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Entrepreneurs' Attitudes Toward Risk in Micro and Small Enterprises: Evidence from Urban Ethiopia

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Abstract

The attitudes toward risk of women and men entrepreneurs in micro- and small enterprises (MSEs) are analyzed, and the factors that influence attitude toward risk of MSE owners are investigated. The empirical analysis first uses the moment-based approach proposed by Antle (1987) to estimate the risk preferences of men and women entrepreneurs. Second, a regression model is employed to understand the correlates of attitude toward risk and to decompose gender differences in risk aversion using the Oaxaca-Blinder technique. The results clearly indicate that MSE entrepreneurs are risk-averse with a relative risk premium of 1.5%. Women entrepreneurs are slightly more risk-averse than are men entrepreneurs. Regression estimates show that entrepreneurs' attitude toward risk is significantly correlated with age and experience, marital status, education level, financial literacy, wealth, sector, and business type. The gender difference in risk aversion is significantly explained by the predictor variables while the unexplained component is insignificant. This suggests that gender differences in risk preference are the result of disparities in socioeconomic factors rather than of biology.

Key words: risk aversion, gender, micro- and small enterprises

JEL Classification: D14; J16; M21

SSRN Subjects: Development Economics: Microeconomic Issues in Developing Economies, Women, Gender, & Human Development; Entrepreneurship & Economics

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I. Introduction

An individual's attitude toward risk in the decision to become an entrepreneur is widely recognized in the literature (Kihlstrom & Laffont, 1979). Creation and expansion of business involves risk, and entrepreneurs' production and marketing decisions are affected by their risk appetite. Risk is more prevalent in developing countries in which the labor market is thin and financial markets may be sparse or nonexistent. Studies suggest that attitude toward risk is significantly correlated with entrepreneurial success (Evans & Jovanovic, 1989). Though there is a growing body of literature on risk in both developed (Schubert et al., 1999; Holt & Laury, 2002, 2005; Harrison, Humphrey & Verschoor, 2005; Hartog, Ferrer-i-Carbonell & Jonker, 2002; Dohmen et al., 2011; Eckel & Grossman, 2002, 2008; Charness & Gneezy, 2012) and developing countries (Binswanger, 1980; Wik et al., 2004; Humphrey & Verschoor, 2004; Yesuf & Bluffstone, 2009; Brick, Visser & Burns, 2012), the literature that focuses on risk in micro- and small enterprises (MSE) is in its infancy.

Attitude toward risk could influence entrepreneurs' decisions to access financing and training. The risks taken by women in MSE differ in some respects from those taken by men who are MSE owners and managers. A growing number of studies examine gender differences in attitudes toward risk, and results vary depending on the context. For instance, in the context of physical and health safety, Barsky et al. (1997) showed that women are more risk-averse than men while, in financial decisions, the effect of gender appears more mixed (Croson & Gneezy, 2009). Schubert et al. (1999) reported no significant difference between women and men in the context of insurance against loss but, in the context of investment, found women to be more risk-averse than men (Beckman & Menkhoff, 2008). This higher risk aversion is also likely to affect women's access to credit (Bardasi, Sabarwal & Terrell, 2011).

In a meta-analysis of psychological studies, Byrnes, Miller & Schafer, (1999) suggested that, in general, women in business were more risk-averse than men (Eckel & Grossman, 2008; Neelakantan, 2010). In contrast, some studies have documented gender-neutral attitudes toward risk in the context of management decisions. Castillo and Cross (2008), Johnson and Powell (1994), and Maxfield et al. (2010) report that women in professional management are risk takers.

A review of this literature gives no clear evidence regarding the risk-taking behavior of women entrepreneurs. Gender differences in attitude toward risk also depend upon

cultural factors across regions. There is no gender difference in household-investment in Europe (Badunenko, Barasinska & Schäfer, 2009), but the gender difference is significant in the US (Jianakoplos & Bernasek, 1998). To the best of our knowledge, studies in developing countries that examine gender differences in attitude toward risk are limited. Moreover, previous studies on gender and attitude toward risk have focused on such contexts as portfolio allocation of investments, gambling, insurance, and managerial setting (Maxfield et al., 2010).

Our study therefore examined entrepreneurs' attitudes toward business risk in micro- and small enterprises in a developing country (Ethiopia) and investigated whether and why a gender difference exists in risk appetite. Importantly, assessing the entrepreneurial risk appetites of men and women entrepreneurs could enhance our understanding of how to better support the growth of MSEs, and evidence regarding gender and risk in developing countries could have implications for the treatment of women in business. If women are more risk-averse than men, the implications for their welfare are significant: they may invest more conservatively, resulting in less wealth accumulation over their lives; they may reduce their chances of climbing to top positions in the corporate world where risk-taking behavior is rewarded (Schubert et al, 1999); and their access to financing for high-risk, high-return investments may also be affected.

