# The Impact of Migration and Remittances on Wealth Accumulation and Distribution in Rural Thailand

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**Abstract**

This paper studies the impact of internal migration and remittance flows on wealth accumulation and distribution in 51 rural villages in Nang Rong, Thailand. Using data from 5,449 households, the study constructs indices of household productive and consumer assets with principal component analysis. The changes in these indices from 1994 to 2000 are modeled as a function of households' prior migration and remittance behavior with ordinary least squares, matching, and instrumental variable methods. The findings show that rich households lose productive assets with migration, potentially due to a reduction in the labor force available to maintain local economic activities, while poor households gain productive assets. Regardless of wealth status, households do not gain or lose consumer assets with migration or remittances. These results suggest an equalizing effect of migration and remittances on wealth distribution in rural Thailand.

**Keywords:** Migration, Remittances, Wealth Distribution, Thailand

To evaluate the economic impact of migration flows, researchers study the amount and distribution of remittances, funds and goods sent by migrants to their origin families and communities. Remittances from international migrants amount to US$325 billion annually, far exceeding the volume of official aid and approaching the level of foreign direct investment flows to developing countries in 2010 (Ratha, Mohapatra and Silwal 2011). These flows are critical for understanding the economic trends in the developing world; thus, several studies have evaluated their impact on the receiving economies (Acosta 2008; Adams and Page 2005; Koechlin and Leon 2007). But most of these studies have relied on macro-level data, and focused only on remittances from international migrants.

This study builds on the recent body of work that has employed micro-level survey data to investigate the impact of migration and remittance flows in origin communities (Garip 2012; McKenzie and Rapoport 2007), but takes a mixed-methods approach in an internal migration setting. The study first uses qualitative data obtained from focus group discussions with migrants, migrant-sending household members and village leaders in 8 rural villages in Nang Rong, a relatively poor district and a major supplier of migrants to urban regions in Thailand. These data suggest migration and remittance choices may have differential effects depending on households' initial economic positions.

To test these hypotheses systematically, I exploit longitudinal survey data from 51 rural villages, which record the migration and remittance choices of 5,449 households prior to 1994 as well as households' asset holdings in 1984, 1994 and 2000. To measure households' economic positions over time, I use Filmer and Pritchett's (2001) method, and create an index of household wealth in

1994 and 2000 based on principal component analysis of 14 asset indicators in the pooled data. I compute separate indices for productive and consumer assets, which differentially shape long-term economic trajectories (Brown and Alhburg 1999; Durand, Parrado and Massey 1996b; Massey and Parrado 1998; Papademetriou and Martin 1991).

I employ regression analysis to link the changes in households' productive and consumer assets from 1994 to 2000 to prior migration and remittance behavior. I estimate separate models for poor, medium-wealth and rich households, as well as for changes in productive and consumer assets. Because households do not choose migration and remittance strategies randomly, I consider two alternative models (matching and instrumental variables) to ordinary least squares to correct for potential sample selection bias.

The results confirm the hypotheses suggested by qualitative data: Poor households with a migrant between 1984 and 1994 (or a remitter between 1993 and 1994) gain productive assets from 1994 to 2000, while rich households with a migrant lose productive assets. Regardless of initial wealth status, households with a migrant (or a remitter) do not experience a change in consumer assets. Qualitative data suggest potential mechanisms for these patterns. Poor households seem to benefit from migration due to reduced consumption needs as well as potential remittances, while rich households often suffer because of reduced labor force for local economic activities.

**Background**

Remittances from internal or international migrants comprise a critical component of economic outcomes in the developing world reaching 20 per cent of the GDP in many countries (Ratha et al. 2011). The key debates in the literature have revolved around the impact of remittance flows on poverty and inequality.

Many studies showed remittances reduce poverty (Adams 2006; Adams and Cuecuecha 2010; Adams and Page 2005; Taylor, Adams and Mora 2009) and initiate a development dynamic by lessening the production and investment constraints in the economy (Goldring 1990; Rozelle, Taylor and DeBrauw 1999; Stark 1991; Stark and Lucas 1988; Stark, Taylor and Yitzhaki 1988; Taylor 1999; Taylor et al. 1996), by providing income growth opportunities (Durand et al. 1996a; Massey and Parrado 1998) or by creating a vessel for risk diversification (Lauby and Stark 1988). Ample evidence from different settings established how remittances help migrants establish small businesses in origin (Funkhouser 1992; Woodruff and Zenteno 2007), afford better education for their children (Edwards and Ureta 2003; Yang 2008) and accumulate wealth (Garip 2012; Greenwood 1985; Taylor 1992; Taylor and Wyatt 1996).

Research also suggested remittances may produce a cycle of dependency and stunted development in the origin (Papademetriou and Martin 1991; Reichart 1981; Wiest 1984) especially if the funds are spent on consumption rather than income- or employment-generating productive activities, hence contributing to a way of life that cannot be sustained in the long run or through local means (Brown and Alhburg 1999; Grasmuck and Pessar 1991; Massey and Basem 1992; Mills 1999; Mines 1982; Rempel and Lobdell 1978; Russell 1992). But recent

work showed that remittances – even used for consumption – generate strong 'multiplier' effects in the receiving economy (Durand et al. 1996a; Taylor et al. 1996).

A related debate in the literature considered the impact of migration and remittances on economic disparities in receiving countries. Several studies found that remittance flows decreased income or wealth inequalities (Adams 1992; Taylor 1992; Taylor et al. 2009), while others observed the opposite pattern (Mora 2005). Recent work attempted to reconcile these patterns by showing how the impact of remittances on inequality depends on the cost (Ebeke and Le Goff 2011) or level of migration (Garip 2012; Koechlin and Leon 2007; McKenzie and Rapoport 2007).

