

Asymmetric Information about Migrant Earnings and Remittance Flows

Ganesh Seshan
Robertas Zubrickas



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Abstract

This paper examine asymmetric information about migrant earnings and its implications for remittance behavior using a sample of Indian households with husbands working overseas in Qatar. On average, wives underreport their husbands' income and underreporting is more prevalent in households with higher earning migrants. The discrepancy in earning reports is strongly correlated with variation in remittances:

greater underreporting by wives is associated with lower remittances. An exchange model of remittances is developed with asymmetric information and costly state verification. The optimal remittance contract prescribes a threshold for remittances that invites verification only if unmet. The model's predictions closely match our empirical findings.

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Ganesh Seshan and Robertas Zubrickas

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Ganesh Seshan (corresponding author) is an assistant professor at Georgetown University, School of Foreign Service in Qatar; his email address is: gks7@georgetown.edu. Robertas Zubrickas is a lecturer in the Department of Economics, University of Bath, UK; his email address is: r.zubrickas@bath.ac.uk. We are grateful for comments and suggestions from presentations at the 2014 ABCDE conference (World Bank), 2014 WEAI Conference (Colorado), 2012 NEUDC Conference (Dartmouth College) and 2012 Australasian Development Economics Workshop (Monash University). Funding for this study was provided by a UREP grant (No. 4-7-11) from the Qatar National Research Fund, a member of The Qatar Foundation. Eilin Francis, Aakash Jayaprakash, Jibin Koshy, Sibi Leney, and Qazi Rashid provided invaluable research assistance. The statements made herein are solely the responsibility of the authors.

INTRODUCTION

The growth of international migration has been accompanied by a rising number of transnational or split households in developing nations with one or more members working abroad. Geographical separation can result in asymmetric information about behavior and economic conditions of separated household members, which may have significant implications for intra-household transfers.

In particular, if foreign earnings are private information, the migrant can strategically take advantage of the informational asymmetry and remit a lower amount than if his earnings were perfectly observable. Indeed, McKenzie et al. (2013) provide suggestive evidence that Tongan male migrants to New Zealand underreport earnings to avoid pressure to remit from family members. In an experimental study, Ambler (2015) finds that Salvadoran migrants in the United States shared less of a lottery prize with their households in El Salvador if their families were unaware of it.¹ This incipient evidence indicates that informational asymmetries about migrants' economic conditions can be a significant factor of remittance behavior, which, even though recognized in the literature (see Rapoport and Docquier 2006, 1143), has hardly been studied.²

This paper deals with informational asymmetry about migrant earnings and examines, theoretically and empirically, the impact of this asymmetry on remittance flows. Generally, the

1. The problem of asymmetric information is also relevant for intact households making intra-household transfers. In a related study of non-migrant households, Ashraf (2009) shows that Filipino men whose wives manage the financial affairs of the household will hide money from their spouses when that decision is kept private. In comparison to intact households, the distinguishing feature of transnational households is a larger scale of intra-household transfers (i.e., remittances) and the availability of data on such transfers.

2. There is a recent body of literature that studies the remittance behavior of migrants that are informationally disadvantaged about remittance uses by household members remaining behind. Ashraf et al. (2015) show that a randomized intervention which helped El Salvadoran migrants in the United States control and monitor savings in recipient households led to higher savings levels back home. De Laat (2014) finds that internal migrants in Kenya not only invest considerable resources in information acquisition before remitting to their spouses but even change their marital search behavior to mitigate the consequences of pending imperfect information. Also see Chen (2006, 2013) for evidence on the effects of imperfect monitoring on household production.

main obstacle for conducting an empirical analysis is the absence of data on informational asymmetries within split households, which surveys of migrant or household alone cannot possibly provide. We offer a new solution to this problem. We assess informational asymmetries about income earned abroad by collecting migrants' reports about their earnings and contrasting these reports with accounts of their earnings collected from the remittance recipients. To our knowledge, this is one of the first few studies using a matched household dataset that collects cross-reports on variables of interest.³

We are able to offer new evidence of substantial asymmetry in information within split households. In our representative sample of South Indian migrant households, where husbands are migrant workers in Qatar and wives remain behind in Kerala, India, wives report on average only about 79 percent of their husbands' earnings, which we show is unrelated to any reporting bias. We find that underreporting is not uniform across households—it is more prevalent in households with higher earning migrants. In particular, we observe that the reported earnings ratio—the ratio of the wife's report of her husband's earnings to that of her husband's—decreases in migrant earnings. Importantly, we find that asymmetric information about the migrant's income is strongly correlated with variation in remittances: all else equal, the lower the reported earnings ratio, the smaller the annual remittance sent home.

By design, existing remittance models, mainly based on the symmetric information assumption, are not able to account for any differences in cross-reports and, consequently, cannot explain the observed relationship between the reported earnings ratio and remittances.⁴ To account for our empirical findings, we develop a model around the exchange motive for

3. De Weerd et al. (2014) use a matched sample of domestic migrants and extended family in Tanzania to examine remittance motives under asymmetric information.

4. In Section V, we compare the predictions of alternative remittance models with our empirical findings. See Stark (1995) and Rapoport and Docquier (2006) for reviews of remittance models.

remittances (Cox 1987, Cox et al. 1998) with asymmetry in information about the migrant's earnings. The purchase of household services by "remittances" are generally indicative of temporary migration, signaling the migrant's intent to return, which is highly applicable with the sample of contract-based migrants studied in this paper. We take the view that remittance behavior is governed by implicit familial contracts,⁵ enforced on migrants under the threat of social or familial sanctions as discussed later. As a concrete situation, we consider a relationship between the recipient and the migrant, where the former provides household services to the benefit of the latter or finances migration costs in exchange for remittances. In this interaction, the recipient offers the migrant a "remittance contract" that specifies how much of his income, net of subsistence cost, is to be remitted. However, the recipient can observe the migrant's income, which can be subject to private income or consumption shocks, only if she verifies it with a costly audit, for example, by exerting effort to collect information from her social or migrant network.

The situation described above falls in the domain of the literature on costly state verification started with Townsend (1979) (also see Gale and Hellwig 1985). The recipient's problem of offering a remittance contract parallels the problem of an investor offering a loan contract to an entrepreneur whose investment returns are unobservable to the investor. The form of the optimal remittance contract resembles that of the optimal loan contract, that is, a fixed-repayment contract. In particular, the recipient specifies a threshold for remittances, which is a minimum level of remittance that the migrant has to provide in order to avoid any scrutiny of his earnings and, possibly, sanctions. If the migrant cannot remit this minimum on account of a negative income or consumption shock, then, aside from remitting his entire net income, he had

5. For more on this view, see Lucas and Stark (1985); Hodinott (1994); Poirine (1997); Ilahi and Jafarey (1999); de la Brière et al. (2002).

better be prepared to justify the smaller amount transferred.

In line with our empirical findings, the model predicts reporting behavior where the migrant is truthful about his income only at its lower levels that prohibits the migrant from fulfilling the remittance expectations held at home. When income is high, the migrant does not need to reveal his income truthfully as long as his remittance meets the prescribed threshold, and he would rather not report or underreport his income out of fear of disadvantageous contractual revisions in the future. The threshold for remittance is reflective of the degree of informational asymmetry and so is the reported earnings ratio because it directly depends on the threshold. As our model predicts that expected remittance increases in the threshold, we can also predict that remittance rises, all else equal, in the reported earnings ratio, which we observe in data. The predicted remittance behavior is confirmed by a piecewise remittance regression that has a much steeper slope at lower levels of income. We also check the robustness of the model by testing its comparative statics predictions.

The following section briefly describes migration background relevant to our study. Section II presents our remittance model with asymmetric information and its theoretical predictions. Section III discusses the dataset, Sections IV and V provide empirical analysis of the observed reporting and remittance behavior, respectively. The last section concludes the study.

I. MIGRATION OVERVIEW

According to Qatar's 2010 census, approximately 90 percent of its 1.7 million population of age fifteen or older were foreign born, rendering it the nation with the highest share of immigrants in the world (see the World Bank's *Migration and Remittances Factbook* 2011). The majority of immigrants to Qatar originate from developing countries, with a significant

proportion from South and East Asia (Kapiszewski 2006). Migration to Qatar and to the other Gulf countries is typically temporary, with work contracts determining the duration of stay (Shah 2008). These contracts are normally for two years, though renewable at the discretion of the employer. Only workers earning income above a minimum level are allowed to bring their dependents with them—in Qatar, the figure was QR 8,000 a month in 2010, the equivalent of US\$ 26,300 annually (henceforth, all monetary measures are converted to US dollars).

Migration from India's southern state of Kerala, where our surveyed migrants come from, accounts for more than half of the total Indian migration to the Gulf in the 1990s. Results from the population-representative Kerala Migration Survey 2011 indicated that 17.1 percent of households in Kerala received remittances which were estimated to make up 31 percent of the state's net GDP (Zachariah and Rajan 2012).

Migration is typically a familial decision made with the expectation of improving the family's economic conditions from the migrant's remittances. Especially for temporary migrants, satisfying the remittance expectations of the family back home is of paramount importance and is often regarded as the price to pay for the option to return home in case of illness, temporary or permanent loss of income, or to inherit property (Banerjee 1981, Dustmann and Mestres 2010). Moreover, the threat of social sanctions or exclusion, including stigmatization from the family is a strong motivating factor for meeting expectations, which the anthropological literature has long emphasized (Philpott 1968, Goldring 2004, Peter 2010). Plateau (2014) points to a large body of ethnographic work that highlights the importance of shaming, disapproval, ostracism, and other means to pressure giving among (extended) family members in the sub-Saharan Africa. For the studied case of male migrants from Kerala to the Arabian Gulf, Osella and Osella (2000) describe the feared risks of migrants losing face and reputation if they do not meet the social

obligations of spending generously on close and direct kin.

