Informal Insurance and Moral Hazard:

Gambling and Remittances in Thailand

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ABSTRACT

More than 35% of Thai households either give or receive remittances, and remittances account for about one-third of the income of the receiving households. Remittances may be an important source of protection against adverse events for the receiving household. This paper provides evidence that remittances behave in a way that is consistent with insurance: they are sensitive to shocks to regional rainfall and they respond to household level events. The paper goes on to examine whether there is evidence of moral hazard in the informal insurance contracts that link households who send and receive remittances. Specifically, we examine how the quality of insurance that is offered through remittances affects the probability and the amount of gambling done by households that either send or receive remittances. The evidence is consistent with moral hazard: households who remit are more likely to gamble and gamble more the higher the potential quality of insurance between the sending and the receiving province. Alternatively, the results can be interpreted to indicate that households who are more insured shift their portfolios toward riskier investments. These findings, together with the fact that remitters are much more likely to gamble than non-remitters, suggest that the remittance contract may induce risk taking behavior. This is consistent with remittances that have the characteristics of debt contracts and suggests that remittances are used to repay parents for the investments they made in their children.

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1. INTRODUCTION

More than 35% of Thai households either give or receive remittances, and remittances account for one-third of the income of the receiving households. Remittances may be an important source of protection against adverse events for the receiving household. This paper provides evidence that remittances behave in a way that is largely consistent with insurance: they are sensitive to shocks to regional rainfall and they also respond to the circumstances of the sending and receiving households. The paper goes on to examine whether there is evidence of moral hazard in the informal insurance contracts that link households who send and receive remittances. Specifically, we examine how the quality of insurance that is offered through remittances affects the probability and the amount of gambling done by households that either send or receive remittances.

Interpreting the results depends on the nature of the informal insurance contract between the sending and the receiving household. Moral hazard considerations may be incorporated into the informal insurance contracts directly. For example, the extended family may only provide insurance for publicly observable shocks like rainfall in order to overcome problems of moral hazard. In this case a finding that households are more likely to gamble when they have higher quality insurance is *not* evidence of moral hazard. Instead, it indicates that households with more insurance are more willing to take on risk. Alternatively, if the informal insurance contract provides for complete risk sharing, then gambling risks and rewards will be insured according to the contract and increased gambling as a function of the quality of insurance *is* evidence of moral hazard. [1] We can study the provisions of the implicit insurance contract between the sending and

[1] Automobile insurance may provide a useful analogy. If I am less likely to wear my seatbelt the more automobile

the receiving households by looking at remittances.

The most common type of gambling in Thailand is playing the government lottery or playing a related, but unofficial numbers game. Every two weeks approximately 27 million government lottery tickets are sold for 40 baht a piece which yield gross annual revenues to the government of approximately $648 million.[2] More than 40% of households surveyed in the 1988 Thai Socio-Economic Survey (SES) report positive expenditures on gambling in the month before the survey.[3] Gambling accounts for approximately 4% of total monthly expenditures among households with positive gambling expenditures. Both the government lottery and the related unofficial lottery are unfair bets. Buying a government lottery ticket lowers your expected income and increases its variance.

The quality of insurance that is available through remittances is captured by the correlation pattern of annual shocks to provincial rainfall and gdp. The lower the correlation between shocks to the sending and the receiving household, the more likely the sending household is to be in a position to help the receiving household in stressful times. Consider the case of two households who live in provinces with perfectly negatively correlated rainfall. Suppose each household has income of 100 half the time and zero income the other half of the time. Because the income shocks to each household are perfectly negatively correlated, one

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insurance I have, that is evidence of moral hazard. On the other hand, if I am more likely to go sky diving the more car insurance I have, this is not evidence of moral hazard. If auto and accidental death insurance were bundled into one policy, then going sky diving more often would be moral hazard.

[2] The government sells the lottery tickets to middlemen for 40 baht each. The retail price of the ticket is 45 baht. Unlike many U.S. lotteries, the Thai lottery offers fixed prizes. Potential winnings are independent of how many tickets are sold.

[3] By comparison, about 70% of households reported positive lottery expenditures in the two weeks prior to a survey conducted in the United Kingdom (King, 1997). Evidence from Dutch households suggests that 36% of households play the lottery each month (Wärneryd, 1996).

household will always have income of 100 while the other household has zero income. If the household with high income sends half of it to the other household then they will both be perfectly insured: every period their post-remittance income will be 50. So long as income shocks to the two provinces are not perfectly correlated, the two households will be able to partially insure themselves via remittances.

It is important to note that any number of things could motivate remittances and still provide insurance. Even if remittances have a strategic or contractual component, to insure future inheritances or to repay parents for educational investments, for example, they can still have an important insurance component. So long as the timing and the amount of payments are sensitive to shocks faced by the remitting and the receiving household, they will help the extended family smooth consumption. Many informal contracts in developing countries appear to provide insurance together with other services. Ligon (1993) finds evidence of insurance in long-term sharecropping arrangements in India. Udry (1990) reports that the timing and the amount of repayment on informal loans in Northern Nigeria vary as a function the circumstances of both the lending and the borrowing household. Lillard and Willis (1997) find that probability and the amount of remittances from Malaysian children to their parents are sensitive to the current and permanent income of the child's family.

Regardless of what motivates remittances in the first place, the receiving household's response to the quality of insurance offered through remittances can reveal something about what governs family relationships – altruism or exchange, or some combination of these. In the absence of sufficient altruism, informal family insurance via remittances may be subject to the same sort of moral hazard problems that affect formal insurance contracts between individuals

and institutions.

At one extreme, if the extended family (the sending and the receiving household) were altruistically motivated, then we would expect that the sending and the receiving household would make decisions that benefit the extended family as a whole. Their willingness to invest in risky projects will be tempered by how the additional risk will affect the welfare of the extended family. If the project is successful, then they will share this windfall, either by receiving smaller remittances or by sending greater remittances.

At the other end of the spectrum, households may care only about their own welfare and value the relationship with the extended family purely for the monetary and insurance value of the remittances. To see how moral hazard might affect informal insurance, consider the extreme case where there is no altruism and the receiving household is perfectly insured by the remitting household: if the receiving household has a shortfall, the remitting household will send a remittance in the full amount of the shortfall. Now consider what happens when a member of the receiving household contemplates buying a lottery ticket. Suppose that the ticket costs 50 baht and there is a 1 in 1,000,000 chance that it will payoff 5,000,000 baht. In the absence of insurance, the expected value of this bet is –45 baht. However, with insurance the expected value of this bet is 5 baht, since if the lottery ticket has a losing number, then the remitting household will send an extra 50 baht.[4] In the absence of altruism, the receiving household will always buy lottery tickets that are a negative pay-off investment for the extended household. With partial insurance, the problem will be similar if less dramatic.

