Are Women as Likely to Take Risks and Compete? Behavioral Findings from Central Vietnam

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Abstract:

Using controlled experiments to compare the risk attitude and willingness to compete of husbands and wives in 500 couples in rural Vietnam, we find that women are more risk averse than men and that, compared to men, women are less likely to choose to compete, irrespective of how likely they are to succeed. Relevant to development programs concerned with lifting women out of poverty, our findings suggest that women may be more reluctant to adopt new technologies, take out loans, or engage in economic activities that offer higher expected returns, in order to avoid setups that require them to be more competitive or that have less predictable outcomes.

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1. Introduction

Development programs intended to alleviate poverty, including those that explicitly target women, have largely failed to consider that men and women may differ, on average, on a number of traits [see Browne (2006) for a concise overview of decades of research in evolutionary psychology on this point]. These attitudinal differences, augmented by the strongly gendered social norms found in rural areas of developing countries (Fletschner and Carter, 2008; Kevane, 2004; Cain et al., 1979), are likely to shape men's and women's preferences. In particular, if men and women differ systematically in their willingness to take risks or compete, one would expect them to also differ in the type of economic activities they prefer to undertake and their willingness to participate in development interventions involving risk and competition.

Behavioral attributes such as individuals' willingness to take risks and compete can shape the set of economic options they are willing to consider.[2] This can be seen, for instance, in rural areas of developing countries which typically lack fully functioning insurance markets and where producers who are risk averse are more likely to abstain from borrowing to meet their credit needs (see Boucher et al (2008) for a formal characterization of risk-rationing mechanisms in the credit market and their implications for agricultural development, and Fletschner et al (2009) for an empirical assessment of the impact of these risk-associated credit constraints on Peruvian farms' financial efficiency). Risk averse producers are also less likely to adopt new technologies (Liu, 2008). Other things equal, they prefer to forego opportunities that offer higher expected returns but expose them to greater uninsured risk, for more secure, albeit less profitable, economic alternatives (Dercon, 2006). Similarly, economic agents who are less inclined to choose to compete may find themselves involved in economic activities with consistently lower returns. This is particularly the case in rural economies that are increasingly market oriented, where producers must regularly negotiate and compete with a wide range of economic agents to gain access to quality inputs, timely and accurate information, good prices, and outlets for their products, and where the environment gets more competitive as producers move up the supply chain. As a result, rural producers who are risk averse or less willing to compete may be reluctant to take part in development initiatives built around

economic strategies that enhance their expected income but require them to undertake levels of risk or competition that exceed those they are capable or willing to endure.

If women do differ from men and are more risk averse and less prone to compete, development interventions blind to these differences could generate exclusionary outcomes by which only the women who are significantly more willing to take risks and compete can benefit, while average women—the group the intervention intended to target—choose not to participate. It is thus important for development programs, increasingly seeking more market-based approaches, to assess whether men and women differ systematically in their preferences in their region of interest.

In a nice piece summarizing the experimental literature on gender differences in preferences, Croson and Gneezy (2008) describe empirical evidence that by and large finds women to be more risk averse and less prone to competition. With few exceptions, however, this research has been carried out in developed countries, and often on well educated, urban, populations. Our study helps to broaden our understanding of how general these results might be by analyzing the behavior of husbands and wives in 500 couples in rural central Vietnam. The data we have allow us to control for factors, such as human and physical capital or characteristics of the communes in which these couples live, that can affect their behavior and if excluded from the analysis could lead to biased results. Furthermore, because our sample design included both spouses interviewed separately, we can control for unobserved household-level characteristics and are able to obtain more efficient estimates.

This paper is organized as follows. Noting excellent recent summaries elsewhere, we provide a very succinct overview of the empirical literature on gender differences in risk behavior and willingness to compete in Section 2. We describe the setting in which we carried out the study in Section 3. In Section 4 we explain how we construct our indicators of willingness to take risks and compete. We present the econometric framework we use to identify possible gender differences in risk and competitive behavior in Section 5, followed by our findings in Section 6. We conclude and provide recommendations in Section 7.

2. Do Men and Women Differ Systematically in Their Preferences? A General Review of the Literature.

In recent years, economists have become interested in a number of behavioral attributes that can shape individuals' preferences and the choices they make. Researchers have analyzed personal characteristics such as individuals' attitudes toward risk, their altruism, their concern for social

positioning, their willingness to compete, and their confidence and assertiveness. For this study, we concentrate on whether and how men and women differ, on average, in their attitudes towards risk and competition, beginning with a brief introduction to the existing literature exploring these questions.[3]

2.1. Risk Attitudes

Psychologists have consistently found women to be more risk averse than men. In a comprehensive meta-analysis of the psychological research on gender differences in risk taking, Byrnes, Miller, and Schafer (1999) find that women are less inclined to take risks than men. Their review of 150 studies included in the PsycLIT and PsycINFO databases reveals that the extent of the gap between men's and women's responses to risk varies by age and the context of the decisions, but women are consistently less likely to take risks. In almost half of the cases they analyzed, men were at least 20% more prone to take risks. Women were more risk averse even in relatively harmless situations or when taking a risk appeared to be a good idea. Moreover, the studies they reviewed suggest that, on average, the difference between men's and women's observed risk behaviors is larger than reported by studies based on hypothetical choices.

