INTRODUCTION

As early as 1885, when Ravenstein's "laws of migration," stated that each current of migration produces a compensating counter-current, return migration has been acknowledged as important to any thorough understanding of migration. Yet, for many years the view of migration as primarily a one-way phenomenon dominated research studies. More recently researchers have begun to utilize new data sources to empirically examine return migration, and theoretical links have been proposed between migrant remittance (money and goods sent by migrants to their home households) and a migrant's intention to return home (Lucas and Stark 1985, Hoddinot 1994).

However, although this theoretical link been between remittance and return migration has been suggested, various shortcomings in past research designs have left a dearth of high-quality empirical investigations into the subject matter. In this study we aim to fill this gap in the literature by examining the effect of remittance on the return of migrants to their households of origin by using longitudinal panel data from Nang Rong, a rural, agricultural district located in the Northeast Thailand. We take advantage of the richness of Nang Rong data to overcome a number of limitations of past studies by examining the phenomenon over time, using explicit data on several varieties of both migrant-to-household and household-to-migrant remittance, and by using a longitudinal sample which avoids some of the problems associated with sample selectivity inherent in many existing studies.

REVIEW OF THE LITERATURE

The literature on return migration has tended to concentrate on both economic and non-economic factors effecting movement back to origin communities. Overall, studies of

return migration are mainly based on individual cost-benefit models that focus on successes and failures at destination as the main reasons for return. Borjas (1989), who infers out-migration from sample attrition in a longitudinal data set of foreign-born scientists and engineers in the United States, concludes that the least successful scientists and engineers are the most likely to leave the sample. However, his data is limited in the sense that he uses a highly selective sample, in which it is impossible to tell whether migrants indeed returned or if they simply migrated to another location. Further, even if they did return, migrants may have had erroneous information about economic opportunities in the destination prior to migration, so their return may not be a failure in the job market so much as a poor choice to start with.

A follow-up work by Borjas and Bratsberg (1996), which incorporates variables ignored in Borjas (1989) original analysis (such as job markets and life-cycle plans) comes to a similar conclusion that return migration intensifies the selection that characterizes the original immigration flows. Research by Oropesa and Landale (2000) using data from both origin and destination communities finds that return migration to Puerto Rico from the U.S. mainland is associated with impoverishment, which further supports the skills bias argument.

Nonetheless, the evidence for a skills bias in return migration is in no way unequivocal. For instance, Michael Piore's (1979) book *Birds of Passage*, examines the role of immigrants in the U.S. labor market, and argues that unskilled migrants are more likely to stay in the U.S. to fill the less skilled jobs in the country's dual labor market, while successful migrants are more inclined to return home abroad. Shumway and Hall (1996) show that return migrants do not appear to have lower earnings profiles, so return

migration does not necessarily mean a failure. In addition, work by Reagan and Olsen (2000) concludes that there is no evidence of a skill bias in return migration. In considering other economic determinants of return migration, a few writings also point to unfavorable conditions in the destination community, such as recessions or layoffs and unemployment as the primary cause of return migration (Hernadez-Alvarez, 1968; Kayser 1972).

While many studies focus on the economic determinants of return, others deliberate about non-economic factors as the primary reason for return migration. Most frequently mentioned are strong family ties and desire to be in the company of one's own kin and longtime friends. For instance, Lockwood (1990) reports that ailing or elderly parents obligate some French Polynesian migrants to return. Also, feelings of loyalty or allegiance to the home society are important considerations among many migrants.

In some cases the decision to return is influenced by the length of exposure to the destination community. For example, Massey (1987) reports that the probability of return declines for U.S. bound migrants from Mexico, as the length of time in the U.S. increases. Massey attributes this effect to migrants' increased ability to handle risk, which results from greater exposure to the host society, and to the gradual accumulation of social and economic ties in destination that encourages migrant settlement.

Although these studies provide many useful insights, they overlook a key proposition from the literature on migration and remittance, namely that migration may be part of a larger household strategy. Households are often defined as a group of people who share a common residence, although in this research we consider the possibility that migrants may remain functional members of an origin household. As units of social

organization, households are found in nearly all societies. They mediate between individuals and larger social structures (Boyd 1989, Goldscheider 1995), and serve as an important context for a variety of individual behaviors, including: marriage, migration, fertility, and mortality (Entwisle et al. 2003). In contemporary post-industrial societies, households play a crucial role as consumption units in the maintenance and support of their members. In agrarian settings, households play a significant role as production units, and farming is often organized around the household.

Research in the New Economics of Migration (NEM) tradition sees migration and remittance as part of a household strategy to diversify risk in the face of incomplete or absent capital, futures, and securities markets (Stark 1991). Stark hypothesizes that migrants play the role of financial intermediaries, enabling rural households to overcome credit and risk constraints on their ability to achieve the transition from familial to commercial production. To overcome such constraints, one or more migrants are sent out to work to make money. Migrants remain a part of their origin household throughout the migration experience, and they remit a portion of their earnings, thereby relaxing the household's credit constraints. Their return migration may thus represent success in fulfilling their responsibility to their home household.

Indeed, past research in many geographic regions such as China (Hare 1999) and Mexico (Roberts and Morris 2004) has suggested that rural-to-urban migrants remit in order to maintain a high degree of attachment to their rural origin communities and households. Also, work by Ahlburg and Brown (1998), using data from a survey of Tongan and Samoan migrants in Sydney, concluded that those who plan to return home remit significantly more than those who do not plan to do so.

While the household's gain from this household-migrant arrangement is obvious, it is less clear what the migrant gains from such a contract. Therefore, in this study we focus on the migrant's motivation rather than the household's motivation. To better understand the migrant's motive, NEM theorists have developed a conceptual model of remittance, which views remittance as part of a mutually-beneficial, inter-temporal, self-enforcing, implicit contract between a migrant and a household (Lucas and Stark, 1985; Stark and Lucas, 1988). According to the model, this contract is motivated by either altruism or instrumental self-seeking, such as concern for inheritance or the right to return home ultimately in dignity. In this contract, migrant and household use remittance to better each other's welfare in addition to using remittance instrumentally to pursue personal gains.

Instrumental motivations are of three varieties: coinsurance, investment, and promise of bequest. Coinsurance, the first type of motive, occurs when a migrant and household take turns insuring each other from market fluctuations and risky ventures, such as when the household provides a safety net to insure the migrant against involuntary unemployment or when the migrant sends remittance to allow a household to invest in a relatively risky new production technology, such as a high-yield crop variety (Stark and Lucas, 1988).

Investment, the second instrumental motive, occurs under circumstances when the household invests in a migrant, such as the financing of a migrant's education with the anticipation of future returns from accruements to the migrant's human capital endowments. Alternatively, migrants, in their absence, may be following an investment motive by sending remittance in order to safeguard assets or land in the origin community

(Lucas and Stark 1985, Hoddinot 1994). Such investment in fixed capital may be connected to a migrant's desire to eventually return home after some period of absence.

The final instrumental motivation, the promise of bequest, occurs when migrants send remittance in anticipation of future inheritance of land or other family assets and the fear of disinheritance (Hoddinot 1994). Altruistic motives, in contrast to instrumental ones, are driven by emotional attachment or simply feelings of obligation to care for family members.

Empirical research into migrant's motivation to send remittance lends support to instrumental self-interested motives, although it has also led to the further elaboration of the conceptual model to include elements of altruism. Lucas and Stark's (1985) work in Botswana led them to conclude that migrants' motives to remit are situated along a spectrum of purely altruistic and purely self-interested motives. They theorized that pure altruism and pure self-interest alone are inadequate explanations of the extent of remittance and its variability through time and across persons. Therefore Lucas and Stark propose that remittance is motivated by a mixture of altruism and self-interest, which they term "tempered altruism" or "enlighted self-interest."