[4] In fact the expected value will be somewhat lower, but still positive, assuming that the winning household will share some of its winnings with the household that insures it.

There is a similar problem from the point of view of the sending household. Suppose this household is contemplating the purchase of the same lottery ticket. If the lottery ticket does not have a winning number, then this household has just wasted 50 baht. However, by reducing their remittances to the receiving household by 50 baht they can eliminate this downside risk. Under these conditions the lottery ticket will always seem like an attractive investment. If moral hazard of this type is a problem in the intra-familial relationships that govern remittances, then receiving and remitting households will be more likely to gamble the higher the quality of insurance they can expect from the remitting household. Equivalently, receiving and remitting households will be less likely to gamble the higher the correlation of shocks to the sending and the receiving household. If the sending and the receiving households internalize the impact that their behavior has on the extended family via altruism or some other enforcement mechanism, then the quality of insurance should not affect the probability and the extent of gambling.

Studying remittances and gambling behavior together may also illuminate the underlying motivation for remittances. For example, if the primary purpose of remittances are to repay parents for the schooling investments that they made when their children were young, then we would expect the remittance payment plan to generate non-convexities in the expected income of the children who send remittances. If the children feel altruistically toward their parents and derive utility from their parents' utility, the non-convexities would not be eliminated so long as the level of remittances is chosen in a manner that is consistent with debt repayment.

The rest of the paper is organized as follows. Section 2 describes and summarizes the household and regional data that is used in the analysis. In section 3, the evidence that remittances do in fact provide insurance is examined. Given that evidence, section 4 describes

how the quality of insurance affects the likelihood and the extent of gambling by households that send or receive remittances. The final section provides a discussion of the results and offers some preliminary conclusions.

2. DATA

The paper draws on two types of data: cross-sectional information on Thai households and time series data on rainfall and gdp in Thailand's 73 provinces. The provincial level time series data on rainfall and gross domestic product are used to estimate the correlation structure of provincial shocks. The potential for remittances to provide insurance depends on the correlation of shocks to the sending and the receiving household. The lower the correlation between shocks to the sending and the receiving household, the more likely the sending household is to be in a position to help the receiving household in stressful times. The correlation between shocks to two provinces provides an estimate of the potential "quality" of the insurance that can be delivered via remittances.

Annual per capita gross domestic product and rainfall (1978-1987) for each of Thailand's 73 provinces are used to calculate the correlation pattern of provincial shocks. Thailand's National Economic and Social Development Board collected the annual per capita gross domestic product data. The rainfall data come from the Meteorological Department of the Ministry of Communications that measures rainfall at 61 meteorological stations in Thailand.[5]

Annual rainfall shocks are constructed by subtracting the long run average for each

[5] Provinces without rainfall stations are assumed to have the same rainfall as the nearest province for which data is available.

province from each annual observation. GDP shocks are found by regressing the ten years of GDP observations for each province on a constant term and a linear time trend.[6] The correlation matrix of the resulting rainfall and GDP shocks is then constructed. For each pair of provinces four correlations are measured: the correlation of annual GDP shocks to the two provinces, the correlation of annual rainfall shocks, the correlation of rainfall shocks in the first province with GDP shocks in the second and, finally, the correlation of GDP shocks in the first province with rainfall shocks in the other province. The covariance that is used in estimation depends on the rural-urban status of the household sending the remittance and the household that receives it. If, for example, a household in Bangkok sends a remittance to a rural household in a northern province then the covariance between GDP shocks to Bangkok and rainfall shocks to this Northern province are used.

One check on the reliability of the provincial GDP data is to look at how it is related to provincial rainfall. When provincial GDP is regressed on rainfall, controlling for year and region effects, the results indicate that mean per capita provincial GDP would increase by 17% if rainfall were one standard deviation above its mean. This regression has an adjusted R^2 of 57%. Using the same rainfall data and observations on household income from the Thai SES, Paxson (1992) finds roughly the same relationship between rainfall and the income of rice farmers: their mean income would increase by 13% if rainfall were one standard deviation above the mean from April to June. Distance data is also collected at the provincial level. The distance in kilometers between the capital of the sending household's province and the capital of the

[6]The results are robust to other specifications of the time series properties of provincial GDP. If, for example, an AR(1) is used the results are very similar.

province that the receiving household lives in provides a proxy for the costs of remitting and monitoring the activities of the extended family.

The 1988 Thai Socio-Economic Survey (SES) provides the household level data used in this paper. The Thai SES records data for 11,045 households in 1988. The survey includes detailed consumption and income information for each of the surveyed households, as well as the age, education, occupation and earnings of each household member. In addition, there is information on household physical asset holdings as well as changes in financial asset holdings in the month prior to the survey.

If someone in the surveyed household reports sending money or goods to someone outside the household during the twelve months prior to the survey, the household is considered a remitter. Receiving households are analogously defined. If a surveyed household receives a remittance, the value of the transfer, how it was delivered and whether it was for educational purposes are recorded. In addition, the survey reports the sender's province, occupation, industry, community type (rural, urban, and foreign) as well as the relationship of the sender and the receiver. There are similar data about the receiver if someone in the surveyed household sends a transfer.

Table 1 summarizes the data by remittance status. The income of households who send remittances is nearly twice that of households who receive remittances. In addition, the transfers recorded in the SES flow from households who are headed by people who, on average, have three years more schooling and are ten years younger than the heads of recipient households. Households who receive remittances are also less likely to be headed by men, 58% versus 84%.

Table 1 also describes the regional and occupational distribution of the sample by

remittance status. Receivers are over-represented in the very poor northeastern region of Thailand, while remitters are more likely to live in Bangkok. Remitters are also more likely to be entrepreneurs and professionals than households who receive transfers. Receiving households, on the other hand, are likely to farm or be economically inactive.[7]

There is a strong life-cycle component to remittances, which suggests that they play an important role in old age support. Figure 1 describes the percentage of households who send and receive remittances as a function of the age of the head of the household. The percentage of households that remit is around 20% when the head of the household is 20 – 50 years old. This figure falls as the head ages, dropping to around 5% by age 65. The percentage of households who receive remittances falls from 30% to 12% from age 20 to age 35. Then it rises steadily as the household head ages. At age 50 approximately 30% of households receive remittances, and by age 70 approximately 50% of households receive remittances. The fraction of inactive households who receive remittances is high for all ages.