We used the moment-based approach proposed by Antle (1987) to estimate the attitude toward risk of men and women entrepreneurs. Specifically, we estimated the Arrow-Pratt (AP) absolute risk and downside (DS) risk-aversion coefficients and computed the relative risk premium in order to analyze the correlates of risk-taking behavior of entrepreneurs in MSEs. We found MSE entrepreneurs to be risk-averse on average, but we also noted a gender difference in risk aversion: women entrepreneurs were slightly more risk-averse than were men. Other factors, such as age and experience, marital status, educational level, financial literacy, wealth, and business sector and type were also significantly correlated with entrepreneurs' attitudes toward risk.

Using the Oaxaca-Blinder decomposition technique, we quantified the contributions of socioeconomic factors to the observed gender difference in risk aversion. Our findings suggest that the gender difference in risk aversion emanated, for the most part, from gender disparities in socioeconomic factors. Specifically, gender disparities in wealth, education,

experience, business sector and type, and financial literacy explained a significant portion of the gender difference in risk aversion, though wealth accounted for approximately 61% of the observed difference and was, therefore, the most important factor. Overall, our findings suggest that gender differences in risk aversion are more a socioeconomic construct than a biological difference in risk preference.

II. Estimating Attitude toward Risk: Antle's Approach

Attitude toward risk is often measured using either experimental or observational data. In the experimental approach, participants are offered actual or hypothetical choices with different levels of risk and return. Based on their responses, attitudes toward risk can be elicited. In the observational setting, data on the production decisions of respondents can be used to estimate their attitudes toward risk econometrically.

In this study, we followed the later approach; namely, the Antle method (1987). This line of analysis was justified, first, by the nature of the risk we studied—entrepreneurial behavior in MSEs. Individuals may make decisions across a variety of contexts and may consequently experience different levels of risk aversion in each: in choice of labor, in the management of retirement, and so on. Ruiz-Menjivar (2014) introduced a number of measurements of risk but linked them all to what he called financial-risk aversion; while Barsky et al. (1997) focused on attitude toward risk in health and retirement management.

The second justification is related to the nature of the data at our disposal as well as to the potential limitations of experimental data in reflecting entrepreneurs' managerial risk aversion. Third, the data we used are actual production data. Indeed, Holt and Laury (2012) showed the limitations of the hypothetical realizations (gains) with experimental data.

In order to estimate the risk-attitude parameters of a population of producers, Antle (1987) proposed a moment-based approach that relied on several assumptions. First, given inputs that were assumed to be predetermined variables, the producer solved an optimization problem in a given period. Second, all producers used similar technology in which the distribution of profit represented stochastic technology. This implied that each enterprise had some profit distribution and that each entrepreneur also formed some

expectation about the profit. We assumed that an entrepreneur maximized a function of moments in the profit distribution given in Equation 1.

$$Max\ E[U(\pi)] = F[\,\mu_2(X), \dots, \mu_m(X)] \tag{1}$$

Where μ_j, *j=2,...,m*, is the *mth* moment of profit. Using the first-order condition of the problem and applying a Taylor series expansion, Antle (1987) showed that the marginal contribution of an input *j* to the expected profit was:

$$\frac{\partial \mu_1}{\partial X_j} = \theta_{1j} + \frac{1}{2j}\theta_{2j}\frac{\partial \mu_2}{\partial X_j} + \frac{1}{3j}\theta_{3j}\frac{\partial \mu_3}{\partial X_j} + \cdots + \frac{1}{mj}\theta_{mj}\frac{\partial \mu_m}{\partial X_j} + u_j \tag{2}$$

where $\theta_{2j}$and θ_{3j} were loosely interpretable as Arrow-Pratt and down-side risk aversion coefficients, respectively (Antle, 1987) and u_j was the usual random error term. Antle's approach amounted to estimating Equation 2 for each input to account for its differential contribution in the moments of profit distribution. While all inputs could increase the expected profit, the input's effect on the variability of profit could either increase or decrease risk. Equation 2 shows that the marginal contribution of input *j* to the expected profit is a linear combination of the marginal contributions of input *j* to the variance, skewness, and higher-order moments.

This model presupposed that whether an input was risk-increasing or risk-decreasing was purely an empirical issue. A negative (positive) sign on the marginal contribution of an input to the second moment indicated that the input was risk-reducing (increasing) whereas a negative (positive) sign on the marginal contribution of an input to the third moment presumed that the input was downside-risk increasing (reducing).

Equation 3 below shows that the Arrow-Pratt (AP) absolute risk aversion coefficient, which is greater than zero for a risk-averse producer.

$$AP = \frac{E\left(U''(\pi)\right)}{E\left(U'(\pi)\right)} \cong -\frac{\partial F(X)/\partial \mu_2(X)}{\partial F(X)/\partial \mu_1(X)} = 2\theta_2 \tag{3}$$

Equation 4 provides the downside (DS) risk aversion, which is greater than zero for a producer averse to downside risk.

$$DS = \frac{E\left(U'''(\pi)\right)}{E\left(U'(\pi)\right)} \cong -\frac{\partial F(X)/\partial \mu_3(X)}{\partial F(X)/\partial \mu_1(X)} = -6\theta_3 \tag{4}$$

Following Groom et al. (2008), we assumed that risk preference was individual but not

input-specific: $\theta_{mj} = \theta_j$ that implies *APj* = *AP* and *DSj* = *DS*. We computed a risk premium (RP) based on AP and DS coefficients and assumed that only the first three moments of distribution were of concern to the producer as shown in Equation 5 below.

$$RP = {}^{\mu_2 AP}/_{2} - {}^{\mu_3 DS}/_{6} \tag{5}$$

where μ_2 and μ_3 are, respectively, a measure of the second- and the third-order moments of the distribution. The producer preferred insurance against risk and was willing to pay if the risk premium indicated positive. Finally, we computed the relative risk premium (*RRP*) by dividing the risk premium by the individual level of revenue.