Lucas and Stark's empirical work finds that migrants send remittance to drought-stricken areas as part of the coinsurance motive, but they do so especially to drought-stricken areas in which their families own cattle, which suggest an investment motive. However, such a test of instrumental motive is not definitive, as a pure altruism model would also predict that during times of particular hardship (such as that of a drought) migrants would be motivated to send remittance to help safeguard the well-being of family members.

It may be that both altruistic and self-interested motivations for remittance depend on whether individuals choose to remain a part of the household at origin. Indeed, the authors also find that remittances by heads of household are substantially and significantly greater than those by other migrants. Headship no doubt reflects strong sense of household membership and a responsibility to care for members of one's own household. However, simply being a household member at a given point in time is not enough to ensure continued remittance. The authors' further find that children of the head of household do not remit more than any other members of the household. The fact that the household head's children do not send remittance may have to do with their membership in other households at the destination community. Thus, the authors conclude that those who continue to be identified as household members are very persistent remitters (Stark and Lucas 1988, Menjivar et al 1998).

Hoddinot's (1994) work in Kenya also shows evidence of both altruistic and bequest motives. However, his work does not rule out the possibility that these are independent motivations, which may be followed as separate strategies by different migrants. Hoddinot finds that the effect of acres of land per adult son is a positive and strongly significant predictor of remittance, which he interprets as an indication that wealthier parents, who can offer a greater reward for remittances, are better placed to extract a greater share of benefits of migration. Thus remittances are affected by the credibility of the parental threat to reduce future bequests. However, the author also finds that elderly widows, who are dependent on transfers for their livelihood, are more likely to receive remittance, a finding that's more consistent with an altruistic motive.

A common weakness found in all of these studies is the inability of their cross-sectional designs to deal with the endogeneity of remittance with various independent variables. In the Botswana study, for instance, the data come from a single wave of the 1978-1979 National Migration Study (NMS) of Botswana. The problem is that, in dynamic settings, such as Botswana, as well as other geographical areas, one cannot rule out the possibility that past remittance sent with an altruistic intent have helped to raise current household income, which may change the migrant's attitude to the family property. A similar problem exists in the Ahlburg and Brown (1998) study. Not only do these authors measure plans to move, rather than actual movement, but their research also has the shortcoming that plans to return may be related to the decision to remit at a given point in time. Hence, it is impossible to tell whether remittance affects return migration or vice versa.

What is needed is a design that measures remittance prior to return, rather than one that measures return migration and remittance contemporaneously, as is done in most cross-sectional studies. This would argue in favor of data on migration and remittance collected over time, which we use in the present study.

Given the empirical evidence and the theoretical model developed by NELM researchers, our research utilizes an explicit household perspective. More specifically, we view migration as part of a household strategy to diversify household income through remittance under an implicit contract with other non-migrant household members. We argue that migrants send remittance because of either altruistic or more self-interested intentions. The altruistic motivation suggests that the migrant feels the responsibility to care for family members, and the latter self-interested motives point to the desire to

invest in the maintenance of equipment, land, or other household assets, or because of the future intention to inherit property after return. In the case of self-interest intentions, the sending of remittance fulfills the implicit migrant-household contract, which makes it more likely that the migrant will return.

Although instrumental motivations may indeed help family members who are experiencing hardship during certain times, which may include the components of altruistic implication, real altruistic motivation will not factually or financially take benefits away from households, such as a bequest of family property. We believe that if remittance results in later return migration, this is the motivated by coinsurance, investment in fixed assets, or promise of bequest.

We further argue that migrants who remit and do not return are probably remitting out of altruistic intentions, such as care for family members. Moreover, migrants who return and do not remit or those who neither return nor remit have probably severed their ties to their origin household, maybe because they have started their own households. Perhaps these migrants no longer engage in any type of contractual agreement, or they never did so in the first place. In any event, we view these cases as mainly counterfactual, and our chief argument is that instrumental or contractual motives may dominate remittance, and that migrants who remit are more likely to gain property and other benefits from the origin household.

HYPOTHESES

Following our theoretical arguments, in this paper we examine two hypotheses. First, *ceteris paribas,* migrants who remit are more likely to return. This is the case because migrants who have sent money or goods to their home household have fulfilled their

implicit contractual obligations, and can return to reap the benefits of such an agreement. Second, relative to migrants who do not remit, all else equal, migrants who do remit are more likely to do so if the household owns fixed capital and land. This is expected because either these migrants desire to inherit property, or because they want to safeguard it during their absence.

Having described a general theory and hypotheses, we now consider the distinctive characteristics of our study site and the ways in which contextual factors can mediate or intervene between remittance and return migration. In what follows we describe the research setting, the data, the operationalization of key measures, the methodology used in this endeavor, as well as the operationalization of control variables.

SETTING

Nang Rong district is located in Buriram province in the southern portion of Northeast Thailand. The district is in the rice-growing delta of the region along the main highway between Nakhon Ratchisima and the Cambodian border (Curran 1995). Although it has experienced rapid economic development in the last several decades, Nang Rong still remains a primarily rural region in which rain-fed patty rice cultivation is the primary economic activity.

Nang Rong is similar to many parts of developing countries, in that asymmetric economic development between rural and urban areas stimulates regular flows of rural-to-urban migrants searching for employment opportunities. In the year 2000, 80 percent of Thailand's population was still living in rural areas. During this time, however, agriculture only made up ten percent of the Gross Domestic Product (GDP), while services made up 50 percent (World Bank 2003).

For the past several decades, the vast majority of job growth was concentrated in urban areas (Curran 1996), and tremendous numbers of migrants flowed into cities to take the increasing job positions. In Thailand, Bangkok and the Central region are major migration destination areas, while the North and Northeast Regions are major sending areas (Jampaklay 2003).

Migrants start to leave Nang Rong villages around the age of twelve, when compulsory education ends (Rindfuss et al. 2000), and frequently migration is carried out in conjunction with variations in agricultural labor demands. During the agricultural seasons when labor demand is low, migrants often flock to Bangkok in search of work, with flows being particularly heavy during the dry months of March and May (Pejaranonda et al. 1995). Many migrants travel back and forth between their place of origin and their place of destination, thereby keeping close connections with their households and communities.

DATA

Data comes from the second and third waves of the CEP-CPC longitudinal study of social change in Nang Rong, Thailand. The first wave of data was collected in 1984, when a household survey was administered to all village households in 51 villages. Follow-up waves of data collection occurred in 1994 and 2000, at which time a complete census was again conducted in each of the villages found in the original sample. Each household survey collects data on all permanent residents, as well as proxy reports on anyone who was away at the time of the survey. Data was also collected on migration, monetary and in-kind remittance, land, household assets, and so on.

Since our data is both longitudinal and origin-based, it avoids the problems inherent in many studies of return migration. Because of the geographical scatter of migrant sending communities, many destination-based studies have trouble following up return migrants. Some such studies (for example Borjas 1989) operationalize return migrants as those who left the sample, with the assumption that they returned to their origin community. Origin-based studies have an easier time identifying return migrants, but these studies have difficulty measuring who is at risk of being a migrant in the first place.

As we have three panels of data, we can identify everyone who migrated between the first and second wave, and using the third wave of data, we can also locate anyone who returned between the second and third wave[1]. Therefore, our data set is ideal for studying return migration. Unlike cross-sectional destination-based and origin-based data, our data uses proxy reports of household members who were known to be migrants in 1994 and then traces their migration experience until the year 2000.

OPERATIONALIZATION OF KEY MEASURES

Given our design, it is necessary to describe the operationalization of several main variables in some detail. Migrants, the units of analysis in this study, are defined as those who were members of a 1984 household, and who were living outside of the village for two or more months prior to the 1994 survey. Return migrants are defined as individuals who were identified as migrants in the 1994 wave of data collection, and who were subsequently living in the village at the time of the 2000 household survey.