II. ANALYTICAL FRAMEWORK

In this section, we present an exchange model of remittances with asymmetric information about migrant earnings based on the classical model with costly state verification of Townsend (1979) and Gale and Hellwig (1985). The choice of the model is also dictated by its ability to account explicitly for migrants' reporting behavior contingent on data made available for this study. In the next section, we state and discuss the predictions produced by the model that are empirically investigated subsequently.

Consider a transnational household where there is a migrant pursuing a job opportunity abroad and a remittance recipient residing in the origin country. The job opportunity is temporary with a promised pay of \tilde{y} net of subsistence costs. However, it is known that the actual income received by the migrant is subject to random shock ψ that can be positive or negative, for example, ranging from employers renegeing on promises, experiencing unexpected expenses, or deductions to finding better-paid jobs, working extra time, or a pay increase. Denote the migrant's disposable income by y , defined by $y = \tilde{y} + \psi$, and its distribution by $F(y)$ that has support $[\underline{y}, \bar{y}]$, where $0 < \underline{y} < \bar{y}$. We refer to disposable income just as income or earnings until further notice. It is assumed that the distribution $F(y)$ is commonly known and twice differentiable with the density function $f(y) > 0$. The realization of income, that is, of the random shock ψ , is private information to the migrant, but the recipient can discover it after incurring a verification cost of $c > 0$.⁶

6. Verifications could take the form of inquiring with others in the social network (friends or relatives working in the same country) about the migrant's situation or making trips to visit the migrant. De Laat (2014) finds that

The migrant can accept the job abroad only if he secures the support of the recipient: she, together with the extended family, would need to finance the cost of migration, take over the migrant's duties, or manage his assets in his absence. In return for support, the recipient requires the migrant to send part of his income as remittance r , $0 \leq r \leq y$. Formally, the recipient offers a take-it-or-leave-it remittance contract, which we model as a triple $(r(\hat{y}), S, p(y, \hat{y}))$. Under the contract, the migrant sends an income report $\hat{y} \in [\underline{y}, \bar{y}]$, which determines the remittance $r(\hat{y})$. If the report \hat{y} is in the set $S \subseteq [\underline{y}, \bar{y}]$, it invokes verification and punishment $p(y, \hat{y})$, where $p(y, \hat{y}) = 0$ if $y = \hat{y}$ and $p(y, \hat{y}) = P > 0$ if $y \neq \hat{y}$, that is, if the migrant is found lying.⁷

The penalty P can take the form of social and familial sanctions against the migrant or loss of reputation or of social prestige with the recipient's family that could reduce the insurance against job loss abroad or the prospect of securing the family's inheritance.⁸ Additionally, let the penalty be sufficiently large, in particular, $P > \bar{y} - \underline{y}$, so that under no circumstance the migrant finds it beneficial to send a false report that falls in the verification region.

For actual and reported income levels, y and \hat{y} , the utility for the recipient is given by

$$U_R(y, \hat{y}) = v_R(r(\hat{y}) + y_R) - cI_S(\hat{y}) \quad (1)$$

and for the migrant by

$$U_M(y, \hat{y}) = v_M(y - r(\hat{y})) - I_S(\hat{y})p(y, \hat{y}) + \eta(r(\hat{y}), y). \quad (2)$$

internal male migrants in Kenya spent considerable resources monitoring their rural wives and one could imagine similar effort going the other way.

7. In our context, as also modeled by Townsend (1979), the problem can be equivalently reformulated where it is the migrant who offers a remittance contract to the recipient. A contract specifies how much of realized income will be remitted and when costly evidence about realized income has to be presented to the recipient. With this formulation, the migrant's optimal contract shares the same properties of the recipient's optimal contract discussed below.

8. Given the recurrent nature of the migrant-recipient relationship, punishment is a credible contractual enforcement device. Thus, the commitment problem to undertake verification arising from the cost of c involved is absent here.

Above, $v_R(\cdot)$ and $v_M(\cdot)$ are the recipient's and the migrant's utility functions of consumption, respectively, which until further notice are assumed to be linear, y_R is the recipient's own income, $I_S(\hat{y})$ is the indicator function defined by $I_S(\hat{y})=1$ if $\hat{y} \in S$ and $I_S(\hat{y})=0$ otherwise.⁹ The function $\eta(r(\hat{y}), y)$ denotes the additive utility the migrant receives from the recipient's consumption of his remittances. Specifically, this function is meant to capture other motives for remittance that the migrant may have, which we control for in our empirical analysis. For analytical convenience, we assume that the recipient does not perfectly observe the size of this additional utility to the migrant and, thus, assumes $\eta \equiv 0$. (This assumption has no qualitative impact on the results unless η dominates utility from private consumption. See also footnote 9).

The recipient offers the contract that maximizes her expected utility in (1) subject to the condition that the migrant obtains the expected utility of at least $U_M^0 \geq 0$. We can reduce the choice set of contracts in the optimization problem as the recipient cannot possibly benefit from contracts that miss (i) $r(y) = \bar{r}$ for $y \notin S$, where \bar{r} is a constant, and (ii) $r(y) < \bar{r}$ for $y \in S$. If remittances for unverified income reports were not constant, then the migrant with income $y \notin S$ would always make the report $\hat{y} \notin S$ that results in the smallest remittance. If for some income level in S the contracted remittance is larger than \bar{r} , then the migrant would rather make a (false) report outside the verification region.

Main Results

The next theorem pins down the form of the optimal contract, which is analogous to a

9. The assumption of linear utility allows for the succinct characterization of the optimal contract determined below. Risk aversion has only an effect on the slope (but not its sign) of the optimal remittance schedule in the verification region, but other contractual properties (of main interest for this work) remain intact, see Winton (1995).

standard (fixed-repayment) loan contract.

Theorem 1 (Townsend 1979) $S = [\underline{y}, \bar{r}]$ and $r(y) = \min(y, \bar{r})$.

In the optimum, the recipient specifies a threshold remittance \bar{r} such that she starts verification only if the migrant remits less than \bar{r} . In other words, the recipient specifies the smallest acceptable remittance level that does not lead to any scrutiny of the migrant's income. The proof of this theorem can be found, for example, in Townsend (1979) or Gale and Hellwig (1985).

By theorem 1, the optimal remittance contract is fully characterized by the remittance threshold. The optimal threshold \bar{r}^* solves the recipient's optimization problem

$$\max_{\bar{r} \in [\underline{y}, \bar{y}]} \int_{\underline{y}}^{\bar{r}} (y - c) dF(y) + \bar{r}(1 - F(\bar{r})) \quad (3)$$

s.t.

$$\int_{\bar{r}}^{\bar{y}} (y - \bar{r}) dF(y) \geq U_M^0. \quad (4)$$

Prior to solving the problem and analyzing its properties, we impose

Assumption 1 (i) The inverse hazard rate $\frac{1 - F(y)}{f(y)}$ is decreasing in y ; (ii) $\frac{1}{f(\underline{y})} > c$.

The purpose of this assumption is to guarantee the existence and uniqueness of solution and to ensure the sufficiency of the first-order approach.

Let $\bar{r}^c = \max(\bar{r} \in [\underline{y}, \bar{y}]: (4) \text{ holds})$ be the largest value of \bar{r} that satisfies the side constraint so that the choice set of \bar{r} for the recipient is $[\underline{y}, \bar{r}^c]$. (Assume that U_M^0 is not too large to ensure that $\bar{r}^c > \underline{y}$ holds). The solution to the unconstrained problem, denoted by \bar{r}^u , is given by the first-order condition

$$\frac{1 - F(\bar{r}^u)}{f(\bar{r}^u)} = c. \quad (5)$$

Because of the monotonicity of the derivative of the objective function in (3), the solution to the recipient's problem is given by

$$\bar{r}^* = \min(\bar{r}^c, \bar{r}^u). \quad (6)$$

As it is evident from (5), due to $c > 0$ we have $\bar{r}^u < \bar{y}$, which also implies that $\bar{r}^* < \bar{y}$, that is, $S \subset [\underline{y}, \bar{y}]$. In words, if verification is a costly exercise, there is a range of income reports which the recipient does not verify.

The next two propositions deal with comparative statics properties of the optimal remittance contract. First, we show that the higher the verification cost c , the lower the remittance threshold the recipient sets. That is, the optimal contract implies that the costlier the verification, the less frequently the recipient invokes it.

Proposition 1 $\frac{d\bar{r}^*}{dc} \leq 0$.

Proof. By the implicit function theorem and assumption 1, we have $\frac{d\bar{r}^u}{dc} < 0$, which

together with $\frac{d\bar{r}^c}{dc} = 0$ proves the proposition. ■

The next proposition says that if the recipient holds more pessimistic beliefs about the migrant's income prospects, then she sets a lower remittance threshold \bar{r}^* . A more pessimistic recipient sets a lower threshold to reduce her expected verification costs as a larger share of income realizations falls in the low end of the income space.