To assess individuals' risk attitudes and how they may differ by gender, economists have relied on a number of approaches. Some have looked at observed behavior, such as the composition of individuals' financial portfolios (Jianakoplos and Bernasek, 1998; Bajtelsmit and VanDerhei, 1997). Others have elicited interviewees' attitudes directly by asking them to assess their willingness to take risks (Dohmen et al, 2005) or by relying on psychological instruments such as the Zuckerman Sensation-Seeking Scale (Zuckerman, 1994). Still others have presented individuals with lotteries or gambles (Booth and Nolen, 2009; Jacobson and Petrie, 2009; Holt and Laury, 2002; Binswanger, 1980). These lotteries go from very simple or "naïve" games where subjects are asked to choose between two options to more complex exercises in which subjects are presented with a set of lottery pairs and are asked to choose one pair. Some of the lotteries are based on hypothetical scenarios, while others involve real pay-offs. Finally, the manner in which choices are framed can affect individuals' willingness to take a risk. To explore this notion, researchers have varied the amounts involved (low stakes gambles versus high stakes gambles) and compared gambles with and without the possibility of losses (Eckel and Grossman, 2008a).

Eckel and Grossman (2008a) synthesize gender differences in risk attitudes reported in the literature on experimental economics. They find that most experiments based on abstract gambles

conclude that women are more averse to risk (see for instance Eckel and Grossman, 2008b; Holt and Laury, 2002; Hartog et al., 2002; Schubert et al., 1999). The results are less conclusive when the gambles include possible losses: while Eckel and Grossman (2008b) find women to be more risk averse than men, Moore and Eckel (2003) and Schubert et al. (1999) report that in the loss-domain women are more risk prone than men.

Results from these abstract gambles largely coincide with the evidence gathered through experiments framed as investment decisions, in most of which women are found to be more risk averse (Moore and Eckel, 2003; Eckel and Grossman, 2008b) versus experiments framed as insurance decisions, in which women are more prone to taking risks (Moore and Eckel, 2003). Finally, similar patterns appear to be even more defined in decisions made outside a controlled environment: field studies indicate that women are more risk averse when they place bets (Johnson and Powell, 1994); in their contributions to pensions (Bajtelsmit and VanDerhei, 1997); in the proportion of their wealth held in risky assets (Jianakoplos and Bernasek, 1998; Hinz et al, 1997); and in the choices they make when enrolled in retirement savings plans that allow them to define how their assets are allocated (Sunden and Surete, 1998).

2.2. Willingness to Compete
A wealth of empirical research in psychology, social psychology, and organizational behavior has reported that, compared to men, women are less likely to choose competitive situations. The results on differences in competitive behaviors when men and women are in a competitive situation are more mixed. See for instance Browne (2006) for a nice overview of the literature; Lynn (1993) for a study of these differences in twenty countries; Walters et al. (1998) for a comparison of how men and women differ in face-to-face bargaining simulations; and Martin and Kirkaldy's (1998) results based on a survey applied to 100 students in Northern Ireland.

In parallel, a number of recent efforts in the economics literature have tried to identify systematic differences between men's and women's willingness to compete by relying on controlled experiments in which everyone has access to the same options. The setups in these experiments allow researchers to control for factors that might otherwise leave men and women with a different set of opportunities and to focus instead on possible differences on whether or not individuals choose to participate when confronted with equivalent options. In these experiments, individuals are asked to perform a task for which they will be rewarded, but they can choose how they want to be compensated. They can be paid a certain piece-rate amount for each time they perform the task

correctly, or they can be paid based on a tournament scheme. In the tournament scheme they receive a higher piece-rate for each time they perform the task correctly, as long as they perform better than some number of others, but they get a lower piece-rate, or nothing, if they do not. Under the secure piece-rate payment, the participant's return is based only on their own performance, whereas under the tournament piece-rate the outcome is also affected by the performance of those against whom they are competing. The exercises vary along several dimensions: the type of tasks individuals are asked to perform, who they compete against, whether or not they do a practice round to assess their own performance before choosing a compensation scheme, and how much the secure piece-rate differs from the tournament piece-rate.

In Niederle and Vesterlund (2007), participants are asked to add up sets of five two-digit numbers, and if they choose to compete, their performance is compared to the "baseline" performance of everybody who participated, including those who chose not to compete. Even though they find no difference between men's and women's performances in the digit summing exercise and each participant received feedback on their individual performance before choosing a payment scheme, 73% of the men chose to compete compared to only 35% of the women.

In a somewhat similar experiment, Gupta et al. (2005) pair up participants, tell them what task they will be asked to perform and who they will be competing against, and then ask each participant to choose a compensation scheme. They also find that men choose to compete more often than women: 60% of the men chose the tournament piece-rate compensation while 66% of the women chose the secure piece-rate. They repeat the experiment increasing the difference between the two compensation rates. This leads to an increase in both men's and women's willingness to compete, but the gap between men's and women's choice to compete remains.

Most of the experimental work on gender differences in willingness to compete found in the economics literature is based on college students in developed countries with two important exemptions. Booth and Nolen (2009) study boys and girls in public single sex and coeducational middle schools. They find that girls in single sex schools are more willing to compete than girls in coeducational schools, suggesting that the gender-based differences in willingness to compete cannot be entirely explained by innate characteristics. Gneezy et al. (2008) compare individuals' competitive behaviors from a patriarchal society (the Maasai in Tanzania) with those in a matrilineal society (the Khasi in India) with a tossing a ball toss game and provide additional support to the notion that observed differences in men's and women's willingness to compete are at least partly attributable to social structures. While among the Maasai, men are almost twice as likely as women

to compete (50% versus 25%), the result is reversed among the Khasi, where women choose to compete more often than men (54% versus 39%).[4]

3. Setting

Vietnam continues to be one of the poorest countries in the region, despite the rapid growth after shifting from a planned economy to a market-based system (*Doi moi* economic reforms of the late 1980s). In this densely populated and mainly agrarian country that ranks 105th out of 177 in the Human Development Index, approximately 20% of its population still lives below the world poverty line. A current emphasis in many development strategies within Vietnam and consistent with the Vietnamese government's Socio-economic Development Plan (SEDP) to reduce rural poverty, are efforts to create employment opportunities via improving market systems and farmers' access to markets and risk management tools.

