Entrepreneurial risk attitude in Micro and small enterprises: Evidence from urban Ethiopia

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Abstract

We analyze the risk attitude of women and men entrepreneurs in the MSEs and investigate the factors that influence the risk attitude of MSE owners. The empirical analysis of the study consists of two parts. First, we use a moment-based approach proposed by Antle (1987) to estimate the risk preference of male and female entrepreneurs. Second, we estimate a regression model to understand the correlates of risk attitude and decompose the gender difference in risk aversion using the Oaxaca-Blinder technique. The results indicate that MSE entrepreneurs are risk-averse, with a relative risk premium of 1.5%. We also find that females are slightly more risk-averse than male entrepreneurs. Our regression estimates show that entrepreneurs' risk attitude is significantly correlated with the age and experience of the entrepreneur, marital status, education level and financial literacy, wealth, sector and business form. Furthermore, the predictor variables significantly explain the gender difference in risk aversion, while the unexplained component is insignificant. This suggests that the gender difference in risk aversion is due to disparities in socio-economic factors than a biological difference in risk preference.

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

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1 Introduction

The role of risk attitude in the decision to become entrepreneur is widely recognized in the literature (Kihlstrom and Laffont, 1979). Creation and expansion of business involve risk. Risk is more prevalent in developing countries where the labor market is thin and the financial markets are sparse or nonexistent in some cases. Production and marketing decisions of entrepreneurs are affected by their attitude towards risk. Studies suggest that risk attitude is significantly correlated with entrepreneurial success (Evans and Jovanovic, 1989). Though there is a growing body of literature on risk in both developed (Schubert et al., 1999; Holt and Laury, 2002; Holt and Laury, 2005; Harrison et al., 2005; Hartog et al., 2002; Dohmen et al., 2011; Eckel and Grossman, 2002, Eckel and Grossman, 2008; Charness and Gneezy, 2012), and developing countries (Binswanger, 1980; Wik et al., 2004; Humphrey and Verschoor, 2004; Yesuf and Bluffstone, 2009; Brick et al., 2012), the literature on risk focusing on micro and small enterprises (MSE) is at its infancy.

Risk attitude could influence entrepreneurs' decisions in accessing finance and training. Risk taken by women in MSE growth differs in some respects from male MSE owners or managers. Female's access to credit is likely to be affected given their high-risk aversion compared to males (Bardasi et al., 2011). There are growing studies on the gender difference in attitudes towards risk and results vary depending on the context. For instance, in the context of physical and health safety, Barsky et al. (1997) show that females are more risk averse than males; while in financial decisions, the results are more mixed (Croson and Gneezy, 2009). For instance, Schubert et al. (1999) report no significant difference between women and men in the context of insurance against loss. In the context of investment, women are more risk averse than men (Beckman and Menkhoff, 2008).

In a meta-analysis of psychological studies, Byrnes et al. (1999) suggest that in general women are more risk averse than men. Females in businesses are more risk averse than males (Eckel and Grossman, 2008;Neelakantan, 2010). In contrast, there are studies that document gender-neutral risk attitude 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.

The above review did not give a clear evidence on the risk-taking behavior of women. Besides, there are gender differences in risk attitude due to difference in culture across regions. There is no gender difference in household investment behavior in Europe (Barasinska et al., 2009), while there is significant gender difference in the US (Jianakoplos and Bernasek, 1998). To the best of our knowledge, there are limited studies in developing countries that examine gender differences in risk attitude. Moreover, previous studies on gender and risk attitude

focus on different contexts such as portfolio allocation of investment, gambling, insurance and in different managerial settings (Maxfield et al., 2010). In this study, thus, we examine entrepreneurs' risk attitude in the business world focusing on the micro and small enterprises in developing country (Ethiopia) and investigate if there is gender difference in risk aversion. Then, we examine the underlying causes of the gender difference in risk aversion. Our evidence could shed light on the gender and risk in developing countries that can have implications in treating womens in enterprises or the business world. It also reveals whether the stereotype about gender and risk hold or not. Importantly, assessing entrepreneurial risk appetites of male and female entrepreneurs could enhance our understanding on how to better support the growth of MSEs. It is very crucial to have a better understanding of gender differences in risk preferences. If women are more risk averse than men, implications in terms of welfare of women are significant. If women are more risk-averse and invest conservatively, this results in less lifetime wealth accumulation. In the corporate world where risk-taking behavior is rewarded, the view that women are more risk averse could reduce their chances of climbing to the top positions (Schubert et al, 1999). This stereotype could also affect their chance of accessing finance for high risk high return investment activities.

