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**Network Effects in Migrant Remittances:
Evidence from Household, Sibling and Village Ties in Nang Rong,
Thailand**

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Abstract

Migrant remittances comprise an important capital source for developing countries. Research to date connects migrants' remittance behavior to altruism, exchange, insurance, and investment motives or to a desire to maintain options available through origin communities. This study provides an alternative 'network' perspective: remittance behavior may depend on the remitting patterns of those in one's social ties: (a) to members of the origin household, (b) to members of 'sibling' households, where a member of the ego household has a sibling, and (c) to members of the origin village. We explore this idea using complete census data from 51 villages in Nang Rong, where one in four residents migrated to internal destinations in either 1994 or 2000, and about half of those migrants remitted to their origin households. We find preliminary evidence on network effects: migrants' likelihood of remitting increases with the number of remitters in the household and with the share of remitters in the village, net of other determinants of remittance behavior, village and year fixed effects, and other potential confounders. We provide additional evidence that connects the former pattern to inheritance-seeking behavior in the household, and the latter to shared norms in the village.

International remittances, funds and goods sent by migrants to origin countries, total 325 billion US dollars annually (Ratha, Mohapatra and Silwal 2011) and are critical to understanding economic outcomes in the developing world. Remittances from internal migrants, although smaller in magnitude, are still vital to livelihoods in developing countries (Reardon 1997; Rempel and Lobdell 1978). Remittances extend household budgets (Durand, Parrado and Massey 1996; Stark and Lucas 1988), and diversify risks to those budgets in volatile developing economies (Lauby and Stark 1988; Taylor 1999). Remittances often lead to productive investments: allowing recipient households to develop small businesses (Funkhouser 1992; Massey and Parrado 1998; Woodruff and Zenteno 2007), give better education to their children (Edwards and Ureta 2003; Yang 2008), and accumulate assets (Garip 2012b; Massey and Parrado 1994; Taylor and Wyatt 1996). These flows are sufficient to shape trends in poverty (Adams 2006; Adams and Cuecuecha 2010; Adams and Page 2005) and distribution of income (Adams 1992; Mora 2005; Taylor 1992) and wealth (Garip 2012b) in receiving regions or countries.

Many studies focus on the macro-economic implications of remittance flows, and some seek to illuminate the micro-level mechanisms underlying individuals' remittance decisions. Existing research offers a number of explanations for why migrants remit. Migrants remit to improve their origin household's welfare, which they equate to their own, according to the *altruistic* explanation (Agarwal 2002; Banerjee 1984; Johnson and Whitelaw 1974), while they remit to buy services or secure inheritances from households based on the *exchange* view of remittances (Cox 1987; Cox, Eser and Jimenez 1998; De la Briere et al. 2002; Fokkema, Cela and Ambrosetti 2013; Hoddinott 1994). Migrants remit as part of a mutual risk diversification

arrangement with the household in the *insurance* explanation (de Brauw, Mueller and Woldehanna 2013; Rosenzweig 1988; Stark and Levhari 1982), and to repay past loans in the *investment* view (Ahlburg and Brown 1998; Bollard et al. 2011; Cai 2003; Poirine 1997; Stark and Bloom 1985).

These explanations, although quite varied, are similar in one critical aspect: each assumes the unit of analysis (the individual or the household or the relationship between the two) to be separate and independent from the larger social structure. Few studies have presented evidence to challenge this assumption. Massey and Basem (1992), for example, showed that Mexican migrants remit more to their families in origin if they have other migrant family members in the United States. The authors connected this pattern to the resources those family members can offer, such as finding better paying jobs in destination or providing safe channels to send back remittances. Roberts and Morris (2003) generalized this finding into the ‘option’ theory of remittances, which asserts that migrants remit to retain membership in the origin community and to access information on employment opportunities in new destinations. Piotrowski (2006) found support for this theory among internal migrants from Nang Rong, Thailand, who were less likely to remit to their origin households if those households were not well-connected in their village and thus were less likely to offer the information benefits Roberts and Morris (2003) presumed.

This study builds on this work, but offers a more general perspective on social interdependencies in remittance behavior. There is abounding evidence in multiple fields on how a wide range of individual behaviors, from smoking (Christakis and Fowler 2008; Fletcher 2010) to fertility choices (Kohler, Behrman and Watkins 2001) or suicide attempts (Bearman and Moody 2004),

are associated with the prevalence of those behaviors in social groups. Similar evidence is also abundant in the migration literature. Many studies show how migrant peers in the household or community increase individuals' likelihood of migration by providing information, help, or normative pressures (Massey 1990; Massey and Zenteno 1999).

This study explores potential peer or network effects in remittance behavior. The general hypothesis asserts that remitting peers increase individuals' likelihood of sending remittances. We use complete census data from 51 villages in Nang Rong, Thailand (35,122 unique individuals and 6,301 households in 1994 and 2000) with an established history of internal migration and remittance flows and measure three types of social ties: (a) to members of the origin household, (b) to members of the sibling households, where a member of the ego household has a sibling, and (c) to members of the origin village. We develop additional hypotheses for the specific social mechanisms that may account for interrelated individual behaviors in each kind of social tie.