In practical terms, we implemented the procedure as follows. First, we generated the three moments of MSE revenue. We regressed the value of monthly revenue on a set of production inputs to get an estimate of mean revenue (first moment) and residuals. We took the squared value of estimated residuals and regressed it on the same set of explanatory variables to generate the second-order moment (variance). Using the same procedure, we estimated the third moment or skewness (estimated residuals raised to the power of three).

Second, we estimated the marginal effect of each input on each moment in line with Groom et al. (2008) and ran a seemingly unrelated regression (SUR) of the marginal effect of expected revenue on the marginal effect of the variance and skewness of the revenue. The coefficients for the marginal effects of variance and skewness of revenue, respectively, are proxies for *AP* and *DS*. Third, we computed the risk premium based on *AP* and *DS* as in Equation 5 above.

To analyze factors that affect entrepreneurs' attitude toward risk, we estimated an OLS regression in Equation 6, in which the dependent variable is the estimated relative risk premium *RRP*. The vector of regressors, x_i, is composed of enterprise and entrepreneur characteristics of the sampled MSEs. β is the vector of coefficients that measure the effect of a regressor on the entrepreneur's attitude toward risk. α is the intercept and ϵ is the error term.

$$RRP_i = \alpha + \beta_i x_i + \epsilon_i \tag{6}$$

In summary, to assess the nature of risk preference of MSEs operators, we utilized production information in the survey data (details of inputs used over the last twelve months

and the value of outputs produced over the same period) and econometrically estimated entrepreneurs' attitude toward risk. Then, we used risk estimates and regressed them on some of the characteristics of entrepreneurs and enterprises.

III. Data and Descriptive Results

3.1. Data

We used firm-level data collected in 2015 by Addis Ababa University and the Addis Ababa City Administration Micro- and Small Enterprise Development Bureau. The Bureau's sample included Addis Ababa-based micro- and small enterprises in such sectors as manufacturing, construction, trade, and urban agriculture and sought information on the constraints and challenges that MSEs faced. The survey adopted the classification of micro- and small enterprises employed by the Ethiopian Ministry of Trade and Industry (MoTI).

To ensure representation of every sub-sector, MSEs were first categorized into two sector strata: manufacturing and nonmanufacturing. Non-overlapping sub-sectors within each of these strata were then defined using the MOTI classification, and a proportional stratified sample was drawn randomly from the sub-sectors.

The survey obtained data from 1,445 MSEs in Addis Ababa and collected information on the firms' characteristics (age, size, composition of the workforce, and owners' gender, education, and experience,); access to business-support services (financing, training, land, and other support services); licensing status (formality and legality); performance measures (annual sales and employment); distribution within sectors; and challenges faced. The survey also provides details regarding firms' activities and use of inputs (labor and capital) and the value of output and inputs over the twelve months before the survey.

3.2. Descriptive Results

Table 1 provides descriptive statistics regarding the variables used in the analysis, disaggregated by gender. The average annual revenue in the sample was 55,586 Ethiopian Birr (ETB). Overall, MSEs owned by men had higher monthly revenue (79,210 ETB) than did

those owned by women (17,236 ETB). This difference in monthly revenue was statistically significant at 1%.

The average age of firms surveyed was 4.76 years, and they reported an average initial capital of 35,635.84 ETB (1,500 USD), three employees, and four enterprise members. The majority of employees (65%) had completed high school or had less than a high-school education; 26% had a Technical and Vocational Education Training (TVET) diploma; and 9% held an undergraduate degree or above. Average labor and material costs were 18,765.9 ETB and 22954.2 ETB, respectively. About 32% of the MSEs had their own working premises. The MSEs in our sample were registered (88%), had bank accounts (59%), prepared financial reports (31%), and used IT (8.8%). The majority of MSEs were engaged in manufacturing (38%) or trade (28%), followed by construction (22%) and services (12%). Most of the MSEs were sole proprietorships (44%), while 34% were some form of cooperative, 17% were partnerships, and the rest were private limited companies.

Women entrepreneurs constituted about 30% of the sample and were, on average, 35 years old with a household size of four. They had been engaged in an MSE for about six years. About 30% were single, and about 22% held a TVET diploma or above. Most were engaged in trade (44%), followed by manufacturing (28%), services (19%), and construction (7.5%).

IV. Econometric Results

4.1. Estimating Attitude toward Risk

The coefficient of relative risk aversion was calculated using Antle's (1987) moment-based approach. The mean estimate of relative risk aversion was 0.015, indicating that MSE entrepreneurs were, on average, risk-averse (See Table 2). Though few published firm-level studies from developing countries exist with which we could compare our risk estimates, our results are close to estimates reviewed in Vollenweider, Di Falco & O'Donoghue (2011): 5% for Norwegian salmon farmers and 3% for Philippine rice farmers. Entrepreneurs in the Ethiopian sample were willing to pay an average of about 1.5% of their monthly revenue to insure themselves against risk, a high figure in a developing country in which incomes are

low.