In support of these market-based objectives, the International Fund for Agricultural Development (IFAD) funded the Program for Improving Market Participation (IMPP), which was implemented in 2007 in the Ha Tinh and Tra Vinh Provinces of Central and Southern Vietnam, respectively. IFAD's strategic framework for 2007–2010, seeks to ensure "that poor rural people have better access to, and the skills and organization they need to take advantage of … transparent and competitive markets for agricultural inputs and produce."[5] Accordingly, the IMPP aims to enhance the income of the rural poor by improving their access to labor, finance, commodities, and service markets.

This study is based on data we gathered with enumerators from the Vietnam Institute for Family and Gender Studies between March and May of 2008 in 17 villages from three communes of Ha Tinh Province: Thach Lac, Tuong Son, and Thach Viet. Median annual household annual income for the respondent group is approximately U.S. $1,200.[6] The sample we use contains 1000 observations from 500 couples where husbands and wives were interviewed separately. The sampling framework was specially designed to include a sufficiently large number of men and women to enable us to obtain robust measures of any gender-based differences that might emerge. Furthermore, because we interviewed the husband and wife in each household, we are able to rely on econometric techniques to account for factors such as illness in the family that we do not observe but are common to both spouses.

The survey included a battery of socio-demographic questions; an exercise to capture the degree of household economic diversification and plans for the future; questions to elicit any unmet

demand for credit or job training, as well as preferences for certain program attributes; questions regarding intrahousehold decision-making; and experiments to gauge a number of attitudes such as willingness to compete, preference for social standing, confidence, and willingness to take risks. A preliminary look at the data suggests that in this region men and women may differ in their attitudes. As reported in Table 1, women are less optimistic about the future than men and, compared to men, women are 10% more likely to worry about low yields due to bad weather and 5% more likely to worry about pests.

4. Eliciting Attitude Toward Risk and Willingness to Compete

To elicit proxies for producers' individual attitude toward risk and willingness to compete, they were presented with five rounds of choices—three related to their willingness to take risks and two to their willingness to compete. In each of the five rounds, interviewees had two options and were asked to select one of them. In an effort to ensure respondents had a clear understanding of the two options they had in each round, we wrote each option on a 3"x5" card, in Vietnamese, using a large font.

4.1. Attitude toward Risk

Interviewees were presented with two hypothetical scenarios that yielded the same expected payoff (VND 10,000, equivalent to approximately 60 U.S. cents, or one day's wage at the time of the study), but differed in their variance:[7]

Round 1

Option 1: You receive VND 10,000 for sure	**Option 2:** You will toss a coin and • If heads: you win VND 20,000 • If tails: you don't receive anything

Risk neutral individuals would be indifferent between the two options. Respondents who chose Option 2 can be classified as more prone to taking risks than those who chose Option 1. In this round, interviewees had nothing to lose, regardless of which option they chose, thus in our results we label this choice "Gains Domain." However, willingness to take risks, choosing a gamble over a sure outcome, can change when the set of possible outcomes includes losses. The second and third rounds consider this by asking respondents to choose between:

Round 2

Option 1: You receive VND 10,000 for sure	**Option 2:** You will toss a coin and • If heads: you win VND 40,000 • If tails: you lose VND 20,000

and between:

Round 3

Option 1: You lose VND 10,000 for sure	**Option 2:** You will toss a coin and • If heads: you win VND 20,000 • If tails: you lose VND 40,000

In each of the three rounds, options 1 and 2 yielded the same expected payoffs, option 1 always represented the certain outcome, and option 2 always involved taking a risk. In each case, we classified respondents who chose option 2 as more willing to take risks than those who chose option 1. In the second round, respondents could win a much larger sum (VND 40,000), but choosing the riskier alternative in the second round entailed a 50% probability of experiencing a loss. In our results, we refer to this experiment as the "Higher Stakes" Round. In the third round, the certain outcome was a loss. Interviewees choosing the gamble in this round had a 50% chance of avoiding the loss, but also a 50% probability of losing four times as much. In our results, we refer to this experiment as the "Losses Domain." In summary, we refer to the indicators of attitude toward risk based on the first, second, and third rounds as individuals' willingness to take risks in the gains domain, under higher stakes, and in the losses domain, respectively.

Preliminary results reported in Table 2 suggest that, in general, respondents were more likely to choose the risky option when they knew the outcome would not entail losses (49% versus 45% or 47%). If the set of possible outcomes included losses, respondents were more likely to choose the gamble to avoid a guaranteed loss than to improve on a certain gain (47% versus 45%). This suggests that, as reported by others in the literature, interviewees' choices are sensitive to how the options are framed. Yet regardless of how the options were presented, in all three rounds women are more averse to risk than men (44% versus 54%, 39% versus 51%, and 44% versus 50%, respectively).

4.2. Willingness to Compete

Our experimental design for these series of questions is based on work done by Gupta et al. (2008), Niederle and Vesterlund (2007) and Gneezy et al. (2003). Interviewees are asked to perform a task

and choose how they want to be compensated for their performance. They can choose a secure piece-rate payment for each time they perform the task correctly, or, they can choose a tournament compensation scheme, whereby the payment they receive is based on how their performance compares to others. This exercise was designed to assess whether or not men and women systematically choose different remuneration incentives, and if they do, to what extent their performance affects their willingness to compete. That is, do they regularly over or under estimate their likelihood of success?