We model individuals' remittance behavior in 1994 and 2000 as a function of remittance behaviors among their social ties in the same years. We use a Heckman probit specification to correct for migrant selectivity and include indicators for the alternative theories of remittance behavior as well as indicators for village and time period. We perform various robustness checks to account for potential simultaneity bias and other confounders, but our results in the end merely suggest an association not a causal link due to difficulties in identifying peer effects also acknowledged in the larger literature (Cohen-Cole and Fletcher 2008; Manski 1993; Mouw 2006).

Competing Accounts of Remittance Behavior

Research in economics provides four competing models that relate remittance behavior to altruistic, exchange, insurance or investment motives, which are described below. Table 1 lists the predictions of each, along with the indicators from study data testing predictions.¹

[Table 1. Empirical Predictions of Remittance Theories]

The altruistic model of remittances suggests that a migrant's utility function encompasses the utility of other household members. The migrant remits to improve her household's, as well as her own, welfare (Agarwal 2002; Banerjee 1984; Fokkema et al. 2013; Johnson and Whitelaw 1974). Empirical work tested two general predictions from this model: remittances increase with migrants' income in destination, and household's economic needs in origin (Cox 1987; Cox et al. 1998; Funkhouser 1995; Lucas and Stark 1985; Massey and Basem 1992). In our data, these predictions imply remittance propensities will be higher for migrants (a) in factory jobs (who earn more than service and construction workers on average in Thailand), (b) from households with more dependents (children or seniors), (c) from villages with water shortage (which implies risks to farm earnings), but lower for those (d) from households with assets (land or cattle), with members in non-agricultural work and in diverse set of economic activities (thus less dependent on volatile farm income) and (e) from households with multiple migrants.

¹ This table is based on Docquier and Rapoport's (2006) Table 2 (p.39), but differs in three respects. First, we do not report the predictions related to the strategic motive of remittances. This motive suggests that migrants' remittances are targeted at positively selecting future migrants. The specific empirical predictions of this model, for example, that remittances will "bribe" unskilled migrants in origin, are not testable with the Thai data. Second, we do not report the predictions for the inheritance motive for remittances. This motive implies that migrants remit to assure future inheritances from the household in origin. The predictions of this model are a subset of those of the exchange model, therefore, we include the inheritance-seeking motive within this more general model. Third and finally, we do not indicate relationships that are ambiguous or non-existent.

The exchange model of remittances argues migrants remit to buy services, secure future inheritances from household members, or integrate easily upon return (Cox 1987; Fokkema et al. 2013). This model predicts that remittance probability is higher for migrants (a) who are potential heirs (youngest daughters in the Thai case followed by older daughters and sons, ordered by the likelihood of receiving remittances), for those from households (b) with inheritable assets (land or cattle) or (c) with multiple migrants, where remittances are used to compete for inheritances (De la Briere et al. 2002; Hoddinott 1994; VanWey 2004). The model implies that remittance propensity is higher for migrants (d) with higher income in destination and (e) with dependents in origin household, where remittances can serve as a payment for dependents' care (Lee, Parish and Willis 1994). The model also makes a distinctive prediction that remittance propensity will be lower for migrants (f) with high education, who are less likely to return home, and thus less likely to expect household favors.

In the insurance model, remittances are a part of a mutual risk diversification arrangement between the migrant and the household (de Brauw et al. 2013; Rosenzweig 1988; Stark 1991; Stark and Levhari 1982). The migrant often works in a different region and different sector of the economy than the origin household, thus, her wages provide a hedge against the risks to origin earnings, and vice versa. The model implies remittances increase with risks to (a) migrants' earnings in destination or (b) households' earnings in origin (Agarwal 2002; Cox et al. 1998; Foster and Rosenzweig 2001).

Finally, in the investment model, remittances are a repayment for household's investment in the migrant, for example, in terms of loans to cover costs of education or migration (Cox and Jimenez 1990; Poirine 1997). Empirical predictions include higher remittances from migrants who require more 'investment', for example, those who (a) are more educated, (b) are in a farther away destination, and (c) earn higher incomes (Ahlburg and Brown 1998; Bollard et al. 2011; Cai 2003; Hoddinott 1994; Regmi and Tisdell 2002). The model also expects higher remittances to (d) households that face greater risks to origin earnings, and hence, more incentives to invest in migrants.

A Network Explanation for Remittance Behavior

The four prominent explanations of remittance behavior focus on the economic incentives, and overlook the social structure that may help generate or sustain remittance flows. Only a handful of studies to date have considered how social ties in origin or destination can shape remittance propensities. Studying the Mexican migrants in the United States with the Mexican Migration Project (MMP) data, Massey and Basem (1992) observed that migrants who had family members in destination were more likely to remit to Mexico. The authors connected this pattern to potential resources family members can offer in destination, for example, finding better-paying jobs for the migrant or offering a secure way to transfer money home.