Our Arrow-Pratt (*AP*) estimate was negative, suggesting lower aversion to risk, while the positive downside (*DS*) risk aversion parameter indicated risk aversion for extreme events. The average absolute risk aversion coefficient was -0.146, and the average downside risk coefficient was 0.048. Few studies exist regarding similar risk estimates in developing countries, but our results were at the lower end of risk estimates reported in literature from other areas around the world. Previous estimates in developed countries were an AP of 2.23 and a DS of 3.07 in Vollenweider et al. (2011) and an AP of 0.34 and 0.0726 and a DS of -0.0884 and 0.29 in Groom et al. (2008).

According to Antle (1987) the intercepts of the equation should be equal to zero because estimates are based on the first-order conditions of an optimization. In contrast to theoretical expectations, all our intercept terms were significant, demonstrating that labor and capital were not used optimally. The positive and significant intercept term for labor and capital costs suggested the overuse of these inputs, while the negative and significant intercept term for the number of employees pointed to the underutilization of labor.

The average relative risk premium for women-owned MSEs was about 1.8% and about 1.4% for MSEs owned by men. Figure 1 shows the distribution of the relative risk premium for women- and men-owned MSEs and indicates a right-tilted distribution for women-owned MSEs with a high peak in comparison to the distribution for men-owned MSEs. This suggests that risk aversion among the women entrepreneurs in our sample was slightly higher than among men. The cause could be women's self-selection into specific sectors (trade and services) in which part-time work was available and was used to supplement family income; in other words, sectors in which they could avoid risk. Most men, in contrast, were involved in manufacturing and construction, sectors that often required full-time work and in which men were often encouraged by their spouses to take risky but high-return opportunities.

Formally, we tested the mean difference in risk preference between women- and men-owned MSEs, with the result that men entrepreneurs showed lower risk aversion (difference=0.0039, p-value=0.0407). Overall, the difference in risk aversion between men and women entrepreneurs was statistically significant at 5% (difference=0.0039, p-value=0.0407). The difference test confirmed the observations reported in Figure 1.

It is important to note, however, that statistical significance shows only the likelihood

that the difference between the two groups is not due to sampling error or chance but does not tell us the size of the difference (Nelson, 2016; Coe, 2002). In other words, the significance test (*p-value*) incorporates the size of the effect and the size of the sample. As a result, a difference could be found if the effect was very large (despite the small sample) or if the sample was very large (even if the effect was actually tiny). To investigate the extent of the size of the difference in mean risk aversion between men and women entrepreneurs, taking into account both within-sex variability and the possibility of overlap between distributions of the two groups, one can estimate Cohen's d and the "Common Language Effect Size" (Cohen, 1988; McGraw & Wong, 1992). Based on Cohen's d estimates, women entrepreneurs' risk aversion lay 0.13 standard deviations above men's mean risk aversion coefficient, implying that about 54% of the risk aversion coefficient for women entrepreneurs was higher than the average for men. In terms of the "Common Language Effect Size," the probability that a randomly chosen woman would have a higher risk aversion than a randomly chosen man entrepreneur was 0.48. Interpreting this result as "small" or "large" is context-specific. Empirical evidence, however, plausibly supports the argument that the difference in risk aversion between women and men MSE owners in our sample was not large. Nelson (2016) and Hyde (2005) provide more detailed discussion of this point.

4.2. Correlates of Attitude toward Risk

We estimated an OLS regression of the measure of attitude toward risk on a set of regressors that could affect entrepreneurs' attitude toward risk. Table 3 provides the results of these estimates. The relative risk premium (*RRP*), which measures the entrepreneur's attitude toward risk, is the dependent variable. Following the empirical literature and recognizing the context of our study, we considered several covariates that correlated with attitude toward risk: age, education, gender, marital status, household size, years of experience, level of capital, sector of the entrepreneur, business type and formality of the MSE, financial literacy (bank account, financial report), and the use of IT.

In view of the significant proportion of women entrepreneurs in MSEs and the mixed evidence regarding a gender difference in attitude toward risk, we considered the entrepreneur's gender a covariate. After controlling for a range of covariates, we found a

statistically insignificant difference in risk aversion between women and men entrepreneurs. This might suggest that no innate, gender-based difference in risk appetite exists, but rather that men and women MSE owners have different characteristics. Indeed, women who owned MSEs in our sample were older, were engaged in the service and trade sector, had fewer employees, had received less education, and had less experience in the MSE sector than men. This result also supports our previous argument that the risk-aversion difference between women and men entrepreneurs is small. The result is close to the findings of Nelson (2016) and to the empirical evidence that documents a gender-neutral attitude toward risk in specific managerial contexts (Maxfield et al., 2010).