Proposition 2 Let \bar{r}_1^* be the optimal remittance threshold in the problem with

distribution $F_1(y)$ and \bar{r}_2^* – with distribution $F_2(y)$. If $F_1(y)$ stochastically dominates $F_2(y)$ in hazard-rate order, then $\bar{r}_1^* \geq \bar{r}_2^*$.

Proof. To prove the proposition, it is sufficient to show that $\bar{r}_1^c \geq \bar{r}_2^c$ and $\bar{r}_1^u \geq \bar{r}_2^u$. Then, even if, for example, $\bar{r}_1^* = \bar{r}_1^c$ but $\bar{r}_2^* = \bar{r}_2^u$, the two inequalities prove $\bar{r}_1^* \geq \bar{r}_2^*$ because $\bar{r}_1^* = \bar{r}_1^c \geq \bar{r}_2^c \geq \bar{r}_2^u = \bar{r}_2^*$ where the last inequality follows from (6). The inequality $\bar{r}_1^u \geq \bar{r}_2^u$ can be established from (5) and the hypothesized stochastic dominance. To show $\bar{r}_1^c \geq \bar{r}_2^c$, first note that the stochastic dominance in hazard rate implies that the conditional means satisfy

$$\frac{\int_{\bar{r}}^{\bar{y}} y dF_1(y)}{1 - F_1(\bar{r})} \geq \frac{\int_{\bar{r}}^{\bar{y}} y dF_2(y)}{1 - F_2(\bar{r})} \quad (7)$$

for any $\bar{r} \in [\underline{y}, \bar{y}]$ and also implies the first-order stochastic dominance, that is, $F_1(y) \leq F_2(y)$.

We have $\bar{r}_1^c \geq \bar{r}_2^c$ if the following holds

$$\int_{\bar{r}_2^c}^{\bar{y}} (y - \bar{r}_2^c) dF_1(y) \geq \int_{\bar{r}_2^c}^{\bar{y}} (y - \bar{r}_2^c) dF_2(y) \quad (8)$$

that is, with $F_1(y)$ the side constraint (4) can be lax at $\bar{r} = \bar{r}_2^c$. Transforming (8) yields the inequality

$$(1 - F_1(\bar{r}_2^c)) \left(\frac{\int_{\bar{r}_2^c}^{\bar{y}} y dF_1(y)}{1 - F_1(\bar{r}_2^c)} - \bar{r}_2^c \right) \geq (1 - F_2(\bar{r}_2^c)) \left(\frac{\int_{\bar{r}_2^c}^{\bar{y}} y dF_2(y)}{1 - F_2(\bar{r}_2^c)} - \bar{r}_2^c \right), \quad (9)$$

which by (7) and $F_1(y) \leq F_2(y)$ holds. ■

Predictions

The optimal remittance contract, characterized by theorem 1, requires the migrant to

reveal his income truthfully only at lower levels of realized income, $y < \bar{r}$. However, at higher levels of income, $y \geq \bar{r}$, the migrant may choose to send any report $\hat{y} \geq \bar{r}$, as it leads to the same remittance \bar{r} and invokes no verification or sanctions. However, in line with the argument of McKenzie et al. (2013), in the case of a positive income shock, the migrant would rather not reveal his higher income or underreport it to avoid future demands for more remittance that the recipient may make on the grounds of the migrant's favorable economic conditions.

Defining the reported earnings ratio as the ratio of the recipient's report of the migrant's earnings to the migrant's own report, we predict

Prediction 1 *The reported earnings ratio decreases with positive income shocks.*

With regard to reporting behavior, we can also make another prediction that is based on the comparative statics results presented in propositions 1 and 2. We interpret the ingredients of the model in the following way. The verification cost c captures the degree of information asymmetry between the migrant and the recipient. The cheaper it is to determine the income earned by the migrant, the less asymmetry there is, and vice versa. The distribution F captures the recipient's beliefs about the migrant's earnings.

Prediction 2 *The reported earnings ratio is lower when (i) there is more asymmetry in information, (ii) the recipient holds more pessimistic beliefs.*

Intuition is straightforward. With a greater degree of asymmetry due to a higher cost of verification c , the optimal contract prescribes a lower threshold for remittances, which in turn necessitates less frequent revelation of current income by the migrant. If the recipient becomes less optimistic about the migrant's earnings, then she should also reduce the verification region, again, implying less frequent revelation of income by the migrant.

Next, we turn to the model's predictions concerning remittance behavior. First of all, we

predict that all else equal

Prediction 3 *The lower the reported earnings ratio, the lower the remittances, and vice-versa.*

In the model, for a given realization of income the amount remitted depends on remittance threshold \bar{r} and, as it follows immediately from theorem 1, the expected remittance decreases in the threshold. At the same time, as discussed above, there is a direct relationship between the threshold and the reported earnings ratio as a lower threshold invokes truthful revelation of income less frequently. Thus, taking the reported earnings ratio as a proxy for the remittance threshold we obtain prediction 3.

Finally, we predict

Prediction 4 *The remittance schedule is steeper at lower levels of income.*

The optimal remittance contract requires the remittance of the entire (net) income when income is low but provides no explicit incentives to remit more than the threshold remittance level. Thus, assuming that other motives such as altruism do not dominate the utility of private consumption, we should observe remittances increase in income more steeply when income is low than when it is high.

III. DATA

To test the model's predictions, we use a matched sample of 108 male migrants in Doha, Qatar, and their wives back home in Kerala, India.¹⁰ The (migrant) husband and the wife were interviewed separately but the interviews were coordinated such that they began simultaneously to avoid the possibility that the couple may discuss responses with each other and the arrival of new information between extended lags. At the start of the interview, each household member

10. We dropped seven observations wherein the wives did not report their husbands' overseas income and one observation where the spouse did not provide a remittance report.

was informed that his or her responses would not be disclosed to the other spouse. The migrants were interviewed face-to-face while their wives were interviewed over the phone. Cross reports were obtained—the interviews documented not only the subjects’ responses to questions about themselves but of their spouse as well. For example, not only was the husband asked about his income but also his wife was separately queried on his income in Qatar. Detailed data were collected on the migrant’s demographics, expenses, income, life and work satisfaction, and remittances sent home, in addition to savings and loan decisions. Similar data were collected from the migrant’s spouse about herself and of the household remaining behind in India.

A local survey firm, staffed with migrants from Kerala, was hired to recruit and subsequently interview the couples between August and December 2010. Recruitment focused on migrants mostly residing in Doha’s Industrial Area. Male interviewers visited migrants at their dormitory-styled residences where they shared a room with three to four other co-workers. After obtaining consent to participate in the study, each migrant was asked to provide contact information and times suitable for a future interview with him and his wife in India.¹¹

Table 1 provides the summary statistics of the key variables reported by the migrants and their wives. The average annual foreign income earned in Qatar was the equivalent of US\$ 6,407 and the average of US\$ 2,900 or 47 percent of income was remitted home on an annual basis. The wives tended to underreport their husbands’ earnings, averaging US\$ 4,807 per year according to their account or 79 percent of the husbands’ reported income.¹² The mean

11. The interviewer would randomly select one migrant to be interviewed per room. A total of eighteen such dormitories were visited which varied in size, the largest of which housed migrants working for a local taxi and bus operator which constituted nearly 50 percent of the sample. The migrants were informed that a female staff member would interview their spouses. If a migrant refused to provide contact information, the survey staff would not arrange for an interview. The firm did not document the number of migrants that declined to provide their spouse’s contact information but they informed us that the fraction was minimal.

12. Such a figure could arise if migrants were instead overreporting their income. We also have comparable data from a separate one-sided survey of married male migrants from Kerala ($n = 204$) collected in the first quarter of 2012, almost fifteen months after the survey for the current study. The average annual income reported

difference of US\$ 1,600 in foreign income reported by the husband and the wife was statistically significant at conventional levels. There was a smaller discrepancy in remittance reports, wherein wives underreported remittances by 12 percent or US\$ 523 on average.¹³ Aside from inaccurate recalls, a possible reason why wives underreport remittances is that they are reporting the amount received net of the fees deducted by the receiving agent (the survey did not query the couple about such fees at the receiving end). We show later that the underreporting of remittances is uncorrelated with the underreporting of income, which alleviates concerns about reporting biases.

We also compared our sample, labeled henceforth as the Qatar Study of Kerala Families (QSKF), with a representative household survey conducted between December 2010 and June 2011 in Kerala by the Center for Development Studies. The Kerala Migration Survey (KMS) 2011 covered 15,000 households in all fourteen districts of the state and collected data on characteristics of household members who migrated outside the state. The number of married, male migrants working in the Arabian Gulf countries (Qatar, United Arab Emirates, Saudi Arabia, Kuwait, Oman, and Bahrain) amounted to 1,778 individuals in the KMS 2011 dataset. Only the household (i.e., not the migrant) was interviewed for the KMS 2011, so their data is comparable to the responses of the wives in our sample. Appendix table A.1 provides the comparison of the summary statistics created from the recipient household's reports from our QSKF survey and KMS sub-sample, which appear to be similar in terms of the average age, duration abroad, and annual migrant earnings.

was US\$ 6,660 and mean annual remittance sent was US\$ 3,297, which is only about US\$ 200 more than the corresponding numbers reported in the current sample. This does not suggest a pattern of overreporting financial information by the migrant.

13. We separately test and find that underreporting of remittance is uncorrelated with the migrant's age, income, years married and duration in Qatar, suggestive of classical measurement error. We also find no statistically significant discrepancy in cross reports on observable characteristics known to both parties.