We limit our sample in several ways. First, we restrict the age range of respondents to only those aged 13 – 55 in 1994. This is reasonable because generally

people under 13 are children, and are probably migrating with their parents. Furthermore, people over 55 have probably ended their working life and are unlikely to change their residence. Second, we restrict our sample to only migrants who have been gone for at least one year prior to the 1994 survey.[2] This is done to ensure that migrants have had enough time to stabilize their economic situation so that they are able to send remittance. Furthermore, because our data on remittance is measured one year prior to the 1994 survey, we ensure that each migrant was at risk of exposure throughout the entire duration[3].

We measure return migration as a dichotomous variable equal to one if the migrant returned, and equal to zero otherwise. Table 1 shows the frequency distribution of return migration for the entire sample, for migrants who sent monetary remittance, and for migrants who did not send any money. Results reveal that overall, just under one-fifth (18.47 percent) of all migrants eventually returned. Moreover, compared to non-remitting migrants, a slightly higher percentage of remitting migrants returned (14.79 versus 21.57 percent). Also, from figure 1, which shows the frequency distribution of return migration for the whole sample, migrants who remit, and those who do not remit, it is also evident that there are more return migrants among those who remit, compared to those who do not remit.

Migrant remittance is the key independent variable of interest in this analysis. Like all independent variables in our analysis, remittance is measured in 1994. This design allows us to overcome the aforementioned shortcoming of many studies that measure remittance and migration contemporaneously.

We use data on several types of remittance as well as information of two directions of remittance flow. The data set includes not only migrant-to-household remittance, but also household-to-migrant remittance. The advantage of using two-directional data is that NEM theory has implications for both directions of support, and information might be lost if one direction is ignored. Further, remittance data is available not only for monetary remittance, but also for goods in-kind remittance. Having data on two types of remittance is theoretically interesting because data on goods-in-kind remittance may measure social ties between households and migrants that go beyond general monetary need, and may suggest an awareness of more specific needs of whoever is receiving the remittance.

Goods-in-kind data come from a series of survey items that ask whether remittance in the form of clothes, food, household items, electrical appliances, or vehicles was sent in the twelve months prior to the 1994 survey. Goods-in-kind remittance (both household-to-migrant and migrant-to-household) is operationalized as a dichotomous variable equal to one if any of the above items was sent, and zero otherwise. Data on monetary remittance comes from a similar survey item about whether or not any money (measured in Thai Baht) was sent, and was also operationalized as a dichotomous variable.

It can be seen from table 2, which shows descriptive statistics for all independent variables, that generally migrant-to-household remittance is more common than household-to-migrant remittance. Also, while just over half of all migrants sent money only about 40 percent of migrants sent goods-in-kind. Household-to-migrant remittance was far less common, with under fifteen percent of migrants receiving any goods, and

just over ten percent of migrants receiving money. Thus the dominant stream of remittance seems to be money coming from migrants to their households.

METHOD

Statistical regression modeling is used to determine the independent effect of remittance and various control variables on the probability of return migration. Because return migration, the dependent variable in our analysis, is measured as a dichotomous variable, ordinary least squares regression is not appropriate for modeling this type of outcome. Instead, we use a binary logit model, which is the most frequently used model for such an outcome.

The model can be written:

$$\ln\left(\frac{\Pr(Y_i = 1)}{\Pr(Y_i = 0)}\right) = b \cdot \mathbf{X} \qquad (1).$$

Where Y_i is return migration in 2000 for individual *i*, and $b \cdot \mathbf{X}$ is matrix notation for the linear predictor, which is the linear combination of independent variables measured at the individual and household level. Since multiple migrants can come from the same household, and multiple households are located in the same village, the data are clustered, and thus not independent of each other. It is important to account for this clustering because each observation contributes less information than it is assumed to, which artificially lowers standard errors associated with coefficients, thereby overestimating the significance of estimates.

To deal with clustering, we use Generalized Estimation Equations (GEE)[4]. Although statisticians created methods with the Generalized Linear Model (GLM) framework to help correct for correlated data, it is well known that these methods are *ad hoc*. GEE was explicitly developed to serve as a means of extending the GLM algorithm

to accommodate the modeling of correlated data. GEE is a population average model. The GEE approach allows for covariances among clustered observations and has the advantage of not requiring parametric assumptions about the form of the covariance structures clustered observations (Hardin and Hilbe 2003).

In the GEE approach, the b vector is estimated by solving the estimation equation:

$$U(b) = \sum (\frac{\partial u_i}{\partial b})' [v_j(a)]^{-1} (y_i - u_i) = [0]_{px1} \quad (2).$$

Where u_i is the expectation of y_i, which is linked to a linear combination of the covariates and the corresponding estimate through the logit function (Zhou et al.2003). Efficiency is gained by choosing a hypothesized structure to minimize the within-cluster correlation. We choose an exchangeable correlation structure for this research, which assumes that there is no specific order for each migrant in same household and they are equally correlated within each cluster, which is valid for migrants within households. Under the exchangeable correlation structure, a is a scalar that represents the pair correlation among different migrants within households. The estimated variance is robust for the clustered observations. Since previous research using the Nang Rong data set suggests that the cluster effect at village level is quite small (Piotrowski 2004), in our study, we ignore the cluster effect at the village level.

OPERATIONALIZATION OF CONTROL VARIABLES

In order to account for other variables that are theoretically related to return migration and remittance, we include a number of controls (all measured in 1994) into our model. Among the controls are measures of the demographic characteristics of migrants, the location of various family members of the migrant, and several household level variables.

In the interest of brevity, we limit detailed discussion of control variables to only those that are relatively less intuitive or more theoretically interesting.

Demographic characteristics of the migrant include education, occupation, age, migration duration, gender, and marital status. Education is measured as a set of indicator variables for whether the migrant had less than a primary school education, only a primary school education, or more than a primary school education. From table 2, which shows descriptive statistics for all independent variables, it can be seen that about 35 percent of migrants have less than a primary school education, while nearly a fifth (about 18 percent) have only a primary school education. Thus, just under half of migrants (around 47 percent) have more than a primary school education.

Occupation is also measured as a set of dummy variables, indicating whether a migrant works in agriculture, as a craftsman/worker/laborer, in a professional position, in a service occupation, or is unemployed[5]. From table 2, it can be seen that about 43 percent of migrants are employed as a craftsman/worker/laborer, while eight percent are professionals, nine percent are employed in service, and five percent are unemployed. That leaves about 35 percent of migrants working in agriculture.

Both education and occupation can be considered a migrant's human capital endowments, and we have included these measures mainly in reaction to the debate about skills and return migration. If less skilled migrants are indeed more likely to return, it is expected that migrants with relatively less education and in relatively lower paying, less secure jobs (such as a agricultural job compared to a professional job) should be more likely to return. Thus, we expect that higher human capital endowments will make

migrants more competitive in the urban labor market, and less likely to return to the rural village.

Migration duration, measured as the number of years that the migrant has been away from the time of the 1994 survey, shows that migrant's time of absence varies from one to thirteen years, with an average of about four years of absence. Following Massey's (1987) argument that greater exposure to the destination society gradually increases a migrant's ability to handle risk, we expect that the probability of return declines as the length of time in the destination increases.

In addition to these other demographic variables, gender may be an important determinant of return migration. Thai gender norms bind women to their origin household through expectations that women should maintain close kinship ties and care for parents in their old age (Curran 1995, DeJong 2000). Indeed past work on remittance in Nang Rong has found that females are more likely to remit than males (Curran 1995, VanWeh 2002, Piotrowski 2004). This may suggest that women are more attuned to the needs of their origin household, and they may be more apt to return. Although Table 2 shows that about 54 percent, or a little over half, of migrants are males, we nonetheless expect that women are more likely to return migrate.