This study contributes to both debates with an analysis of internal migration in Thailand. Remittances from internal migrants – although smaller in magnitude compared those from international migrants – comprise a vital component of rural livelihoods in many developing countries (Reardon 1997; Rempel and Lobdell 1978). Studies in the Thai setting obtained mixed results on the economic impact of internal migration and remittances. Ford et al. (2009), for example, found that remittances have no effect on asset accumulation in Kanchanaburi province, while Entwisle and Tong (2005) observed strong positive effects in Nang Rong.

This study seeks to move beyond prior work by not only evaluating the economic effects of migration and remittance flows, but by also suggesting the reasons for those effects using a mixed-methods approach. I first rely on qualitative data from focus group interviews to develop hypotheses about the economic impact of migration and remittance choices. I then test these

hypotheses through a rigorous statistical analysis of longitudinal survey data. Finally, I return to qualitative data to understand the potential mechanisms underlying the observed statistical regularities.

## Analytical Strategy

### The Thai setting

The study uses qualitative and survey data from Nang Rong, a district in the historically poor Northeastern region of Thailand, and an important source of migrants to urban areas. Migration flows from this region gained steam from mid-1980s to mid-1990s, when Thailand led the world in economic growth (Jansen 1997). This growth, fuelled mostly by production in export manufacturing, led to an increased demand for labor in urban destinations (Bello, Cunningham and Li 1998), and attracted rural migrants, mostly from the Northeast region, to factory, construction and service jobs at unprecedented rates (Mills 1999). The period of expansive growth slowed down in the mid-1990s. In 1996, the export growth slumped from over 20 percent to zero, partly due to increasing competition from China and India. In 1997, the Asian financial crisis hit Thailand leading to a devaluation of the Thai currency, baht, and precipitating a brief recession. Unemployment rates increased as a consequence, and migration flows from rural to urban regions slowed down. The survey data capture this roller coaster period of economic boom and bust in the country, leading to dramatic changes in migration and remittance flows between rural and urban regions.

Generating hypotheses from qualitative data

The study first employs qualitative data from focus group interviews conducted in 8 rural villages in Nang Rong in 2005 to generate hypotheses about the effect of migration and remittances on wealth accumulation. In each village, the headman helped us identify 6 to 8 participants (typically equal number of men and women) for each of the three focus groups: (i) village leaders (village headman, village committee members, mothers group members), (ii) migrant-sending household members, and (iii) return migrants. I trained and supervised three graduate students from Mahidol University. One student, who spoke the Northeastern dialect, ran the focus group discussions – which lasted from one to two hours – and asked open-ended questions about the reasons for and consequences of migration and remittance decisions. The remaining two students took notes, recorded and simultaneously translated the discussion. The fieldwork lasted four weeks and recruited a total of 158 respondents. Three bilingual research assistants transcribed the data and translated them into English. The data were then compiled in a word-processing document and organized around various themes,

The fieldwork observations suggested that migration and remittances often positively contribute to household economies in Nang Rong. A headman told us that in his village, "Some migrant households have improved so much from remittances that they are now richer than [initially] rich households." A village committee member similarly commented: "Migrant households receive remittances and become rich. In our village, the richest person is not the Kamnan (the town chief) but one of the migrant villagers."

Many parents talked about the contributions of their migrant children. A mother of migrants, for example, stated: “We were poor and had nothing to live on. There was nothing to do here, no farmland for us… If [my children] had stayed, we would have to feed them. They went with our blessing because we understood they wanted to help support the family.” When asked about remittances, the mother replied: “That is the reason why I sent my children away.” Another mother echoed: “When my kids went, I was happy. I was eagerly waiting for them to remit some money home every month so that we would have money to spend.” Return migrants also recognized the benefits of their absence to the household economy: “There are more expenses if the children stay home. If we go away to work, there are less people home, and it is less expensive to feed the family.” Thus, in poor households, migrants helped the household economy not only by sending back remittances, but also by the sheer fact of leaving and relieving the household’s burden of supporting them.

The experiences of households that owned land, however, were different. A father, whose three sons migrated, told us about the devastating effect of that move on the household economy: “Before, three men helped work in the rice field, so things were easier. Now I don’t have any help.” Similarly, a return migrant acknowledged the negative effect of his migration decision on the household: “It might have been better for me to stay in the village because we had land. When I migrated for work, no one took care of the land, so we had to rent it out.”

In rich households, then, migration implied a loss in the labor force available for local economic activities. Some migrants, realizing the effect of their departure, sent remittances to make up for their absence, as one migrant told us: “The money [I send] is mainly for hiring help with the

farm." But in most cases, migrants from wealthier households chose not to. A village headman explained this pattern: "They think that their father is already well-off… not in any difficulty, so they don't send money. [Migrants] are still teenagers, so they go out and spend all their money." In fact, in some cases, migrants from wealthy households asked for money. The father of the three migrant sons, for example, told us: "No one sends me money. Whenever they come, I give them money."

These observations suggest that households' initial economic status determines the labor needs in the origin, and thus, the potential impact of migration on the household economy. In poor households, the departure of young adults seems beneficial as it relieves the consumption burden and potentially brings remittances. In rich households, the opportunity cost of losing young adults is higher due to household's local economic activities. Accordingly, migration may be detrimental especially if the migrants do not send remittances in lieu of their domestic labor.