Examples in the literature of tasks used to assess individuals' performance in developed countries include computer mazes, running races, and complicated addition problems. We chose to assess their performance by relying on the digit recall exercise suggested by Djankov et al. (2005) for their work in Russia, Brazil, India, China, and Nigeria. This exercise is easy to explain, it does not require that respondents have sophisticated mathematical skills, and we had no a priori reason to expect men and women to perform differently. More specifically, each respondent was asked to repeat a series of digits of varying lengths. After a practice session respondents engaged in "a game" where the interviewer told them, for example, "I will say six numbers for you, and you, please, repeat them exactly in the same order." The first series was 6-1-4-9-2-7. The second series had nine digits and the third series had five digits they were asked to repeat in reverse order. We assigned respondents a score between 0 and 3 depending on how many of the first three digit-recall series they were able to repeat correctly. Our results, reported in Table 2, indicate no significant difference between men's and women's performances: averaging 1.38 and 1.39 correct answers, respectively.

After the initial three series, respondents were told how many they had recalled correctly. We then told respondents that they would be given six additional series, and we offered them the opportunity "to earn a little money."[8] Their scores would be compared to the scores of 5 other people from the region who had already played the same game. Including the interviewee, the group was comprised of 3 men and 3 women. Before playing the next six rounds, respondents had to choose between:

Option A:	**Option B:**
Earn 1,000 VND for each correct answer	• Earn 3,000 VND for each correct answer **if your score is better than the scores of at least 4 people in the group**. • Nothing otherwise

We classified those who chose Option B as more willing to compete than those who chose Option A. Since respondents were asked to choose between being compensated under a piece-rate or a tournament scheme without receiving information on how well others had performed, the results we label "willingness to compete" include producers' prior self-assessments of their own relative ability. This is, arguably, a reasonable proxy for how individuals may be inclined to behave when faced with prospects, such as a new market-oriented activity, in which they must engage in competition with a number of economic agents for whom they are unlikely to have complete information.

Despite their almost identical performance on the first three digit recall series, the figures reported in Table 2 indicate that, on average, men are noticeably more likely than women to compete: 49% of the men compared to 37% of the women. Comparing their individual performances to the performance of the group we can gauge each producer's likelihood of succeeding in the competition. Producers who scored more(less) than two correct answers in the initial three rounds had a high(low) probability of succeeding. Similarly, if they scored more(less) than five correct answers out of all nine rounds, they had a high(low) overall probability of succeeding. Table 3 allows us to see how their choice to compete varied with their probability of succeeding. These results, consistent with Niederle and Vesterlund (2007), suggest that a substantial proportion of the men who are unlikely to succeed will nonetheless choose competitive situations over more secure but lower paying opportunities, and that a large proportion of women who are likely to succeed in competitive situations will choose to forego higher returns for guaranteed remuneration.

Once they finished the exercise, but before they were told their score or learned the score of the group against which they were competing, interviewees were asked to consider the same game and report which of the two options they would have chosen if instead of competing against a mixed group they were told the group consisted of 5 women. The bottom row of Table 2 indicates that both men and women were approximately 5% more likely to choose the tournament rate when they were competing against a group comprised entirely of women.

The preliminary results described above suggest that among rural producers in central Vietnam, risk aversion and willingness to compete may differ by gender. However, a more systematic and rigorous assessment of the existence and magnitude of this gender-gap in preferences requires a multivariate analysis, which we describe in the next section. We explain the econometric framework we use in Section 5 and discuss our findings in Section 6.

5. Model Specification and Estimation Strategy

For each of the behavioral attitudes described, namely the three indicators of individuals' willingness to take risks (in the gains domain, under higher stakes, and in the losses domain) and the two indicators of their willingness to compete (against a mixed group and against women), we can estimate the following Probit model:

$$\Pr(A_j = 1) \ = \ \alpha + \beta_j FEMALE_j + \delta X_j + \gamma V_j + \varepsilon_j \tag{1}$$

where our dependent variable A_j is one of these five behavioral attributes for individual j; $FEMALE_j$ takes the value of 1 if the jth individual is a woman and 0 otherwise; X_j is a vector of individual and household level characteristics that can impact individuals' willingness or ability to take risks or compete; and V_j controls for village-specific effects such as distance and access to markets, soil quality, and agroclimatic conditions.

As discussed earlier, however, the 1000 observations in our sample correspond to 500 couples, one observation for the husband and one for the wife. By exploiting this sample design, we can improve our estimates, controlling for unobserved household-level characteristics, such as illness in the family, that can affect both husbands' and wives' attitudes but are not explicitly included in the model. To account for household-level unobserved effects that might affect individuals' attitudes, we modify our model and estimate instead the following random effects Probit model:

$$\Pr(A_h^t = 1) \ = \ \alpha + \beta \, FEMALE_h^t + \delta X_h^t + \gamma V_h^t + \mu_h + \varepsilon_h^t \tag{2}$$

where t equals 1 for observations that correspond to a woman and 0 otherwise; A_h^1 and A_h^0 are behavioral attributes for the woman and man in household h; the explanatory variables are defined as above and the error term now has two components: μ_h is the random effect that is drawn from a household-specific mean-zero normal distribution and ε_h^t, which is a normally distributed, mean-zero error term independently and identically distributed across households and gender.