The effects of gender on return may also be related to the marital status of a migrant. The Thai custom of postnuptial matrilocal residence compels Thai women to move in with their families for a period directly following marriage (Chamratrithirong et al. 1988). Thus if a woman got married at her migration destination and subsequently returned home, this may be another source of gender-specific return migration[6]. More importantly, for married migrants, return migration may depend on the migrant's spouse

location. Therefore, we measure marital status and the location of spouse together as a set of dummy variables[7].

Table 2 shows that only two percent of married migrants have a spouse living in the origin household. Relatively more migrants, almost 36 percent, have a spouse that lives in the same migration destination, while four percent of spouses live in a different migration location. In twelve percent of cases, the migrant's spouse location could not be identified because of missing data[8]. Also, two percent of spouses are divorced or widowed, while the majority of migrants (about 44 percent) are never-married.

We expect that migrant's decision to return will be strongly affected by the location of their spouse. Migrants who have a spouse living in the origin household should be the most likely to return, while those whose spouse is a migrant living in the destination community should be the least likely to return. This is reasonable because the latter migrants are probably living with a new household to which they may feel are more obligated than their former household. This effect may also be related to the location of the migrant's children. Thus, we also include two indicator variables for whether any of the migrant's children live in the household, or whether any of them are migrants.

In addition to the location of the migrant's spouse, we also examine whether the migrant's parents still live in the origin household. Research in Thailand suggests that adult Thai children provide old age security to their elderly parents (Knodel, et al. 1995, Knodel and Chayovan 1997). We measure parent location (including in-laws) using a series of dummy variables indicating whether: both parents are in the origin household, only the mother lives in the origin household, only the father lives in the origin household, or neither parent lives in the origin household. Table 2 shows that the most

common arrangement is for both parents to live in the household (this is true for 60 percent of the cases), while having only a mother live in the household (occurs 18 percent of cases) is almost four times more common that having only a father live in the household (occurs five percent of the time). In only 17 percent of cases does neither parent live in the origin household.

Household variables include controls measuring the presence of agricultural equipment, a household wealth index, the amount of land owned, whether the household grew rice, and counts of the people living in the household who are of working age, of non-working age, or who are migrants. The presence of agricultural equipment is measured as an indicator variable equal to one if the household owns any of the following assets: a large tractor, a small tractor, a rice thresher, a water pump, or an electric generator.

Agricultural equipment is specifically linked to farming. For instances, rice farmers in Nang Rong use small tractors for tilling fields, water pumps for irrigation, and rice threshers cutting rice stalks. In some cases, farmers rent agricultural equipment to other farmers as a way of making additional income. Table 2 shows that about one-fifth (18 percent) of households own some form of agricultural equipment.

Following work by Filmer and Pritchett (2001), household wealth will initially be measured using an additive index, which results from a principal components analysis of a set of household assets (see appendix 1 for details)[9]. After constructing the wealth index, each household will be grouped into one of three categories, based on its overall household wealth index score. Specifically, households in the bottom 33rd percentile will be considered to be at the bottom of the wealth distribution, those in the 34th to 79th

percentiles will be considered to be in the middle of the distribution, and those at the top fifth will be considered at the top of the distribution.

Inheritance of land is a basic social security strategy in rural areas of developing countries, especially for rural-to-urban migrants who pursue employment in the informal labor sector without the basic social security system. Land provides an investment opportunity for migrant remittance, as well as employment and a livelihood for rural residents.

Empirical research in Columbia has found that return migrants are disproportionately selected from the landowners and business strata in their communities of origin (Simmons and Cardona 1972). This indicates that ties with the land may be a principal reason for returning. Also, VanWeh's (2002) research in Nang Rong finds evidence that migrants are remitting in anticipation of future bequests of land and that they are competing with each other for these bequests. In our research we include a measure of the amount of square wa of land (1 wa^2 = 4 m^2) owned by the household. We use a log transformation to deal with skewness in the amount of land across households. Our anticipation is that the propensity to return will be directly proportional to the amount of land owned by the household.

Generally we expect that migrants will be more likely to return if the household has more fixed capital such as land, agricultural equipment, and household assets. This is especially the case if migrants are remitting back to the household, perhaps in anticipation of inheriting property, or to safeguard such property.

Counts of people of working and non-working age and of the number migrants do not include the counts of anyone who is known to be a spouse, parent, or child of the

migrant[10]. Results from table 2 show that the number of people of working age people, defined as anyone age 13 to 60, ranges from zero to ten, with an average of just under two people. The number of non-working age (under 13, or over 60) people ranges from zero to six with a mean of almost one. The number of migrants also ranges from zero to ten, with an average of just over two migrants.

In general, these counts probably mainly include migrants' siblings and their families. As a result of the demographic transition that Thailand underwent in the two decades prior to the early 1980s, Thai households can be sizeable, and young adult Thais sometimes can have substantial numbers of siblings. Thus Thais are used to high levels of crowding (Edwards et al. 1994). We expect that the number of working-age people will be inversely related to return migration, as migrants may not want to return to crowded conditions. Crowding may be a similar issue when considering the number of non-working age people. However, migrants may also be less willing to return if the number of working age-people represents a greater supply of household labor. If this is the case, the propensity to return should be directly proportional to the number of non-working age people.

The literature on migrant networks suggests that migrants provide a form of social capital, defined as a productive value inherent in the structure of social relations that facilitates action, by improving each other's access to such things as employment and housing (Massey and Basem 1992, Massey et al. 1993, Roberts and Morris 2004). It may be that household migration streams extend to similar migration destinations, thereby creating more contact with fellow household migrants, who in turn provide a measure of

security and access to social capital. Therefore, we expect return migration to be inversely proportional to the number of migrants from a household.

RESULTS

Table 3 presents the results of the regression analysis of return migration as predicted by the effect of migrant-level covariates such as remittance behavior, demographic characteristics, and kin connections, in addition to various household-level measures such as household assets and household composition. Model 1 shows results for the full sample, while models 2 and 3 respectively show results for migrants who did not send monetary remittance and those that did send such remittance[11].

The results for remittance, the main variables of interest, show that a migrant's decision to return is motivated by migrant-to-household remittance, rather than household-to-migrant remittance. While none of the household-to-migrant remittance variables are statistically significant, results for migrant-to-household remittance show that migrants who sent money to their home household are more likely to return compared to migrants who did not send money. The odds of a migrant who sent money returning are 20 percent higher than the odds of a migrant who did not send such remittance.

There is also evidence that the process of return migration is different for migrants who send monetary remittance and for those who do not. In model 3, which shows results for migrants who sent monetary remittance, it can be seen that sending money back is associated with a higher likelihood of return if the household owns agricultural equipment. The odds of remitting migrants returning are about 25 percent higher if the household owns agricultural equipment than if it does not own such

equipment. However, this is not the case in model 2, which shows results for migrants who did not send monetary remittance.

This perhaps suggests that migrants move to urban areas to find employment that allows them to earn enough money to send back as an investment in their origin household's farm. After investing in the farm for some period of time, the migrants return and possibly begin to be engaged in farming more directly or they use the money to invest in equipment, which allows them to engage in equipment renting as a form of entrepreneurship. It is notable that this effect is significant even with controls for non-productive household assets, and the total amount of land owned by the household. Therefore this is not a return motivated by general household wealth, but by agricultural assets in particular, which is clearly connected with farming.