Based on these observations, I hypothesize that the impact of having a migrant or a remitter will vary by households' wealth status. Poor households with a migrant will gain more assets compared to those without a migrant, all else equal. Poor households with a remitting migrant will gain more assets compared to those with a non-remitting migrant. Rich households with a migrant, by contrast, will lose more assets compared to those without a migrant. But rich households with a remitting migrant will gain more assets compared to those with a non-remitting migrant.

These hypotheses qualify some of the mixed findings on the impact of migration on household wealth. Many studies have found that migration increases household investments through remittances (Dustmann and Kirchkamp 2001; Lucas 1987; Woodruff and Zenteno 2007; Yang 2008), while others have argued that migration diminishes household investments by reducing the labor endowment (Miluka et al. 2010; Rozelle et al. 1999) or efficiency (Itzigsohn 1995). Our hypotheses connect these two sets of findings, and suggest that the impact of migration on household wealth depends on the household's initial wealth status.

Prior research distinguished between migrants' investments in productive and consumer assets, suggesting that the former leads to greater economic growth in the long run (Durand et al. 1996a; Massey and Parrado 1998). Qualitative data provided mixed evidence on how households utilized remittance funds in the Nang Rong villages. Asked about how remittances have contributed to her household's welfare, for example, the mother of a migrant responded: "My life is much better than before. I now own a home and farmland." Referring to a successful migrant, a headman described: "[With remittance money] he bought cattle worth of 200,000 baht. He also bought land for his wife worth 200,000-300,000 baht [about 4000-6000 US$]." A return migrant similarly explained that he "opened a grocery store for [his] wife with remittance income."

Although such examples of productive use of remittances were numerous, a considerable share of respondents spent remittances to buy consumer goods. Some respondents actually received household appliances from migrants instead of money. The mother of a migrant daughter told us: "Sometimes they [migrants] do send back some small commodities like clothes or small electronic devices. It is quite rare to get microwaves, fridges and other big stuffs, but two or three

of us do get those things." Similarly, a return migrant explained: "Those whose children remit have a TV and a fridge." A return migrant remarked on the gender differences: "Men usually spend money on new cars, new motorcycles.... They're less likely to open a business compared to women."

These mixed observations do not suggest a clear direction on whether migrant households invest in productive or consumer assets, thus, I pose this as an empirical question for the survey data.

Survey data

To test the hypotheses, I use the Nang Rong survey data collected in three waves in 1984, 1994 and 2000. The 1984 wave was a census of 51 villages in Nang Rong (including the 8 villages selected for fieldwork), and collected information on individual demographics, household assets and village characteristics. The 1994 and 2000 waves replicated the 1984 census, following all 1984 respondents still living in the original 51 villages and adding any new residents. The 1994 and 2000 household rosters recorded if a household member from the previous wave moved out of the village two months or more prior to the survey, and whether those who moved out sent money or goods to the household in the past 12 months. The rosters also collected detailed records of household assets. These data are used to compute the key indicators for analysis.

The 1997 Asian financial crisis falls roughly in the middle of the study period. Our data cannot capture the immediate response to the crisis. But, migration and remittance behaviors show remarkable consistency over time. 93 (78) per cent of households that had migrants (remitters) according to the 1994 survey also had migrants (remitters) in the 2000 survey. Therefore, I

expect the 1994 measures to provide a good proxy for the migration and remittance patterns after the 1997 crisis.

Measuring Wealth Change

The analysis seeks to evaluate how having a migrant or a remitter in the household prior to 1994 affects subsequent changes in assets from 1994 to 2000. Migrants are defined as individuals who were members of their households in 1984, but moved out of the village two months or more prior to the 1994 survey. Remitters are defined as migrants who sent money or goods (food, clothing, household items, electrical appliances or vehicles) to their households in the 12 months preceding the survey (as reported by the household members in origin).

To measure the change in household assets from 1994 and 2000, I created an aggregate index from 14 asset categories measured in both years. Following Filmer and Pritchett (2001), I applied principal components analysis (PCA), but retained the ordinal measures by using polychoric rather than Pearson's correlation (Kolenikov and Angeles 2009). The `polychoricpca` routine in Stata generated weights for the 14 asset indicators in the *pooled* data from 1994 and 2000. These indicators included counts (number of cows, buffalos or pigs, number of TVs, VCRs, refrigerators, cars, motorcycles, itans (small tractors), tractors and sewing machines), and categorical variables (house has windows, household uses gas or electricity for cooking, whether water is piped into household). [1] To avoid arbitrary weighting in PCA due to differences in scale, I used three categories for the count measures. For the cattle indicators, the categories included a

[1] Household land is measured inconsistently across survey waves, and excluded from the asset index computation. While the 1984 and 1994 surveys captured both the total amount of land owned and land used, the 2000 survey only asked about the latter. The exclusion of land does not affect the main results. Alternative models of productive asset change (where the asset index includes land owned in 1994 and land used in 2000) produce qualitatively similar results (available upon request) to those presented here.

group of zero values (the majority of cases) and two groups for low and high levels of ownership based on the median of non-zero values. The counts of assets were top-coded at two (the higher values contain less than one percent of the sample).

A separate PCA generated weights for the assets in the 1984 survey, which included a different set of indicators. I did not include the 1984 data in the global PCA above because it would force us to drop several indicators measured in 1994 and 2000. The 1984 asset index is not a central measure for our analysis and only serves as a control for baseline wealth.