Methodologically, we use a moment-based approach proposed in Antle (1987) to estimate the risk attitude of male and female entrepreneurs. Precisely, we estimate the Arrow-Pratt (AP) absolute risk and downside (DS) risk aversion coefficients and we compute the relative risk premium. Then, we analyze the correlates of risk-taking behavior of entrepreneurs in the MSEs sector. There are several key findings of the study: We find entrepreneurs in the MSE to be risk-averse on average. Our results suggest that there is a significant difference in gender-based risk aversion; female entrepreneurs are slightly more risk averse than their male counterparts. Age and experience of the entrepreneur, marital status, education level and financial literacy, wealth, sector and business form are significantly correlated with risk attitude of the entrepreneur. Using Oaxaca-Blinder decomposition technique, we quantify the contributions of socio-economic factors on the observed gender difference in risk aversion. Our findings suggest that the observed gender difference in risk aversion, for the most part, emanates from gender disparities in socio-economic factors. Specifically, gender disparities in wealth, education, experience, sector and business ownership form and financial literacy explain a significant portion of the gender difference in risk aversion. However, wealth is the most important factor as it explains approximately 61 percent of the observed difference. Overall, our finding suggests that gender difference in risk aversion is more of a socio-economic construct than biological difference in risk preference.

The study is organized as follows. The next section provides the framework for estimating risk preference. Section 3 presents the data and descriptive results. Section 4 provides and

discusses the risk estimates and decomposition of risk aversion difference by gender. The last section concludes and draws policy implications of the study.

2 Estimating risk attitude: Antle's approach

Risk attitude is often measured using experimental (real or hypothetical) or observational data. In the experimental approach, participants are offered with actual or hypothetical choices with different level of risk and return. Based on their choices in the experiment, we can elicit their risk attitude assuming certain preference function. In the observational setting, we can use data on the production decision of the respondents and estimate their risk attitude econometrically. In this study, we follow the later approach. The choice of the Antle (1987) method is justified by different aspects. The first is the nature of the studied risk, which focusses in our case on the entrepreneurial behavior in SME enterprises. The individual may face different decision spaces and may consequentelly have different risk aversion levels . For instance, the risk aversion towards the choice of labor, the risk aversion toward the management of retirement, etc. Ruiz-Menjivar (2014) introduces in a chronic way the different suggested measurements of risk, but link the all to what they call the financial risk aversion, and this even of the covered spaces varies from one approach or empirical paper to another. For instance, the Barsky et al. (1997) focuses rather on the space of health and retirement management. The second justification is related to the nature of the data that we dispose, as well as, the potential limitations of the experimental data to cover the managerial risk aversion of entrepreneurs. The third justification is that the used data are real realizations. Indeed, Holt and Laury (2012) show the limitations of the hypothetical realizations (gains) with the experimental data. This section discusses the empirical approach we follow. First, we present the econometric procedure for estimating risk attitude due to Antle (1987) based on cross-sectional survey data. Second, we specify a regression model to estimate correlates of risk preference.

In order to estimate risk-attitude parameters of a population of producers, Antle (1987) proposed a moment-based approach that relies on some assumptions. First, given inputs that are assumed predetermined variables, the producer solves an optimization program in a period. Second, all producers use similar technology in which the distribution of profit represents the stochastic technology. It implies that each enterprise has some profit distribution and each entrepreneur also forms some expectation. We assume that an entrepreneur maximizes a function of moments of the profit distribution given in 1.

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

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

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

Where $\theta_{2j}$and θ_{3j} are loosely interpretable as Arrow-Pratt and down-side risk aversion coefficients respectively Antle, 1987 and u_j is the usual random error term. Antle's approach amounts to estimating equation 2 for each input to account for differential contribution of each input in the moments of profit distribution. While all inputs could increase the expected profit, the inputs 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 as well as higher order moments.

This model presupposes that whether an input is risk increasing or risk decreasing is purely an empirical issue. A negative (positive) sign on the marginal contribution of an input to second moment indicates that the input is risk reducing (increasing), whereas a negative (positive) sign on the marginal contribution of an input to the third moment presumes that the input is downside-risk increasing (reducing).

Equation 3 below shows that the Arrow-Pratt (AP) absolute risk aversion coefficient, which is greater than zero for risk averse producer ($AP > 0$ for risk averse producer).

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

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

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

Following Groom et al. (2008), we assume that the risk preference is individual but not input specific, $\theta_{mj} = \theta_j$ that implies $AP_j = AP$ and $DS_j = DS$. We compute risk premium (RP) based on AP and DS coefficients and assuming only the first three moments of distribution are of concern to the producer as 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 third-order moments of

the distribution. The producer prefers insurance against risk given a positive willingness to pay for insurance as reflected by the positive risk premium. Finally, we compute the relative risk premium (RRP) dividing the risk premium with the individual level of revenue.

Practically, we implement the procedure as follows. First, we generate the three moments of MSE's revenue function. We regress the value of monthly revenue on set of production inputs to get an estimate of the mean revenue (first moment) and the residuals. We take the squared value of estimated residuals and regress it on the same set of explanatory variables to generate the second order moment (variance). Using the same procedure, we finally estimate the third moment or skewness (the estimated residuals raised to the power of 3).