Table 1. Summary Statistics

	Mean	Std. Deviation
<u>Migrant's Report</u>		
Age in years	38.56	7.62
Years married	10.84	7.92
Years employed in Qatar	6.48	6.98
Household has other members working abroad (indicator)	0.03	-
Annual earnings (US\$)	6406.9	2,364.7
Annual remittances sent to household net of fees (US\$)	2900.4	1,563.2
Net annual remittance as a share of income	0.47	0.23
Household's annual medical expenditure as a share of migrant's income	0.08	0.16
Spends on temptation goods (indicator)	0.38	0.49
Aware of others having disagreement over remittance use (indicator)	0.49	-
<u>Wife's Report</u>		
Wife is employed in India (indicator)	0.13	-
Wife's years of education	11.68	2.75
Wife's report of husband's (migrant's) annual earnings (US\$)	4807.3	1,799.6
Wife's report of annual remittances received from husband (US\$)	2377.8	1,827.4
Household's monthly income in India (US\$)	38.49	90.54
Household's monthly expenses in India (US\$)	227.30	118.07
Migrant is the primary decision-maker for money matters (indicator)	0.19	-
Wife does not know husband's overseas expenses (indicator)	0.36	-
<u>Constructed Variables</u>		
Difference between wife and husband's account of annual earnings in Qatar (USD)	-1599.6	207.1 §
Ratio of wife to husband's account of annual earnings in Qatar	0.79	0.26
Difference between wife and husband's account of annual remittances (USD)	-522.7	165.1 §
Ratio of wife to husband's account of annual remittances	0.88	0.60
Difference between wife and husband's account of weekly hours worked**	-8.31	2.00 §
Ratio of wife to husband's account of weekly hours worked	0.90	0.28
Number of observations		108

§ Statistically significant at the 1% level.

** Only 81 cross-reports of weekly hours were recorded.

Source: Authors' analysis based on data from QSKF

IV. REPORTING BEHAVIOR

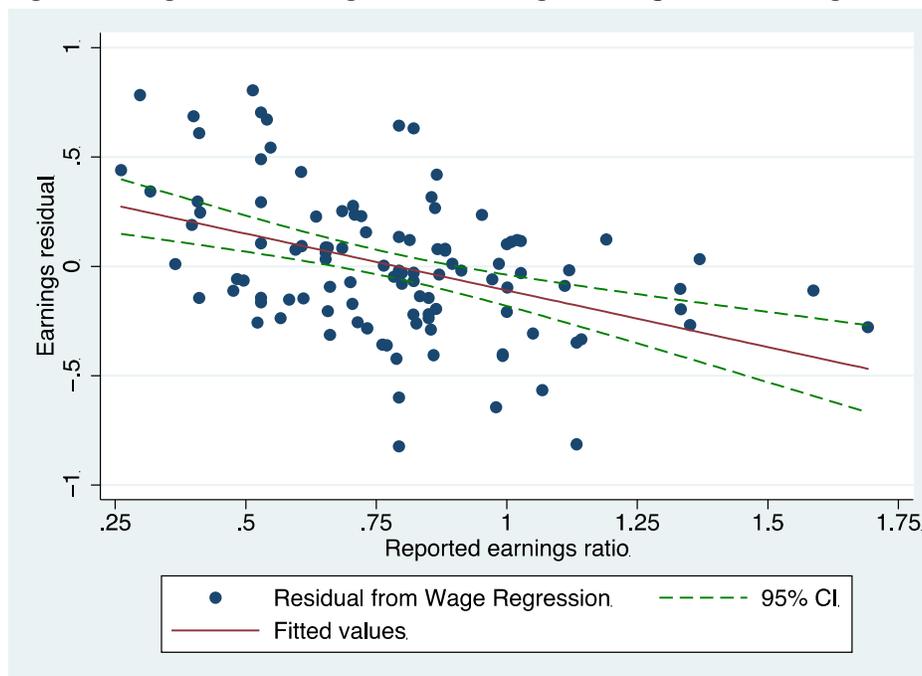
We examine the reporting behavior of migrants using the discrepancy in the couple's account of overseas income. The reported earnings ratio, denoted by ω , is given by

$$\omega = \frac{y_w}{y_h}, \quad (10)$$

where y_w is the husband's monthly earnings reported by his wife and y_h is the monthly earnings

reported by the husband himself. In terms of the model, y_w corresponds to the income \hat{y} reported by the migrant to the recipient, and y_h corresponds to his actual income y .

Figure 1. Migrants' Earnings Residuals Against Reported Earnings Ratio



Source: Authors' analysis based on data from QSKF

Our theoretical predictions describe implications for underreporting of income by the recipient in a number of cases. According to prediction 1, the migrant with levels of income above the remittance threshold \bar{r}^* is more likely to take advantage of the recipient's unawareness of his earnings and to underreport or conceal a positive income shock. The graphical examination of our data finds strong support for this prediction (econometric tests are presented in the next subsection). Absent panel data, we measure income shocks as outcomes that are unobserved by the remittance recipient. Figure 1 plots residuals from the Mincer wage regression of the migrant's earnings and shows that positive income shocks (i.e., those that are not anticipated by the spouse based on observable characteristics of the migrant) is associated

with greater underreporting by the wife.¹⁴ Similar patterns hold with the reported earnings ratio simply plotted against the migrant’s report of his annualized earnings and when the level difference in reported earnings is plotted against the migrant’s annual income (see figures A.1 and A.2 in the appendix). Greater underreporting of income by wives tends to occur with higher earning migrants.

A potential reason for underreporting is the wife’s inattentiveness. Specifically, the wife who receives an amount that meets the remittance threshold may not inquire into or may be less attentive to her husband’s economic conditions. However, if we assume that the wife makes her report of the husband’s earnings based on the remittance received plus subsistence costs, we should obtain the same prediction of discrepancy in reports at higher levels of overseas income. In the next subsection, we further explore and are able to rule out potential reporting biases.

Determinants of Underreporting

Here, we provide the empirical tests of predictions 1 and 2 by exploring determinants of the reported earnings ratio. We ask to what extent the reported earnings ratio reflects differing information sets about the migrant’s economic conditions, recipient’s belief about the migrant’s income, and conflicting preferences within the split household, as opposed to simply being noise or an inherent tendency for the wife to underreport financial information. To examine our conjectures, we estimate an empirical model of the reported earnings ratio as follows:

$$\omega_k = \beta_0 + \beta'X_k + \mu_k, \tag{11}$$

where ω_k is the reported earnings ratio of household k , the vector X_k is a collection of co-

14. The residuals were obtained from the regression of log monthly earnings reported by the migrant on years of education and work experience. The residuals would also reflect unobservable characteristics such as motivation at work or cognitive abilities that could be partly known to the wife. However, shocks at destination or the intensity of effort are not observed. As a falsification test, we also examine whether predicted earnings given the same background characteristics observed by the wife are correlated with the reported earnings ratio. The regression of the latter on the former yields a coefficient that is statistically not different from zero (p-value =0.40).

variables that are expected to influence the reported earnings ratio, and μ_k is a random mean-zero error term. The co-variables are discussed in the following paragraphs.

In terms of variables that reflect the wife's ability to monitor her husband's economic conditions abroad, we include an indicator variable for wives who are unaware of their spouses' expenses in Qatar. If a wife does not know her husband's expenses, it is likely that she would also be less aware about his earnings. Hence, by part (i) of prediction 2, we expect this indicator variable to be negatively associated with the reported earnings ratio. Also, as wives' main outside source of information about their husbands' economic conditions is their social network, wives with paid jobs in India are likely to have a wider and more diverse social network and, thus, to be in a better position to inquire into the labor market returns of their spouses. Furthermore, working spouses should also be better at assessing their husbands' overseas economic conditions as would more educated ones be as well. Therefore, assuming that working and educated wives face a lesser problem of asymmetric information, wives' employment and education should have a positive impact on the reported earnings ratio.

Regarding the predicted role of beliefs on reporting behavior, that is, part (ii) of prediction 2, we measure the wife's beliefs with the median migrant earnings in the district that her household belongs to. We compute median earnings using the household reports of migrant earnings in the Arabian Gulf countries from KMS 2011 to avoid the influence of outliers. Our prediction is that the lower the median, the smaller the ratio.¹⁵

We also control for a number of other factors that may affect reporting behavior. A closer coincidence of preferences between the couple is likely to reduce underreporting, with an

15. The Arabian Gulf countries share similar compensation structures. There are fourteen districts in Kerala. While a more disaggregated level of reported migrant income would have been preferred to account for the relevant information flows to each household, we were only able to identify the district where spouses resided in our matched sample. However we note that there is a strong correspondence between the *taluk* or sub-district level ($n = 72$) and district level ($n = 14$) median earnings ($r = 0.52$).

opposite effect for diverging views on remittance uses. A migrant who disagrees with his household over remittance uses is less likely to fully disclose his income so as to mitigate financial demands from the other end. We follow Ashraf et al. (2015) and indirectly capture this by asking the migrant whether he is aware of other people having disagreement over the uses of remittances by the household back home.¹⁶ A migrant who desires to privately spend on temptation goods (tobacco, alcohol, entertainment, etc.) is also more likely to conceal his true income from his spouse and we expect the variable indicating the consumption of temptation goods as reported by the migrant to be negatively correlated with the reported earnings ratio.