Roberts and Morris (2003) develop an alternative theory of remittance behavior by replicating Massey and Basem's (1992) findings on a larger sample from the MMP. Mexican migrants, the authors observed, are more likely to remit if they find their employment through social ties and if

their origin community members are dispersed to diverse locations in the United States. These patterns, the authors argued, might mean that migrants remit to affirm membership in their origin community networks, which gives them the option to access information on job opportunities in different destinations.

Using the Nang Rong data, like the present study, Piotrowski (2006) provided more evidence to the so-called ‘option’ theory from the internal migration setting of Thailand, finding that urban migrants remit less to their rural households if those households are isolates (that is, unconnected nodes) in the rice harvesting networks in the village. These networks organize the exchange of help among households during the labor-intensive rice harvest each year, and are a crucial aspect of the region’s subsistence economy. The households that are disconnected from these networks, Piotrowski argued, are less likely to be privy to information about employment opportunities in migrant destinations, hence less likely to receive remittances from option-seeking migrants.

These studies provide a first glimpse into how migrants’ remittance behavior may depend on certain qualities of their social group, for example, the ability to control resources, such as job information. But the studies do not explore network effects, as we understand them, where a migrant’s remittance behavior may depend on that behavior’s prevalence in her social group. This gap is all the more surprising given the plethora of empirical work in the larger migration literature, which establishes how individuals’ migration behavior depends on that behavior in their families or communities (Curran et al. 2005; Davis, Stecklov and Winters 2002; De Jong, Richter and Isarabhakdi 1996; Garip 2008; Massey and García-España 1987; Winters, Janvry

and Sadoulet 2001). Prior migrants in the family or community, the argument goes, provide resources or normative pressures that increase individuals' likelihood of migration.

This study extends a similar argument for remittance behavior. We suggest that a migrant's likelihood of remitting will depend on remittance behavior in her household, among kin, and in her community, the three social groups that the Nang Rong data allow us to capture. The mechanisms generating the network effects, however, will be different for each social group.

In the household, the existing theories alert us to two factors – household's economic needs and migrant's heir status – that might generate network effects in remittance behavior. If remittances are directed to meet household needs without any future expectations on the part of the migrant, as in the altruistic explanation, then the presence of other remitting migrants in the household might imply a diffusion of responsibility, deterring a migrant from remitting herself. In this case, a migrant's propensity to remit should decline with the number of remitters in the household, and the rate of decline should be highest for wealthier households, who need the remittances least. If, on the other hand, remittances are meant to secure future inheritances, as in the exchange view of remittances, then the presence of other remitting migrants might create a competition in the household to send more remittances. Then, a migrant's propensity to remit should increase with the number of remitters in the household, and the rate of increase should be higher for potential heirs in the household, who are most likely to inherit.

Among kin (measured with sibling ties among households in the Nang Rong villages) and village members, we envision two mechanisms that potentially lead to interrelated remitting behavior.

The first mechanism – relative deprivation – is based on the insight that households send workers to other cities or countries not only to increase income in absolute terms, but also to improve their relative status, and reduce their relative deprivation with respect to some reference group (Stark and Bloom 1985; Stark and Taylor 1989, 1991). This idea implies network effects in remittances. Imagine household H in Village V sends a migrant to Bangkok and soon starts receiving remittances. Suddenly the other households in Village V that are connected to household H feel relatively deprived, and some of them decide to send migrants and collect remittances as well. This further increases inequality in the village, inducing more households to send migrants and expect remittances.

Relative deprivation implies two hypotheses. First, a migrant's propensity to remit should increase with the share of remitters in her social group (kin and village members). Second, the rate of increase should be highest for the poorest households, who are the most relatively deprived.

An alternative mechanism underlying remitting behavior among households is migrant social capital, the information or assistance offered by prior migrants, which reduce costs and increase the benefits of migrating. Massey and Basem (1992), Roberts and Morris (2003) and Piotrowski (2006) have investigated how these resources affect remittance behavior directly. We argue resources can also impact remittance propensities indirectly through their interaction with the prevalence of remittance in social groups. Imagine, again, household H in village V sends a migrant to Bangkok, who returns to the village and brings information about jobs. Now the households in the village connected to household H learn about these jobs and some of them can

also send migrants. Those new migrants supply more information through their networks, propelling more individuals to migrate. Returning to the migrant from household H, if she wants access information about new jobs through her origin networks, she should retain ties to her household. One way to achieve that is to send remittances, the Roberts-Morris option theory suggests. We argue that the migrant will be more likely to send remittances as a way of retaining ties if others in her social group are also doing so.

The social capital mechanism suggests two hypotheses. First, a migrant's propensity to remit should increase with the share of migrants or remitters in her social group (kin and village members, in our case), and second, the rate of increase should be lowest for migrants in (highest-paying) factory work, and thus need the origin networks the least.

A final mechanism we consider for network effects in the village level is shared norms.

We argue that migrants should be more likely to respond to the remittances of others who occupy similar social categories. In the Thai setting, gender and birth order are critical dimensions that determine an individual's role within the household. Prior work shows that daughters are more likely to remit than sons, and older daughters more than younger (Phongpaichit 1993; VanWey 2004). Research attributes this pattern to Buddhist tradition assigning religious merit to women supporting their families (Osaki 1999), and to inheritance norms that favor daughters, the youngest daughters in particular, who often receive the homestead and a larger portion of the land in return for caring for elderly parents (Curran et al. 2005). These findings suggest that remittance norms may be specific to social categories, such as those delineated by gender and birth order.