Age may have a nonlinear effect on risk aversion. Young individuals could be willing to take risks but, as they get older, their willingness to take risk declines. The empirical evidence on this point is mixed. Some studies find a positive correlation between age and risk (De Brauw & Eozenou, 2014; Levesque & Minniti, 2006), while Adhikari and O'Leary (2011) found a negative relationship. We found a negative and significant correlation between age and risk aversion as well as a negative relationship between the entrepreneur's experience and risk aversion. This is perhaps attributable to the fact that, with experience, entrepreneurs become more familiar with business challenges and more able to take risks.

The more educated an individual, the more possible it becomes for him or her to make informed decisions, and individuals with high levels of education should therefore be less risk-averse. Risk aversion may result from lack of information or inability to process information about possible outcomes. For example, individuals with higher levels of education may be more able to receive and process the kind of information that would lower risk aversion. Education may also increase wealth and access to financing that lowers risk aversion (Knight, Weir & Woldehanna, , 2003). We found a negative link between educational attainment and risk aversion: Those with a higher level of education were relatively less risk-averse than were those with less education. This is in line with previous empirical studies that show a negative relationship between education and risk aversion in financial decisions after controlling for demographic characteristics (Riley & Chow, 1992; Ahn, 2010; De Brauw & Eozenou, 2014).

Entrepreneurs' marital status may also correlate with attitude toward risk. Weber (2013) found married women (with greater family responsibility) to be more risk-averse while

Grazier and Sloane (2008) showed that risk aversion was affected by a spouse's attitude toward risk: individuals were more risk-averse if their spouses were risk-averse and vice versa. Our results showed that married entrepreneurs were more risk-averse than single entrepreneurs. Large households that include more adult labor, and which could mobilize that labor to take more risk, should be less risk-averse (Gong & Yang, 2012), though we found no significant relationship between household size and risk aversion.

Risk aversion decreases with income and wealth (Yesuf & Bluffstone, 2009), perhaps because higher incomes and wealth improve risk taking. We used current level of capital as a proxy for the income or wealth of the entrepreneur and obtained similar results. Production risk is associated with effective use of inputs and management. Current capital is associated with high risk-taking whereas labor (quantified as the number of MSE employees) has a risk-reducing effect.

We assessed the link between additional covariates specific to our contexts (sector, business type, formality, and financial and IT literacy, for example). Compared to those in the trade sector, entrepreneurs in manufacturing, construction, and services are more risk-averse. Entrepreneurs with formally registered enterprises do not significantly differ in attitude toward risk from those in unregistered enterprises. We found significant differences in risk aversion by business type. Those in private limited companies or partnerships were less risk-averse. Having a bank account, owning the workplace, or using IT did not correlate with risk aversion. We found a significant and negative relationship between financial reporting and risk aversion: entrepreneurs in MSEs that produced financial report were less risk-averse. Overall, the OLS estimation showed that entrepreneurs' attitude toward risk was significantly correlated with the age and experience of the entrepreneur, with marital status, education level, and financial literacy, and with wealth, sector and business type.

4.3. Gender Differences in Attitude toward Risk: A Decomposition Analysis

As discussed in subsection 4.1, women are relatively more risk-averse than men. This led us to examine the underlying causes of this observed gender difference. Using the Oaxaca-Blinder decomposition technique, introduced independently by Oaxaca (1973) and

Blinder (1973), we quantified the underlying socioeconomic factors that resulted in gender differences in risk aversion. Details of the decomposition method are presented in the Appendix.

Table 4 presents the decomposition results. The gender difference in risk aversion was significantly explained by the predictor variables. The decomposition showed that the explained component was statistically significant, while the unexplained component was insignificant. Of the overall gap in risk aversion between women and men, 75% was explained while the rest is unexplained. This shows that the gender difference in risk aversion was due to disparities in socioeconomic factors and not by a biological difference in risk preference. Individual predictors, current capital, and sectors (manufacturing, services, and construction) were the main factors that accounted for a significant proportion of the explained component. Such other factors as education, experience, business type, and financial reporting also influenced the explained variation. Notably, some of the regressors (such as manufacturing and construction) increased the explained gap. This implies that, if women entrepreneurs made up the same proportion of the manufacturing or construction sectors as men do, the mean predicted gap in risk aversion between women and men would increase rather than decrease.

The reasons for the unexplained components of the gender difference in risk aversion could include omitted variables that may have affected risk aversion, measurement errors (for instance, if entrepreneurs erroneously reported their wealth or capital), or other factors. In our case, the unexplained case might have been a measure of biological difference in risk aversion between women and men entrepreneurs.

V. Conclusions and Policy Implications

In this study, we assessed the nature of attitude toward risk of women and men entrepreneurs in urban MSEs and investigated the factors that influence their attitudes toward risk. The empirical analysis took place in two parts. First, we used the moment-based approach proposed by Antle (1987) to estimate the risk preferences of men and women in MSEs. Second, we estimated an OLS regression to identify the correlates of attitude toward

risk and used the Oaxaca-Blinder decomposition technique to decompose gender differences in risk aversion.

