184)	-0.224	(0.186)	-0.211	(0.185)
Other services	-0.462 *	(0.254)	-0.475 *	(0.248)	-0.492 *	(0.253)	-0.480 *	(0.249)
Other trade	-0.466 **	(0.188)	-0.471 ***	(0.183)	-0.486 ***	(0.187)	-0.486 ***	(0.184)
Number of workers	0.140 **	(0.055)	0.132 **	(0.055)	0.132 **	(0.055)	0.140 **	(0.055)
Young firm (≤ 2 years)	-0.560 ***	(0.200)	-0.582 ***	(0.196)	-0.602 ***	(0.200)	-0.566 ***	(0.197)
Months open	0.132 ***	(0.043)	0.122 ***	(0.043)	0.121 ***	(0.043)	0.134 ***	(0.043)
Male	0.491 ***	(0.125)	0.501 ***	(0.123)	0.497 ***	(0.124)	0.486 ***	(0.123)
Married	-0.071	(0.132)	-0.060	(0.130)	-0.055	(0.132)	-0.069	(0.131)
Age	0.057	(0.036)	0.054	(0.035)	0.057	(0.036)	0.054	(0.035)
Age^2	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Primary completed	0.510 ***	(0.198)	0.521 ***	(0.195)	0.500 **	(0.198)	0.513 ***	(0.196)
Secondary completed	0.787 ***	(0.209)	0.800 ***	(0.206)	0.779 ***	(0.208)	0.794 ***	(0.207)
Tertiary completed	1.329 ***	(0.239)	1.334 ***	(0.233)	1.315 ***	(0.238)	1.312 ***	(0.234)
Constant	8.440 ***	(0.931)	7.791 ***	(0.917)	7.699 ***	(0.979)	8.310 ***	(0.900)
R-squared	0.166		0.174		0.174		0.164	
Observations	539		544		538		545	

*, ** and *** represent significance at the 10%, 5% and 1% level respectively. The omitted sector dummy is 'trade in clothing' and the omitted education dummy is 'less than primary completed'.

Table C.2: Multiple OLS regressions on Risk propensity and Risk perception (Six items)

Risk propensity	(1) base		(2) including control variables		(3) including asset index		(4) including risk perception	
	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.
Risk perception	-		-		-		-0.325 ***	(0.031)
Male	0.311 ***	(0.096)	0.243 **	(0.101)	0.245 **	(0.100)	0.175 *	(0.092)
Married	-0.109	(0.105)	-0.112	(0.109)	-0.126	(0.108)	-0.176 *	(0.098)
Age	0.000	(0.005)	-0.002	(0.005)	-0.001	(0.005)	-0.001	(0.004)
Primary completed	0.257	(0.158)	0.254	(0.161)	0.226	(0.165)	0.209	(0.148)
Secondary completed	0.300 *	(0.172)	0.246	(0.174)	0.208	(0.177)	0.157	(0.160)
Tertiary completed	0.589 ***	(0.177)	0.444 **	(0.198)	0.355	(0.220)	0.326	(0.203)
Control variables†								
Household assets index	-		-		0.076	(0.051)	0.023	(0.050)
Per capita consumption (e-7)	-		1.713 ***	(0.310)	-		-	
# household members	-		0.000	(0.025)	-0.002	(0.023)	0.023	(0.020)
Lends	-		0.235 *	(0.127)	0.219 *	(0.127)	0.208 *	(0.118)
Has credit	-		-0.010	(0.137)	-0.035	(0.137)	-0.033	(0.122)
Savings (e-6)			0.838 *	(0.487)	0.809 *	(0.484)	0.838 **	(0.420)
Constant	2.937 ***	(0.296)	2.981 ***	(0.319)	2.739 ***	(0.343)	4.009 ***	(0.334)
R-squared	0.042		0.063		0.068		0.248	
Observations	539		521		524		524	

Risk perception	(1) base		(2) including control variables		(3) including asset index		(4) including risk perception	
	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.	coeff.	st. dev.
Risk propensity	-		-		-		-0.244 ***	(0.035)
Male	-0.179 **	(0.087)	-0.179 *	(0.092)	-0.176 *	(0.093)	-0.077	(0.090)
Married	-0.035	(0.099)	-0.069	(0.104)	-0.062	(0.104)	-0.084	(0.097)
Age	0.006	(0.005)	0.006	(0.005)	0.006	(0.005)	0.006	(0.004)
Primary completed	0.005	(0.150)	-0.020	(0.154)	0.010	(0.158)	0.092	(0.145)
Secondary completed	-0.053	(0.155)	-0.068	(0.161)	-0.041	(0.165)	0.032	(0.154)
Tertiary completed	-0.150	(0.164)	-0.168	(0.182)	-0.058	(0.197)	0.094	(0.185)
Control variables†								
Household assets index	-		-		-0.057	(0.049)	-0.007	(0.050)
Per capita consumption (e-7)	-		1.511 ***	(1.680)	-		-	
# household members	-		0.033	(0.023)	0.023	(0.022)	0.021	(0.019)
Lends	-		0.064	(0.115)	0.076	(0.114)	0.140	(0.106)
Has credit	-		0.163	(0.129)	0.195	(0.129)	0.213 *	(0.114)
Savings (e-6)			-0.484 *	(0.279)	-0.451	(0.288)	-0.405 *	(0.213)
Constant	4.476 ***	(0.264)	4.288 ***	(0.287)	4.573 ***	(0.303)	5.351 ***	(0.303)
R-squared	0.017		0.032		0.033		0.170	
Observations	544		526		529		529	

† The household assets index is a sum of a number of items including e.g. TVs, computers and watches, Lends is a dummy with 1 = someone in the household has lend money to someone outside of the household in the past 12 months, Has credit is a dummy with 1 = someone in the household bought on credit or had outstanding credit in past 12 months and Savings is the total value of the respondent's individual savings. The lower number of observations is due to 3 missing observations on consumption, 4 on lending and 12 on credit.

*, ** and *** represent significance at the 10%, 5% and 1% level respectively.