Table 2 documents the importance of remittances in supplementing the income of receiving households. Remittances account for one-third of the income of receivers, and sending households remit 16% of their income on average. While remitters report doing so to help pay for educational expenses more than 30% of the time, only 9% of receiving households report that the remittance was intended for this purpose. This is likely to be a feature of who was included in the sample, rather than evidence of moral hazard. The number of people who actually receive remittances for educational purposes is likely to be much higher than reported in the survey,

[7] Most "economically inactive" households receive property income. In rural areas, this income is typically equal to some fraction of the rice harvest from land that has been rented out. So despite being "economically inactive" the income of these households is subject to the same rainfall risk as their neighbors.

since the institutional population (students living in dormitories, for example) is not included in the sample. The fraction of remittances that were for educational purposes is consistent with the fraction received from parents (in the case of households who received a remittance) and with the fraction of households giving to sons or daughters (in the case of households who gave a remittance).

Almost 60% of remittances were delivered in person. This suggests that the distance between the sending and the receiving province may be an appropriate proxy for the transaction cost associated with remitting and monitoring the activities of the receiving household.

Tables 3.A and 3.B describe gambling expenditures and receipts. Fifty-six percent of households who send remittances play the lottery compared to 40% of households who receive remittances (see Table 3.A). Sending households who play the lottery bet about twice as much as receiving households per month. Winnings make up a greater fraction of income for the sending households as well: 9% compared to 7% for receiving households.

3. REMITTANCE ESTIMATES

If remittances provide act as insurance then they should offset shocks to the sending and receiving households. One measure of shocks to the sending and the receiving households is captured by regional conditions in the places where they live. When the recipient lives in a region that experiences a bad shock, remittances should be higher to make up for this hardship. When the remitter lives in a region that experiences adverse conditions, remittances should be scaled back. Similarly, we expect remittances to be higher when the sending region experiences especially favorable conditions and lower when the receiving province gets a good shock. The regressors include a dummy variable that is equal to one when the sending province experiences

below average rainfall and a similar dummy variable for below average rainfall in the receiving province.

In addition to providing insurance for aggregate regional shocks, remittances may also provide insurance for idiosyncratic shocks – job loss, illness, for example.[8] We would expect that households who experience unusually good conditions to send higher remittances (or receive lower remittances). Households with particularly bad outcomes may receive higher remittances (or reduce the remittances that they send). It is difficult to accurately measure "unusually" good or bad household conditions from cross-sectional data. The data do not provide a benchmark for what is "usual" for the household. Despite these difficulties, expenditures on medicine and medical services are also included in the remittance regressions as a potential measure of idiosyncratic household shocks.

Lottery winnings are also included in the remittance regressions. Winning the lottery is always "unusual" in the sense that it is determined by a random draw. The remittance estimates include net gambling winnings (gross winnings – expenses). If idiosyncratic shocks are insured through remittances then we would expect households to send remittances to offset gambling winnings and losses. Households should send higher remittances when they have lottery winnings and lower their remittances when they have losses. Similarly, receiving households should receive smaller remittances when they win the lottery and higher remittances when they lose.

[8] Demand for insurance via remittances against idiosyncratic risk may be smaller than demand for insurance against regional risk. Since regional risk by definition affects many households in the region, these households may be unable to insure one another. By contrast, idiosyncratic risk may be cheaply available in local areas.

Table 4.A presents estimates of average monthly remittances for households who *sent* a cash or in-kind remittance during the twelve months prior to the survey. The regression incorporates some characteristics of the receiving household as well as the income and other characteristics of the sending household. Older, urban remitters with higher incomes send significantly larger transfers. Remittances that are targeted to urban areas, to the sending household's children and to more distant households are also higher. Remittances that are delivered in person are lower. Higher income also leads to significantly higher remittances. If the sending household's income were to increase by 1000 baht ($40), remittances would go up by 130 baht ($5.20).

Controlling for these and other factors, remittances are significantly higher when the receiving household lives in a province that experienced below average rainfall in the year prior to the survey. When the province of the receiving household experiences adverse conditions, remittances are about 118 baht ($4.72) higher. This is equal to 17% of average monthly cash remittances in the 12 months prior to the survey. We also predict that remittances will be lower when the sending province receives a negative shock. However, in the estimates of remittances sent, a negative shock to the sending province does not significantly affect the level of transfers.[9]

[9] One possibility is that rainfall shocks capture conditions in the receiving region (often rural) more accurately than they do in the sending region (often urban).

Remittances also respond significantly to idiosyncratic shocks as measured by lottery winnings. The average lottery playing household will have lost 200 baht ($8.00) – this will lead to a reduction in remittances of about 14 baht ($0.56), or about 2% of average monthly cash remittances in the 12 months prior to the survey. Sending households also share lottery winnings with the household they remit to. Remittances would go up by 28 baht ($1.11) for typical net winnings. Medical expenditures do not have a significant impact on remittances.

Table 4.B presents a similar regression for households who reported *receiving* a cash or in-kind remittance during the twelve months prior to the survey. When the receiving household lives in a province that experienced a bad shock, remittances go up by 291 baht ($11.64), which is equal to 19% of the average monthly per capita income of households who receive remittances. Remittances are not significantly affected by negative shocks to the sending region or by the receiving household's net lottery winnings. In contrast, remittances do appear to provide substantial insurance for illness. If medical expenditures increase, remittances increase to cover 77% of the increased expenditure. Illness is likely to be of particular importance to households who receive remittances since they are often elderly.

Male-headed households also receive smaller remittances as do households with higher per capita income (net of remittances). If the receiving household's income increases by 1000 baht ($40.00), remittances will go down by 110 baht ($4.40). The magnitude of the impact is very similar to the results for increases in the sending household's income. This type of result is typically interpreted as evidence in favor of altruistic motives for remitting (see Cox 1987, for example). It is important to note that this result is consistent with many motives for remitting – so long as the remittances offer some insurance.

It is interesting to note that households with more educated heads receive higher remittances. One additional year of schooling leads to an increase in remittances of 70 baht ($2.80). It is possible that this variable captures characteristics of the sending household. More educated parents are likely to have children who also have relatively more schooling and therefore higher income that would result in larger remittances. Farm households receive lower remittances, while urban households and households that live further from the sending province receive higher remittances. Households that own their home and land also receive much higher remittances – remittances are 249 baht ($9.96) higher for households who own their home and land. Strategic motives for remittances – remitting in order to ensure a bequest – would be consistent with this result.