Finally, the observed pattern in the reported earnings ratio could be attributed to the wife's inherent tendency to underreport her husband's economic position. In the data, we observe that the wife's account of remittances received from the migrant is, on average, 88 percent of the amount he reports sending annually. Using the difference in reported level of remittances is therefore a good gauge of the wife's tendency to underreport (or the husband's tendency to overreport). If we find a positive and statistically significant correlation between the earnings gap and remittance gap, the latter measured as the ratio of annual remittance reported by the wife to that reported by her husband, then this would be evidence of a reporting bias. We could not then readily interpret the earnings ratio as indicative of an information problem.

Empirical Findings

The results in column 1 of table 2 begin with just the inclusion of the migrant's (log) annual earnings. Column 2 presents results from the OLS regression of the reported earnings ratio on covariates described earlier. Bootstrapped standard errors are corrected for clustering at the couple's origin district level in Kerala to account for common shocks to the wife's

16. A response to asking him directly whether such disagreements exist within his own household would likely be biased downwards since he may not be prepared to openly admit to having a conflict with his family.

information set in her locality. We first note a strong negative relationship between the earnings ratio and the log of the migrant's annual income in columns 1 and 2, which is in line with prediction 1 of our model. The results also hold when residuals from the previous Mincer regression predicting log annual earnings are used instead (see appendix table A.2).

Table 2: Determinants of the Reported Earnings Ratio

	(1)	(2)
Migrant's annual earnings (log)	-0.290*** (0.06)	-0.330*** (0.06)
Ratio of wife to husband's account of annual remittance	-	0.003 (0.04)
Median monthly income of Gulf migrants (log)	-	0.176* (0.10)
Wife's years of education	-	0.0184** (0.01)
Wife is employed (Indicator)	-	0.134* (0.07)
Wife is unaware of husband's overseas expenses (indicator)	-	-0.093 (0.06)
Disagreement over remittance use (Indicator)	-	-0.111*** (0.04)
Migrant spends on temptation goods (indicator)	-	-0.143*** (0.04)
Constant	-	1.891* (1.07)
R-squared	0.14	0.35
Observations	108	108

Notes: The dependent variable is the ratio of the wife's report of the migrant's monthly earnings to that of the migrant. Bootstrapped standard errors (with 500 replications) are displayed in parenthesis, clustered at the district level.

*** denotes statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Source: Authors' analysis based on data from QSKE.

Referring to column 2, the positive coefficient on the reported remittance gap is small and statistically not different from zero ($p = 0.95$). We also performed a similar exercise using the discrepancy in reported hours worked per week by the migrant, which is unobserved by the

wife but which the migrant has less reason to underreport. For the subset of couples for which this data is available, wives underreported hours worked by 10 percent. We find that the ratio of hours worked is uncorrelated with the reported earnings gap (p -value = 0.73) when included as an additional variable in the empirical specification. Consequently, a possible predisposition by the wives to underreport unobserved variables does not seem to play a role in explaining the reported earnings ratio.

The remaining variables in column 2 behave as expected. Wives' years of education and the presence of wives who are employed are positively correlated with the reported income gap. More optimistic belief held by the wife about overseas income is also positively associated with the earnings ratio. In contrast, being unaware of the husband's expenses in Qatar, having disagreement with the household over the uses of remittances and spending on temptation goods by the migrant are negatively associated with the reported income ratio. With the exception of the wife's unawareness of her husband's expenses, all the predictors of the earnings gap are statistically significant at the 10 percent level or lower. Overall, the effects of asymmetric information on reporting behavior predicted by our model are supported by the empirical evidence that cannot be explained by reporting biases.

We also separately examined the role of migrant networks on the wife's ability to verify foreign earnings or to influence her expectations of it. Access to a larger migrant network could increase the availability and quality of information that recipients have about migrant earnings abroad, potentially lowering the cost of verification (Chort et al. 2012 and De Weerd et al. 2014). At the same time, larger networks could be associated with greater negative selection of migrants with respect to education and earnings as stronger networks help reduce the transaction costs associated with finding jobs abroad (McKenzie and Rapoport 2007, 2010). Using the KMS

2011 dataset, a plot of the average years of education of migrants to the Gulf against the migration prevalence rate at the *taluk* (sub-district) level reveals that localities with higher rates of Gulf migration tend to have migrants with lower levels of education (see appendix figure A.3). Consequently, we would anticipate that spouses residing in areas with larger migrant networks may expect lower overseas wages relative to localities with lower incidences of Gulf migration.

Consistent with our prediction, when the migration prevalence rate is used instead of the median migrant income as a regressor, we find it to be negatively correlated with the reported earnings ratio and statistically significant at conventional levels.¹⁷ Since migrant networks indirectly capture expectations, we preferred the use of the median income term in all subsequent analysis as a more direct measure of the potential information available to wives of their husbands' foreign earnings.

V. REMITTANCE BEHAVIOR

In this section, we provide empirical analysis of the remittance behavior postulated in predictions 3 and 4.

Remittances and Underreporting

Our model predicts a positive association between the reported earnings ratio and remittances. Appendix figure A.4 is a scatterplot of annual remittances reported by the migrant as a share of his annual income against the constructed earnings ratio. Consistent with prediction 3, which applies both to levels and shares of income, the fitted linear line shows that the lower the reported earnings ratio, the lower the income share of remittances.

Interesting patterns emerge, when we plot together income shares of remittances

17. Adding the district-level migration prevalence rate to the existing specification with the median income of migrants (log) resulted in a multicollinearity issue. Both variables are negatively correlated with a pairwise correlation of -0.67 ($p = 0.00$). The regression with the migration prevalence rate is available upon request.

constructed from the migrant's and his wife's reports against the earnings reported by the migrant. In figure 2, which is a plot of shares fitted nonparametrically, we see that up to a certain level of income, approximately US\$ 6,700, both constructs of income shares of remittances closely trail one another. However, after the mark of US\$ 6,700, the income shares of remittance start to diverge, with wives increasingly reporting a higher share of income remitted. These patterns are also consistent with the theoretical predictions of our model. At lower income levels, where husbands make truthful reports about their earnings, there should be little discrepancy in reports and, accordingly, income shares of remittances. But at higher income levels, that is, above the prescribed threshold, the model predicts the migrant's income share of remittances to decrease in his income but the wife's reported share to increase.¹⁸ Finally, the patterns obtained are indicative of the existence of a threshold for remittances and earning reports, which we later provide further evidence of.¹⁹

In the ensuing empirical exercise we adopt a parsimonious remittance function with the reported earnings ratio as a covariate. Let r_k be the log amount of annual remittances, sent by the migrant husband belonging to household k , and ε_k be a random mean-zero error term. The impact of earnings ratio ω on remittance is obtained by estimating the following specification:

$$r_k = \gamma_0 + \delta\omega_k + \gamma'Y_k + \varepsilon_k. \quad (12)$$

The coefficient of interest is δ and a positive value would indicate that greater underreporting of the migrant's income by his spouse is associated with lower remittances. The

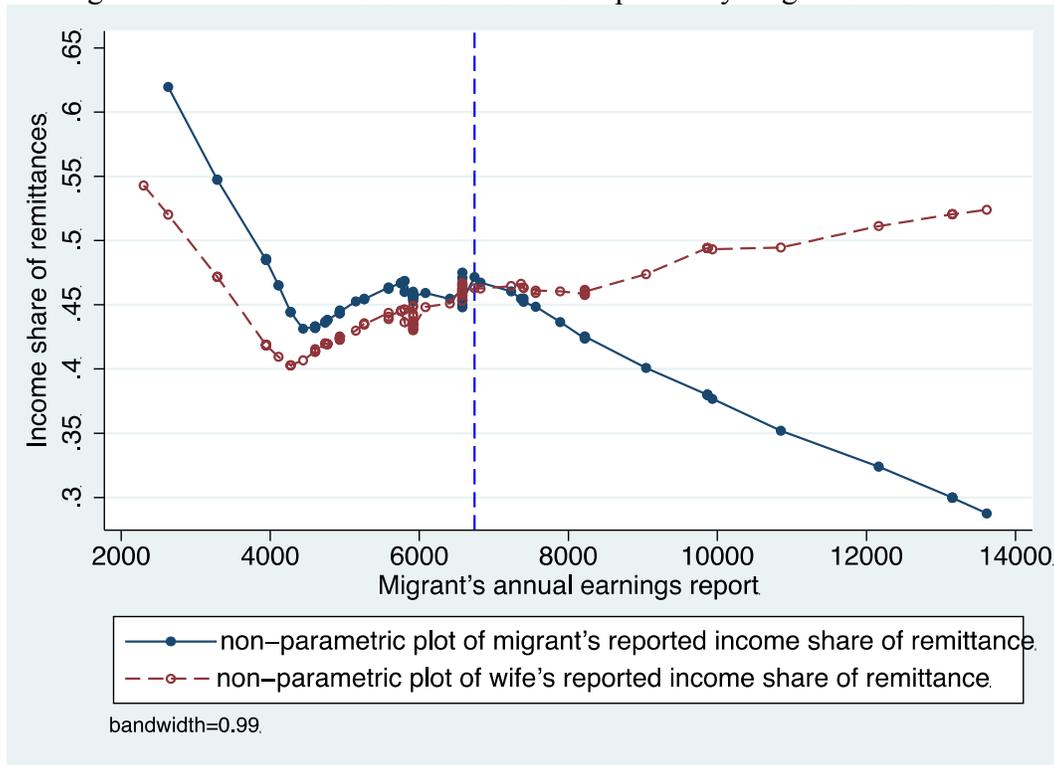
18. To see the latter relationship, if at all times the wife believes that her husband remits all his earnings net of subsistence costs x , then her reported income share of remittances can be expressed as

$(\hat{y}_{gross} - x)/\hat{y}_{gross} = 1 - x/\hat{y}_{gross}$, where \hat{y}_{gross} is the migrant's gross income reported, and we see that this share is increasing in \hat{y}_{gross} .