The definition and descriptive statistics of the individual and household level characteristics included as explanatory variables are reported in Table 4. One would expect an individual's willingness to take risks to be influenced by their perceptions of their fallback position were undesirable outcomes to materialize. As a proxy for their fallback position, we have included their education, their age, the number of dependents (children under 18) in the household, the amount of land they own, and, arguably, their gender. Other things equal, we would expect individuals to be more willing to select the riskier option when they are more educated, they own more land, or have

fewer dependents. Ex-ante, the impact of age is less obvious; people who are older might be more or less prone to take risks.

An individual's willingness to engage in the competition is bound to be influenced by their performance in the digit recall exercise as well as by their perceptions of the chances they can outperform their competitors. To measure their performance in the digit recall exercise we considered their results for all 9 rounds and calculated the percentage of correct responses. As before, we observe no significant difference between men's and women's performances: the average man had 43% correct responses, while the average woman had 44%.

The interviewees did not know who they were competing against, nor did they have information on how their performance compared to that of others. As a result, their assessment of their relative position must have been based on their perceptions of how they rank in their communities more generally. To capture characteristics that can influence these perceptions, we rely on their level of education, their age, the number of dependents in the household (kids under 18), and their relative wealth as proxied by a standardized measure of the amount of land they own. We anticipate that producers' choice to compete will be positively correlated with their performance in the digit recall exercise, their education, and their relative wealth. A priori, it is hard to predict whether people who are older or have fewer dependents will be more or less likely to choose to compete than those who are younger or have more dependents for whom to care.

6. **Do Rural Vietnamese Men and Women Differ in Their Preferences?**

6.1. Attitudes Toward Risk

The left panel of Table 5 summarizes our findings regarding the factors that can help predict whether or not individuals are willing to take a risk. The first column corresponds to their willingness to take a risk when they have nothing to lose (Gains Domain). The second column is based on their choice when the stakes are higher and the probability of losing by choosing the risky option is 50% (High Stakes). Finally, the third column refers to their willingness to take a risk when the guaranteed outcome is a loss that can be avoided or made worse by choosing the gamble (Losses Domain). The results reported are the marginal effects for an average producer—a producer who is 38 to 41 years old, has nine years of education, owns 3,500 square meters of land, and has two kids under 18 living at home—and take into account that the error terms of husbands and wives might be correlated (i.e., they are calculated by estimating the random effects model described in Equation 2).

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Our findings indicate that gender matters regardless of how the risk is framed. The average rural producer in central Vietnam is between 6% and 13% less likely to choose the gamble if she is a woman. Education appears to have a significant, if small, impact on their willingness to take risks: a producer with an additional year of education is 1–2% more likely to select the gamble. When we consider only the rounds in which the set of possible outcomes included losses (second and third columns), the likelihood that producers will choose to take the risk goes up when they own more land, but they are more averse to risk the larger the number of dependents (kids under 18) for whom they are responsible.

The random effects model makes fuller use of the information available in the data; more concretely, it allows us to identify a gender invariant and household specific component of the error variance.[9] We find that in the first two regressions, this household specific component accounts for 15% and 29% of overall variance, respectively. Consistent with this, the results of a likelihood ratio test comparing the random effects versus pooled model (Equation 2 versus Equation 1) suggests that the random effects model is preferred. This is not the case for the third regression, where the random effects model fails to improve over the pooled model and thus the results reported are those of the basic pooled probit model specified in Equation 1. In other words, in the case of gambles over gains, including a household specific component—perhaps capturing illness, a past economic shock, or household dynamics—helps to explain variation across responses, whereas in the case of gambles over losses, where individual gender differences are less pronounced, it does not.

Finally, the models predict that an average producer will choose to take the gamble in the gains domain 49% of the time and will take a risk to try to avoid a sure loss 47% of the time, but will only opt for the higher stakes gamble in which he has a 50% chance of incurring a loss 44% of the time. The models' predictions are correct in 58% to 69% of the cases.

6.2. Willingness to Compete

We estimated the model described in Equation 2 for the two indicators of producers' willingness to compete, namely their willingness to compete against a mixed group and their willingness to compete against a group of women. Our results are reported in the left panel of Table 6, as each variable's marginal effect on the probability that an average producer will choose to compete. These figures consider the possible correlation between the error terms of husbands and wives.

Once again, our results suggest that men and women systematically differ in their behavior. The gap is considerable and highly significant: an average producer in Central Vietnam is about 13%

less likely to choose to compete if she is a woman. This difference matters because it can lead women to systematically forego economic opportunities that can offer higher returns but require engaging in competitive behavior.

A producer's choice to compete is not random: our results suggest that education and performance in the digit recall exercise are positively and strongly associated with choosing to compete. For the average producer, an extra year of education is associated with a 1% increase in the probability that he or she will compete. Similarly, that same producer is 4% more likely to compete if he or she scores one more correct response, or equivalently if their score increases by 11%.

These patterns appear to be similar when producers are faced with the option of competing against a women-only group instead of a mixed group. Gender, performance in the digit recall exercise, and education are the factors that help predict whether or not producers will choose to compete. These marginal effects have the same sign as before, but the impact of education and performance is noticeably higher. When the option is to compete against women, an additional year of education increases the probability that the average producer will choose to compete by 3% and one more correct answer in the digit recall exercise is associated with a 6% increase in the chances that he or she will compete.

Finally, our results using the random effects model indicate that having observations for husbands and wives in our sample yields better predictions of whether they would compete against a mixed group: the household specific component of the error variance accounts for 13% of overall variance. It does not, however, improve our predictions of whether or not they would compete against a women-only group.