Whatever the motive for remitting, the remittances themselves appear to have an insurance component that is sensitive to both aggregate and idiosyncratic measures of shocks. In particular, remittances are higher when the sending household's income is higher and lower when the receiving household's income is higher. They are also higher when the province where the receiving household lives has below average rainfall. Sending households share their lottery winnings (and losses) with the households they remit to and receiving households receive higher remittances when they have higher medical expenditures. This evidence suggests that remittances are used to insure a combination of events – some of which would be public and easily verifiable, like provincial rainfall conditions, and others that would be private and might be easily hidden, like lottery winnings.

4. GAMBLING, INCOME AND THE OF QUALITY OF INSURANCE

Given the evidence that remittances between Thai households appear to provide some insurance against both aggregate and idiosyncratic shocks, this section of the paper examines whether the provision of this insurance is subject to moral hazard by looking at how gambling behavior responds to the quality of insurance. If moral hazard is an issue, then households will be more likely to gamble, and gamble more, the higher the quality of insurance offered through remittances. Equivalently, households will be less likely to gamble, and gamble less, the higher the correlation of shocks to the sending and the receiving household.

Estimates of the Probability and the Extent of Gambling

Table 5.A presents two probit estimates of the likelihood that the surveyed household reports positive gambling expenditures in the month prior to the survey. The first set of estimates is for households who reported sending a remittance. The second set of estimates if for households who received remittance. For both estimates, the number in the column headed "dF/dx" is the change in the probability of gambling associated with an infinitesimal change in the independent variable. If the independent variable is discrete, dF/dx is for the discrete change in the dummy variable from 0 to 1.

The independent variables include per capita income, a dummy variable for male household head, the age and age squared of the household head, the years of schooling of the household head, household size, and a dummy variable if the household lives in an urban area. The distance in kilometers between the sending and the receiving province is also included in an effort to measure the cost of enforcing and monitoring the implicit insurance contract.

The estimates also include a measure of the quality of insurance that is offered through

remittances, the correlation of shocks between the sending and the receiving household. The correlation is the correlation of rainfall shocks if both the sending and the receiving household live in rural areas, the correlation of gdp shocks if both are urban and the correlation of gdp in the sending province with rain in the receiving province if the sender is urban and the receiver is not. If the sender is rural and the receiver is urban then the correlation of rainfall shocks with gdp shocks in the receiving province is used. Dummy variables for each of Thailand's provinces are also included. Their inclusion is intended to rule out the possibility that the correlation variable picks up some other spatial variation that is associated with gambling.

Higher income significantly increases the likelihood of gambling for receiving households but is insignificant for sending households. A one standard deviation increase in income increases the likelihood that a receiving household gambles by 6%, a 14% increase from the mean. Receiving households are 8% more likely to gamble if they have a male head. This result is even more dramatic for sending households: they are 17% more likely to gamble if they have a male head. For both receiving and sending households, older household heads are more also significantly more likely to report gambling expenditures, although the propensity to gamble mitigates with age. Education has no effect on the likelihood of reporting gambling expenditures. This is consistent with the prevalence of gambling across all levels of Thai society.

Both receiving and sending households are more likely to gamble the larger the household. Presumably this captures the fact that bigger households have more people who may have gambled in the month prior to the survey. Urban dwellers, regardless of whether they send or receive remittances, are much more likely to gamble than their rural counterparts. Among remitting households, urban dwellers are 12% more likely to gamble. Urban, receiving

households are 6% more likely to gamble. The distance between the sending and the receiving household has no impact on the probability of gambling for either receiving or remitting households. One interpretation of this result is that distance does not accurately capture the enforcement costs associated with remittances.

For households who send remittances, the quality of insurance appears to have a significant impact on whether the household gambles or not. When the quality of insurance is higher (the correlation between shocks to the sending and the receiving provinces is lower), the household gambles more. If a remitting household were in a position to offer perfect insurance (correlation = -1), the probability that they would gamble would be 5% higher compared to a case where they could offer very good insurance (correlation = 0). If the correlation between the sending and the receiving household was 1 (no insurance potential), they would be 5% less likely to gamble.[10] Given the patterns of remittances that were revealed in Tables 4A and 4B, this finding is very suggestive of moral hazard.

For receiving households, the quality of insurance appears to have no impact on the probability that the household gambles. This result would be consistent with the receiving household behaving altruistically and internalizing the impact of their risky behavior on the extended household. However, non-parametric findings suggest that most receiving households do in fact gamble more when the quality of insurance is increased, however the relationship between gambling and the quality of insurance is very non-linear for receiving households. We address this non-linearity by including the correlation squared in the estimates for the receiving

[10] At the mean correlation, a one standard deviation increase in the correlation of shocks to the sending and the receiving province, an increase of 0.53, would lead to an decrease in the probability of gambling of 2.28%. This is a decrease of 4% from the average likelihood of gambling for remitters of 56%.

households. These results are found in Table 5B. They indicate that if the correlation between shocks to the sending and the receiving household were to go from 0 (good insurance) to –1 (perfect insurance), the likelihood that receiving households would gamble would increase by 6%, roughly the same magnitude as for households who send remittances.

Table 5.C presents estimates of gambling expenditures as a function of the same independent variables. The dependent variable in these estimates is gambling expenditures in the last month expressed as a percentage of food expenditures over the past month. Across all households (gamblers and non-gamblers), gambling expenditures average 4% of food expenditures. For households who receive remittances the figure is also 4%. Among households who send remittances, the average rises to 7%. Because many households report zero gambling expenditure, a tobit model is used.[11]

These estimates are similar to the estimates of the probability of gambling in many respects: income, having a male household head, having an older household head and living in an urban area are all associated with significantly higher gambling expenditures. Larger households also have higher gambling expenditures. In contrast to the estimates of the probability of gambling, education is marginally significant in reducing the gambling expenditures of remitting households. Like the previous results, the distance between the sending and the receiving province has no impact on gambling expenditures.

These estimates also suggest that moral hazard is also important in determining the amount of spending on gambling by remitting households. Remitting households gamble less the higher the correlation between the sending and the receiving households. Equivalently, they

[11] OLS estimates which ignore the censoring issue produce similar results.

gamble more the higher the quality of insurance. Remitters with perfect insurance would spend 3.7% more on gambling as a percentage of food expenditures. This corresponds to a 53% increase in gambling expenditures from the average of 7%.[12] For receiving households, gambling expenditures do not respond to the quality of insurance. In contrast to the results for the probability of gambling, non-parametric estimates do not reveal important non-linearities in the relationship between gambling expenditures and the quality of insurance for receiving households.