The results clearly indicated that MSE entrepreneurs were risk-averse with a relative risk premium of 1.5%. Risk aversion was slightly higher for women entrepreneurs (average relative risk premium=1.8%) vs. men (1.4%). Importantly, the gender difference in attitude toward risk disappeared after controlling for demographic and enterprise characteristics. This might suggest that no innate difference exists in risk appetite by gender. It is important to mention that the majority of women entrepreneurs in our sample owned micro-enterprises in the trade sector with very little growth potential. Women MSE owners also lacked education and work experience in comparison to men entrepreneurs. Looking into the correlates of attitude toward risk, our OLS estimates showed that entrepreneurs' attitudes toward risk were significantly correlated with the age and experience of the entrepreneur, marital status, education level and financial literacy, wealth, sector and business type.

Understanding and properly identifying the underpinnings of these observed gender differences is vital for effective policy intervention. If gender differences in risk preferences are based on biological differences, policy interventions should account for the disadvantage faced by women. If socioeconomic factors explain observed gender differences, then policy interventions should be targeted appropriately. The decomposition shows that the explained component is statistically significant, while the unexplained component is insignificant. This shows that the gender difference in risk aversion is due to disparities in socioeconomic factors rather than to biological differences. Thus, women entrepreneurs' aversion toward risk could be reduced by appropriately targeting deficits in women's socioeconomic characteristics.

From a policy perspective, our results suggest that improving the endowment accumulation (encompassing financial and human capital) of women entrepreneurs will have a positive effect on their risk-taking behavior. Further studies should also assess the risk behavior of different segments of the population (for instance, across socioeconomic groups).

Table 1: Descriptive Statistics of the Key Variables

	Men		Women		Total	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Revenue per month (in Birr)	68500.3	(159302.6)	25216.4	(94870.4)	55613.1	(144511.2)
Sex (1=Female)	0	(0)	1	(0)	0.295	(0.456)
Age of the enterprise	4.713	(3.959)	4.864	(3.938)	4.757	(3.952)
Initial capital	42506.5	(154280.8)	19249.5	(68802.6)	35635.8	(135183.9)
Current capital	322786.4	(1231207.9)	88053.0	(263132.)	253496.6	(1048796.)
Labor cost per month	25373.8	(627696.6)	3006.2	(15541.7)	18765.9	(526972.6)
Material cost per month	27636.6	(77393.9)	11186.8	(45245.2)	22954.2	(70144.9)
Total number of employees	3.614	(7.338)	1.768	(5.062)	3.069	(6.797)
Total number of MSE members	3.986	(5.056)	3.014	(4.417)	3.699	(4.894)
Own bank account(1=yes)	0.645	(0.479)	0.462	(0.499)	0.591	(0.492)
Own work premise(1=yes)	0.297	(0.457)	0.369	(0.483)	0.318	(0.466)
Financial report(1=yes)	0.365	(0.482)	0.200	(0.400)	0.316	(0.465)
IT use(1=yes)	0.107	(0.310)	0.0446	(0.207)	0.0888	(0.285)
Registered(1=yes)	0.892	(0.311)	0.852	(0.355)	0.880	(0.325)
Age of entrepreneur	34.50	(9.390)	35.42	(10.46)	34.77	(9.725)
Marital status (1=Married)	0.652	(0.477)	0.709	(0.455)	0.669	(0.471)
Household size	3.990	(2.083)	4.408	(1.998)	4.114	(2.066)
Experience of entrepreneur	6.769	(5.873)	5.885	(5.195)	6.508	(5.694)
Below high school (1=yes)	0.212	(0.409)	0.350	(0.477)	0.252	(0.435)
High school (1=yes)	0.382	(0.486)	0.432	(0.496)	0.397	(0.489)
Diploma (1=yes)	0.291	(0.455)	0.178	(0.383)	0.258	(0.438)
Degree and above (1=yes)	0.115	(0.319)	0.0399	(0.196)	0.0929	(0.290)
Sole proprietorship (1=yes)	0.382	(0.486)	0.606	(0.489)	0.448	(0.497)
Public initiate cooperative (1=yes)	0.251	(0.434)	0.176	(0.381)	0.229	(0.420)
Private initiated cooperative (1=yes)	0.114	(0.318)	0.0822	(0.275)	0.105	(0.306)
Private limited company(1=yes)	0.0630	(0.243)	0.0282	(0.166)	0.0527	(0.224)
Partnership(1=yes)	0.190	(0.392)	0.108	(0.311)	0.166	(0.372)
Manufacturing (1=yes)	0.414	(0.493)	0.286	(0.453)	0.377	(0.485)
Service (1=yes)	0.0955	(0.294)	0.192	(0.395)	0.124	(0.330)
Construction (1=yes)	0.274	(0.446)	0.0751	(0.264)	0.215	(0.411)
Trade (1=yes)	0.217	(0.412)	0.446	(0.498)	0.284	(0.451)

Table 2*:* Risk Parameter Estimation Results

Parameters	Coefficients
θ_2	-0.0732***
θ_3	-0.00793***
$\theta_{\text{current capital intercept}}$	0.415***
$\theta_{\text{number of employees intercept}}$	-0.148***
$\theta_{\text{labor cost intercept}}$	0.621***
$\theta_{\text{material cost intercept}}$	0.509***
$\text{Arrow} - \text{Pratt risk}$	-0.146***
Downside risk	0.047***
$\text{Relative risk premium}$	0.015***
Observations	1333