Individual characteristics of the migrant also influence the decision to return to the home household. A consistent finding is that women are more likely to return than men. Both in the model for the entire sample, and across all models, it can be seen that the odds of men returning are about 25 percent lower than the odds of women returning. This may have to do with return migration following matrimony, where in accordance with Thai customs of matrilocal residence women move in with their families for a period directly following marriage (Chamratrithirong et al. 1988). Otherwise, it may be related to traditional Thai gender norms which, relative to men, bind women to their origin household through expectations that women should maintain close kinship ties and care for parents in their old age (Curran 1995).

Education effects indicate that return migration to households in rural villages is associated with relatively less education. In every model, compared to migrants with no

more than a primary school education, migrants with more than a primary education are less likely to return. In fact, the odds of a migrant with more than a primary school education returning are about 30 percent lower than the odds of a migrant with just a primary school education returning. Also, for the entire sample, migrants with less than a primary school education are more likely to return compared to migrants with at least a primary school education. The odds of a migrant with less than a primary school education returning are about 28 percent higher than the odds of a migrant with only a primary school education returning. It is also noteworthy that this effect is non-significant for migrants who do not send monetary remittance, although it is significant for those sending money.

This effect is consistent with expectations related to a migrant-household coinsurance scheme. Hypothetically, migrants with lower education may have more difficulty finding employment compared to those who are better educated, and therefore they may be more susceptible to instability in the labor market, which makes them more dependent on their rural household. Conversely, it is also possible that individuals who are planning to be farmers choose to forgo an investment in their education, and instead move away for period of time in order to earn enough money to be able to invest in a farm, which they plan to operate directly upon returning home to Nang Rong.

Results for the effect of kin connections demonstrate that the location of spouses and children and the duration of migration are important determinates of a migrant's return. The longer that migrants were away from the village at the time of the 1994 survey, the less likely that they are to return home. Consistent across all models, generally the odds of migrants returning diminish by about 15 percent for a year of being

away. It is possible that migrants who are away longer have become more acclimated to life away from the village and that they are enmeshed in a web of social connections at their place of destination that makes them less willing to leave.

This is supported to some extent by the results for migrant's marital status and spouse location. A robust finding across all models is that compared to single migrants, those whose spouse lives in the home household are more likely to return, while those whose spouse lives in the destination household are less likely to return. For the full sample, the odds of migrants whose spouse lives in the household returning are almost 4 times (400 percent) higher than the odds of a non-married migrant returning. Furthermore, the odds of a migrant whose spouse lives in the same destination returning are about 40 percent lower than the odds of a non-married migrant returning.

At the household level, in addition to the effect of household equipment, the composition of people living in the home household and the number of migrants who have ever migrated from the household affect return migration. As stated previously, migrants are more likely to return if the household owns productive agricultural equipment, although this seems to be especially the case when a migrant remits money back to the home household.

In addition, migrants in the full sample are less likely to return when both the number of working and the number of non-working age people living in the household increases. The odds of migrants returning are about seven percent lower for an increase in one non-working age person and about 11 percent lower for an increase in one working-age household member. As these counts exclude the migrants' parents (and in-laws), spouses, and children, it is likely that these people are siblings and their family

members. Therefore, this effect may have to do with the process of initially moving out of family of orientation to start a family of procreation, or it may be related to migration aimed at avoiding household crowding. Often rural Thais live in vertically extended households comprised of three or more generations. Many young people who experience such a living arrangement may experience a lack of privacy, or perceived sense of crowding (Edwards et al. 1994), and they may wish to migrate away in order to start their own family.

As the number of migrants from a household increases, the likelihood of a migrant returning decreases. For an increase in one migrant from the household, the odds of the focal migrant returning diminish by about seven percent. Perhaps migrants are providing social capital, by improving each other's access to such things as employment and housing (Massey and Basem 1992, Massey et al. 1993, Roberts and Morris 2004), which makes the focal migrant less willing to return to the home household.

DISCUSSION AND CONCLUSION

This paper test two general hypothesis regarding remittances and return migration: that migrants who remit are more likely to return, and that they are especially likely to do so when the household owns fixed capital, property, and assets. Our findings provide general support for both hypotheses. We demonstrate that remittance is positively related to return migration, and that remitting migrants are more likely to return if the household owns agricultural equipment, while non-remitting migrants are unaffected by the household's ownership of such equipment.

These findings are consistent with the view that remittance and migration are part of a household strategy, whereby migrants leave for a period of time in order to earn

money, which they send back in the form of remittance. Having completed their obligation to the household, the migrants return to the household, and they resume life in the origin village. By sending remittance, migrants pursue a self-interested strategy in which they hope to either safeguard or inherit agricultural equipment. After investing in such equipment perhaps return migrants use it to engage in family farming, or maybe they use it as a capital resource by renting it out others. Alternatively, perhaps these migrants aim to get into the good graces of those who own these assets, in hopes of future inheritance.

While we find support for economic factors driving returning migration, we note that non-economic factors are also important. Results show that the migrants are less likely to return the longer they have been away. Furthermore, as the number of migrants from a household increases, the propensity to return to the origin village decreases. The evidence implies that migrants are becoming embedded into the social networks of their destination communities. Perhaps some of these migrants are establishing their own households, to which they feel more immediately obligated. Or perhaps they are making connections with friends and fellow migrants that make it more difficult to return to their home villages.

Also, migrants tend to end up in the same location as their spouses, which no doubt reflects the effect of continued membership in a household. If the migrant's spouse is living in the home household, migrants are significantly more likely to return home, whereas if the spouse lives in the same migration destination, return is less likely.

We also find evidence for a negative selection of migrants based on their human capital endowments. Results show that return migration is generally associated with

lower education achievement. Yet, such a finding does not necessarily imply a failure on the part of return migrants, or necessarily a lack of skills. For instance, if indeed migrants are returning to work on the family farm, it is unclear how high education attainment will help them in such an endeavor. Conceivably these migrants may under-invest in their education with the knowledge that their work in agriculture does not depend on being highly educated.

For a period of time, maybe in the agricultural off-season, people may migrate to find work as unskilled laborers in order to earn enough money to invest in agricultural improvements. Thus these migrants may not lack skills *per se*, rather they may have highly context-specific skills, such as knowledge about farming.

One finding that is surprising is the lack of a land effect on migration, especially given past research findings linking land to return migration. This is also surprising due to the importance of land for farming. Although land provides investment opportunities for the money that migrants send back (VanWey 2001) qualitative research in 2004 by the Nang Rong research team has suggested that Nang Rong does not have a well-developed land market. People rarely sell land, so perhaps it is not surprising that land had no effect on return migration. Future work can look at the relationship between land and return migration in more detail, perhaps by exploring complex interaction effects between land and other variables, or by examining the location of different land plots, or possibly the land's suitability for agriculture.

[1] However, in the event that a whole household moves, we do not have the ability to follow up both those who migrate and those who return.