It is useful to consider what the gambling behavior of remitting and receiving households reveals about motivations to send remittances. One fact that stands out is that remitters are much more likely to gamble, compared to all other households. Fifty-six percent of remitting households report positive gambling expenditures in the past month, compared to 40% of households who receive remittances, 53% of households who send and receive remittances and 43% of households who neither send nor receive remittances. When we control for other observable household characteristics that may be important determinants of gambling, being a remitter still increases the likelihood of gambling substantially. Table 6 presents probit estimates of whether a household gambles for the entire sample of 11,045 households. In addition to controls for whether the household sends or receives remittances, the estimates also control for per capita income, the sex, age and education of the household head, household size and whether the household lives in a rural or an urban area. Seventy-three province controls are also included. According to this estimate, remitting households are 10% more likely to gamble controlling for

[12] At the mean correlation, a one standard deviation increase in the correlation of shocks to the sending and the receiving household would lead to a decrease in gambling expenditures of 1.97%. This is a decrease of 28% from the average gambling expenditures as a percentage of food expenditures for remitters of 7%.

the other characteristics listed above. There is no tendency for households who receive remittances to gamble more.

The finding that households who send remittances are more likely to gamble, even controlling for other household characteristics, suggests that there may be something about having a remittance relationship that promotes risk taking behavior. It is well known that debt contracts can lead to risk taking behavior because of the non-convexities they cause in expected income (or expected utility), see Jensen and Meckling (1976) for example. A plausible rationale for the finding that being a remitter leads to increases in behavior that raises the variance of consumption is that a primary purpose of remittances is to repay parents for investments that they have made in their children when they were young.

Figure 2 describes the income, net of remittances, of a remitting household if we assume that the pre-remittance income of the receiving household is fixed and if the sending household behaves in the following way: if income is below y_L remit nothing, if income is greater than y_L but lower than y_H remit all income above y_L, when income is above y_H, the households remits some fixed maximum amount. The net income of the receiving household is non-convex and risk taking behavior would be sensible for this household. Note that even if the remitting household is altruistic and gets utility from the utility of the receiving household, this non-convexity will remain, if we keep the remittance payments the same. Figure 3 gives an example of the utility of an altruistic sending household where their utility is a weighted average of the utility of the sending and the receiving household.[13] As is clear from the figure, the non-convexity remains even when the household is altruistic.

[13] In particular, we assume that the remitting household's utility is equal to 0.75*ln(net income of remitting

This discussion ignores the impact of altruism (or the lack of altruism) on the nature of the remittance contract itself. Altruism would lead sending households to share a percentage of their income with the receiving household at all levels of income. This type of remittance contract would not lead to the type of non-convexities that are described above.

5. DISCUSSION AND CONCLUSION

This paper provides evidence that remittances between Thai households have an insurance component. In particular, remittances are significantly higher when the receiver's province experiences a negative shock. Remitters also share lottery winnings (and losses) with the houses they remit to and households receive higher remittances when their medical expenses are higher. We also find that remittances are lower when the receiving household's income is higher. In addition we have shown that households who remit are more likely to gamble and gamble more the higher the potential quality of insurance between the sending and the receiving province. The impact of insurance on gambling expenditures is particularly notable.

The analysis of gambling behavior provides evidence that, whatever altruism is present among extended family members, it is not sufficient to rule out moral hazard, especially on the part of remitting households. The finding that remitters' gambling losses are partially insured by remittances lends particular support to the conclusion that the results presented in the previous section are evidence of moral hazard. The picture that emerges from this exercise is one of one-sided altruism: parents (receivers) have altruistic feelings toward their children (remitters) but the children do not reciprocate these feelings. If it were the case that the parents controlled the bulk

household) + 0.25*ln(net income of receiving household).

of the resources available to the family, then we would expect the "rotten kid theorem" to hold and for parents to be able to force altruistic behavior on the part of their children. In Thailand, and many other developing countries, however, it is the younger remitting households who are likely to have higher incomes.

An alternative interpretation of these results is that households who have more insurance shift their portfolios toward riskier investments. This is optimal if expected returns on the new portfolio compensate for the additional risk. Playing the lottery does not satisfy this requirement since its expected return is negative. However, playing the lottery may be an indication that households who face less risk do indeed shift their portfolios toward riskier investments. Whether or not this is the case depends on how much we can generalize from gambling behavior. Binswanger (1980) estimated risk parameters for rural Indian farmers through a series of lottery like games (using real money). The estimated risk parameters are systematically related to agricultural decisions (Binswanger et. al, 1980). Farmers whose lottery choices indicate that they are more risk averse choose more conservative agricultural options. In a study of the effect of the effect of liquidity constraints on self-employment, Lindh and Ohlsson (1996) find that people who have won the lottery are more likely to become entrepreneurs. Their interpretation of this result emphasizes the role of lottery winnings in overcoming liquidity constraints. Alternatively, these findings could be interpreted to suggest that playing the lottery is correlated with other risky activities like entrepreneurship.

Finally, the finding that remitting households are more likely to gamble compared to other households is sensible if remittances are used to repay parents for investments that they made in their children. The repayment of these debts causes non-convexities in the expected

utility of the children, even if they are altruistic, and leads to increases in risky behavior in the form of gambling.

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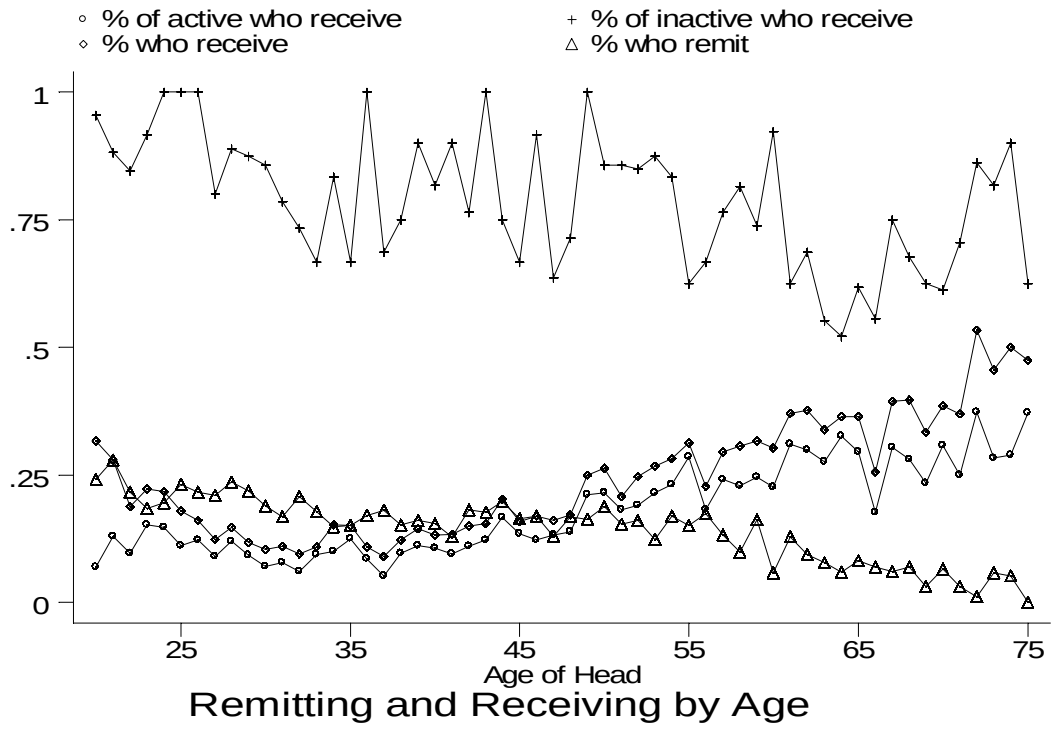
Figure 1