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

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

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

In recapitulation, to assess the nature of risk preference of the MSEs operators, we utilize the details of production information in the survey data (details of inputs used over the last 12 months and value of outputs produced over the same period) and econometrically estimate risk attitudes of the entrepreneurs. Then, we use the risk estimates and regress them on some of the entrepreneurs' and enterprise characteristics.

3 Data and descriptive results

3.1 Data

We use firm-level data collected in 2015 by Addis Ababa University and Addis Ababa City Administration Micro and Small Enterprise Development Bureau. The objective of the survey is to obtain information on the major constraints and challenges that have been facing MSEs in Addis Ababa. The sampling is done using the database of Addis Ababa City

Administration Micro and Small Enterprise Development Bureau, which constituted micro and small firms operating in the city in major sectors such as manufacturing, construction, trade and urban agriculture. The survey follows the definition of Ethiopian Ministry of Trade and Industry (MoTI) to classify micro and small enterprises.

With the objective of ensuring representation of every sub-sector, a two-stage stratified sampling procedure is applied. First, MSEs are categorized into two sector strata: manufacturing and non-manufacturing. Then, each sector, manufacturing and non-manufacturing, is classified into non-overlapping strata of sub-sectors using MOTI classification. A proportional stratified sampling based on the available sub-sectors is drawn. Then, within each sub-sector or the strata, the sample is drawn randomly using simple random sampling.

The data covers 1,445 MSEs operating in Addis Ababa. The survey collected information on firms' characteristics (age, size, owner's gender, education, experience, workforce composition), access to business support services (access to finance, training, land and other support services), licensing status (formality and legality), performance measures (annual sales and employment), sectoral distribution and challenges of MSEs. The survey also provides details of firms' activities and use of inputs (labor and capital), the value of output and inputs over the last 12 months before the survey.

3.2 Descriptive results

Table 1 offers the descriptive statistics of the key variables used in the analysis disaggregated by gender. The average annual revenue in the sample is Birr 55,586 birr. Overall, male owned MSEs have higher monthly revenue (79210 Birr) than female owned counterparts (17236 Birr). The difference in monthly revenue between female and male owned firms is statistically significant at 1%.

Female entrepreneur constitute about 30% of the ownership in the sample. The average age of the firms is 4.76 years. The firms reported an average of Birr 35,635.84 (USD 1500.00) initial capital, have 3 employees and 4 enterprise members. In terms of education, the majority of employees (65%) have less than or completed high school education, 26% have a diploma, while 9% have a first degree and above. The average labor and material costs are 18765.9 and 22954.2 Birr respectively. About 32% of the MSEs have their own working premises. The MSEs in our sample are registered (88%), have their own bank account (59%), prepare financial reports (31%) and use IT (8.8%). The majority of MSEs are engaged in the manufacturing sector (38%) and trade (28%), followed by construction (22%) and services (12%). Most of the MSEs are sole ownerships (44%); while 34% are some form of cooperatives, 17% are partnerships and the rest are private limited companies.

Looking into the female entrepreneurs, on average, they are 35 years old, with household size of 4 and has been engaged in the MSE sector for about 6 years. About 30% of them are single. In terms of educational level, about 22% have diploma and above. Most of them are engaged in trade (44%), followed by manufacturing (28%), services (19%) and construction (7.5%).

4 Econometric results

In this section, we provide the econometric results based on the empirical framework discussed in Section 2. We present the risk parameters and discuss the gender difference in risk attitude. Then, we analyze the factors that influence the risk attitude of the entrepreneurs in the MSE.

4.1 Risk attitude estimates

The coefficient of relative risk aversion is calculated using Antle (1987) moment-based approach. The mean estimate of relative risk aversion is 0.015, indicating average entrepreneurs in the MSEs are risks averse. Though, there is limited firm level studies to contrast our risk estimates based on previous literature from developing countries, our results are close to estimates reviewed in Vollenweider et al. (2011), which is 5% for Norwegian salmon farmers and 3% for Phillipines rice farmers. The result indicates that entrepreneurs in the MSEs are willing to pay on average about 1.5% of their monthly revenue, which is 834 Birr, to safeguard themselves from risk. This is very high in a developing country context, where incomes are low.

Our Arrow-Pratt (AP) estimate is negative that suggests entrepreneurs' less aversion of risk; while the positive downside (DS) risk aversion parameter indicates the riska version fo entrepreneurs for extrem events. The average absolute risk aversion coefficient of -0.146 and average downside risk coefficient of 0.048. Though, there is limited firm level studies to contrast our risk estimates based on previous literature from developing countries, our results are on the lower bound of the global literature on risk estimates. Previous estimates in the developed countries are AP of 2.23 and DS of 3.07 in Vollenweider et al. (2011), AP of 0.34 and 0.0726 and 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, since the estimated equations are based on first order conditions of an optimization. In contrary to theoretical expectations, all the intercept terms are significant. This shows that labor and capital is not optimally used. The positive and significant intercept term for labor and

capital costs suggests the overuse of the inputs; while the negative and significant intercept term for the number of employees suggests the underutilization of the labor employed by the MSEs.