[TABLE 1]

Table 1 displays the scoring coefficients of the first principal component given by the polychoric PCA of the pooled data from 1994 and 2000. The left-hand-side panel reports the coefficients for *productive assets*: (i) farming tools (itans and tractors), and (ii) cattle (cows, buffalos and pigs). The right-hand-side panel reports the coefficients for *consumer assets*: (i) housing quality (windows, type of cooking fuel, water pipe), and (ii) durables (TVs, VCRs, refrigerators, cars, motorcycles, and sewing machines). (Some of the consumer assets can be considered productive. For example, household members may use a car or motorcycle for work, or a sewing machine to produce clothing to be sold. This alternative classification does not change any of the results.) Household indices for productive and consumer assets are computed by summing up the value of each indicator weighted by the corresponding PCA coefficient. For ease of interpretation, the asset indices are scaled to range between 0 and 10. The change in household assets is measured by subtracting the 1994 (productive or consumer) index from its 2000 value.

Modeling Households' Migration and Remittance Choices

Our analysis begins with two logit models of (i) whether a household has any migrants recorded in the 1994 survey (who may have moved any time from 1984 to 1994), and (ii) whether any of the migrants send remittances in the year preceding the survey. These models help demonstrate the selectivity in migration and remittance choices, which the subsequent models for wealth change correct for. For the first model, let $\pi_i = \Pr(mig_i = 1)$ denote the probability that household *i* has a migrant. The log-odds of migrating relative to not migrating, denoted $\eta_i$, is a linear function of relevant characteristics $x_i$,

$$\eta_i = \log\left(\frac{\pi_i}{1-\pi_i}\right) = x_i\beta \qquad (1)$$

where $\beta$ represents the vector of coefficients. The second model is identical, but considers the probability that household *i* receives remittances given that it has a migrant.

The surveys did not collect information on the exact timing of migration, which may have occurred any time from right after the 1984 (1994) survey to two months prior to the 1994 (2000) survey. All indicators in the migration model are kept at 1984 values to ensure that they capture the conditions *prior to* migration. Number of seniors (aged 65 or more) and children (aged 14 or less) indicate the dependents in the household, while the age of the household head, number sons and daughters (aged 15 or more), and mean years of education capture the potential for mobility in the household. Indices of household productive and consumer assets in 1984 measure household's baseline wealth. Indicators for whether household had any prior migrants

and the percentage of ever-migrants in village (both aggregated from the 1984 household survey)[2] proxy the prevalence of migration behavior. The indicators for electrification, number of rice mills and presence of a primary or secondary school capture the village development level. Months of water shortage in the village measure risks to farming income. Time to district proxies distance to urban centers, and hence, the cost of migrating.

The remittance model includes four additional indicators that measure migrant characteristics as recorded in the 1994 survey. (Because migration, by definition, precedes remittance behavior, simultaneity bias is not a concern.) The indicators for the number of male and female migrants seek to capture the gendered remittance patterns. The average years of education among migrants indicates the earning potentials in destination. Finally, the percentage of remitters among households in the village (aggregated from the 1994 household survey) measures the collective remittance behavior.

[TABLE 2 ]

Table 2 summarizes the sample characteristics by households' migration and remittance status as reported in the 1994 survey. Households with migrants have a higher number of seniors and children as well as older sons and daughters, higher average education, but are poorer in productive assets than non-migrant households. Among households with migrants, those receiving remittances have a higher number of sons and daughters and a higher number of male and female migrants. Migrants are more likely to come from households with prior migrants and

[2] Migrants are defined as 'temporarily absent' household members, whose reason for moving is reportedly related to education or work.

villages with a higher percentage of migrants, and remitters from villages with a higher percentage of remitters ($p<0.05$, two-tailed, for all mentioned differences). This descriptive analysis suggests the explanatory power of the selected variables for migration and remittance outcomes.

Modeling Wealth Change

The main analysis of the paper tests the effect of migration and remittance decisions (binary indicators introduced in two separate models) on the change in households' productive and consumer asset indices from 1994 to 2000. The hypotheses suggest that the effect might vary across wealth groups; thus, the analysis is run separately for poor, medium-wealth and rich households. The wealth categories are based on the tertiles of the productive asset index, but the robustness of the results to alternative categorizations is established in Table A1 of Appendix A. The wealth change models include all the controls in the migration and remittance models.

To set a baseline, I start with an ordinary least square (OLS) estimation. The model expresses the change in household *i*'s assets from 1994 to 2000 $\left(\Delta a_i = a_{i,00} - a_{i,94}\right)$ as a function of household's migration decisions prior to 1994 $\left(mig_{i,84\to 94}\right)$ and other relevant characteristics $x_i$ (measured in 1984),

$$\Delta a_i = a_{i,00} - a_{i,94} = mig_{i,84\to 94}\lambda + x_i\alpha + \varepsilon_i \qquad (2)$$

where $\lambda$ and $\alpha$ are the corresponding coefficients and $\varepsilon_i$ is the error term. A second model estimates the effect of remittance behavior prior to 1994 $\left(rem_{i,93\to 94}\right)$ on asset change among households with migrants. Based on the definitions in the questionnaires, migration could have occurred anytime from 1984 to two months prior to the 1994 survey (indicated as 84→94 in the

variable subscript). Remittances could be sent anytime during the 12 months preceding the 1994 (indicated as 93→94 in the variable subscript).[3]

I focus on the *change* in assets in order to control for unobserved time-invariant factors that might affect a household's assets in both 1994 and 2000. By comparing the change in households with a migrant (or a remitter) to that in households without a migrant (or a remitter), I also account for unobserved time-varying factors to the extent that those factors affect both types of households similarly. This method (also known as "difference-in-differences") assumes that, in the absence of migration or remittances, all households would have experienced similar changes in wealth from 1994 to 2000 (controlling for the observed characteristics). A descriptive analysis suggested by Gertler et al. (2011), and available upon request, suggested no threat to this "equal trends" assumption.