19. We can also observe a special type of dynamics at the bottom end of income distribution where higher shares of income are remitted. Different factors could be responsible for this dynamics, e.g., in case of an adverse income shock, migrants may borrow from others to remit.

vector Y_k is the collection of covariates expected to influence remittance sent by the migrant— (log) annualized income as reported by the migrant, an indicator variable if another family member is working abroad, household income in India, the total amount the household spent over the past 12 months on medical expenses expressed as a share of the migrant’s income and (log) median monthly income of overseas members reported by households in Kerala.

Figure 2. Income Shares of Remittances Reported by Migrants and Wives



Source: Authors’ analysis based on data from QSKF

In particular, having another family member working abroad is likely to reduce the amount of remittance sent as the responsibility of supporting the household is distributed between the members who are employed abroad. A higher share of income spent on medical expenses over the year may reflect an unexpected event that warranted additional remittances. The median income of migrants from households in origin districts may directly influence remittance norms. Bootstrapped standard errors are clustered at the district level where the

household back in Kerala resides.

Table 3: Correlates of Log Annual Remittances (OLS)

	(1)	(2)	(3)
Reported earnings ratio	-	0.655***	0.591***
	-	(0.23)	(0.22)
Migrant's annual earnings (log)	0.532***	0.737***	0.755***
	(0.18)	(0.20)	(0.21)
Hhold has other members working abroad (indicator)	-0.625***	-0.586***	-0.645***
	(0.18)	(0.12)	(0.13)
Hhold's annual medical expenditure as a share of migrant's income	0.679*	0.664	0.665
	(0.41)	(0.46)	(0.45)
Household's monthly income in India (log)	0.0501**	0.0343**	0.026
	(0.02)	(0.02)	(0.03)
Median monthly income of Gulf migrants (log)	-	-	0.745**
	-	-	(0.35)
Additional controls	No	No	Yes
R-squared	0.31	0.40	0.41
Observations	108	108	108

Notes: The dependent variable is the annual remittances reported by the migrant. Additional controls consist of the wife's years of education and indicators for whether a wife is employed, unaware of her husband's expenses, having disagreements over remittance uses, and if the migrant spends on temptation goods. All regression includes a constant term. Bootstrapped standard errors (with 500 replications) are displayed in parenthesis, clustered at the district level.

*** denotes statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Source: Authors' analysis based on data from QSKF.

Table 3 presents the OLS estimates of equation (12), where column 1 is the basic remittance regression that excludes the reported earnings ratio. Column 2 is the same regression, now augmented with the reported earnings ratio that is statistically significant at the 1 percent level. The overall fit of the regression substantially improves with the addition of the earnings ratio. Remittances sent home are about 6 percent higher when the reported earnings ratio is 10 percent larger. In column 3, we also include the predictors of the earnings ratio explored in table 2 and find that the correlates of the reported earnings ratio are not statistically different from zero at conventional levels, individually and collectively.²⁰ This suggests that the earnings ratio can

20. An F-test of joint significance yields a p-value of 0.47.

be used as a summary statistic to reflect the various channels through which the presence of information asymmetry about foreign earnings affects remittances.

As a test of robustness, we provide additional results in appendix table A.3, where the migrant's report of remittances sent is replaced with the wife's report of remittance received as the dependent variable (columns 1 and 2) and the mean report of remittances sent and received (columns 3 and 4). The reported earnings ratio in each case remains statistically significant at conventional levels.

The coefficient of the reported earnings ratio from column 3 of table 3 shows that, all else equal, a wife who understates her husband's overseas earnings by the average amount in the sample receives 13 percent less in annual remittances compared to a wife with perfect information about her husband's wages. Hypothetically, closing this information gap about foreign earnings would be associated with an increase in annual remittances of US\$ 387 or nearly two months worth of monthly household expenses in India.

Nonlinearity of Remittances

Our theoretical model posits that remittances past the threshold are not responsive to increased levels of the migrant's income (prediction 4). We estimate the threshold at US\$ 6,740 using a nonlinear least squares method that fits a piecewise regression with the full set of control variables for remittance and reporting behavior previously used.²¹ The results of the piecewise regression are presented in table 4. Appendix figure A.5 shows a nonparametric relationship between the migrant's income and remittances.

21. The specification used for estimation is as follows:
 $r = (\alpha_0 + \alpha_1 y)I(y \leq t) + (\alpha_0 + \alpha_1 t + \alpha_2 (y - t))I(y > t) + \delta' X$, where r is remittances, y is the migrant's income, t is the threshold to be determined, and X is a vector of controls for remittance and reporting behavior.

Table 4: Piecewise Regression for Annual Remittances

	(1)	(2)	(3)	(4)
Migrant's annual earnings (US\$)	0.255*** (0.08)	0.547*** (0.15)	0.527*** (0.12)	0.527*** (0.13)
Migrant's annual earnings beyond income threshold (US\$)		-0.455* (0.25)	-0.438** (0.22)	-0.425* (0.22)
No. of other household members working abroad			-1,556*** (348)	-1,670*** (350)
Hhold annual medical expenditure as a share of income			3,506*** (1263)	3,374** (1299)
Log household's annual income in India			122.3** (55.6)	81.87 (72.4)
Median monthly income of Gulf migrants (log)			1,994*** (651.7)	2,112*** (707.8)
Additional controls	No	No	No	Yes
R-square	0.15	0.19	0.41	0.44
Number of observations	108	108	108	108

Notes: Additional controls consist of the wife's years of education and indicators for whether the wife is employed, unaware of her husband's expenses, having disagreements over remittance uses, and if the migrant spends on temptation goods. All regression includes a constant term. Bootstrapped standard errors (with 500 replications) are displayed in parenthesis, clustered at the district level. The threshold income of USD 6,740 was determined using a non-linear least square method using all variables in column (4).

*** denotes statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Source: Authors' analysis based on data from QSKF.

From column 4 in table 4, we observe that, all else equal, that is, for the “representative household,” remittances increase on average by US\$ 0.53 for every dollar increase in income below the threshold of US\$ 6,740. However, past the threshold, transfers increase only by US\$ 0.11.²² Thus, consistent with the model’s prediction, the slope of the remittance function is smaller beyond the threshold. This pattern of remitting behavior is similar to the threshold reporting behavior as discussed in relationship to figure 2.²³

22. A potential concern is that these results may not be robust due to the limited number of observations beyond the threshold of US\$ 6,740 (which is about 28% of all the observations). We also tested the robustness of the change in slopes using the median level of annual income of US\$5,918 as the threshold. Annual remittances rose by US\$0.57 for every dollar below the threshold and US\$0.16 for each dollar of income above it.

23. Joseph et al. (2015) using matched administrative data on remittance and earnings data for a panel of U.A.E. migrants find that remittances are unresponsive to increases in income over time but fall with negative income shocks, consistent with the empirical pattern we find.

Robustness

The remittance behavior observed in the data can hardly be explained under the assumption of symmetric information unless strong assumptions are imposed on the recipient's and the migrant's utility functions $v_R(\cdot)$ and $v_M(\cdot)$. In particular, in our model with symmetric information, the slope of the remittance schedule is given by

$$r'(y) = \frac{\rho_M(y - r(y))}{\rho_R(r(y) + y_R) + \rho_M(y - r(y))}, \quad (13)$$

where ρ_M and ρ_R are the migrant's and the recipient's coefficients of absolute risk aversion, respectively. We have to assume concave utility functions because with linearity the remittance schedule is not well defined under symmetric information.²⁴ The slope in (13) is obtained by implicitly differentiating the first-order condition of the recipient's maximization problem $\max_{r(y)} \int_{\underline{y}}^{\bar{y}} v_R(r(y) + y_R) dF(y)$ subject to the migrant's participation constraint.²⁵

From our data, at levels of income below the threshold, the remittance slope is around 0.5 implying $\rho_M \approx \rho_R$ from (13) or that the migrant's and the recipient's risk attitudes are similar. Past the threshold, however, risk attitudes must dramatically change in order to explain the data. Namely, for the remittance slope to take the value of 0.11, the coefficient ρ_M must become significantly smaller than ρ_R . Put differently, past the threshold the migrant's aversion to risk has to decrease at a much faster rate than that of the recipient's in spite of the precarious conditions of temporary migration and an equal, if not larger, share of income remitted up to and at the threshold. Arguably, a more plausible scenario is when the migrant's and the recipient's

24. As noted in footnote 9, concavity does not change the predictions of the model with asymmetric information.

25. See, e.g., Freixas and Rochet (2008, 128–29) who obtain the same slope for the optimal repayment schedule in the borrower-lender relationship.

risk attitudes do not vary drastically with relatively modest changes of income. Then, if a half of overseas income is initially remitted, the symmetric information model predicts a nearly constant remittance slope throughout.