By gender, female entrepreneurs in our sample are slightly more risk averse than the male counterparts. The average relative risk premium for female owned MSEs is about 1.8%, while male owned MSEs is about 1.4%. We plot the distribution of relative risk premium for female and male owned MSEs in Figure 1. The figure shows that the risk preference distribution for female owned MSEs is tilted toward the right and has high peak in comparison to the distribution for male owned MSEs. This suggests that female entrepreneurs have slightly high risk aversion than male entrepreneurs. This could be due to several factors such as self-selection of female entrepreneurs (more risk averse) into the specific sectors (trade and services), where working on part-time basis is possible or aim to support the family income hence interested in avoiding risk. While most of the male entrepreneurs are involved in MSEs sectors such as manufacturing and construction, where operations often require full time and often encouraged by spouses to take risky but high return opportunities.

Formally, we test the mean difference in risk preference between female and male owned MSEs. The mean difference test show that male entrepreneurs have lower risk aversion than their female counterpart (difference=0.0039, p-value=0.0407). Overall, the difference in risk aversion between male and female entrepreneurs is statistically significant at 5% (difference=0.0039, p-value=0.0407). The difference test in risk preference between female and male entrepreneur confirm the observations in Figure 1.

However, it is important to note that the statistical significance shows only the likelihood that the difference between the two groups could be due to an accident of sampling and does not tell us the size of the difference (Nelson, 2016; Coe, 2002). In other word, the significance test (p-value) incorporates the size of the effect and the size of the sample. As a result difference can be found either if the effect were very big (despite having only a small sample) or if the sample were very big (even if the actual effect size were tiny). To investigate the extent of size of the difference of risk aversion in means of men and women entrepreneurs in a way that takes into account both within-sex variability and the possibility of overlap between distributions of the two groups, one can estimate Cohen's d and "Common Language Effect Size" (Cohen, 1988; McGraw and Wong, 1992). Based on Cohen's d estimates, risk aversion of women entrepreneurs lies 0.13 standard deviations above the male mean risk aversion coefficient. This implies that about 54% of women coefficient in our sample have a higher risk aversion coefficient than the average male entrepreneurs. When we look at "Common Language Effect Size" the probability that a randomly chosen woman would have a higher risk aversion than a randomly chosen man entrepreneur is 0.48. Interpreting this results as

"small" or "large" is context specific. However, based on the existing empirical evidence it is plausible to argue that the difference in risk aversion between women and men MSE owners in our sample is not large (see Nelson (2016) and Hyde (2005) for detail discussions).

4.2 Correlates of risk attitude

We estimate an OLS regression of the measure of risk attitude on set of regressors that could affect entrepreneurs risk attitude. Table 3 provides the results of OLS estimates. The dependent variable measuring risk attitude of the entrepreneur is the relative risk premium (RRP). In this study, we consider several covariates that correlate with risk attitude following the existing empirical literature and considering our context of the study. The set of explanatory variables include age, education, gender, marital status, household size, years of experience, level of capital, sector of the entrepreneur, business form and formality of the MSEs, financial literacy (bank account, financial report) and IT use.

In view of the significant proportion of female entrepreneurs in the MSEs and the mixed evidence on the gender difference in risk attitude reviewed above, we consider the gender of the entrepreneur as a covariate. We find statistically insignificant difference in risk aversion between female and male entrepreneurs once controlling for a range of covariates. This might suggest that no innate difference in risk appetite by gender, but rather that men and women MSE owners have different characteristics. In deed female-owned MSEs in our sample are older, engaged in service and trade sector, have fewer employees with lower educational attainment and lower experience in the MSEs sector than their male peers. This result also supports our previous argument that the risk aversion difference between women and men entrepreneurs in the context we are working is "small". The result is close to recent findings of Nelson (2016) and to the empirical evidence that document gender neutral risk attitude on specific managerial contexts (Maxfield et al., 2010;Castillo and Cross, 2008 and Johnson and Powell, 1994).

Age could have a possible nonlinear effect on risk aversion. Young individuals could be willing to take risk; however, as individuals gets older, their willingness to take risk declines. The empirical evidence is mixed. Some studies find positive correlation between age and risk (De Brauw and Eozenou, 2014 and Levesque and Minniti, 2006); while Adhikari and O'Leary (2011) find negative relationship. We find negative and significant correlation between age and risk aversion. Similarly, we find negative relationship between experience of the entrepreneur and risk aversion. This is perhaps due to familiarity of the business challenges in which the more experienced the entrepreneurs, they are more able and familiar to take the risks. Levesque and Minniti (2006) argue that with age comes experience that

could help in dealing with riskier and uncertain business challenges.