OLS regression also assumes treatment effects to be constant in the population, but, in reality, households may assign themselves to treatment (having a migrant or a remitter) based on expectations about the outcome (change in assets). This endogenous selection leads to heterogeneity in the treatment effects. (Put differently, households do not randomly send migrants or receive remittances, thus, a simple comparison of the change in assets across households' migration-remittance choices confounds the effect of those choices with the selection process into those choices.) Matching methods account for this heterogeneity by

[3] I restrict the analysis to migration decisions reported in the 1994 survey to ensure that the decisions are strictly prior to the changes in wealth from 1994 to 2000. I exclude from the sample 835 households that reported no migrants in the 1994 survey, but had a migrant in the 2000 survey (final N = 4,614). Thus, I compare households with a migrant in the 1994 survey to those without a migrant in both the 1994 and 2000 surveys. Similarly, in testing the effect of remittances on wealth change, I take out 531 households that reported no remitters in 1994, but had a remitter in 2000 (final N = 2,687).

balancing the covariates between the treatment and control groups, and thus 'undoing' the selection into treatment, given that the selection is based on observable characteristics.[4] (In our case,

Prior research on wealth accumulation in Thailand relied on matching methods to correct for heterogeneous treatment effects (Ford et al. 2009). These methods use a distance measure to group similar observations from the treated and control cases (e.g., households with and without migrants) into 'matched' categories. A popular distance measure is the Mahalanobis distance based on the Euclidean distance between the covariate vectors of each pair of observations weighted by the sample covariance matrix. Using this measure, I performed one-to-one nearest neighbor matching using the same covariates, *x*, included in OLS with `psmatch2` routine in Stata. I removed the treated units that are outside the common support of the control units as well as those that are more distant to the controls than a selected caliper (cut-off for the maximum distance allowed). I used a caliper of 2 to match migrants to non-migrants and a caliper of 5 to match remitters to non-remitters (among migrants).[5] I repeated the matching for each subsample

[4] Endogenous selection is especially problematic for remittance receipts, as households with a migrant can exercise the option to ask for remittances under economic duress. But the matching method used here, along with the descriptive analysis testing the equal trends assumption, reduce its viability to households that do not show any visible signs of wealth change prior to 1994, but still expect one between 1994 and 2000, and receive remittances as a result. The IV method applied later further reduces the potential sources of endogeneity to time-variant unobservables that affect both wealth change and the selected instruments (that is, the percentage of remitters among sibling and village ties).

[5] A common concern with the one-to-one nearest neighbor matching is that it can discard a large number of observations that are not selected as matches (Stuart 2010). An alternative method, Kernel matching, includes all observations, matching treated units with a weighted average of all controls. The weights are inversely proportional to the distance between the treated and control pairs. The estimates from this method (available upon request) are very similar to those from one-to-one nearest neighbor matching.

(poor, medium-wealth and rich households) and computed the standard errors for the estimates with the bootstrap.[6]

[TABLE 3]

Table 3 compares covariate and propensity score (the predicted probability of treatment given the covariates) means in the overall and the restricted 'matched' sample for two treatments of interest (having a migrant or a remitter) across three wealth groups. For each covariate, the table reports the standardized difference of means, that is,

$$bias = \left| \frac{100\left(\bar{x}_T - \bar{x}_C\right)}{\sqrt{\frac{\left(s_T^2 + s_C^2\right)}{2}}} \right| \qquad (3)$$

to quantify the bias between treatment and control samples (Rosenbaum and Rubin 1985), where $\bar{x}_T$ and $s_T$ represent the mean and standard deviation of the covariate in the treatment sample, and $\bar{x}_C$ and $s_C$ denote the same statistics in the control sample.

Panel A shows the standardized mean differences in all covariates for a subsample of poor households. In the unmatched sample, the differences between the treatment and control groups are considerable. The bias for the age of the household, for example, is about 90 percent (suggesting that the difference in means for the treatment and control groups is 90 percent as

[6] Abadie and Imbens (2008) questioned the use of the bootstrap for calculating standard errors, and provided an alternative estimator (Abadie and Imbens 2006, 2011). The results obtained with this estimator (available upon request) are very similar to those with the bootstrap standard errors.

large as the standard deviation). The bias drops to 11 percent in the matched sample (an 88 percent reduction). Other covariates display similar rates of reduction in bias suggesting dramatic improvements in balance.

Panels A to F also show the standardized differences in propensity scores for different subsamples (poor, medium-wealth and rich households) and treatments (having a migrant or a remitter). In all six cases, the standardized difference in the matched sample is much smaller than 50 percent, the upper bound suggested by Rubin (2001) for the regression adjustment to be reliable. Each panel also shows the ratio of the variances of the propensity score in the treatment and control groups in the matched sample. In all cases, the ratio is close to one (and invariably between 0.5 and 2) indicating acceptable balance according to Rubin's (2001) rule-of-thumb. Finally, Table B1 in Appendix B shows the robustness of the final results to caliper size. It also demonstrates the trade-off between the size of the matched sample and the size of the caliper (inversely related to the degree of covariate balance).

Matching methods are not robust to potential bias arising from unobserved variables that affect both assignment to treatment (migrating and remitting) and the outcome (change in assets). Instrumental variable (IV) estimation provides an alternative method for identifying treatment effects in such cases (implemented in the `treatreg` routine in Stata for binary treatments). The method relies on the availability of an instrument, a variable that affects the probability of treatment, but not the outcome (nor any unobserved variables affecting the outcome).

