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, irrespectively of how likely they are to succeed. Our findings suggest that women are more likely to self-select into economic activities with lower expected returns to avoid setups that require them to be more competitive or have less predictable outcomes and that development programs concerned with lifting women out of poverty should consider these differences.

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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 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. Behavioral attributes can shape the set of economic options individuals are willing to consider.[2] Other things equal, producers who are more risk averse prefer to forego opportunities that offer higher expected returns but expose them to greater uninsured risk, for more secure, albeit less profitable, economic alternatives. Similarly, economic agents who are less inclined to choose to compete may find themselves involved in economic activities with consistently lower returns.

   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 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 risk 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.

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 context of the decisions, but women are consistently less likely to take risk. In almost half of the cases they analyzed, men were at least 20% more prone to take risks than women. Furthermore, 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 pairs of lotteries 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 their contributions to plan assets (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 are outperformed. Under the secure piece-rate payment, the participant's return is based only on their own performance. Under the tournament piece-rate, however, 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 away 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 tennis ball into a bucket game and provide additional support to the notion that observed differences in men's and women's willingness to

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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%).[3]

3. **Setting**

Vietnam continues to be one of the poorest countries in the region, despite the rapid growth that stemmed from 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 according to 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 the markets and risk management tools.

In support, 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."[4] 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 in 17 villages from three communes of Ha Tinh Province: Thach Lac, Tuong Son, and Thach Viet, between March and May of 2008. Median annual household annual income for the respondent group is approximately U.S. $1,200.[5] 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 preference 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 interviewees' individual attitude toward risk and willingness to compete, respondents 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:[6]

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 outcomes 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 those of 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 include computer mazes, running races, and complicated addition problems. We chose to assess their performance using a digit recall exercise suggested by Djankov et al. (2005) that seemed better suited for rural Vietnam. 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 3, 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."[7] Their scores would be compared to the score 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. Despite their almost identical performance on the first three digit recall series, the figures reported in Table 4 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 5 allows us to see how their choice to compete varied with their probability of succeeding. The figures indicate that men, on average, overestimated their likelihood of winning, and women underestimated it. 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 were finished with 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 4 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 multivariate analysis, which we describe in the next section. We describe 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 6. While an individual's behavior responds to innate characteristics, one would expect their willingness to take risks to be also shaped by their perceptions of their fallback position were the case the least desirable outcome 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.

Similarly, an individual's willingness to engage in the competition is bound to be affected by their biological predisposition, but also 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 differences 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

Table 7 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 cannot lose (Gains Domain). The second column is based on their choice when the stakes were higher and the probability of losing by choosing the risky option was 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 is38 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., the random effects model described in Equation 2).

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. This is important because, as has been described in the literature, producers with a higher degree of risk aversion are more likely to find themselves constrained in the credit market (Boucher et al., 2009 and 2008) and as a result might use the resources they do have less efficiently (Fletschner et al., 2009) or stay away from expected-income enhancing opportunities (Dercon, 2006).

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.[8] We find that in the first two models, 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 model, 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, arguably, a reasonable fit given that our model does not account for biological differences that can also influence individuals' willingness to take risks.

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 Table 8, 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.

Producers' choice to compete is not random: our results suggest that both their education, as well as their performance in the digit recall exercise, are positively and strongly associated with whether or not they choose 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 performances 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. As was the case with the models predicting risk behavior, biological characteristics are likely to account for some of the unexplained differences.

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 important and should inform 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. More specifically, effective targeting of women in this region must acknowledge these gender-based gaps and address 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 Tables 9 and 10 and discussed below 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.

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 9). By comparison, the average man is expected to prefer to take the risk between 50% and 54% of the times. 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 behavior. 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 sobering effect in the high stakes gamble; decreasing the probability of them taking gambles to avoid a loss if by taking this risk they can suffer a much larger loss.

The results in Table 10 indicate the probability that 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 larger 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 decision to compete: older women are less likely to choose to compete against a group that includes men. Our results suggest that men's choice to compete, however, does 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 their aversion to risk 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 11, 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%

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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 attributed 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 used 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 village 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).

Our findings suggest that rural women in Vietnam are more likely to self-select into economic activities with lower expected returns to avoid setups that require them to be more competitive or have outcomes that are less predictable. Development programs concerned with lifting women out of poverty 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 these 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. More generally, programs should provide clear, public information regarding the costs, benefits, and transactions required to participate.