The shared-norm mechanism produces the following hypothesis: a migrant's propensity to remit should increase with the share of remitters in her social category (youngest daughter, older daughter, son or other), not with the share of remitters in other categories.

Study Setting, Data, and Methods

The study data come from the Nang Rong surveys, which provide a rich source of information from more than 40,000 individuals in 51 villages and allows us to observe migration and remittance behaviors in household, network, and village levels across two time periods (1994 and 2000).² Nang Rong is a poor district of the Buriram Province in Northeastern Thailand. Migrant streams from this district once included mostly seasonal workers who moved for a few months during the droughts preceding the monsoon rains (Phongpaichit and Baker 1998). The seasonal character of migration began to shift in the mid-1980s, when Thailand's economic growth averaged 9 percent per year (Jansen 1997). Growth created an increasing demand for migrant labor in urban destinations. Rural migrants in their teens and early twenties, many from the Northeast region, filled factory, construction, and service jobs at unprecedented rates (Mills 1997). Economic growth slowed in the mid-1990s, and came to halt with the 1997 Asian financial crisis. Unemployment rates increased, tempering the rate of rural-urban migration. Our data cover 1994 and 2000, falling roughly into the boom and bust periods of the Thai economy, respectively.

Nang Rong surveys were collected in three waves: 1984, 1994, and 2000. Each wave included a census of all households in 51 villages (defined according to 1984 administrative boundaries).

² For more information: <http://www.cpc.unc.edu/projects/nangrong/>

The census asked questions on demographic characteristics, education, employment, family, and migration histories of all individuals (including absent migrants). Additional questions captured household assets, debt, and agricultural activities, as well as village institutions and agricultural, natural, economic, social, and health resources. The 1994 (2000) census contains information on 40,846 (46,722) individuals in 7,331 (8,638) households.

Nang Rong surveys are unique in containing complete social network data across sibling relations. These data were collected at the household, not individual, level in 1994 and 2000. Sibling ties link each household to other households in the village, where a sibling of a member of the ego household lives.³ Due to Thailand's rapid population growth in the 1960s and 1970s, households in our sample have substantial sibling ties (an average of 1.36 in 1994 and 2.13 in 2000) to other households in their villages. Figure 1 shows the variation in the structure of sibling networks in three selected villages in 1994 and 2000. Nodes (circles) indicate households, and edges (lines) a sibling relation between any two members of the ego and alter households. Isolates (households with no ties) are not shown. Sibling networks in villages A and C have several components (sets of connected nodes), while the village B sibling network has few. In fact, a single component in village B encompasses almost all households. As a result, the density of ties (ratio of existing to all possible ties) is highest in village B (0.022) followed by village A (0.013) and C (0.010). In all three villages, the structure of sibling ties changes from 1994 and 2000; the average degree and density increases, while isolates decline.

[Figure 1. The Structure of Sibling Networks in Three Selected Villages in 1994 and 2000]

³ The survey question for sibling ties is: "Does this person other siblings besides the ones [living in the household] that are living? If so, record their location." For each sibling not in the household, the current location identified a specific household if that household was in the village or a specific village or district otherwise.

Roberts and Morris's (2003) option theory suggests remittance behavior depends on the structure of social ties, predicting migrants will be less likely to remit to villages that are less connected, where information about employment opportunities flows less freely. We test this prediction with sibling network indicators at the village level: (a) the average degree (i.e., number of ties) across households, (b) the density of ties, and (c) the number of isolates. Given the theory, we expect remittance propensity to increase with average degree and density, but decline with the number of isolates. These predictions are summarized in column 5 of Table 1.

Our dependent variable is an indicator for remittance behavior among migrants. Migrants are individuals who were members of their households in 1984 (1994), but moved out of the village two months or more prior to the 1994 (2000) survey. Remitters are migrants who sent money or goods (food, clothing, household items, electrical appliances or vehicles) to their households during the 12 months preceding the survey (as reported by the origin household members). Column 1 of Table 1 lists variables in the Nang Rong data that capture predictions of the altruistic, exchange, insurance, investment and option models in prior work and the network model put forth here.

We measure education using three indicators (primary, middle, and high school or more) and heir status with indicators for whether the person is the youngest daughter, older daughter, or son, in descending likelihood of receiving remittances. We include dummies for factory, service or construction worker, which, in descending order, proxy migrant's income in destination. The total number of children (of women younger than 30) and number of seniors (older than 64) measure the dependency in the household. The number of migrants (excluding the individual)

captures potential competition in household for future inheritance (as in the exchange model), or the alternative economic resources available to the household (as in the altruistic model). Three land categories (1-14 rai, 14-31 rai, 31 rai or higher; 1 rai=0.4 acre) and logarithm of cattle owned represent major household assets. The number of household members in a non-agricultural occupation and the number of economic activities (silk weaving, silk worm raising, other cloth weaving, charcoal making), also proxy household income. The months of water shortage in year capture the duration of the droughts that can be detrimental to household subsistence or income. The presence of a school in the village and the years since the village was electrified measure the level of development, and potential opportunities for investment in origin village. The number of remitters in household, the proportion of remitters in the sibling network and village capture the prevalence of remitting behavior in household, among kin and village members, respectively, all expected to be positively related to an individual's remittance propensity (see the last column of Table 1). Age, marital status, household size and logarithm of village size are added as controls.