Prior work has relied on an indicator of migration prevalence in the community as an instrument for selecting into migration (Hoddinott 1994; Mora 2005; Taylor, Rozelle and DeBrauw 2003). Similar to this work, I used the percentage of migrants in the village prior to 1984 as an instrument for migration. Additionally, I computed the percentage of migrants in household's sibling network in 1984. The sibling network includes the households where the members of the ego household have at least one sibling (often due to marriage) in 1994. Similarly, for remittance behavior, I used two instruments: the percentage of remitters in the community and in the household's sibling network in 1984. (The sibling network is measured in 1994, but I computed the aggregate migration or remittance behavior in that network in 1984. Some of the network ties in 1994 may be absent in 1984. To consider this possibility, I excluded the ties to siblings who were younger than 35 in 1984 as those siblings may still be living in the ego individual's household then. The results, however, were robust to their inclusion.)

This estimation strategy relies on the assumption that the instruments affect changes in household wealth only indirectly through their effect on migration (or remittances). This exogeneity assumption is essentially untestable, but one can consider potential threats to its validity. One potential threat is that village characteristics may have determined prior migration or remittance rates as well as current opportunities for wealth gain. To consider this possibility, I included controls for the availability of infrastructure (electrification, schools, rice mills) and village distance to district measured in 1984 - the same year as the migration (and remittance) prevalence indicators. I also included indicators of household size and education, which may affect both past migration and remittance decisions in the sibling network and recent trends in household wealth.

A second potential threat is that the members of the sibling network may have remitted to the ego household, contributing to that household's asset gain directly. To discard this possibility, I excluded from the sample 388 households with ties to households where the members reported remitting to other households than their own. Despite the introduction of the household and village-level controls and the sample restrictions, the instruments remained strong predictors of migration and remittance decisions in 1994, with F-statistics (displayed in Table 5) typically higher than or close to the lower bound of 10 suggested by Staiger and Stock (1997) to reject the hypothesis of weak instruments.

A lingering threat to validity involves the possibility that past migration and remittance rates are associated with the unobserved determinants of wealth change. In that case, one would expect those rates to be correlated with other measures, such as household's local labor force, that are highly predictive of wealth change. I examined the partial correlations between the instruments and number of individuals involved in local economic activities in 1994. The regression results (available from the author) showed that both instruments have statistically insignificant associations with household economic activities for all wealth categories. These analyses suggest the proposed instruments as valid sources of identification.

**Results**

Modeling Households' Migration and Remittance Choices

Table 4 presents the odds ratios from two logit models of households' migration and remittance choices, which allow us to demonstrate the selectivity in these choices – and to suggest potential

underlying behavioral mechanisms – in the Thai setting. The estimates in the first column show that the odds of having a migrant increase with the age of the household head, the number of children in the household, but decrease with the number of seniors in the household. The odds of remitting also increase with the number of children, suggesting a potential a contractual agreement between the household and the migrant to exchange childcare for remittances (Banerjee 1984; Itzigsohn 1995), and countering opposite findings in the same setting (Osaki 2003).

[TABLE 4]

The odds of migrating increase with the number of sons and daughters (older than 15) in the household. This pattern may reflect a competition for future inheritances, where sons or daughters opt to show their worth by migrating and remitting, or a simple crowding-out effect where young adults leave large households for better opportunities. Given that the odds of remitting also increase with the number of daughters (the more likely heirs in the Thai context), the inheritance-seeking hypothesis seems more viable, and is supported by prior evidence from Thailand (Chamratrithirong, Morgan and Rindfuss 1988; Curran, Garip and Chung 2005; VanWey 2004). The slightly higher effect sizes for daughters and female migrants compared to sons and male migrants support the gendered remittance patterns identified by Vanwey (2004).

The odds of migration increase with the mean years of education in the household, possibly due to the higher returns to education in urban destinations compared to the rural origin. The odds of migration decrease with household's productive and consumer assets in 1984, suggesting that

individuals from poor households, those who have the least to lose and most to gain by migrating, are at the greatest risk to do so. This pattern, also identified in Osaki's (2003) work and facilitated by the low financial costs of migrating in Thailand, could reflect an individual strategy to maximize income in line with the neoclassical theory of migration (Todaro 1969), or a household strategy to overcome credit constraints as argued by the new economics of labor migration (NELM) (Stark and Taylor 1989). The latter implies that migrants from poor households should be more likely to send remittances to reach household economic objectives. The data support this pattern; the odds of receiving remittances are higher in poor households (measured by consumer assets).

Migration is more likely in communities with a higher percentage of migrants, and remittances in communities with a higher percentage of remitters. Both patterns suggest that individuals or households may respond to social influences or resources from prior migrants or remitters as argued by the cumulative causation theory of migration (Massey 1990). An alternative explanation, which considers the lingering economic pressures that lead past behavior to be correlated with current decisions, has been discarded with longitudinal data from Nang Rong in other work (Garip and Curran 2011, Garip 2008).

Modeling Wealth Change

Panel A of Table 5 shows results from OLS, matching, and IV models of the change in households' productive assets from 1994 to 2000 estimated separately for poor, medium-wealth and rich households. Wealth categories are based on the tertiles of the productive asset index in 1994. The dependent variable is standardized to mean 0 and standard deviation 1. The primary

variables of interest, whether a household has any migrants in the 1994 survey, and whether those migrants send remittances, are introduced separately in the left- and right-hand-side columns.

[TABLE 5]

The three estimation strategies, with different set of assumptions, yield remarkably similar results. For *poor* households, having a migrant is associated with a 0.38-standard deviation *increase* in productive assets according to OLS. This effect is slightly lower (0.33) in the matching model, and highest (0.42) in the IV model. For *medium-wealth* households, having a migrant is related to a 0.20-standard deviation *decrease* in productive assets, an effect closely mirrored in the matching model, but insignificant in the IV model. For *rich* households, having a migrant leads to a devastating 0.36-standard deviation *decrease* in productive assets, an effect replicated in the matching (-0.39) and IV (-0.35) estimates.