% of active who receive
% of inactive who receive
% who receive
% who remit
1
.75
.5
.25
0
25
35
45
55
65
75
Age of Head
Remitting and Receiving by Age

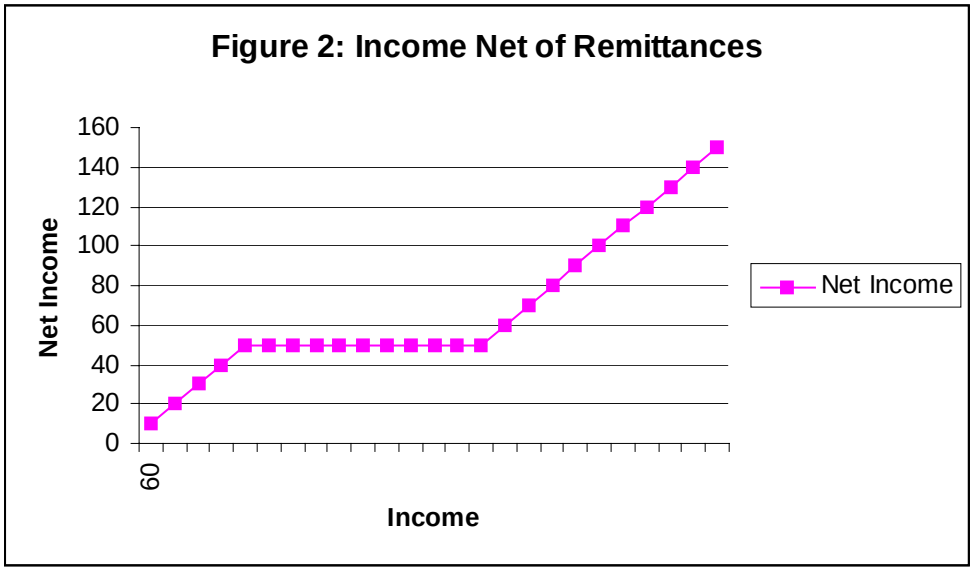


Figure 2: Income Net of Remittances
160
140
120
100
80
60
40
20
0
Net Income
60
Income
Net Income

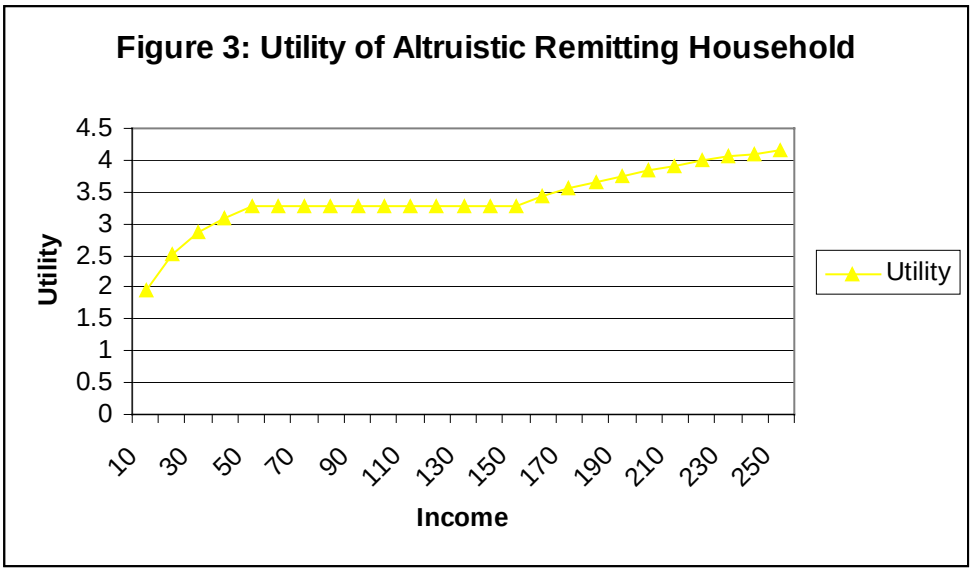


Figure 3: Utility of Altruistic Remitting Household
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Utility
10
30
50
70
90
110
130
150
170
190
210
230
250
Income
Utility

TABLE 1

CHARACTERISTICS OF SAMPLE HOUSEHOLDS BY REMITTANCE STATUS

	Give = 0, Get = 0	Give = 0, Get = 1	Give = 1, Get = 0	Give = 1, Get = 1
# Household	7149	2174	1503	219
% of Sample	(64.73)	(19.68)	(13.61)	(1.98)
Characteristics of Household				
Age of head	44.01	51.05	39.42	46.00
	(14.31)	(16.77)	(12.66)	(15.31)
Education of head	5.23	4.84	7.80	7.21
(years)	(4.02)	(4.22)	(5.01)	(5.25)
Income	1543.36	1561.49	3023.64	2593.08
	(1986.06)	(1679.84)	(2617.24)	(1847.82)
Size	4.11	3.60	3.31	3.59
	(1.76)	(1.82)	(1.73)	(1.83)
% Male head	82.67	58.37	83.97	63.01
% Urban	32.49	31.92	54.96	42.92
% Migrant	20.32	17.34	40.59	31.05
Regional Distribution (Percent)				
North	22.24	22.08	14.57	15.98
Northeast	21.99	29.25	16.63	29.22
Central	21.11	20.29	18.16	14.16
South	16.97	10.63	15.97	12.33
Bangkok	17.69	17.76	34.66	28.31
Occupational Distribution (Percent)				
Farmers	34.33	3.18	12.77	17.35
Entrepreneurs	19.61	11.73	22.69	14.61
Professionals	7.02	4.65	17.10	20.09
Laborers	11.06	6.72	2.86	1.37
Other Employees	25.07	16.47	41.92	24.66
Inactive	2.91	37.26	2.66	21.92

Notes: "Give" means someone in the household reported giving a cash or in-kind remittance during the 12 months preceding the survey. "Get" means someone in the household reported receiving a remittance during the 12 months preceding the survey. Income is in 1988 per capita (standardized using adult male equivalents) baht per month (25 baht = $1). "Migrant" means the household has changed amphoes (county) in the last ten years. Standard deviations are in parentheses.