Table 2. Characteristics of the Overall Sample, Subset of Migrants and Subset of Remitters in 51 Villages (Nang Rong Survey, 1994 and 2000 waves)

We exclude 11,064 (5,276) individuals who live in households with no information on sibling networks in 1994 (2000)⁴ and 3,616 (376) individuals who have missing data on demographic or socio-economic characteristics in 1994 (2000). Our final sample contains 32,042 (30,006) individuals in 6,293 (5,932) households in 51 villages in 1994 (2000).

⁴ Alternative models where we exclude the indicators based on sibling network data and include the individuals with missing information in these indicators yield substantively similar results.

Table 2 summarizes the means for all variables for the overall sample (62,048 person-years), subset of migrants (15,304) and subset of remitters (8,439) along with results from clustered difference-of-means tests that compare migrants to non-migrants and remitters to non-remitters, while accounting for multiple observations at the individual level (means for non-migrants and non-remitters omitted to conserve space).

Our main analysis employs a bivariate probit specification that accounts for censoring in remittance behavior (the fact that it is only observed among migrants, not the entire population). This specification requires a variable (instrument) that influences migration (selection), but does not directly affect remittances (outcome), nor is it correlated with the unobservables affecting remittances. Here, we use the distance to district center, to which migrants need to travel to reach urban destinations, as an instrument. Individuals who live in a village far from the district face higher travel costs, and thus may have lower propensities to migrate, especially if their families have limited financial resources. (Garip (2012a) evaluates the validity of this instrument in the Nang Rong data.)

Results

Table 3 presents the marginal effect of each indicator on the conditional probability of remitting given migration, when other indicators are kept at their mean (for continuous) or mode (for binary). The propensity to remit increases with education, although not linearly, and is higher for daughters compared to other members of the household. These patterns are consistent with the investment and exchange models, respectively. The propensity to remit is highest for migrants in

factory jobs, who tend to earn the highest salaries, consistent with altruistic, exchange and investment models. The likelihood of remitting declines with the unemployment rate in migrant's occupation, defying a pattern expected in the insurance model, but increases with the number of seniors in origin household, confirming a pattern implied in the altruistic and exchange models. The probability of remitting declines with the number of migrants in the household, and also with the number members in a non-agricultural occupation in household, confirming patterns implied by the altruistic view. The propensity to remit does not vary by the structure of sibling networks in the village, defying a prediction of the option model of remittances, but increases significantly with the number of remitters in the household, and the proportion of remitters in the village, consistent with the network model proposed here. The likelihood of remitting, however, does not respond to the proportion of remitters in the sibling network, suggesting household and village as the main social foci for the transmission of remittance behavior.

[Table 3. Estimated Marginal Effects of Individual, Household and Village Characteristics on the Propensity to Remit]

Table 4 presents two models testing potential mechanisms – household's economic needs and migrant's heir status – underlying the observed network effects in the household. The former suggests a negative association between other remitting migrants in the household and a migrant's likelihood of remitting that would be larger (in absolute terms) for wealthy households. The latter mechanism, by contrast, implies a positive association between other remitters in household and a migrant's propensity to remit that would be highest for potential heirs. Model 1

introduces interaction terms between the number of household remitters and household land, which are not statistically significant, thus providing no support for the former mechanism. Model 2 introduces interaction terms between the number of household remitters and indicators for heir status. Consistent with the latter – inheritance-seeking – mechanism, the results show that a migrant’s propensity to remit increases with the number of other remitters in the household, and is highest for the youngest daughters, the most likely heirs.

[Table 4. Estimated Marginal Effects of Remittance Behavior in Household and Sibling
Networks on the Propensity to Remit]

Models 3 and 4 test relative deprivation and migrant social capital mechanisms for linked remittance behavior in sibling networks. Both imply a positive association between the share of remitters in the sibling network and a migrant’s odds of remitting. The former mechanism expects the association to be higher in poor (and more relatively deprived) households, while the latter posits the association to be lower for migrants in factory jobs (who are in less need of information through origin networks). The interaction terms in Models 3 and 4, all statistically insignificant, defy these expectations.

[Table 5. Estimated Marginal Effects of Remittance Behavior in Village Networks on the
Propensity to Remit]

In Table 5, Models 5 and 6 test if the same mechanisms could underlie the network effects in remitting at the village level. While the share of remitters in village significantly increases a

migrant's chances of remitting, the effect does not vary by household wealth or type of job migrant holds, suggesting no support for the relative deprivation or migration social capital mechanisms.