According to our results, the probability that the average producer will choose to compete against a mixed group is 0.42. And the probability increases to 0.48 when the competition is only against women. The two models discussed in this section are accurate in their predictions for 61% of the cases.

The findings discussed in the previous two sections provide robust empirical evidence that among these producers in central Vietnam, women are systematically more risk averse and less willing to compete than men of equivalent socioeconomic demographics. These differences are likely important to the design of development programs in the region, especially the suite of programs intended to decrease poverty by promoting the adoption of market-oriented activities including job training and credit initiatives targeted at activities further up the agricultural supply

chain. Targeting women in this region may be more effective by acknowledging these gender-based gaps and addressing those differences throughout the programs' design. To help inform which approaches might be more likely to succeed, the analysis that follows splits the sample by gender and allows for gender-specific patterns that might explain men's and women's willingness to take risks or compete.

6.3. Do the Patterns Explaining Behavioral Attitudes Differ by Gender?
The results reported in the center and right panels of Tables 5 and 6 were obtained by estimating the model described in Equation 1, without a dummy variable for gender, on the sample of 500 men and 500 women, respectively.[10]

Our models predict that the average woman is between 38% and 44% likely to choose the gamble depending on how it is framed (first row of Table 5). By comparison, the average man is expected to prefer to take the risk between 50% and 54% of the time. The gap between the two is wider under the high stakes frame, where women are noticeably more risk averse. The figures reveal that women's willingness to take risk is significantly related to their education, with an additional year of education raising the probability that an average woman will choose the gamble by 2– 3%. Interestingly, we find no statistically significant association between men's level of education and whether or not they choose to take risks. Conversely, the amount of land owned by the household seems to enable men to take the higher stakes gambles that come with a 50% chance of yielding a loss, but has no effect on women's risk choices. Finally, other things equal, the more dependents in her household, the less likely a woman is to risk a sure gain for a gamble that might lead to a loss. For men, an increasing number of dependents has a similar effect in the high stakes gamble; decreasing the probability of them taking gambles to avoid a potentially large loss.

The results in Table 6 indicate that the probability an average male producer in this region will choose to compete is 0.49 when competing against a mixed group, or 0.53 if the group is only made up of women. The equivalent figures for an average female producer are noticeably lower but follow a similar pattern: 0.37 if the group is mixed, 0.43 if it is a women-only group. Producers' overall performance in the digit recall exercise is a strong predictor for whether or not they will choose to compete. This is the case for both men and women, regardless of whether they are competing against a mixed group or only against women. Men and women do differ, however, in the magnitude of their response to an improvement in their performance. Other things equal, when his performance improves by one response, the chances that an average man will choose to compete

are 6% higher. It is important to note, however, that women's response to better performance has a noticeably smaller impact on whether or not she chooses to compete against a mixed group (3%), but a large impact on whether she competes against a women-only group (6%). More educated women are more likely compete: the probability that the average woman will choose to compete goes up by 3–4% with an additional year of education. Age makes a difference in women's decisions to compete: older women are less likely to choose to compete against a group that includes men. Our results suggest that men's choices to compete, however, do not vary with age and their education is relevant only when the option is to compete against women.

Finally, individuals' attitude toward risk and their willingness to compete can be correlated and are likely to be influenced by similar characteristics. Thus to assess how risk aversion might impact their choice to compete, we also estimated a bivariate probit model:

$$
\begin{cases}
\Pr(A_j^C = 1) &= \alpha^C + \delta^C X_j^C + \gamma^C V_j^C + \varepsilon_j^C \\
\Pr(A_j^R = 1) &= \alpha^R + \delta^R X_j^R + \gamma^R V_j^R + \varepsilon_j^R
\end{cases}
\tag{3}
$$

where the set of independent variables are as before, the first equation corresponds to their willingness to compete and the second to their willingness to take risks, and the disturbances ε_j^C and ε_j^R have a standard bivariate normal distribution with an unknown correlation ρ to allow for unobserved factors that might affect both behavioral attributes.

As reported in Table 7, the probability of men or women competing varies with their attitude towards risk. Notice, for instance, that if an average woman is risk averse, the probability that she will choose to compete against a mixed group is only 30%. Contrast this with the 58% chance that an average man will be willing to compete if he is a risk taker. This difference is important given that, as our previous results indicate, compared to male peers of equivalent demographics, women are more averse to risk. In other words, some of the gender-differentiated willingness to compete that we find among rural producers in central Vietnam can be related to differences in their risk attitudes.

7. Conclusions and Policy Recommendation

Our results indicate that among rural producers in central Vietnam, women are on average more risk averse and less willing to compete than men. The indicators of attitudes toward risk we use are based on three rounds of experiments to assess respondents' willingness to take risks when they are framed in the gains domain or in the losses domains, and when the stakes are higher. To assess

producers' competitive behavior we rely on a digit recall exercise and analyze their willingness to compete against a mixed group, unknown to them, or against a group of women.

To obtain rigorous measures of the depth of these gender-based differences in behavioral attributes, as well as to identify the, possibly gender-specific, patterns that shape them, we control for respondents' human capital and wealth, and employ random-effects and bivariate probit models to account for unobserved individual, household, and commune level unobserved characteristics that might be of relevance. Our results are consistent with findings in the literature that largely refer to college age students and are overwhelmingly based in developed country settings (Croson and Gneezy, 2008).

The findings we present have important implications for policy makers and development agencies concerned with lifting women out of poverty and puzzled by their inability to increase women's participation rates in their activities (IFAD, 2008). A number of empirical studies, albeit based on male farmers, have demonstrated that individuals who are risk averse are more likely to be rationed out of the credit markets, refraining from borrowing if collateral requirements imply that they bear too much risk (Boucher et al, 2008) and suffering losses of up to 27% of their profits (Fletschner et al, 2009); that they are less likely to adopt new technologies (Liu, 2008); and, that they may choose economic alternatives that offer lower but more stable returns (Dercon, 2006).