TABLE 2

CHARACTERISTICS OF SAMPLE REMITTANCES

	Get = 1	Give = 1
Delivery Method (%)		
Person to Person Delivery	56.90	60.94
Money Order	27.60	29.61
Other Delivery Method	15.5	9.45
Relationship (%)	Who Remitted	Who Received
Spouse	15.96	3.53
Son or Daughter	57.59	29.21
Parents	13.11	54.49
Brother or Sister	5.38	7.32
Other	7.96	5.45
% For Education	9.34	30.67
Size of Remittance		
Last Year: Cash/Mo.	994.27	713.89
#	2137	1486
	(2256.21)	(970.39)
Last Year: In-Kind/Mo.	237.32	142.44
#	232	108
	(452.85)	(176.18)
Last Month: Cash	1655.30	1173.78
#	1514	1059
	(3585.24)	(1257.23)
Last Month: In-Kind	887.27	793.63
#	145	60
	(1461.36)	(1079.10)
Remittance as % of Total Income (last Month)	33.20	16.35

Notes: Remittances are in 1988 baht (25 baht = $1) per household. See Table 1 for definition of "Give" and "Get". Standard deviations are in parentheses.

TABLE 3.A

LOTTERY CHARACTERISTICS OF SAMPLE HOUSEHOLDS BY REMITTANCE STATUS

	Give = 0, Get = 0	Give = 0, Get = 1	Give = 1, Get = 0	Give = 1, Get = 1
% who play lottery	42.86	40.39	56.15	52.97
% who win lottery	6.95	9.06	12.84	17.35
Lottery Expenditures				
All Households				
Mean	74.66	62.39	161.27	97.28
Std deviation	(333.67)	(362.71)	(898.27)	(195.78)
% of expenditure	1.82%	1.50%	2.64%	1.85%
Players				
Mean	174.19	154.49	287.19	183.66
Std deviation	(492.42)	(558.32)	(1183.83)	(283.02)
% of expenditure	4.24%	3.72%	4.71%	3.50%
Lottery Winnings				
All Households				
Mean	28.92	25.19	88.06	62.71
Std deviation	(485.33)	(202.45)	(823.35)	(414.98)
% of income	.69%	.65%	1.71%	1.00%
Winners				
Mean	416.00	278.03	685.78	316.39
Std deviation	(1798.12)	(619.47)	(2211.61)	(950.67)
% of income	9.89%	7.21%	9.08%	5.72%

TABLE 3.B

LOTTERY CHARACTERISTICS BY INCOME DECILE

		Bets/Monthly Expenses		Winners		Winnings/Monthly Income		
Income Decile	% who play	All HHs %	Players %	All HHs %	Players %	All HHs %	Players %	Winners %
1	30.58	1.27	4.16	6.79	16.27	1.15	2.95	16.94
2	33.42	1.80	5.39	6.88	16.53	0.79	2.04	11.53
3	38.55	1.56	4.04	7.24	16.20	0.83	2.02	11.52
4	38.50	1.50	3.91	8.24	18.12	0.70	1.73	8.51
5	43.44	1.84	4.23	9.32	18.75	0.57	1.16	6.15
6	46.74	1.67	3.58	7.79	14.15	0.53	1.00	6.76
7	51.13	2.22	4.33	8.60	15.22	0.93	1.67	10.92
8	53.17	1.98	3.73	8.70	14.48	0.59	1.04	6.79
9	56.02	2.36	4.21	10.32	17.45	0.74	1.22	7.12
10	52.26	2.49	4.76	9.87	17.12	0.67	1.26	6.82
All	44.38	1.87	4.21	8.37	16.38	0.75	1.52	9.98

TABLE 4.A

ESTIMATES OF REMITTANCES *FROM* THE SURVEYED HOUSEHOLD

Variable	Coefficient	T-Statistic
Characteristics of the Receiving Household		
Monthly Per Capita Income	0.134	15.202
Age of HH Head	8.293	4.463
Male HH Head	83.423	1.690
Years of Schooling, Head	-0.463	-0.104
Monthly Lottery Winnings	0.071	3.634
Monthly Per Capita Medical Expenses	0.046	1.031
Farm Household	-158.58	-2.455
Urban Household	-44.729	-0.989
Own Home and Land	-32.185	-0.670
Characteristics of Remittance		
Sent to Urban HH	177.370	3.977
Sent to Parents	-77.251	-1.311
Sent to Kids	270.711	4.068
Sent for Educational Purposes	73.205	1.196
Delivered in Person	-135.165	-2.923
Characteristics of Sending and Receiving Provinces		
Rain Shock < 0 to Sending Province	-22.910	-0.442
Rain Shock < 0 to Receiving Province	118.103	2.377
Distance between Sending and Receiving Province	0.150	2.079
Constant	-205.572	-1.722
Observations	1591	
Adjusted R^2	29.34%	

Note: Dependent variable is the amount of cash and value of goods remitted per month during the twelve months prior to the survey.

TABLE 4.B

ESTIMATES OF REMITTANCES *TO* THE SURVEYED HOUSEHOLD

Variable	Coefficient	T-Statistic
Characteristics of the Receiving Household		
Net Monthly Per Capita Income	-0.113	-3.248
Age of HH Head	4.369	1.430
Male HH Head	-282.077	3.442
Years of Schooling, Head	69.737	5.947
Monthly Lottery Winnings	-0.098	-1.039
Monthly Per Capita Medical Expenses	0.776	3.435
Farm Household	-264.971	-2.667
Urban Household	566.105	5.699
Own Home and Land	249.402	2.575
Characteristics of Remittance		
Sent from Urban HH	146.927	1.795
Sent from Parents	-155.028	-1.151
Sent from Kids	-398.728	-3.895
Sent for Educational Purposes	204.029	1.488
Delivered in Person	-25.662	-0.277
Characteristics of Sending and Receiving Provinces		
Rain Shock < 0 to Sending Province	-58.569	-0.544
Rain Shock < 0 to Receiving Province	291.368	3.126
Distance between Sending and Receiving Province	.451	2.894
Constant	121.894	0.548
Observations	1952	
Adjusted R^2	11.54%	

Note: Dependent variable is the amount of cash and value of goods received per month during the twelve months prior to the survey.