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Correlates of Attitude toward Risk

	Coefficient	t-statistics
Sex (1=Female)	0.001	(0.643)
Age of entrepreneur (log)	-0.011***	(-2.675)
Marital status (1=Married)	0.004*	(1.931)
Household size (log)	0.000	(0.234)
High school (1=yes)	-0.004*	(-1.666)
Diploma (1=yes)	-0.006**	(-2.350)
Degree and above (1=yes)	-0.007*	(-1.870)
Experience of entrepreneur (log)	-0.004***	(-3.736)
Current capital	-0.002***	(-3.201)
Manufacturing (1=yes)	0.012***	(4.960)
Service (1=yes)	0.012***	(4.346)
Construction (1=yes)	0.019***	(6.534)
Registered(1=yes)	0.002	(0.739)
Public initiated cooperative(1=yes)	-0.002	(-0.591)
Private initiated cooperative(1=yes)	0.001	(0.334)
Private limited company(1=yes)	-0.012***	(-3.027)
Partnership(1=yes)	-0.007**	(-2.532)
Own bank account(1=yes)	0.002	(1.009)
Own work premise(1=yes)	-0.002	(-0.853)
Financial report(1=yes)	-0.012***	(-5.961)
IT use(1=yes)	-0.002	(-0.589)
Constant	0.075***	(5.216)
Observations	1302	
Adjusted R^2	0.130	

t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

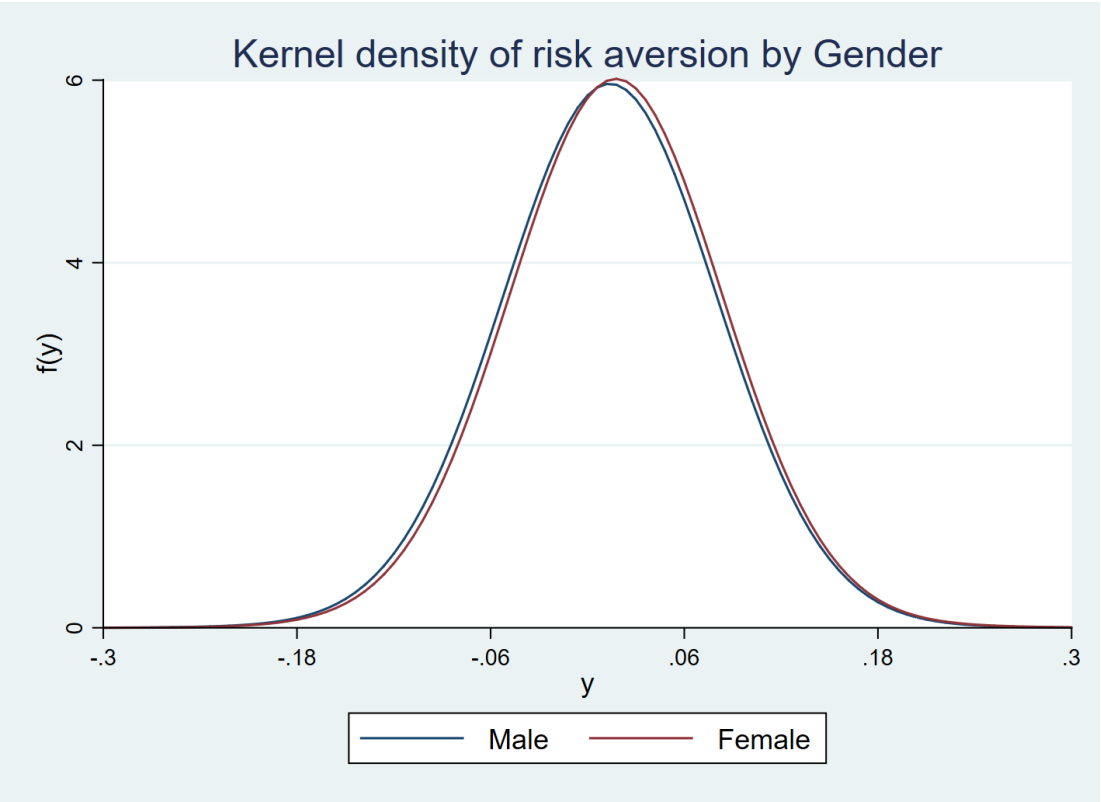
Table 4: Oaxaca-Blinder Decomposition Results

Risk aversion	Overall	Explained	Unexplained
Men	0.0137*** (13.19)		
Women	0.0176*** (11.14)		
Difference	-0.0039** (-2.07)		
Explained	-0.0027** (-2.44)		
Unexplained	-0.0013 (-0.66)		
Age of entrepreneur (log)		0.0003 (1.33)	0.0159 (0.44)
Marital status (1=Married)		-0.0003 (-1.48)	0.0010 (0.30)
Household size (log)		-0.0001 (-0.25)	-0.0004 (-0.08)
High school (1=yes)		0.0002 (1.28)	0.0008 (0.35)
Diploma (1=yes)		-0.0007** (-2.09)	0.0015 (1.19)
Degree and above (1=yes)		-0.0005* (-1.65)	0.0009* (1.66)
Experience of entrepreneur (log)		-0.0006** (-2.23)	-0.0032 (-0.85)
Current capital		-0.0022*	-0.0622***