If women are systematically less prone to take risks or to compete we would expect that, compared to men of equivalent socio-economic conditions, they will be more likely to opt out of a wide range of economic opportunities that are expected to yield higher returns but require them to be entrepreneurial, specialize in one or two sectors, take out loans, make relatively large investments of capital, and become more vulnerable to changes in prices or climatic conditions. At an aggregate level, their choices may have a multiplier effect. If a sufficiently large number of women choose not to take up these opportunities, other women might have to follow in settings where the social penalty for deviating from the norm is high (Fletschner and Carter, 2008). In addition, this will likely reinforce views often held by staff from rural banks and agricultural agencies who tend to overlook women as producers worthy of receiving loans, quality inputs, timely information, or training.

Development programs that target women typically focus on traditional constraints, such as limited access to land, credit, fertilizers, and technical assistance, that can disproportionately hamper women's ability to participate in economic activities yielding higher expected returns. While those constraints are undoubtedly important, our work suggests that for any of these interventions to be effective programs should be mindful of how women's preferences tend to differ from men's.

Our results ought to not be interpreted as an endorsement for programs that promote gender-specific economic enterprises or activities thereby reinforcing segregation patterns that have often relegated women to more traditional activities with noticeably lower returns. Instead, we hope these findings will be taken as robust empirical evidence that it is important to acknowledge and address these differences in the program design. This can be accomplished by targeting women with education programs, with workshops that improve their negotiating skills as well as their confidence, and with safety nets or insurance tools that enable them to feel more comfortable taking risks or engaging in competition.

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TABLES

Table 1. Attitude and Concerns

	Men	Women
Optimistic about the future***	81.7%	75.5%
Worry about health problems	16.4%	19.3%
Worry about low yields because of weather***	63.5%	74.0%
Worry about pests**	24.6%	29.8%
Worry about livestock disease	28.3%	29.7%
Worry about low output prices	15.0%	12.7%

Note: double (**), and triple (***) asterisks indicate that the figures reported for men and women are different at the 95% and 99% confidence level, respectively.

Table 2. Behavioral Attributes

	All	Men	Women
Willingness to Take Risks			
Gains Domain***	49.0%	53.8%	44.2%
Higher Stakes***	44.8%	50.8%	38.8%
Losses Domain**	47.1%	50.2%	44.0%
Average Recall Ability			
Performance in Initial 3 Rounds (# Correct)	1.38	1.37	1.39
Performance in Next 6 Rounds (# Correct)	2.55	2.52	2.58
Overall Performance (% Correct in 9 Rounds)	43.7	43.2	44.2
Willingness to Compete			
Against Mixed Group***	42.9%	48.6%	37.2%
Against Women***	48.2%	53.2%	43.2%

Note: double (**), and triple (***) asterisks indicate that the figures reported for men and women are different at the 95% and 99% confidence level, respectively.

Table 3. Willingess to Compete and Likelihood of Succeeding

	Chose to Compete Against Mixed Group			Chose to Compete Against Women		
	All	Men	Women	All	Men	Women
Initial Performance (First 3 Rounds)*						
Low Probability of Succeeding	37.8%	43.8%	31.9%	43.6%	48.6%	38.5%
Medium Probability of Succeeding	45.6%	51.9%	39.1%	50.9%	56.1%	45.7%
High Probability of Succeeding	79.2%	80.0%	78.6%	79.2%	84.0%	75.0%
Overall Performance (All 9 Rounds)						
Low Probability of Succeeding	37.1%	41.9%	31.9%	40.3%	46.4%	33.7%
Medium Probability of Succeeding	51.0%	58.0%	45.0%	53.7%	62.3%	46.3%
High Probability of Succeeding	51.6%	60.2%	43.7%	63.2%	65.0%	61.5%

Note: Respondents with a high(low) probability of succeeding based on the initial 3 rounds are those who scored more(less) than 2 correct answers. Similarly, they have a high(low) overall probability of succeeding if they scored more(less) than 5 correct answers out of 9.

Table 4. Independent Variables. Definition and Descriptive Statistics.

	Definition	Mean	St.Dev.
Woman	Dummy variable that takes the value of 1 if the observation corresponds to a woman.	0.500	0.500
Performance Digit Recall	% of correct answers in the 9 rounds of the digit recall exercise.	43.711	22.863
Education	Years of education.	8.554	2.723
Age	Years of age.	39.237	7.053
Kids Under 18	Number of children under 18 in the household.	2.148	1.186
Land Owned	Agricultural land owned by the family (with red book), in thousands of square meters.	3.581	2.075
Standardized Land Owned	Standardized value of the land owned by the family.	0.000	1.000
Commune 2	Dummy variable that takes the value of 1 if the household is in the Tuong Son Commune.	0.332	0.471
Commune 3	Dummy variable that takes the value of 1 if the household is in the Thach Viet Commune.	0.332	0.471

Note: Men have an average of 8.60 years of education and women have an average of 8.51 years. The average age is 40.72 for men and 37.76 for women.

Table 5. Probability of Taking the Risky Option. Marginal Effects at Mean of Regressors.