The more educated an individual, the more informed decision one could make. Thus, high levels of education is expected to negatively correlate with risk aversion. Risk aversion may emanate from information asymmetry about future outcomes. Individuals with high levels of education could be able to receive and process information better that lowers their risk aversion. Besides, education could increase wealth and access to finance that lowers risk aversion (Knight et al., 2003). Therefore, individuals with high levels of education are less likely to be risk averse. We find negative link between educational attainment of the entrepreneur and risk aversion. Those with a high level of education have relatively lower risk aversion than those with lower level of education. This is inline with previous empirical evidence that show negative relationship between education and risk aversion in financial decisions after controlling for demographic characteristics (Riley Jr and Chow, 1992; Ahn, 2010; De Brauw and Eozenou, 2014).

Marital status of the entrepreneur could also correlate with risk attitude. Weber (2013) finds that married women (with greater family responsibility) to be more risk averse. On the contrary, Grazier and Sloane (2008) show that individuals risk aversion is affected by spouse's risk attitude. Individuals are more risk averse if their spouse are risk averse and vice versa. We find positive link between marital status and risk aversion. Our result shows compared to single entrepreneur, those that are married are more risk averse. Large household size composed of more adult labor could negatively correlate with risk aversion, since they could mobilize the labor to take more risk (Gong and Yang, 2012). We find no significant relationship between household size and risk aversion.

Risk aversion decreases with income and wealth (Yesuf and Bluffstone, 2009). This is perhaps due to the high level of income and wealth could improve once risk taking. We proxy the income or wealth of the entrepreneur using the current level of capital and find similar results. Those entrepreneurs with high levels of capital are relatively less risk averse than those with low level of capital.

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) is found to have risk reducing effect. Regardless of the above, the impact of both capital and labor input uses on efficiency of enterprise performance could have different effects than when the risk attitudes of enterprise owners are included in the efficiency calculations. Performance of MSEs in different sectors is affected by production risk as well as inefficiency. In our study risk aversion is highly associated with enterprises engaging in the trade sector and where the majority of women owned MSEs are engaged. Further study is needed to understand why significant number women-owned MSEs are situated in those sectors. High

risk sectors such as manufacturing and construction are found to have a higher revenue. From this one can imply that MSE performance can be improved if one joins the high risk sectors. Especially majority of women-owned enterprises that are in service and trade sector can improve their performance by joining the high risk and high return sectors like manufacturing and construction. However, this does not imply that better performance can only be improved by being in high risk sectors. Improving risk management and developing the knowledge base of women-owners on how to mitigate and manage risks might also improve their performance.

We also assess the link between additional covariates specific to our contexts such as sector, business form, formality, financial and IT literacy. Compared to those in the trade sector, entrepreneurs in the manufacturing, construction and services are more risk averse. Entrepreneurs with formally registered enterprises do not significantly differ in risk attitude than those in the unregistered enterprises. We find significant difference in risk aversion by business form of the MSEs.Those in the private limited companies or partnerships are less risk averse. Having a bank account, own work premise or using IT do not correlate with risk aversion. We find significant negative relationship between financial reporting and risk aversion. Those entrepreneurs in MSEs that produce financial report are less risk averse. Overall, the OLS estimation results show that entrepreneurs' risk attitude is significantly correlated with age and experience of the entrepreneur, marital status, education level and financial literacy, wealth, sector and business form.

4.3 Gender differences in risk attitude: a decomposition analysis

Our results in subsection 4.1 show that women are relatively more risk averse compared to men. This leads us to examine the underlying causes of this observed gender difference in risk aversion. Using Oaxaca-Blinder decomposition technique introduced independently by Oaxaca (1973) and Blinder (1973), we quantify the underlying socio-economic factors that induce gender differences in risk aversion. Details of the decomposition method is presented in the Appendix.

Table 5 presents the decomposition results. The gender difference in risk aversion is significantly explained by the predictor variables. The decomposition shows that the explained component is statistically significant, while the unexplained component is insignificant. Of the overall gap in risk aversion between women and men, 75 percent is explained while the rest is unexplained. This shows that the gender difference in risk aversion is due to disparities in "endowment" or socio-economic factors than biological difference in risk preference. By individual predictors, current capital and sectors (manufacturing, services and construction)

are the major factors that account for significant proportion of the explained component. Other factors such as education, experience, business form of the enterprise and financial reporting also influence the explained variation. Notably, some of the regressors (such as manufacturing and construction) increase the explained gap. This implies that if women entrepreneurs are in the same proportion as men in the manufacturing or construction sectors, this would increase the mean predicted gap in risk aversion between women and men rather than decreasing it.

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

5 Conclusion and policy implications

In this study, we assess the nature of risk attitude of female and male entrepreneurs in urban MSEs and investigate the factors that influence their risk attitude. The empirical analysis of the study consists of two parts. First, we use a moment-based approach proposed by Antle (1987) to estimate the risk preference of male and female entrepreneurs. Second, we estimate an OLS regression to identify the correlates with risk attitude and use Oaxaca-Blinder decomposition technique to decompose the gender difference in risk aversion.