[2] We also limit our sample using listwise deletion (i.e. complete case analysis) to deal with missing data. This procedure diminished our sample from a total of 7096 cases, down to 6578 cases, a decrease of about 7 percent. We also deleted 219 migrants who returned to the same village but to a different household, since they are probably starting a new household, and are likley no longer a part of their origin household.
[3] This limitation probably excludes some short term migrants.
[4] Previous studies have used a partial solution to correcting for the cluster effect at the household level by randomly selecting one individual from each household. While fitting models from such a sample corrects the standard errors, it produces conservative estimates of regression coefficients (Espenshade and Fu, 1997). It also produces another problem. Because most households have two or more migrants, randomly selecting one from each household may bias parameter estimates, especially if the unobserved household effect in clustered data, such as the "need" in the same household, is correlated with the observed explanatory variables.
[5] Agricultural workers include primarily paddy rice farmers, while craftsman/worker/laborers/ are made up mostly of auto or furniture repair employees, factory workers, construction workers, and general/unskilled laborers. Professionals are divided amongst various occupations, such as clerical workers, police officers, soldiers, teachers, government employees, and monks. Service workers are made up mostly of domestic workers; Tuk-tuk, Taxi, motorcycle or mini-bus drivers; salesman; and small shopkeepers. Also, we consider students and housewives, as well as those who report have no job, as being unemployed.
[6] This is particularly true because our data comes from an origin sample. Therefore, if a woman got married during a migration episode, although her husband may return with her, he would never have been considered a migrant in the first place. This is the case because he never would have made it on the household roster prior to his return, thus he would never have been at risk of exposure to the initial migration or to subsequent return migration.
[7] Measuring the location of migrant's spouses, children, and parents involves the construction of these variables from the records of individuals on the household roster, which was collected as part of the 1994 data panel. The household roster includes data on individuals who are currently living in the household, who are new to the household, and who are migrants and local movers. It also includes data on the identification number of the spouse, mother, and father of each individual listed on the roster. Thus it is possible to link the identification numbers listed for ego migrants, their spouses and their parents, in order to create a matched file containing data from both ego and his/her relatives. For spouses, there is also additional information on the spouses' location, even if they do not appear on the household roster. Thus while data for parents and children will tend to miss some information on individuals who are not listed on the household roster (who tend to be migrants or local movers), data on spouses' migration district and province is known. We consider a couple to be living in the same location if they live in the same district and province, although it may be the case that they do not actually share a residence.
[8] A variable indicating an unknown spouse location is used in this instance. It is not intended to be interpreted, rather it is used as a way of avoiding the deletion of a few cases.
[9] Included as household assets are the number of: black and white televisions, color televisions, VCRs, refrigerators, Etans (agricultural trucks), cars/trucks/pickups, motorcycles, and sewing machines. In addition, also included are dummy variables for whether a household: cooks with electricity or gas or does not do so; does or does not have windows with wood panes and shutters, glass panes, or bug screens; and has piped water.
[10] This is done so that parents, children, and spouses are not double counted in the analysis. As a result, in our descriptive statistics households may appear to be smaller than they really are.
[11] In results not shown, we also tried including several other independent variables. Among them were measures of the amount of monetary remittance sent by both households and migrants. These were broken up into five different ranges, as the data were collected in such a fashion. We also tested to see if migrants were responding to specific types of land, so we tried a measure of the amount of titled land owned by the household. None of these variables were statistically significant, thus none were included in the final models. We also tried several village-level variables. Among them was a measure of the number of people who migrated from the village in 1994, and the ratio of population to village land. None of these variables had any effect either.

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Table 1. Frequency Distribution of Return Migration in 2000 for Migrants age 18 - 55 in 1994

		Whole Sample		Migrants Who Did Not Remit Money		Migrants Who Did Remit Money	
Category	Description	Frequency	Percent	Frequency	Percent	Frequency	Percent
0	Non-Return Migrant	5363	81.53	2563	85.21	2800	78.43
1	Return Migrant	1215	18.47	445	14.79	770	21.57
Totals		6578	100	3008	100	3570	100

Table 2. Descriptive Statistics of Independent Variables for Migrants Age 18 - 55 in 1994

	Whole Sample				Migrants Who Did Not Remit Money				Migrants Who Did Remit Money			
Variable	Min	Max	Mean	StdDev	Min	Max	Mean	StdDev	Min	Max	Mean	StdDev
Remittance												
Migrant-to-Household Monetary Remittance was Sent	0	1	0.543	0.498	-	-	-	-	-	-	-	-
(Migrant-to-Household Monetary Remittance was not Sent)												
Migrant-to-Household In-Kind Remittance was Sent	0	1	0.405	0.491	-	-	-	-	-	-	-	-
(Migrant-to-Household In-Kind Remittance was not Sent)												
Household-to-Migrant Monetary Remittance was Sent	0	1	0.101	0.301	-	-	-	-	-	-	-	-
(Household-to-Migrant Monetary Remittance was not Sent)												
Household-to-Migrant In-Kind Remittance was Sent	0	1	0.131	0.338	-	-	-	-	-	-	-	-
(Household-to-Migrant In-Kind Remittance was not Sent)												
Demographic Characteristics of Migrant												
Age	13	55	25.829	6.932	13	55	27.176	7.320	13	55	24.694	6.371
Migrant is Male	0	1	0.544	0.498	0	1	0.621	0.485	0	1	0.479	0.500
(Migrant is Female)												
Less than Primary Education	0	1	0.351	0.477	0	1	0.449	0.497	0	1	0.268	0.443
Greater than Primary Education	0	1	0.179	0.383	0	1	0.184	0.388	0	1	0.174	0.379
(Only Primary School Education)												
Number of Years Gone	1	13	4.091	2.727	1	10	4.460	2.841	1	13	3.780	2.586
Migrant Works as Laborer, Craftsman, Unskilled Worker	0	1	0.431	0.495	0	1	0.279	0.448	0	1	0.559	0.497
Migrant Works in Service or Professional Occupation	0	1	0.081	0.273	0	1	0.078	0.268	0	1	0.084	0.278
Migrant Works in Service Occupation	0	1	0.089	0.284	0	1	0.064	0.246	0	1	0.109	0.312
Migrant is Unemployed	0	1	0.049	0.216	0	1	0.077	0.267	0	1	0.025	0.158
(Migrant Works in Agricultural Occupation)												
Migrant's Parents Location												
Both Parents Live in Household	0	1	0.602	0.490	0	1	0.507	0.500	0	1	0.682	0.466
Only Mother Lives in Household	0	1	0.189	0.392	0	1	0.183	0.387	0	1	0.194	0.396
Only Father Lives in Household	0	1	0.053	0.225	0	1	0.059	0.235	0	1	0.049	0.216
(Neither Parent Lives in Household)												
Migrant's Marital Status and Spouse Location												
Migrant Married, Spouse Lives in Origin Household	0	1	0.020	0.141	0	1	0.019	0.135	0	1	0.022	0.145
Migrant Married, Spouse is a Migrant in the Same Location	0	1	0.358	0.479	0	1	0.473	0.499	0	1	0.261	0.439
Migrant Married, Spouse is a Migrant in the Different Location	0	1	0.043	0.203	0	1	0.039	0.193	0	1	0.047	0.211
Migrant is Post-Married	0	1	0.024	0.152	0	1	0.031	0.174	0	1	0.017	0.131
Spouse is in an Unknown Location	0	1	0.120	0.325	0	1	0.150	0.357	0	1	0.095	0.293
(Migrant is Single)												
Migrant's Children												
At Least One of Child Lives in Origin Household	0	1	0.026	0.159	0	1	0.026	0.158	0	1	0.026	0.160
(None of the Migrant's Children Live in the Household)												
At Least One of Child is a Migrant	0	1	0.042	0.201	0	1	0.063	0.244	0	1	0.024	0.154
(None of the Migrant's Children are Migrants)												
Household Variables												
Total Amount of Land Owned by the Household (logged, in wa^2)	-11.513	11.513	7.858	4.023	-11.513	11.513	7.767	4.195	-11.513	11.513	7.935	3.872
Household Grows Rice	0	1	0.795	0.403	0	1	0.782	0.413	0	1	0.806	0.395
(Household Does Not Grow Rice)												
Household Owns Equipment	0	1	0.183	0.386	0	1	0.171	0.376	0	1	0.193	0.394
(Household Does Not Own Equipment)												
Top 20th Percentile of the Wealth Distribution	0	1	0.232	0.422	0	1	0.227	0.419	0	1	0.235	0.424
Bottom 33rd Percentile of the Wealth Distribution	0	1	0.244	0.430	0	1	0.247	0.431	0	1	0.242	0.428
(Middle 34 - 79th Percentile of the Wealth Distribution)												
Number of People of Working Age	0	10	1.592	1.286	0	10	1.777	1.323	0	8	1.435	1.232
Number of People of Non-Working Age	0	6	0.962	1.056	0	6	1.053	1.093	0	6	0.886	1.018
Number of Migrants from Household	0	10	2.354	1.752	0	10	2.331	1.783	0	10	2.374	1.726
N	6578				3008				3570			