Model 7 considers a third mechanism – shared norms – posited at the village level, which implies a migrant's propensity to remit should increase with the share of remitters in her own specific social category (determined by gender and birth order, and measured with indicators for youngest daughter, older daughter, son and other), and not with the share of remitters in other categories. The model introduces separate indicators for the share of village remitters in each social category, which are interacted with a dummy for that category. The results are consistent with the shared norm hypotheses: each category only responds to the prevalence of remitting behavior in their own category, not to other categories.

Discussion

Our results establish an association between individuals' remittance behavior, and that of those in their social group, but do not provide a causal link. To use Manski's (1993) terminology, our hypotheses posit *endogenous* network effects, which arise if individuals' remittance behavior varies with the average remittance behavior in their social group, creating positive feedbacks over time. But these effects are difficult to separate from *contextual* or *correlated* effects, which imply no such feedbacks. Contextual effects arise when individuals' remittance behavior varies with the exogenous attributes (e.g., average education) of the social group, while the correlated effects occur when individuals' remittance behavior varies with personal or environmental

factors that may be similar across peer group members.

The village and year dummies in our models capture time-invariant environmental confounders that may lead to correlated effects, while the comprehensive set of time-varying controls at the individual, household, and village levels account for possible trends in those confounders, which may have changed at different rates in different sub-samples (Cohen-Cole and Fletcher 2008). Similarly, the indicators for the average background characteristics in our models (e.g., average education and land in household, among sibling ties and in village) capture potential contextual effects.

These controls, however, do not ensure the proper identification of endogenous effects, which is further complicated by two issues. First is the simultaneity of remittance behaviors. Our data do not allow us to determine if an individual remits before or after those in her social group. To address this issue, we estimated an alternative specification on the 2000 cross-section of the data, where we modeled an individual's propensity to remit in 2000 as a function of the number or share of remitters in her social groups in 1994. The results (available upon request) remained substantively similar. Second, we considered the possibility that a household might receive remittances from other sources than members of the household, for example, from sibling households, complicating the relationship between the remittance behavior in the household and that among sibling households. In additional analysis we excluded the individuals whose sibling ties report remitting to other households than their own. (These siblings, we presumed, could be remitting to the index household.) The results (available upon request) remained substantively similar.

Conclusion

This study investigated the social interactions in remittance behavior. Prior work offers competing explanations that relate remittance behavior to various economic incentives, such as altruism, exchange, insurance, or investment, or to options available to migrants through origin communities. These models vary in their unit of analysis (individual, household, or the relation between the two), but not in their treatment of that unit as an isolated entity independent from the social context. This runs counter to evidence from multiple fields that shows how various individual behaviors, including migration, are conditioned on the prevalence of those behaviors in social groups.

This study made a first attempt to identify similar network effects in remittance behavior. We employed two waves (1994 and 2000) of the Nang Rong surveys with complete data on more than 30,000 individuals in 51 rural Thai villages, where about a fourth of individuals have migrated internally, and about half of migrants sent remittances to their origin households. Our key indicators measured the prevalence of remittance behavior (a) in the household, (b) among other households where a sibling of an ego household member lives, and (c) in the village. We fit a censored bivariate probit specification, linking various indicators to migrants' propensity to remit, while accounting for migrant selectivity.

We found that, net of alternative explanations of remittance behavior, the number of remitters in the household and the share of remitters in the village both increase the propensity that a migrant will remit, while the share of remitters in the sibling network has no impact. We argued that the

household and village provide the key social foci in the Thai setting for the transmission of remittance behavior.

We also considered mechanisms that might underlie the network effects in remittances. We found that inheritance seeking, where potential heirs compete for future inheritances, might explain the positive affect of other remitters in the household on one's propensity to remit. We also suggested that shared village norms, where each social category (defined by gender and birth order) responds to the remitting behavior of those in her own category, to be the most likely explanation for the positively linked remittance behaviors at the village level. We found no support for alternative mechanisms – relative deprivation or migrant social capital – which respectively imply household's wealth status and resources available through other migrants as the main anchors of network effects in remittance behaviors among kin or village members.

Our analysis employed a number of strategies to address issues of identification, but our results still provide suggestive associations, not causal links, among remittance behaviors of related individuals. Future work could better address the issues of identification especially if more detailed longitudinal data with exact time stamps of remittance receipts. Our analysis also relied on simple definitions of social groups (households, sibling ties, village members) measured in the origin setting alone; future work could consider other kinds of social groups (e.g., friends) captured in both the origin and destination settings.

TABLES and FIGURES

Table 1. Empirical Predictions of Remittance Theories^a

Variables (measures in Nang Rong data)	Expected Relationship by Theory					
	Altruism	Exchange	Insurance	Investment	Option	Network
Migrant's education (advanced > secondary > primary)		-		+		
Migrant's heir status (youngest daughter > older daughter > son)		+				
Migrant's income in destination (factory > service > construction occupation)	+	+		+		
Risks to migrant's income (unemployment rate in occupation)			+			
Dependents in household (number of children and seniors)	+	+				
Number of migrants from household (current migrants excluding index migrant)	-	+				
Household assets in origin (land and cattle)		+				
Household income in origin (land, cattle, number of economic activities)	-					
Risks to household subsistence or income (months of water shortage)	+		+	+		
Investment opportunities in community (school and years since electrification)				+		
Sibling networks (number and density of ties)					+	
(isolates in village)					-	
Remittance behavior in networks (number of remitters in household, sibling ties and village)						+

^a Expected relationships for altruism, exchange, insurance and investment theories are taken from Rapoport and Docquier (2006), Table 2 (p.39). Empty cells denote no or ambiguous relationship. Expected relationships for the option theory are implied in Morris (2003) and Piotrowski (2006). Expected relationships for the network effects are based on original hypotheses in the present paper.