	All			Men			Women		
	Gains Domain	Higher Stakes	Losses Domain	Gains Domain	Higher Stakes	Losses Domain	Gains Domain	Higher Stakes	Losses Domain
Probability Of Taking Risky Option	0.489	0.435	0.469	0.539	0.508	0.502	0.438	0.382	0.437
Woman	-0.109***	-0.130***	-0.061**						
Education	0.017**	0.010	0.013**	0.011	0.003	0.006	0.023**	0.016 *	0.027 ***
Age	-0.003	-0.002	-0.002	-0.003	0.000	-0.002	-0.003	-0.004	-0.003
Kids Under 18	-0.013	-0.030**	-0.037***	0.007	-0.008	-0.050***	-0.033	-0.052 ***	-0.033
Land Owned	0.010	0.022**	0.014*	0.011	0.030**	0.018	0.008	0.015	0.014
Commune 2	-0.059	-0.075*	-0.085**	-0.091	-0.116**	-0.139***	-0.027	-0.028	-0.050
Commune 3	0.123***	0.043	-0.004	0.063	0.003	-0.011	0.182***	0.080	0.002
Constant	0.007	0.006	0.042	0.029	-0.056	0.141	-0.144	-0.070	-0.156
Rho	0.149**	0.287***	0.000						
Log Likelihood	-662.058	-661.693	-669.942	-337.851	-338.397	-336.117	-322.883	-320.026	-332.125
Correct Predictions	60%	58%	59%	57%	55%	59%	63%	61%	60%

Note: single (*), double (**), and triple (***) asterisks represent the 10%, 5%, and 1% levels of significance, respectively.

Table 6. Probability of Choosing to Compete. Marginal Effects at Mean of Regressors.

	All		Men		Women	
	Against Mixed Group	Against Women	Against Mixed Group	Against Women	Against Mixed Group	Against Women
Probability Of Choosing To Compete	0.421	0.480	0.485	0.534	0.367	0.426
Woman	-0.125***	-0.120***				
Performance Digit Recall	0.004***	0.005***	0.005***	0.005***	0.003***	0.005***
Education	0.013**	0.027***	0.002	0.019**	0.026***	0.036***
Age	-0.002	-0.004	0.002	-0.004	-0.006*	-0.004
Kids Under 18	0.002	0.000	0.003	0.001	0.002	0.001
Standardized Land Owned	0.021	0.013	0.003	0.000	0.038	0.026
Commune 2	-0.033	0.014	-0.056	0.008	-0.003	0.022
Commune 3	-0.055	-0.021	-0.017	-0.008	-0.086	-0.038
Constant	-0.180	-0.250*	-0.310*	-0.186	-0.230	-0.452***
Rho	0.131*	0.074				
Log Likelihood	-654.944	-648.554	-334.224	-331.238	-318.237	-315.678
Correct Predictions	61%	62%	58%	59%	59%	62%

Note: single (*), double (**), and triple (***) asterisks represent the 10%, 5%, and 1% levels of significance, respectively.

Table 7. Probability of Choosing to Compete Conditional on Risk Attitude in the Gains Domain.

	Men		Women	
	Against Mixed Group	Against Women	Against Mixed Group	Against Women
Risk Taker	0.580	0.626	0.455	0.566
Risk Averse	0.373	0.424	0.297	0.318

[2] We use the term "behavioral attributes" to refer to the innate attitudes of individuals, layered with social influences, that underlie choice as measured in our experiment (Ben-Akiva et al., 1999).

[3] While extensive, this literature may suffer from systematic biases since, as pointed out by an anonymous referee, significant differences are more likely to get discussed and published.

[4] This is by no means meant to negate the existence of biological conditions that can intensify or weaken individuals' willingness to compete. For interesting work on the effect of hormones, see Chen et al. (2005), Bateup et al. (2002), and Manning and Taylor (2001).

[5] From http://www.ifad.org/sf, December 12th, 2008.

[6] Annual household income in millions of VND, as reported by producers, had a mean of 23.7, a median of 19.5, a standard deviation of 18.2, and ranged from 1.8 to 250. The exchange rate at the time was 16,084 VND to the dollar, and the corresponding income figures in USD are 1,474, 1,272, 1,132, and 112 to 15,543.

[7] Besides the hypothetical experiments described in this subsection, our initial survey included a round where the gamble was "for real," in which we paid people according to the option they chose (and the result of a coin flip). However, commune leaders asked that we abstain from implementing this round in the final two communes because it went against their long-term efforts to curve gambling in the region. In the first commune, choices in the hypothetical and real gamble were identical in 92% of the cases. When making choices involving real payoffs, 3% switched to the riskier option while 5% switched to the option with a certain and known outcome. The stability of their choices suggests that producers' choices are largely unaffected by the hypothetical nature of the exercise or their understanding of it. Furthermore, the figures are very similar when we disaggregate the sample by sex: 3% of the men and 4% of the women switched to the riskier option and 5% in each of the two groups switched to the option with the fixed payoff.

[8] Remuneration for this game was up to 18,000 VND.

[9] The short dimension of our panel (only two observations per household) would lead to inconsistent parameter estimates under a fixed effects model. This leaves a choice between a random effects versus a pooled Probit model.

[10] Our results are based on dual-headed households. This raises two possible concerns. First, are women in the sample representative of those without partners? And, second, can we rule out that some of the differences we find in men's and women's behavioral attributes are simply a result of spouses' responses to gendered social norms by which husbands are expected to assume the role of risk takers while wives are expected to be more cautious. We address both concerns by relying on data from women in female headed households whom we had surveyed as part of a larger project. Women in this group are single, divorced, widowed, or have husbands who have migrated and are not around for day-to-day decisions. Using multivariate analysis we find no significant evidence that women's attitudes toward risk are systematically different when they are in dual-headed households than when they are not.