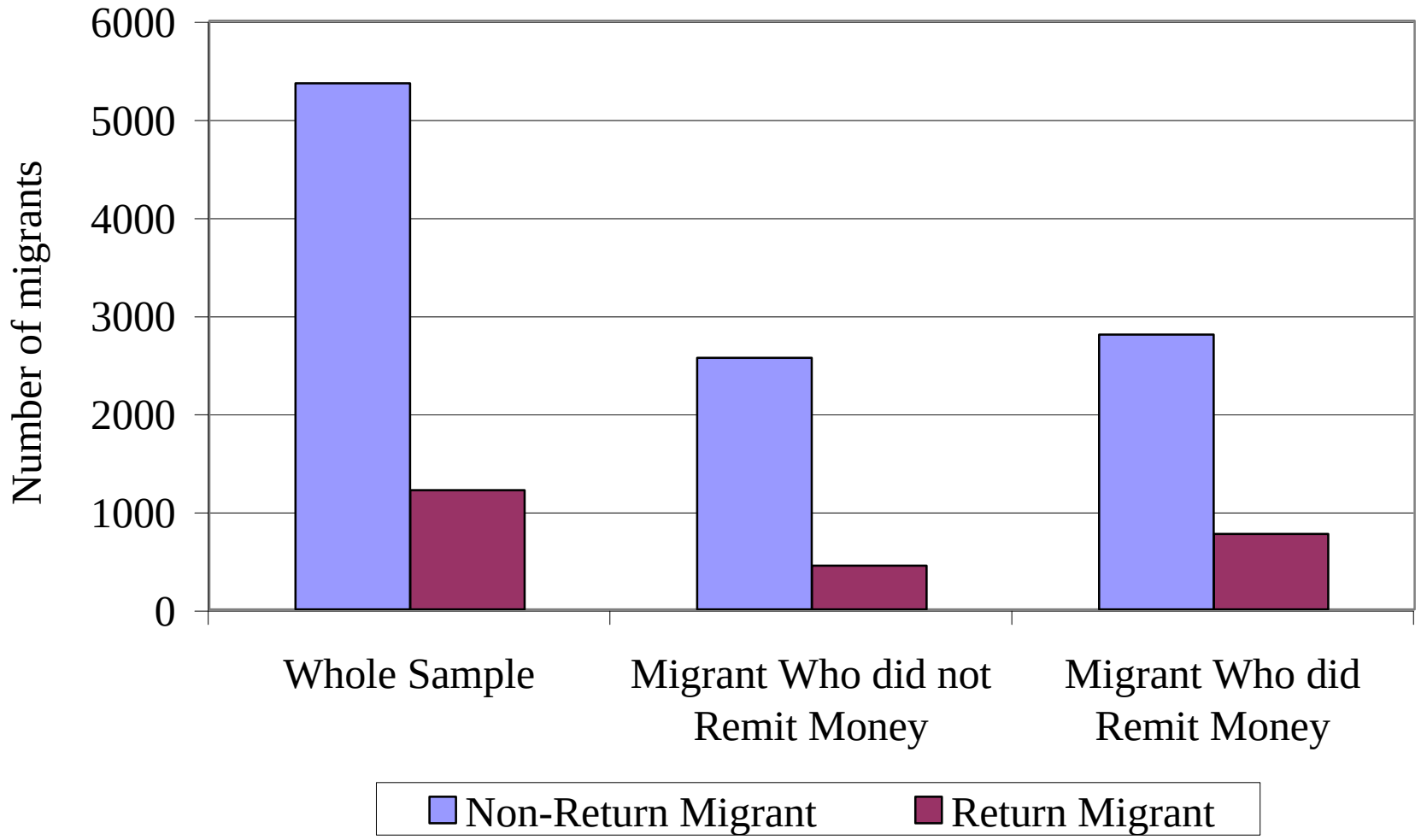
Table 3. Binary Logit Estimates of Return Migration in 2000 for Migrants age 18 - 55 in 1994[1]

	Whole Sample			Migrants Who Did Not Remit Money			Migrants Who Did Remit Money		
Variable	Coeff	StdErr	Odds Ratio	Coeff	StdErr	Odds Ratio	Coeff	StdErr	Odds Ratio
Intercept	-0.824***	0.242	0.439	-0.726*	0.357	0.484	-0.463	0.338	0.629
Remittance									
Migrant-to-Household Monetary Remittance was Sent	0.182*	0.085	1.200	-	-	-	-	-	-
(Migrant-to-Household Monetary Remittance was not Sent)									
Migrant-to-Household In-Kind Remittance was Sent	-0.122	0.079	0.885	-	-	-	-	-	-
(Migrant-to-Household In-Kind Remittance was not Sent)									
Household-to-Migrant Monetary Remittance was Sent	-0.040	0.114	0.961	-	-	-	-	-	-
(Household-to-Migrant Monetary Remittance was not Sent)									
Household-to-Migrant In-Kind Remittance was Sent	0.105	0.099	1.111	-	-	-	-	-	-
(Household-to-Migrant In-Kind Remittance was not Sent)									
Demographic Characteristics of Migrant									
Age	0.007	0.008	1.007	0.013	0.012	1.013	0.002	0.010	1.002
Migrant is Male	-0.304***	0.070	0.738	-0.355**	0.114	0.701	-0.273**	0.088	0.761
(Migrant is Female)									
Less than Primary Education	0.243*	0.099	1.275	0.165	0.155	1.180	0.301*	0.129	1.352
Greater than Primary Education	-0.334**	0.110	0.716	-0.357	0.182	0.700	-0.352*	0.140	0.703
(Only Primary School Education)									
Number of Years Gone	-0.158***	0.015	0.854	-0.177***	0.024	0.837	-0.138***	0.020	0.871
Migrant Works as Laborer, Craftsman, Unskilled Worker	0.278**	0.088	1.320	0.351*	0.136	1.420	0.171	0.117	1.187
Migrant Works in Service or Professional Occupation	0.106	0.153	1.112	0.149	0.234	1.161	-0.057	0.204	0.944
Migrant Works in Service Occupation	0.053	0.135	1.055	0.237	0.225	1.267	-0.119	0.171	0.888
Migrant is Unemployed	0.177	0.180	1.193	-0.002	0.251	0.998	0.229	0.282	1.257
(Migrant Works in Agricultural Occupation)									
Both Parents Live in Household	0.164	0.118	1.178	0.278	0.160	1.320	-0.080	0.182	0.924
Only Mother Lives in Household	0.162	0.129	1.176	0.237	0.184	1.267	-0.057	0.194	0.944
Only Father Lives in Household	-0.101	0.192	0.904	0.178	0.271	1.195	-0.481	0.280	0.618
(Neither Parent Lives in Household)									
Migrant's Marital Status and Spouse Location									
Migrant Married, Spouse Lives in Origin Household	1.385***	0.206	3.993	1.343***	0.311	3.832	1.339***	0.286	3.814
Migrant Married, Spouse is a Migrant in the Same Location	-0.529***	0.094	0.589	-0.732***	0.151	0.481	-0.489***	0.123	0.613
Migrant Married, Spouse is a Migrant in the Different Location	-0.372*	0.179	0.689	-1.133**	0.370	0.322	-0.106	0.208	0.899
Migrant is Post-Married	-0.63*	0.251	0.533	-1.387**	0.429	0.250	-0.196	0.319	0.822
Spouse is in an Unknown Location	-0.198	0.117	0.820	-0.53**	0.183	0.588	-0.030	0.155	0.971
(Migrant is Single)									
Migrant's Children									
At Least One of Child Lives in Origin Household	0.397	0.223	1.487	0.589	0.347	1.803	0.260	0.298	1.297
(None of the Migrant's Children Live in the Household)									
At Least One of Child is a Migrant	0.257	0.198	1.293	0.51*	0.260	1.666	-0.011	0.319	0.989
(None of the Migrant's Children are Migrants)									
Household Variables									
Total Amount of Land Owned by the Household (logged, in wa^2)	0.008	0.009	1.008	0.011	0.014	1.011	0.007	0.011	1.007
Household Grows Rice	-0.030	0.091	0.971	-0.084	0.143	0.919	0.032	0.120	1.033
(Household Does Not Grow Rice)									
Household Owns Equipment	0.213*	0.089	1.237	0.169	0.151	1.185	0.219*	0.110	1.245
(Household Does Not Own Equipment)									
Top 20th Percentile of the Wealth Distribution	-0.048	0.089	0.953	0.040	0.150	1.041	-0.089	0.112	0.915
Bottom 33rd Percentile of the Wealth Distribution	-0.027	0.081	0.973	0.054	0.132	1.055	-0.080	0.104	0.923
(Middle 34 - 79th Percentile of the Wealth Distribution)									
Number of People of Working Age	-0.065*	0.030	0.937	-0.125**	0.048	0.883	-0.031	0.038	0.969
Number of People of Non-Working Age	-0.118***	0.035	0.888	-0.117*	0.055	0.890	-0.121**	0.045	0.886
Number of Migrants from Household	-0.072***	0.020	0.930	-0.081*	0.032	0.922	-0.072**	0.026	0.931
N		6578			3008			3570	
-2 LL		5833.175			2292.015			3511.641	