The three models also yield consistent estimates of the effect of remittances on household assets (among those with migrants). For *poor* households, having a remitter is associated with a 0.45-standard deviation *gain* in productive assets according to OLS, an effect that is slightly larger in the matching (0.56) model, and the largest in the IV (0.72). For *medium-wealth* households, having a remitter has *no effect* on productive assets in any of the models. For *rich* households, having a remitter is related to a 0.32-standard deviation *loss* in productive assets, an effect that is larger in the matching (-0.38) model, but insignificant in the IV. The negative effect in first two models is likely due to unobserved factors that are correlated with both having a remitter and

wealth change. (For example, rich households may be receiving remittances only if they are already losing wealth due to unobserved economic difficulties.) The IV estimate takes account of such unobserved characteristics, and, thus, is given the highest weight here.

Panel B of Table 6 repeats the same analysis for consumer assets. In all wealth groups, and across the three estimation strategies, having a migrant or a remitter has no effect on the changes in consumer assets, with one exception: The effect of having a migrant is negative for poor households in the OLS model. But this result is not supported by the alternative models, so not given any weight here.

**Discussion**

The results generally support the hypotheses generated from qualitative data. Poor households with a migrant gain more assets compared to those without a migrant, and those with a remitting migrant gain more assets compared to those with a non-remitting migrant. By contrast, rich households with a migrant lose more assets compared to those without a migrant. In contrast to our hypothesis, rich households with a remitting migrant experience similar, not higher, wealth gain compared to those with a non-remitting migrant. One explanation for this pattern - that rich households do not receive sufficiently large remittances to instigate wealth gain – could be tested with more refined data on remittance amounts in future work. Finally, the results contribute to the empirical debate on migrant investments by showing that having a migrant or a remitter is associated with the changes in households' productive, but not consumer, assets.

The qualitative data suggest the differential labor needs in origin as a potential mechanism for the observed differences in wealth change in poor and rich households, and the survey data provide some supporting evidence. In 1984, prior to migration, poor and medium-wealth households engaged in an average of 3.7 and 3.8 economic activities (land cultivation, animal raising, cloth weaving, silkworm raising, food preservation, bamboo and basket weaving, and vegetable gardening). Rich households, by contrast, participated in 4.3 activities on average, a significantly higher number ($p<0.001$). Similarly, poor and medium-wealth households both had around 1.6 members per economic activity, while rich households had the significantly lower number of 1.5 ($p<0.001$). These patterns confirm that rich households may face higher opportunity costs to sending migrants.

Given these costs, then, why do rich households still send migrants? A potential explanation is an intergenerational maximization model, where parents invest in migration to transfer low-return resources in rural areas (e.g., land) to higher-return resources in urban destinations (e.g., education for the migrant). This model implies that rich households may benefit from migration in the next generation. Our data cover a limited period of six years, thus do not allow us to test such long-term trajectories.[7] An alternative explanation builds on the within-household conflict suggested in focus group discussions. A village headman told us: "if parents have enough money, they don't want their children to go [migrate]." But, children sometimes ignore their parents' wishes, as a return migrant explained: "I went to find work. [My parents] didn't really want me to go, but I was stubborn." A father of three migrant sons similarly told us: "[My sons] ran away. Maybe they were bored of working in the rice fields… The oldest son went first, and told the two younger brothers to follow." These examples challenge the household-level

[7] I thank an anonymous reviewer for suggesting this explanation.

accounts such as the NELM theory, which presume joint decision-making between the migrant and other household members (Stark 1991; Stark and Taylor 1991). Prior work showed how gender hierarchies in the household produce conflict about women's migration (Goss and Lindquist 1995; Grasmuck and Pessar 1991; Hondagneu-Sotelo 2001). These findings contribute to that work, but suggest alternative, potentially intergenerational, sources of conflict, and similarly render the treatment of household as a unified decision-making unit questionable (Mahler and Pessar 2005).

**Conclusion**

This study evaluated the impact of internal migration and remittance flows on wealth accumulation and distribution in 51 rural villages in the Nang Rong district of Thailand. Migration literature remains bifurcated on these questions. Many studies found that remittances from migrants lead to productive asset accumulation, and therefore support economic growth in origin, while others showed that these funds are spent exclusively on consumption, and merely contribute to higher living standards that are unsustainable in the long run. Similarly, several studies claimed that remittances decrease economic disparities by closing the gap between the rich and the poor, while others have connected these funds to increasing economic inequalities in origin communities.

To contribute to these debates, this study first used qualitative data from focus group interviews to generate hypotheses about the impact of migration and remittances on wealth accumulation in the internal migration setting of Thailand. The study then tested the hypotheses with survey data

from 51 rural villages in Nang Rong, and returned to qualitative data to suggest potential mechanisms for the observed regularities.

This mixed-methods approach yielded several insights. First, households' migration and remittance choices had a significant effect on the level and nature of their subsequent investments. The direction of the effect, however, depended on households' initial wealth status. Among the poorest one-third (based on the distribution of productive assets), households with a migrant gained more productive assets compared to those without a migrant; and households with a remitting migrant gained more compared to those with a non-remitting migrant. Many studies observed the latter pattern, but not the former, which the focus group participants attributed to reduced consumption needs in households with a migrant.