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Table 1. Willingness to Take Risks

	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. Willingness to Take Risks

	All	Men	Women
Gains Domain***	49.0%	53.8%	44.2%
Higher Stakes***	44.8%	50.8%	38.8%
Losses Domain**	47.1%	50.2%	44.0%

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. Average Recall Ability

	All	Men	Women
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

Note: there is no statistically significant difference between the figures reported for men and women at the 90% confidence level.

Table 4. Willingness to Compete

	All	Men	Women
Against Mixed Group	42.9%	48.6%	37.2%
Against Women	48.2%	53.2%	43.2%

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

Table 5. 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 6. 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 7. Probability of Taking the Risky Option. Marginal Effects at Mean of Regressors.

	Gains Domain	Higher Stakes	Losses Domain
Probability Of Taking Risky Option	0.489	0.435	0.469
Woman	-0.109***	-0.130***	-0.061**
Education	0.017**	0.010	0.013**
Age	-0.003	-0.002	-0.002
Kids Under 18	-0.013	-0.030**	-0.037***
Land Owned	0.010	0.022**	0.014*
Commune 2	-0.059	-0.075*	-0.085**
Commune 3	0.123***	0.043	-0.004
Constant	0.007	0.006	0.042
Rho	0.149**	0.287***	0.000
Log Likelihood	-662.058	-661.693	-669.942
Correct Predictions	60%	58%	69%

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

Table 8. Probability of Choosing to Compete. Marginal Effects at Mean of Regressors.

	Against Mixed Group	Against Women
Probability Of Choosing To Compete	0.421	0.480
Woman	-0.125***	-0.120***
Performance Digit Recall	0.004***	0.005***
Education	0.013**	0.027***
Age	-0.002	-0.004
Kids Under 18	0.002	0.000
Standardized Land Owned	0.021	0.013
Commune 2	-0.033	0.014
Commune 3	-0.055	-0.021
Constant	-0.180	-0.250*
Rho	0.131*	0.074
Log Likelihood	-654.944	-648.554
Correct Predictions	61%	61%

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

Table 9. Gender-Differentiated Probability of Taking the Risky Option. Marginal Effects at Mean of Regressors.

	Men			Women		
	Gains Domain	Higher Stakes	Losses Domain	Gains Domain	Higher Stakes	Losses Domain
Probability Of Taking Risky Option	0.539	0.508	0.502	0.438	0.382	0.437
Education	0.011	0.003	0.006	0.023**	0.016 *	0.027 ***
Age	-0.003	0.000	-0.002	-0.003	-0.004	-0.003
Kids Under 18	0.007	-0.008	-0.050***	-0.033	-0.052 ***	-0.033
Land Owned	0.011	0.030**	0.018	0.008	0.015	0.014
Commune 2	-0.091	-0.116**	-0.139***	-0.027	-0.028	-0.050
Commune 3	0.063	0.003	-0.011	0.182***	0.080	0.002
Constant	0.029	-0.056	0.141	-0.144	-0.070	-0.156
Log Likelihood	-337.851	-338.397	-336.117	-322.883	-320.026	-332.125
Correct Predictions	57%	55%	59%	63%	61%	60%

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

Table 10. Gender-Differentiated Probability of Choosing to Compete. Marginal Effects at Mean of Regressors.

	Men		Women	
	Against Mixed Group	Against Women	Against Mixed Group	Against Women
Probability Of Choosing To Compete	0.485	0.534	0.367	0.426
Performance Digit Recall	0.005***	0.005***	0.003***	0.005***
Education	0.002	0.019**	0.026***	0.036***
Age	0.002	-0.004	-0.006*	-0.004
Kids Under 18	0.003	0.001	0.002	0.001
Standardized Land Owned	0.003	0.000	0.038	0.026
Commune 2	-0.056	0.008	-0.003	0.022
Commune 3	-0.017	-0.008	-0.086	-0.038
Constant	-0.310*	-0.186	-0.230	-0.452***
Log Likelihood	-334.224	-331.238	-318.237	-315.678
Correct Predictions	58%	59%	59%	62%

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

Table 11. 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] 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).

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

[5] Annual household income in millions of VND, as reported by participants, 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.

[6] 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 91% of the cases.

[7] Remuneration for this game was up to 18,000 VND, more than the median daily income for this group.

[8] 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.