The results clearly indicate that MSE entrepreneurs are risk-averse with relative risk premium of 1.5%. Risk aversion is slightly higher for female entrepreneurs with average relative risk premium of 1.8% compared to 1.4% for their male peers. Importantly, the gender difference in risk attitude disappears after controlling for demographic and enterprise characteristics. This might suggest that no innate difference in risk appetite by gender. It is important to mention that the majority of women entrepreneurs in our sample own micro enterprises in service and trade sector with very little growth. Women MSE owners also lack education, as well as work experience than that of men entrepreneurs. Looking into the correlates of risk attitude, our OLS estimates show that entrepreneurs' risk attitude is significantly correlated with age and experience of the entrepreneur, marital status, education level and financial literacy, wealth, sector and business form.

Understanding and properly identifying the underpinnings of the observed gender differences are vital for effective policy interventions. If gender differences in risk preferences are based on biological differences, policy interventions should account for this disadvantage faced by women. If socio-economic 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 "endowment" or socio-economic factors than biological difference in risk preference. Thus, the aversion towards risk by women entrepreneurs could be reduced by appropriately targeting the deficits in socio-economic characteristics of the women.

From policy perspective, our result suggests that improving 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, different socio-economic groups). Besides comparing risk preference of male and female, it is also significant to compare across different segments of male as well as female groups.

Table 1 – Descriptive statistics of the key variables by gender

	Male	Female	Total
Revenue per month	79210.03	17236.13	55586.43
	(235479.4)	(41971.24)	(144360.1)
Sex (1=Female)			0.295
			(0.456)
Age of the enterprise	4.713	4.864	4.757
	(3.959)	(3.938)	(3.952)
Initial capital	42506.5	19249.5	35635.8
	(154280.8)	(68802.6)	(135183.9)
Current capital	322786.4	88053.0	253496.6
	(1231207.9)	(263132.9)	(1048796.1)
Labor cost per month	25373.8	3006.2	18765.9
	(627696.6)	(15541.7)	(526972.6)
Material cost per month	27636.6	11186.8	22954.2
	(77393.9)	(45245.2)	(70144.9)
Total number of employee excluding mse members	3.614	1.768	3.069
	(7.338)	(5.062)	(6.797)
Total number of mse members	3.986	3.014	3.699
	(5.056)	(4.417)	(4.894)
Own bank account (1=yes)	0.645	0.462	0.591
	(0.479)	(0.499)	(0.492)
Own working premises (1=yes)	0.297	0.369	0.318
	(0.457)	(0.483)	(0.466)
Financial reports (1=yes)	0.365	0.200	0.316
	(0.482)	(0.400)	(0.465)
IT use (1=yes)	0.107	0.0446	0.0888
	(0.310)	(0.207)	(0.285)
Registered (1=yes)	0.892	0.852	0.880
	(0.311)	(0.355)	(0.325)
Age of entrepreneur	34.50	35.42	34.77
	(9.390)	(10.46)	(9.725)
Marital status	0.652	0.709	0.669
	(0.477)	(0.455)	(0.471)
Household size	3.990	4.408	4.114
	(2.083)	(1.998)	(2.066)
Experience of entrepreneur	6.769	5.885	6.508
	(5.873)	(5.195)	(5.694)
Below high school	0.212	0.350	0.252
	(0.409)	(0.477)	(0.435)
High school	0.382	0.432	0.397
	(0.486)	(0.496)	(0.489)
Diploma	0.291	0.178	0.258
	(0.455)	(0.383)	(0.438)
First degree and above	0.115	0.0399	0.0929
	(0.319)	(0.196)	(0.290)
Government initiated Cooperative	0.251	0.176	0.229
	(0.434)	(0.381)	(0.420)
Private initiated cooperative	0.114	0.0822	0.105
	(0.318)	(0.275)	(0.306)
Private limited company	0.0630	0.0282	0.0527
	(0.243)	(0.166)	(0.224)
Partnership	0.190	0.108	0.166
	(0.392)	(0.311)	(0.372)
Manufacturing	0.414	0.286	0.377
	(0.493)	(0.453)	(0.485)
Services	0.0955	0.192	0.124
	(0.294)	(0.395)	(0.330)
Construction	0.274	0.0751	0.215
	(0.446)	(0.264)	(0.411)
Trade	0.217	0.446	0.284
	(0.412)	(0.498)	(0.451)

Table 2 – Risk parameter estimation result

Parameters	Coefficients
θ_2	-0.0732***
θ_3	-0.00793***
$\theta_{totalnumberofemployee}$	-0.148***
$\theta_{laborcost}$	0.621***
$\theta_{materialcost}$	0.509***
$\theta_{currentcapital}$	0.415***
Arrow-Pratt risk (AP)	-0.146 ***
Downside risk (DS)	0.047 ***
Relative risk premium (RRP)	0.015***
N	1333