		(-1.95)	(-2.76)
Manufacturing (1=yes)		0.0014***	-0.0057***
		(3.17)	(-3.13)
Service (1=yes)		-0.0014***	-0.0009
		(-3.21)	(-1.02)
Construction (1=yes)		0.0040***	0.0004
		(5.01)	(0.39)
Registered(1=yes)		0.0001	-0.0147***
		(0.65)	(-2.95)
Public initiated cooperative(1=yes)		-0.0001	0.0002
		(-0.58)	(0.20)
Private initiated cooperative(1=yes)		0.0000	0.0006
		(0.33)	(1.12)
Private limited company(1=yes)		-0.0004**	0.0005
		(-2.18)	(1.61)
Partnership(1=yes)		-0.0006**	-0.0012
		(-2.18)	(-1.44)
Own bank account(1=yes)		0.0004	-0.0010
		(1.02)	(-0.46)
Own work premise(1=yes)		0.0001	0.0008
		(0.82)	(0.61)
Financial report(1=yes)		-0.0023***	0.0008
		(-4.55)	(0.72)
IT use(1=yes)		-0.0001	0.0001
		(-0.53)	(0.13)
Constant			0.0645*
			(1.70)
Observations	1302		

t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Kernel Density of Risk Aversion by Gender



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Appendix
Oaxaca-Blinder Decomposition Technique

We decomposed the gender difference in risk aversion using techniques independently introduced in Oaxaca (1973) and Blinder (1973). Later variants appeared in Reimers (1983), Cotton (1988), and Neumark (1988). The methodology is often used in labor market analysis of wage gaps by group (e.g. sex, race, union membership). We are not aware of a study that decomposes gender difference in risk aversion.

The decomposition technique allowed us to divide the gender difference in risk aversion into explained and unexplained parts. The explained part is due to the differences in socioeconomic factors (education, experience, and wealth, e.g.) between the two gender; while the unexplained part is the one that cannot be accounted for by differences in the determinants of risk aversion between men and women. The unexplained part, however, could be meaningful for measuring social or economic aspects. In the gender wage gap decomposition, the unexplained part measured discrimination but also encompassed other unobserved predictors.

The relative risk premium, *RRP*, is a linear function of a set of predictors, *X*, that can be estimated as in Equation A1.

$$RRP_j = \alpha_j + \beta_j X_j + \epsilon_j \qquad j \in \{w, m\} \qquad \text{(A1)}$$

where *j* is group indicator, *j* = *w* and *j* = *m*, for women and men respectively; α is the intercept, β is vector of coefficients, and ϵ is the error term. The mean difference in risk aversion between the two groups, *D*, can be represented as follows:

$$D = E(RRP_w) - E(RRP_m) = E(\alpha_w + \beta_w X_w + \epsilon_w) - E(\alpha_m + \beta_m X_m + \epsilon_m) \qquad \text{(A2)}$$

$$D = \Delta X \beta_w + \Delta\alpha + \Delta\beta E(X_m) \qquad \text{(A3)}$$

The first part is the explained component: aggregate gender difference in risk aversion attributable to differences in mean values of the regressors (socioeconomic factors). This part also shows the amount by which the gender difference in risk aversion would decline if women had the same mean levels of predictors as men, other things being equal.

The second part is the unexplained component that resulted from a difference in coefficient estimates, including the intercept. This gender difference in risk aversion would

remain even if women entrepreneurs had the same mean level of predictors as men. In an ideal setting, where there were no omitted variables or measurement errors, the unexplained component would measure the innate risk preference produced by biological differences between men and women.

Alternatively, Equation A2 can be given as in Equation A4:

$$D = E(RRP_w) - E(RRP_m) = \Delta X\beta_m + \Delta\alpha + \Delta\beta E(X_w) \quad \text{(A4)}$$

Here the average mean difference in predictors is weighted by coefficients for men (β_m), and the differences in coefficients are weighted by the mean value of the predictors for women. Following Oaxaca and Ransom (1994), the general formulation of the decomposition equation can be represented as in Equation A5:

$$D = E(RRP_w) - E(RRP_m) = \Delta X[W\beta_w + (I - W)\beta_m] + [(I - W)E(X_w) + WE(X_m)]\Delta\beta \quad \text{(A5)}$$

where I is the identity matrix and W is the matrix of weights given to coefficients of group, w. Choosing $W = I$ leads to Equation A3, while $W = 0$ leads to Equation A4. Reimers' (1983) formulation can be obtained by assuming $W = 0.5I$. Assuming $W = pI$ gives the formulation in Cotton (1988) with p denoting the proportion of belonging to one of the groups (e.g., the proportion of women). Neumark (1988) used coefficient β^p from the pooled regression of both groups, and the outcome difference can be represented as in Equation A6:

$$D = E(RRP_w) - E(RRP_m) = \Delta X\beta^p + E(X_w)(\beta_w - \beta^p) + E(X_m)(\beta^p - \beta_m) \quad \text{(A6)}$$