TABLE 5.A

PROBIT ESTIMATES THAT HOUSEHOLD GAMBLES

	REMITTERS		RECEIVERS	
Independent Variable	dF/dx	Z Statistic	dF/dx	Z Statistic
Income per Capita†	0.0081	1.31	0.0345	3.49
Male Household Head*	0.1709	4.79	0.0785	2.95
Age	0.0287	4.79	0.0192	4.20
Age^2	-0.0003	-4.57	-0.0002	-4.24
Years of Schooling	0.0012	0.38	0.0022	0.58
Household Size	0.0266	2.86	0.0380	5.06
Urban Dummy*	0.1195	3.31	0.0630	1.81
Correlation b/w sending and receiving province	-0.0478	-1.71	0.0156	0.58
Distance b/w sending and receiving province†	0.0167	0.34	-0.0132	-0.26
	χ^2 (63)	$p > \chi^2$	χ^2 (66)	$p > \chi^2$
χ^2 test that province dummies are jointly zero	95.47	0.0052	141.76	0.0000
Pseudo R^2	9.81%		10.54%	
# of observations	1568		1878	

* dF/dx is for discrete change of dummy variable from 0 to 1.

† The number in the table is the estimated coefficient multiplied by 1,000.

Notes: Estimates also include dummy variables for provinces (66 or 63 provinces). The dependent variable is equal to 1 if the household reports positive spending gambling in the past month, 0 otherwise. The correlation is the rainfall shock if neither the sending nor the receiving household are urban, the correlation of gdp shocks if both are urban and the correlation of gdp in the sending province with rain in the receiving province if the sender is urban and the receiver is not. If the sender is rural and the receiver is urban then the correlation of rainfall shocks with gdp shocks in the receiving province is used. Independent variables are characteristics of the head of the household.

TABLE 5.B

PROBIT ESTIMATES THAT RECEIVING HOUSEHOLD GAMBLES

	RECEIVERS	
Independent Variable	dF/dx	Z Statistic
Income per Capita†	0.0349	3.53
Male Household Head*	0.0807	3.03
Age	0.0190	4.16
Age^2	-0.0002	-4.17
Years of Schooling	0.0023	0.62
Household Size	0.0363	4.82
Urban Dummy*	0.0572	1.64
Correlation b/w sending and receiving province	0.1283	2.71
Correlation Squared	-0.1766	-2.88
Distance b/w sending and receiving province†	-0.0630	-1.17
	χ^2 (66)	$p > \chi^2$
χ^2 test that province dummies are jointly zero	137.31	0.00
Pseudo R^2	10.87%	
# of observations	1878	

* dF/dx is for discrete change of dummy variable from 0 to 1.

† The number in the table is the estimated coefficient multiplied by 1,000.

Notes: Estimates also include dummy variables for provinces (66 or 63 provinces). The dependent variable is equal to 1 if the household reports positive spending gambling in the past month, 0 otherwise. The correlation is the rainfall shock if neither the sending nor the receiving household are urban, the correlation of gdp shocks if both are urban and the correlation of gdp in the sending province with rain in the receiving province if the sender is urban and the receiver is not. If the sender is rural and the receiver is urban then the correlation of rainfall shocks with gdp shocks in the receiving province is used. Independent variables are characteristics of the head of the household.

TABLE 5.C

TOBIT ESTIMATES OF GAMBLING EXPENDITURES AS A PERCENTAGE OF FOOD EXPENDITURES

	REMITTERS		RECEIVERS	
Independent Variable	Coefficient	T Statistic	Coefficient	T Statistic
Income per Capita†	0.0158	4.172	0.0217	3.133
Male Household Head	0.1046	4.447	0.0401	2.053
Age	0.0108	2.768	0.0090	2.687
Age^2	-0.0001	-2.938	-0.0001	-2.775
Years of Schooling	-0.0037	-1.941	0.0009	0.329
Household Size	0.0191	3.350	0.0180	3.353
Urban Dummy	0.0372	1.665	0.0358	1.444
Correlation b/w sending and receiving province	-0.0371	-2.136	-0.0222	-1.148
Distance b/w sending and receiving province†	-0.0173	-0.551	0.0107	0.292
	F(63, 1496)	Prob > F	F(66, 1803)	Prob > F
F test that province dummies are jointly zero	1.10	0.2798	1.70	0.0004
Pseudo R^2	12.18%		11.79%	
# of observations	1568		1878	

† The number in the table is the estimated coefficient multiplied by 1,000.

Notes: Estimates also include dummy variables for provinces (66 or 63 provinces). The dependent variable is the expenditures on gambling in the last month divided by food expenditures in the last month. The correlation is the rainfall shock if neither the sending nor the receiving household are urban, the correlation of gdp shocks if both are urban and the correlation of gdp in the sending province with rain in the receiving province if the sender is urban and the receiver is not. If the sender is rural and the receiver is urban then the correlation of rainfall shocks with gdp shocks in the receiving province is used. Independent variables are characteristics of the head of the household.

TABLE 6

PROBIT ESTIMATES THAT HOUSEHOLD GAMBLES, ALL HOUSEHOLDS

	ALL HOUSEHOLDS	
Independent Variable	dF/dx	Z Statistic
Income per Capita†	0.0116	3.700
Male Household Head*	0.0810	6.450
Age	0.0193	9.560
Age^2	-0.0002	-9.590
Years of Schooling	0.0054	3.760
Household Size	0.0190	6.010
Urban Dummy*	0.0892	6.460
Remitting Household*	0.0999	6.970
Receiving Household*	-0.0100	-0.790
	χ^2 (72)	Prob > F
χ^2 test that province dummies are jointly zero	662.44	0.00
Pseudo R^2	8.17%	
# of observations	11045	

* dF/dx is for discrete change of dummy variable from 0 to 1.

† The number in the table is the estimated coefficient multiplied by 1,000.

Notes: Estimates also include dummy variables for provinces (73 provinces). The dependent variable is equal to 1 if the household reports positive spending gambling in the past month, 0 otherwise. Independent variables are characteristics of the head of the household.