* p < .05 ** p < .01 *** p < .001 (Two-Tailed Test)

[1] Standard Errors are Adjusted For Clustering Within Households Using General Estimation Equations

Figure 1. Frequency Distribution of Return Migration in 2000 for Migrants age 13 - 55 in 1994



APPENDIX 1. CREATING A WEALTH INDEX FROM HOUSEHOLD ASSETS USING PRINCIPAL COMPONENTS ANALYSIS.

While the Nang Rong data do not contain information on individual income or household consumption expenditures, data was collected about household ownership of various consumer durables or assets. These variables can be used to create an index of assets that is a proxy for household wealth. In creating such an index, choosing an appropriate weight to attribute to each asset maybe difficult. To calculate these weights, I use principal components analysis (PCA), a well-known technique for reducing the dimensionality of a data set.

PCA is a technique that extracts a few uncorrelated linear combinations of an original set of variables that captures most of the information in the original variables (Dunteman 1989). Suppose we had a set of *p* variables, representing the ownership of assets by each household. PCA transforms these *p* wealth indicator variables, which can be characterized as a *p* dimensional random vector **x** (x_1, x_2, … x_p) into a one-dimensional wealth index z, using the following equation:

$$z = u_1x_1 + u_2x_2 + \ldots + u_px_p \qquad (1)$$

The weights (u_1, u_2, … u_p) are determined mathematically by maximizing the variation of the linear composite. Furthermore, the principal components are ordered with respect to their variation so that the first principal component accounts for the most variation in the original variables, and each subsequent principal component accounts for less and less of the remaining variation.

The first principal component is the line of closest fit to the *j* observations in the *p* dimensional variable space defined by the asset variables. It minimizes the squared

distance (defined in a direction perpendicular to the line) of the *j* observations from the line in the variable space representing the first principal component. The *p* principal components can be expressed in equation form:

$$z_1 = u_{11}x_1 + u_{12}x_2 + \ldots + u_{1p}x_p$$

$$z_2 = u_{21}x_1 + u_{22}x_2 + \ldots + u_{2p}x_p$$

...

$$z_p = u_{p1}x_1 + u_{p2}x_2 + \ldots + u_{pp}x_p \qquad (2)$$

or in matrix form:

$$\mathbf{z}_i = \mathbf{u}_i'\mathbf{x}$$

where $\mathbf{u}_i$ is a weight vector $(u_{i1}, u_{i2}, \ldots, u_{ip})$ associated with the *i*th principal component, which can be calculated separately for every household *j*. Also, **x** is a $p \times 1$ vector of original variables. The main statistics resulting from PCA are the variable weight vector $\mathbf{u}_i$ associated with each principal component, and its corresponding variance, λ_i (Dunteman 1989).

PCA finds a weight matrix **U** that maximizes $\mathbf{U}'\mathbf{R}\mathbf{U}$, given the constraint that $\mathbf{U}'\mathbf{U} = \mathbf{I}$, the identity function. This method is based on a result from matrix algebra involving a $p \times p$ symmetric, nonsingular matrix **R**, a correlation matrix of asset variables. Because the units in which the original variables are measured are often arbitrary, and variables with large variances automatically get large weights in the principal component, a correlation matrix is often preferred to a covariance matrix (Dunteman 1989).

As detailed in Jackson (1991), the matrix λ, can be calculated by premultiplying and postmultiplying **R** by a weight vector **U** such that:

$$\mathbf{U}'\mathbf{R}\mathbf{U} = \lambda \qquad (3)$$

The diagonal elements of l, (l_1, l_2, … l_p) are called *characteristic roots* or *eigenvalues*, and they are equal to the variance of each respective principal component. The off-diagonals of l are all equal to zero. The columns of $\mathbf{U}$, $\mathbf{u}_1$, $\mathbf{u}_2$, … $\mathbf{u}_p$ are called *characteristic vectors* or *eigenvectors* of $\mathbf{R}$. Eigenvalues can be obtained by solving for l in the *characteristic equation*:

$$| \mathbf{R} - l\mathbf{I} | = 0 \tag{4}$$

where $\mathbf{I}$ is the identity matrix. After solving for l, one can obtain eigenvectors by finding the solution of the equations:

$$[\mathbf{R} - l\mathbf{I}]\mathbf{t_i} = 0 \tag{5}$$

and

$$\mathbf{u_i} = \frac{\mathrm{t}_i}{\sqrt{\mathrm{t}_i'\mathrm{t}_i}} \tag{6}$$

for $i = 1,2, \ldots, p$.

Upon solving for these eigenvectors, one can make up the matrix $\mathbf{U}$, with the ith row corresponding to the elements of the eigenvector associated with the ith eigenvalue:

$$\mathbf{U} = [\mathbf{u}_1 \mid \mathbf{u}_2 \mid \ldots \mid \mathbf{u}_p]. \tag{7}$$

This can be used to express the functional relationship between principal components, the weight vector, and the original variables more succinctly as:

$$\mathbf{z} = \mathbf{U}'\mathbf{x} \tag{8}$$

where $\mathbf{z}$ is a $p \times p$ matrix of principal components, $\mathbf{U}'$ is a $p \times p$ matrix of eigenvectors and $\mathbf{x}$ is a p column vector of original variables (Jackson 1991). While there are p principal components of the original p variables, it is the first principal component that captures the most variation. Thus, following work by Filmer and

Pritchett (2001), I use only the eigenvectors from the first principal component as weights in creating a wealth index for each household *j*, which can be expressed as:

$$z_{11} = u_{11}x_{1j} + u_{12}x_{2j} + \ldots + u_{1p}x_{pj}$$

$$\ldots \qquad\qquad j = 1,\ldots,J$$

$$z_{1j} = u_{11}x_{1j} + u_{12}x_{2j} + \ldots + u_{1p}x_{pj}$$

The critical assumption is that household wealth is what causes the most common variation in asset variables Filmer and Pritchett (2001).