The results are based on SUR estimates of marginal effect of the inputs on the marginal effect of variance and skewness of the inputs

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 – Correlates of risk attitude

Dependent variable: Relative risk premium (RRP)	Coefficient	t-statistics
Sex (1=Female)	0.00111	(0.56)
Age of entrepreneur (log)	-0.0110***	(-2.69)
Marital status (1=Married)	0.00396*	(1.90)
Household size (log)	0.000184	(0.12)
High school (1=yes)	-0.00382*	(-1.71)
Diploma (1=yes)	-0.00669**	(-2.53)
Degree and above (1=yes)	-0.00760**	(-2.15)
Experience of entrepreneur (log)	-0.00457***	(-3.87)
Current capital	-0.00275***	(-4.10)
Number of employee	0.00350***	(2.96)
Manufacturing (1=yes)	0.0102***	(4.26)
Service (1=yes)	0.0115***	(3.99)
Construction (1=yes)	0.0175***	(5.82)
Registered(1=yes)	0.000623	(0.23)
Public initiated cooperative(1=yes)	-0.000143	(-0.05)
Private initiated cooperative(1=yes)	0.00165	(0.54)
Private limited company(1=yes)	-0.0115***	(-2.95)
Partnership(1=yes)	-0.00615**	(-2.26)
Own bank account(1=yes)	0.00146	(0.70)
Own work premise(1=yes)	-0.00140	(-0.76)
Financial report(1=yes)	-0.0134***	(-6.34)
IT use(1=yes)	-0.00216	(-0.70)
Constant	0.0833***	(5.71)
Observations	1302	
Adjusted R^2	0.135	

t statistics in parentheses

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

Table 4 – SUR estimation results

		Coefficient	t-statistics
Dependent variable:	$\frac{\partial \mu_1}{\partial ck}$		
$\frac{\partial \mu_2}{\partial ck}$		-0.0732***	(-87.74)
$\frac{\partial \mu_3}{\partial ck}$		-0.00793***	(-177.17)
Intercept		0.415***	(58.24)
Dependent variable:	$\frac{\partial \mu_1}{\partial tne}$		
$\frac{\partial \mu_2}{\partial tne}$		-0.0732***	(-87.74)
$\frac{\partial \mu_3}{\partial tne}$		-0.00793***	(-177.17)
Intercept		-0.148***	(-11.98)
Dependent variable:	$\frac{\partial \mu_1}{\partial lc}$		
$\frac{\partial \mu_2}{\partial lc}$		-0.0732***	(-87.74)
$\frac{\partial \mu_3}{\partial lc}$		-0.00793***	(-177.17)
Intercept		0.621***	(55.66)
Dependent variable:	$\frac{\partial \mu_1}{\partial mc}$		
$\frac{\partial \mu_2}{\partial mc}$		-0.0732***	(-87.74)
$\frac{\partial \mu_3}{\partial mc}$		-0.00793***	(-177.17)
Intercept		0.509***	(125.97)
N		1333	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1 – Kernel density of relative risk premium by gender