Table 2 Characteristics of the Overall Sample, Subset of Migrants and Subset of Remitters in 51 Villages (Nang Rong Survey, 1994 and 2000 waves)

Variable	All	Migrants ^a	Remitters ^b
Education			
Less than primary school	0.57	0.32	0.29
Primary school	0.31	0.49	0.52
Middle school	0.06	0.07	0.07
High school or higher	0.06	0.12	0.12
Heir status			
Youngest daughter	0.13	0.13	0.17
Older daughter	0.11	0.21	0.27
Son	0.24	0.43	0.42
Other (Head, spouse or other relative)	0.52	0.22	0.14
Destination income (migrants only)			
Factory worker		0.20	0.27
Service worker		0.21	0.24
Construction worker		0.10	0.10
Other (Student, unemployed or agricultural worker)		0.50	0.39
Risks to destination income (migrants only)			
Unemployment rate in occupation (%)		1.68	1.77
Dependents in household			
Number of children (of women < 30 year old)	1.24	1.27	1.19
Number of seniors (> 64 year old)	0.35	0.40	0.38
Migrants in household			
Number of migrants (excl. index individual)	1.65	2.48	2.37
Household assets in origin			
No land	0.08	0.06	0.05
Low land (1-14 rai)	0.38	0.37	0.37
Medium land (14-31 rai)	0.32	0.33	0.34
High land (>31 rai)	0.22	0.24	0.24
Log of cattle owned	0.94	0.95	0.98
Household income in origin			
Members in a non-agricultural occupation	2.13	2.60	2.54
Number of economic activities (0-3)	0.90	0.94	0.95
Risks to household subsistence or income			
Months of water shortage	1.70	1.63	1.71
Investment opportunities in community			
Primary or secondary school in village	0.41	0.40	0.40
Years since electrification	11.56	11.59	11.50

(continued)

(Table 2, continued)

Variable	All	Migrants ^a	Remitters ^b
Sibling networks ^c			
Number of ties	1.72	1.32	1.29
Density of ties	0.01	0.01	0.01
Number of isolates in village	38.00	38.31	39.19
Remittance behavior in networks (migrants only)			
Number of remitters in household (excl. index individual)		2.79	3.18
Proportion of remitters in the sibling network (excl. index hh)		0.14	0.13
Proportion of remitters in the village		0.39	0.39
Controls			
Age	31.96	27.34	26.72
Married	0.54	0.55	0.51
Household size	6.63	7.90	7.75
Log of village size	6.28	6.28	6.28
Average education in household (excl. index individual)	4.79	4.89	4.88
Average education in sibling network (excl. index hh)	3.22	2.89	2.89
Average education in village (excl. index hh)	4.67	4.67	4.67
Average land in household (in rai, excl. index individual)	20.38	21.50	21.69
Average land in sibling network (in rai, excl. index hh)	12.69	11.15	10.98
Average land in village (in rai, excl. index hh)	19.63	19.67	19.79
Proportion of households with migrants	0.53	0.54	0.54
Instruments for the migration model			
Distance to district (in km)	16.56	16.71	16.24
N (person-years)	62,048	15,304	8,439

a Means for migrants and nonmigrants (not shown) differ significantly ($p < .05$) for all variables except for the indicators for the youngest daughter, log of cattle owned by household, average education and land in village. Difference-of-means test accounts for clustering at the individual-level.

b Means for remitter and non-remitter migrants (not shown) differ significantly ($p < .05$) for all variables except the indicators for middle or high school education, construction worker, low or high land, number of economic activities in household, school in village, proportion of remitters in sibling network, log of village size, average education in household, sibling network and village, and average land and sibling network.

c Sibling networks include households as nodes and sibling ties as edges. A sibling tie exists if a member of the ego household has a sibling in the alter household.

Table 3. Estimated Marginal Effects of Individual, Household and Village Characteristics on the Propensity to Remit^a