For similar reasons, the same conclusion applies to the remittance models of altruism and investment as the optimal remittance schedule takes the same slope as in (13). This is hardly surprising as similar marginal utility trade-offs arise under different motives. In the model of altruism, as presented in Rapoport and Docquier (2006, 1143–44), the first-order condition for the optimal remittance transfer $r(y)$ is given by

$$-(1-\theta)v'_M(y-r(y)) + \theta v'_R(r(y) + y_R) = 0, \quad (14)$$

where θ is the coefficient of altruism. Taking the internal derivative $dr(y)/dy$, dividing its numerator and denominator by $(1-\theta)v'_M(y-r(y))$, and rearranging by using the first-order condition yield the slope as in (13). It can also be noted that the model of altruism fails its canonical test of the negative effect of the household's income y_R on remittances. As table 3 shows, the effect is close to zero, but never negative.

With regard to the systematic underreporting patterns observed here, existing models of remittance can hardly explain them assuming no sudden shifts in the migrant's and the recipient's risk attitudes. Suppose it is the case that wives infer their husbands' income from the remittances received. Then, the prediction of a constant remittance slope obtained under our assumption implies that the accuracy of wives' inference should not vary with their husbands' income. But the observed discrepancy suggests the opposite—inference becomes less accurate at higher levels of income. These observations, coupled with our empirical findings, suggest that the model extended with asymmetric information can better explain the observed remittance

behavior, calling for further theoretical and empirical research in this area.²⁶

VI. CONCLUSION

This paper contributes to the emerging body of literature that studies the effects of informational asymmetries on intra-household transfers. Our results strongly support the view that asymmetric information is an important determinant of remittance behavior. Specifically, our contribution is three-fold. First, we provide direct empirical evidence of informational asymmetries by collecting and contrasting household members' reports of foreign earnings that are observable by only one party. Second, we show that the discrepancy in foreign earning reports between migrants and remittance recipients is highly correlated with remittance behavior. Third, we offer a new approach towards modeling the exchange motive for remittances with asymmetric information about overseas earnings that is consistent with our empirical results.

Our survey of Indian households with husbands working in Qatar reveals significant informational asymmetries within transnational households. Empirical analysis demonstrates the presence of a number of patterns in reporting and remittance behavior that cannot be explained by individual biases. A striking feature of these patterns is the difference in the behavior of low- and high-income migrants, where the latter tend to underreport their earnings more and, accordingly, remit less as a share of their income. To explain the observed patterns in migrants' behavior, which is inconsistent with existing remittance models, we adapt the classical model of costly state verification to the problem of remittance contracting under an exchange motive. The theoretical results produced by the model closely match our empirical findings. The optimal remittance contract, offered by the recipient who can observe the migrant's earnings only at some cost, prescribes a threshold for remittances such that, if not met, verification is initiated.

26. Relatedly, Kinnan (2014) finds asymmetric information an important factor for insurance provision in Thai villages by showing that it is the predictions of the insurance model with hidden income that receive the most empirical support.

Under the threat of sanctions, the migrant is truthful but only up to the threshold, which is sufficient to explain our empirical findings. Finally, our empirical analysis, together with theoretical insights, suggests that the reported earnings ratio is a useful summary statistic of direct and indirect effects of informational asymmetries on remittance flows, calling for further research.

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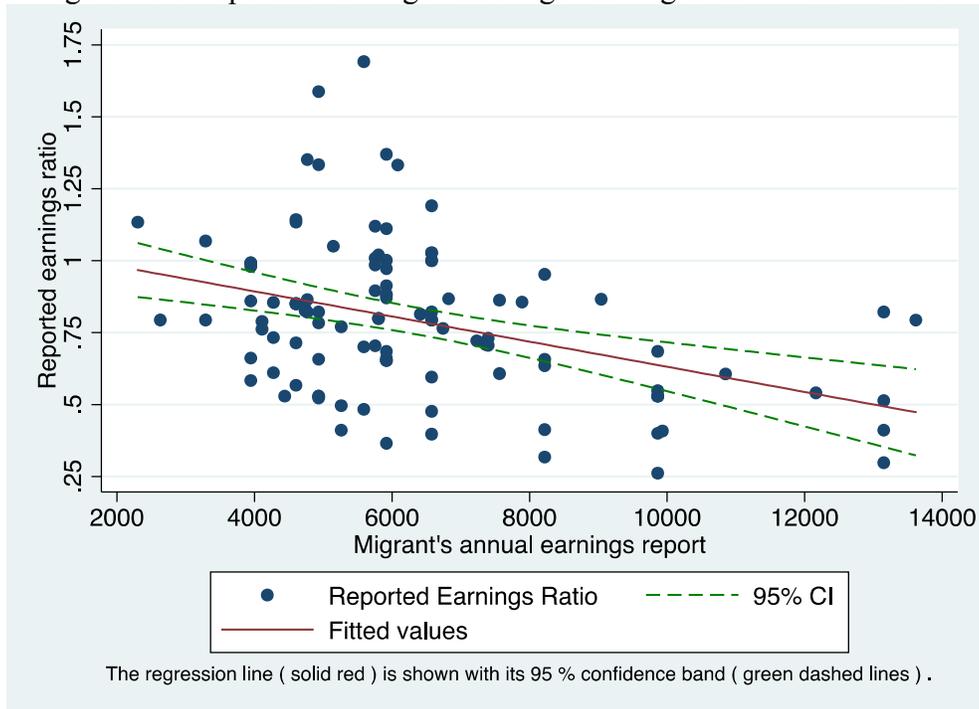
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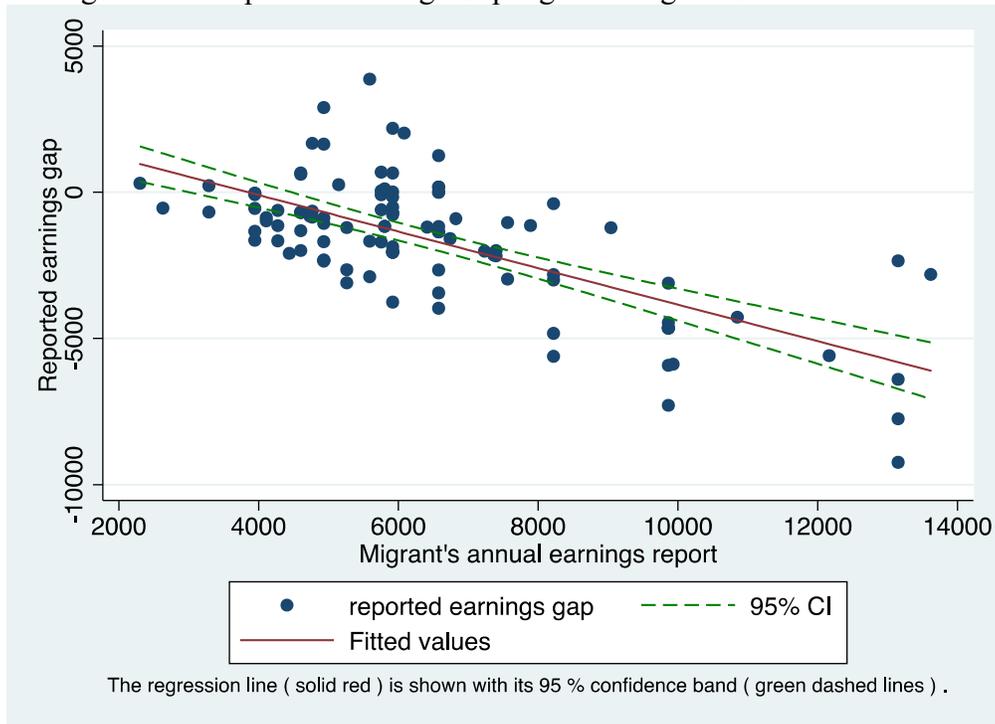
Appendix. Tables and Figures

Figure A.1: Reported Earnings Ratio Against Migrant's Annual Income



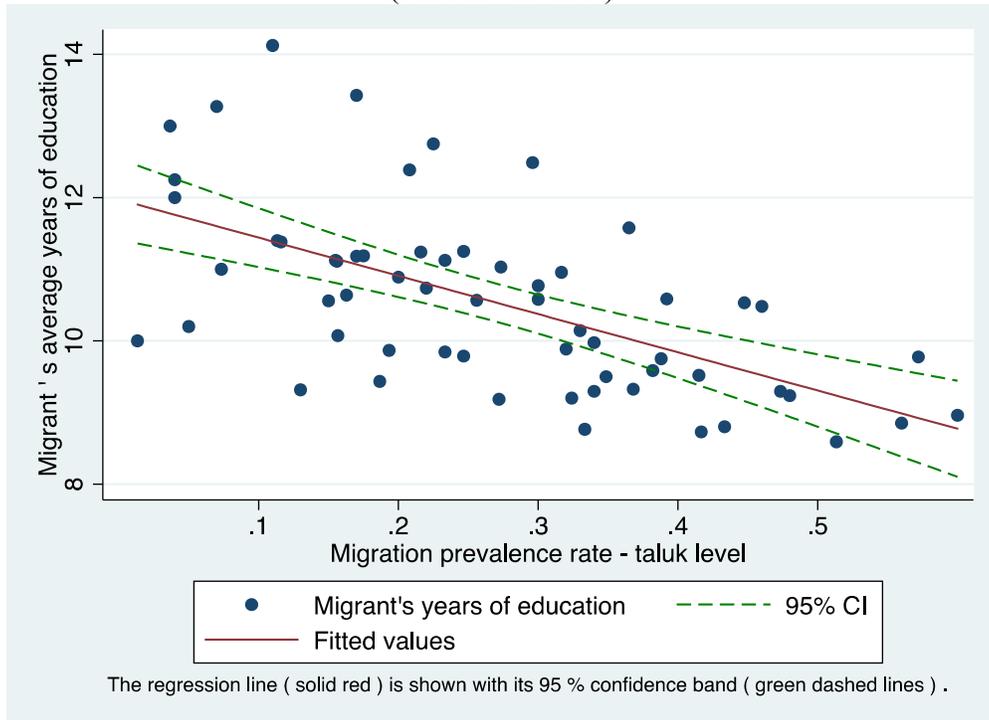
Source: Authors' analysis based on data from QSKF