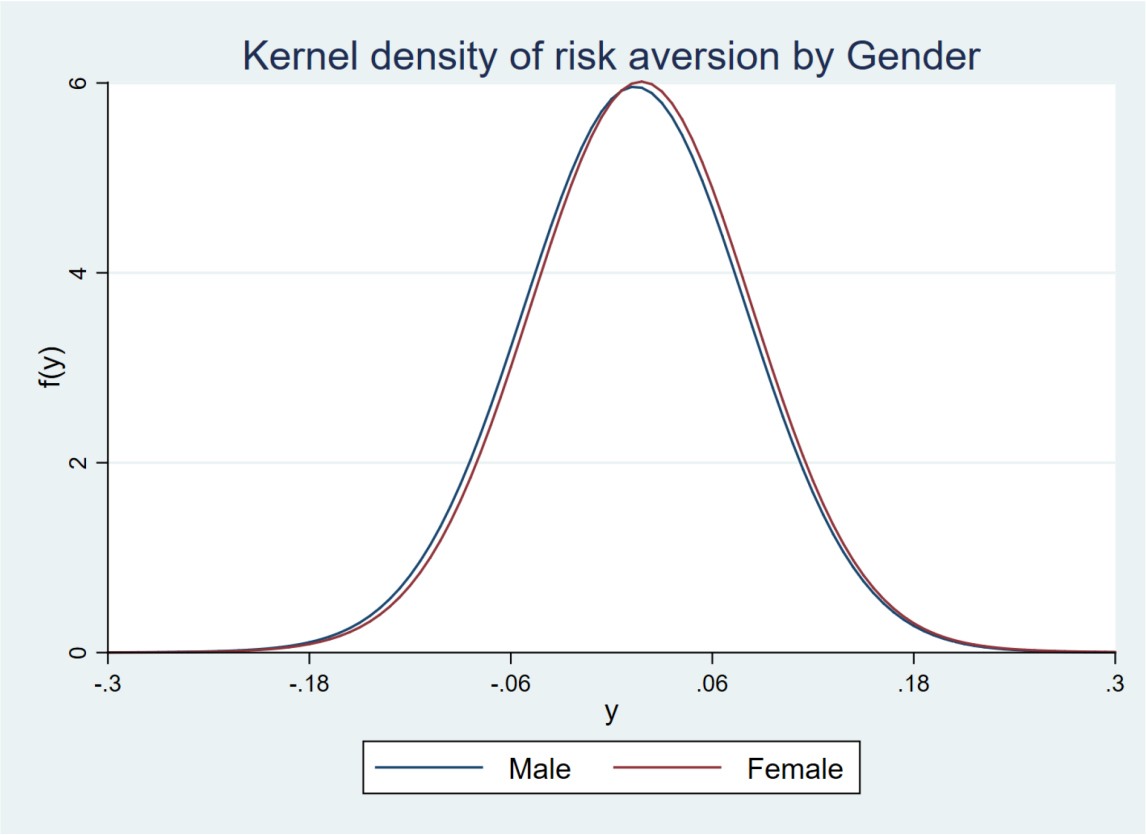

Table 5 – Oaxaca-Blinder decomposition results

	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	0.0159
		(1.33)	(0.44)
Marital status (1=Married)		-0.0003	0.0010
		(-1.48)	(0.30)
Household size (log)		-0.0001	-0.0004
		(-0.25)	(-0.08)
High school (1=yes)		0.0002	0.0008
		(1.28)	(0.35)
Diploma (1=yes)		-0.0007**	0.0015
		(-2.09)	(1.19)
Degree and above (1=yes)		-0.0005*	0.0009*
		(-1.65)	(1.66)
Experience of entrepreneur (log)		-0.0006**	-0.0032
		(-2.23)	(-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)

A Oaxaca-Blinder decomposition technique

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

The decomposition technique allows to divide the difference into parts that are explained by group differences in socio-economic factors (such as education, experience and wealth) and the unexplained part that cannot be accounted for by differences in determinants of risk aversion. The unexplained part, however, could be meaningful for measuring some social or economic aspects. In the gender wage gap decomposition, the unexplained part measures discrimination but it also encompasses other unobserved predictors.

Let the risk attitude, RRP, is a linear function of a set of predictors, X, that can be estimated as in 7.

$$RRP_j = \alpha_j + \beta_j X_j + \epsilon_j \qquad j \in \{w, m\} \tag{7}$$

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:

$$D = \quad E(RRP_w) - E(RRP_m) = \quad E(\alpha_w + \beta_w X_w + \epsilon_w) - E(\alpha_m + \beta_m X_m + \epsilon_m) \tag{8}$$

$$= \quad \Delta X \beta_w + \Delta\alpha + \Delta\beta E(X_m) \tag{9}$$

The first part is the explained component, a part of aggregate gender difference in risk aversion attributable to differences in mean values of the regressors (endowments or socio-economic 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 due to difference in the coefficient estimates including the intercept.This is the gender difference in risk aversion taht remains even if women entrepreneurs had the same mean level of predictors as the men entrepreneurs. In an ideal setting, where there are no omitted variables and measurement errors, the unexplained component in our case measures the risk preference due to biological difference of

being female and male. This can give a sense of innate risk preference difference between female and male entrepreneurs.

Alternatively, Eq 8 can be given as in Eq 10:

$$D = E(RRP_w) - E(RRP_m) = \Delta X \beta_m + \Delta\alpha + \Delta\beta E(X_w) \tag{10}$$

Here the average mean difference in predictors are 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) Oaxaca and Ransom (1994), the general formulation of the decomposition equation can be represented as in Eq. 11

$$D = E(RRP_w) - E(RRP_m) = \Delta X'[W\beta_w + (I - W)\beta_m] + [(I - W)'E(X_w) + W'E(X_m)]'\Delta\beta \tag{11}$$

where I is the identity matrix, W is matrix of weights given to coefficients of group, w. Choosing $W = I$ gives the Eq. 8, while $W = I$ gives the Eq. 10. The formulation in Reimers (1983) Reimers (1983) can be obtained assuming $W = 0.5I$ and assuming $W = pI$ gives the formulation in Cotton (1988) Cotton(1988) with p denoting the proportion of observed belonging to one of the group (e.g. proportion of women). Neumark(1988) Neumark (1988) uses coefficients, β^p, from the pooled regression of both groups and the outcome difference can be represented as in Eq. 12

$$D = E(RRP_w) - E(RRP_m) = \Delta X \beta^p + E(X_w)(\beta_w - \beta^p) + E(X_m)(\beta^p - \beta_m) \tag{12}$$

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