Variable				
Education				
[Reference: Less than primary]				
Primary school	0.027	(0.005)	**	
Middle school	0.012	(0.006)	*	
High school or higher	0.037	(0.008)	**	
Heir status				
[Reference: Head, spouse or other relative]				
Youngest daughter	0.183	(0.035)	**	
Older daughter	0.207	(0.025)	**	
Son	0.104	(0.011)	**	
Destination income				
[Reference: Student, unemployed or farmer]				
Factory worker	0.132	(0.047)	**	
Service worker	0.061	(0.022)	**	
Construction worker	0.092	(0.033)	**	
Risks to destination income				
Unemployment rate in occupation	-0.030	(0.011)	**	
Dependents in household				
Number of children (of women < 30 year old) (/100)	-0.012	(0.102)		
Number of seniors (> 64 year old)	0.005	(0.002)	*	
Migrants in household				
Number of migrants (excl. index individual)	-0.007	(0.004)	*	
Household assets in origin				
[Reference: No land]				
Low land (1-14 rai)	0.006	(0.006)		
Medium land (14-31 rai)	0.007	(0.006)		
High land (>31 rai)	-0.005	(0.007)		
Log of cattle owned	-0.002	(0.001)		
Household income in origin				
Members in a non-agricultural occupation	-0.004	(0.001)	**	
Number of economic activities (0-3)	0.004	(0.002)		
Risks to household subsistence or income				
Months of water shortage	0.001	(0.001)		
Investment opportunities in community				
Primary or secondary school in village	-0.005	(0.004)		
Years since electrification	0.001	(0.001)		

(continued)

(Table 3, continued)

Variable			
Sibling networks ^c			
Number of ties	-0.001	(0.001)	
Density of ties	0.577	(1.160)	
Number of isolates in village	0.000	(0.000)	
Remittance behavior in networks			
Number of remitters in household	0.015	(0.005)	**
Proportion of remitters in the sibling network	-0.001	(0.004)	
Proportion of remitters in the village	0.388	(0.146)	**
Controls			
Age (/100)	0.048	(0.028)	
Married (/100)	0.019	(0.621)	
Household size	0.001	(0.001)	
Log of village size	0.004	(0.005)	
Average education in household	-0.003	(0.001)	*
Average education in sibling network	0.001	(0.001)	
Average education in village	-0.003	(0.008)	
Average land in household (/100)	0.002	(0.006)	
Average land in sibling network (/100)	-0.006	(0.005)	
Average land in village (/100)	0.022	(0.061)	
Proportion of households with migrants	-0.254	(0.115)	*
Year fixed effects	yes		
Village fixed effects	yes		
ρ	0.458	(0.121)	**
N (all)	62,048		
N (censored: nonmigrants)	46,744		
N (uncensored: migrants)	15,304		

**p<.01, *p<.05. Standard errors, shown in parentheses, are adjusted for household-level clustering. The dependent variable is whether a migrant has sent remittances to his or her household in the past 12 months. The specification is a bivariate probit model of migration and remittances where the exclusion restriction is the distance indicators. We present the marginal effects of each indicator on the *conditional* probability of remitting given migration.

Table 4. Estimated Marginal Effects of Remittance Behavior in Household and Sibling Networks on the Propensity to Remit^a

	Model 1		Model 2		Model 3		Model 4	
No of remitters in hh	0.035	(0.046)	0.012	(0.006)	*			
x Low land	-0.002	(0.010)						
x Medium land	0.002	(0.009)						
x High land	0.003	(0.009)						
x Youngest daughter			0.009	(0.003)	*			
x Older daughter			0.006	(0.002)	*			
x Son			0.005	(0.002)	*			
Proportion of remitters in the sibling network						-0.030	(0.020)	-0.002 (0.005)
x Low land						0.031	(0.022)	
x Medium land						0.031	(0.021)	
x High land						0.034	(0.023)	
x Factory worker								0.009 (0.011)

**p<.01, *p<.05. Standard errors, shown in parentheses, are adjusted for household-level clustering. The dependent variable is whether a migrant has sent remittances to his or her household in the past 12 months. The specification is a bivariate probit model of migration and remittances where the exclusion restriction is the distance indicators. We present the marginal effects of each indicator on the *conditional* probability of remitting given migration. All models include the individual, household and village indicators in Table 3 as well as binary indicators for year and village.

Table 5. Estimated Marginal Effects of Remittance Behavior in Village Networks on the Propensity to Remit^a

	Model 5			Model 6			Model 7		
Proportion of remitters in the village	0.458	(0.176)	**	0.391	(0.147)	**			
x Low land	0.026	(0.108)							
x Medium land	0.140	(0.149)							
x High land	0.128	(0.145)							
x Factory worker				-0.0002	(0.001)				
Proportion of remitters among youngest daughters in village							0.025	(0.054)	
x Youngest daughter							0.272	(0.108)	**
Proportion of remitters among older daughters in village							0.033	(0.042)	
x Older daughter							0.284	(0.108)	**
Proportion of remitters among sons							0.158	(0.082)	
x Son							0.349	(0.132)	**
Proportion of remitters among other (head, spouse, etc.)							0.065	(0.169)	
x Other							1.396	(0.491)	**

**p<.01, *p<.05. Standard errors, shown in parentheses, are adjusted for household-level clustering. The dependent variable is whether a migrant has sent remittances to his or her household in the past 12 months. The specification is a bivariate probit model of migration and remittances where the exclusion restriction is the distance indicators. We present the marginal effects of each indicator on the *conditional* probability of remitting given migration. All models include the individual, household and village indicators in Table 3 as well as binary indicators for year and village.

Figure 1 The Structure of Sibling Networks in Three Selected Villages in 1994 and 2000 Nodes (circles) indicate households and edges (lines) a sibling relation between any two members of the ego and alter household. Isolates (households with no sibling ties) are not shown.

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