Figure A.2: Reported Earnings Gap Against Migrant's Annual Income



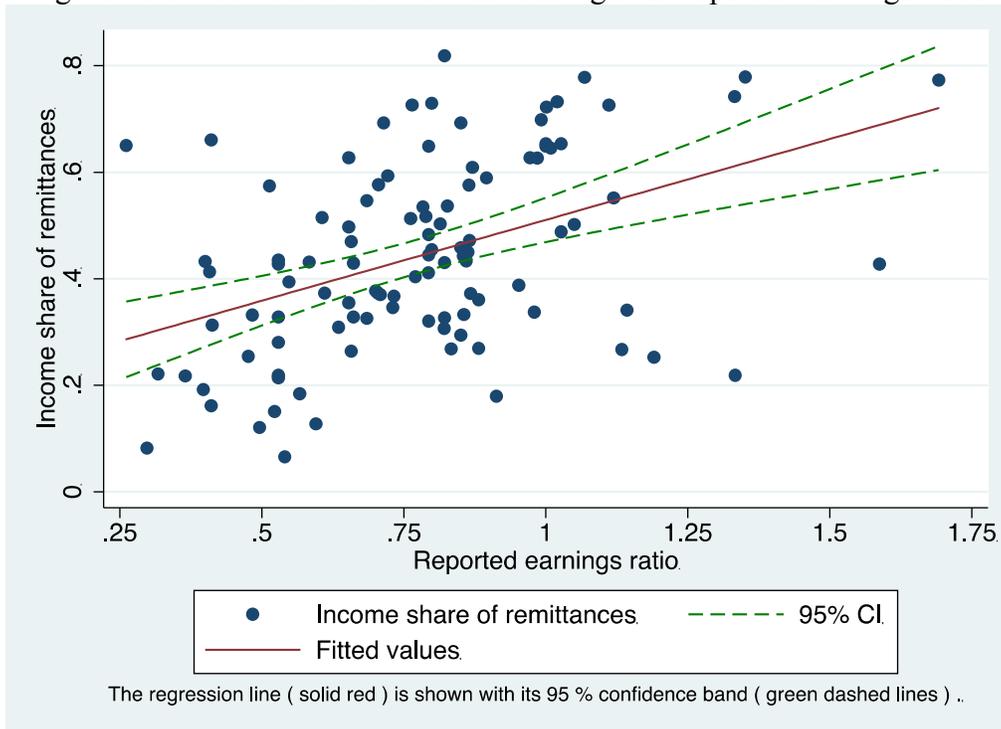
Source: Authors' analysis based on data from QSKF

Figure A.3: Migrant's Average Education Attainment Against Migration Prevalence Rate (subdistrict-level)



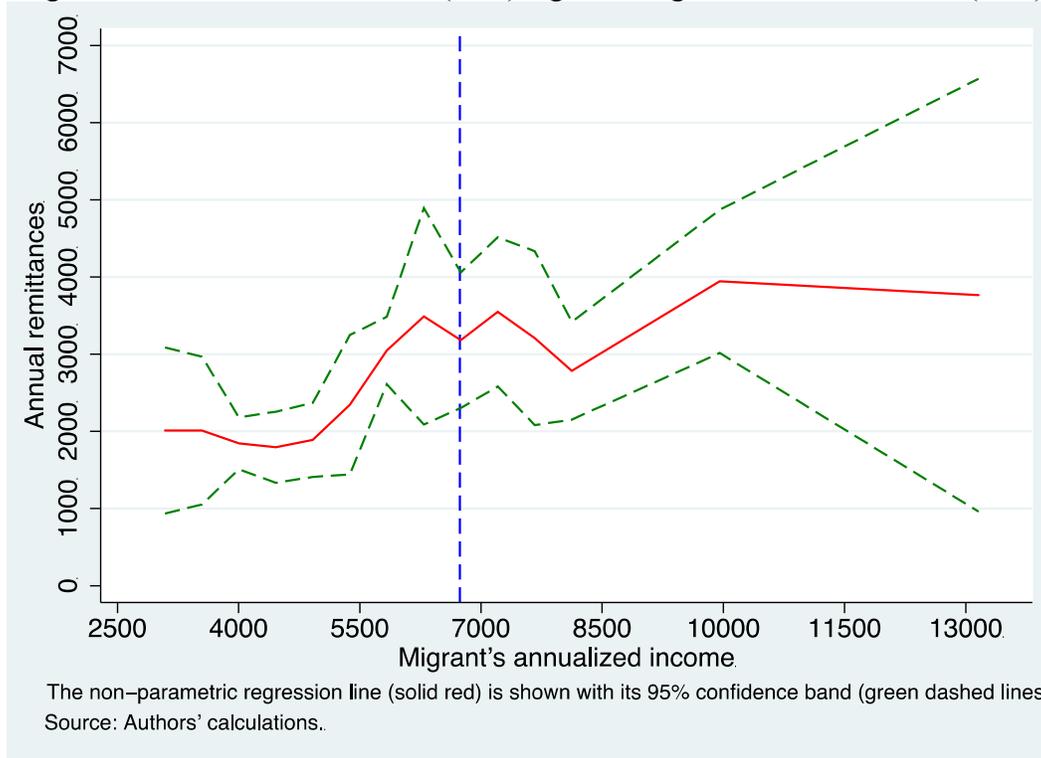
Source: Authors' analysis based on data from QSKF

Figure A.4: Income Share of Remittances Against Reported Earnings Ratio



Source: Authors' analysis based on data from QSKF

Figure A.5: Annual Remittances (US\$) Against Migrant's Annual Income (US\$)



Source: Authors' analysis based on data from QSKF

Table A.1: Comparison of QSKF and KMS

	<u>QSKF 2010</u>	<u>KMS 2011</u>
Migrant's Age (years)	38.56 (7.62)	39.81 (8.33)
Years worked abroad	9.98 (8.53)	10.95 (8.40)
Migrant's annual earnings (US\$)	4807.33 (1799.63)	4639.75 (3047.94)
Annual remittance received (US\$)	2377.77 (1827.44)	1845.03 (1985.06)
Number of observation	108	1778

Note: Standard deviations are in parentheses.

Source: Authors' analysis based on data from QSKF and KMS 2011 with a restriction to migrants working in the Arabian Gulf countries.

Table A.2: Determinants of the Reported Earnings Ratio

	(1)	(2)
Log earnings residual	-0.351*** (0.06)	-0.354*** (0.06)
Ratio of wife to husband's account of annual remittance		-0.002 (0.04)
Median monthly income of Gulf migrants (log)		0.144 (0.09)
Wife's years of education		0.0149* (0.01)
Wife is employed (Indicator)		0.134* (0.07)
Wife is unaware of husband's overseas expenses (indicator)		-0.085 (0.06)
Disagreement over remittance use (Indicator)		-0.116*** (0.04)
Migrant spends on temptation goods (indicator)		-0.133*** (0.04)
Constant	0.788*** (0.02)	-0.632 (0.91)
R-squared	0.18	0.37
Observations	108	108

*** denotes statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

Notes: The dependent variable is the ratio of the wife's report of the migrant's monthly earnings to that of the migrant. Bootstrapped standard errors (with 500 replications) are displayed in parenthesis, clustered at the district level.

Source: Authors' analysis based on data from QSKF.

Table A.3: Determinants of Log Annual Remittances (OLS)

	Wife's Report		Mean of Migrant's and Wife's Report	
	(1)	(2)	(3)	(4)
Reported earnings ratio	0.761*** (0.25)	0.631* (0.34)	0.714*** (0.20)	0.626*** (0.21)
Migrant's annual earnings (log)	0.892*** (0.21)	0.819*** (0.21)	0.819*** (0.19)	0.811*** (0.18)
Hhold has other members working abroad (indicator)	-0.14 (0.23)	-0.12 (0.24)	-0.417*** (0.16)	-0.459*** (0.16)
Hhold's annual medical expenditure as a share of migrant's income	-0.109 (0.61)	-0.172 (0.61)	0.379 (0.45)	0.365 (0.45)
Household's monthly income in India (log)	-0.002 (0.02)	-0.053 (0.05)	0.022 (0.01)	-0.002 (0.03)
Median monthly income of Gulf migrants (log)	0.551* (0.31)	0.453 (0.36)	0.671*** (0.21)	0.693*** (0.25)
Additional controls	Yes	Yes	Yes	Yes
R-squared	0.19	0.25	0.38	0.41
Observations	108	108	108	108

*** denotes statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

reports (columns 3 & 4). Additional controls consist of the wife's years of education and indicators for whether a wife is employed, unaware of her husband's expenses, having disagreements over remittance uses and if the migrant spends on temptation goods. All regression includes a constant term. Bootstrapped standard errors (with 500 replications) are displayed in parenthesis, clustered at the district level.

Source: Authors' analysis based on data from QSKF.