In stark contrast, among the richest one-third, households with a migrant lost more productive assets compared to those without a migrant. One explanation for this pattern – supported by descriptive analysis – is provided by our respondents, who emphasized the existing investments of rich households in the origin, which require labor to maintain, and thus impose high opportunity costs to migration. Theoretically, migrants can compensate for their departure by sending remittances. But in the Thai data, households with a remitting migrant did not experience an additional asset gain compared to those with a non-remitting migrant, suggesting remittances may not be sufficiently large in magnitude, which could be tested in future work.

Finally, the results established that while migration and remittances significantly affected the changes in households' productive assets, these decisions had no impact on households'

consumer asset investments. These results show that migration and remittance flows lead to productive asset acquisitions among poor households, and carry potential for long-term economic growth. The same flows lead to losses among the rich, and thus are likely to have an equalizing effect on the wealth distribution in rural Thai villages.

A shortcoming of this analysis is the lack of data to assess the impact of the 1997 Asian financial crisis on the changes in household assets. But our focus is on the differences in wealth gain (or loss) between households with and without migrants, thus, this omission is not problematic as long as we can assume that the crisis affected all households similarly, regardless of their migration choices. This assumption can be verified (or refuted) in future work if longitudinal data capturing household wealth immediately before and after the crisis became available to researchers.

Overall, the findings suggest two fruitful research directions. The first is to consider households' initial wealth as an important qualifier for the impact of migration on future investments. Prior work observes that migration may affect household investments through three channels: (i) by reducing the consumption needs, (ii) by changing the labor supply, and (iii) by generating remittances (Davis, Carletto and Winters 2010). Future work might question how households' initial wealth interferes with each channel. A second direction is to develop more complex behavioral models of migration. Prevailing models depict migration as an individual strategy to maximize income (Todaro 1969) or a household strategy to diversify risks (Stark and Taylor 1989). The findings here, for example, migration out of rich households despite subsequent economic loss, call these classic models into question. New models that take into account

intergenerational dynamics (e.g., households maximizing income across multiple generations) or conflicts (e.g., sons and daughters migrating despite parents' objections) may help us better understand these outlier cases.

**Appendix A. Robustness of the results to alternative wealth categories**

Table A1 checks the robustness of the results to alternative wealth categorizations. The first row of Panel A reproduces the matching estimates presented in Table 5, where the wealth categories are based on the tertiles of the household productive index in 1994. The second row uses an alternative categorization, where the poorest one-fourth in productive assets is compared to the richest one-fourth and the remaining middle half. The third row employs the tertiles of household land owned in 1994 to determine wealth categories. The fourth row uses a simple sum of assets, where binary indicators for having land greater than 10 rai (4 acres), a tractor, an itan and a car are added and top coded at two to create three categories (0,1 and 2) that correspond to poor, medium-wealth and rich households respectively.

[TABLE A1]

The effect of having a migrant on productive assets is positive and significant for poor households in the first two categorizations based on the tertiles and quantiles of the productive asset index. The effect is negative and significant for medium-wealth households in the first categorization only. The effect is negative and significant for rich households in three of the four categorizations. The effect of having a remitter (among households with migrants) on productive assets is positive for poor households in the first two categorizations and negative for rich households across all categorizations except for the one based on land alone. Models in Panel B replicate the analysis for consumer assets. Regardless of the categorization, having a migrant or a remitter has no effect on the changes in consumer assets for all wealth groups. These results

show certain consistency across alternative categorizations, establishing the robustness of the conclusions to various definitions of wealth.

**Appendix B. Sensitivity of the matching estimates to caliper size**

[TABLE B1]

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# TABLES

**Table 1. Scoring coefficients for productive and consumer asset indices generated by polychoric principal component analysis**

| Productive assets | | Coefficients | Consumer assets | | Coefficients |
|---|---|---|---|---|---|
| Number of itans | | | House has windows | | |
| | 0 | -0.10 | | 0 | -0.07 |
| | 1 | 1.07 | | 1 | 0.49 |
| | 2 | 2.02 | Use gas or electricity in cooking | | |
| Number of tractors | | | | 0 | -0.44 |
| | 0 | -0.29 | | 1 | 0.14 |
| | 1 | 0.75 | Water piped to house | | |
| | 2 | 2.10 | | 0 | -0.07 |
| Number of cows raised | | | | 1 | 0.21 |
| None | 0 | -0.12 | Number of tvs | | |
| Low (<median among owners) | 1 | 0.47 | | 0 | -0.40 |
| High (≥median among owners) | 2 | 0.75 | | 1 | 0.14 |
| Number of buffalos raised | | | | 2 | 0.79 |
| None | 0 | 0.14 | Number of vcrs | | |
| Low (<median among owners) | 1 | -0.15 | | 0 | -0.04 |
| High (≥median among owners) | 2 | -0.36 | | 1 | 0.78 |
| Number of pigs raised | | | | 2 | 1.31 |
| None | 0 | -0.04 | Number of refrigerators | | |
| Low (<median among owners) | 1 | 0.28 | | 0 | -0.20 |
| High (≥median among owners) | 2 | 0.42 | | 1 | 0.48 |
| | | | | 2 | 1.20 |
| | | | Number of cars | | |
| | | | | 0 | -0.05 |
| | | | | 1 | 0.71 |
| | | | | 2 | 1.07 |
| | | | Number of motorcycles | | |
| | | | | 0 | -0.25 |
| | | | | 1 | 0.25 |
| | | | | 2 | 0.69 |
| | | | Number of sewing machines | | |
| | | | | 0 | -0.05 |
| | | | | 1 | 0.46 |
| | | | | 2 | 0.74 |
| Variance explained by 1st component | | 0.41 | | | 0.47 |

*Source:* Author's calculations using the Nang Rong household surveys, 1984, 1994 and 2000 waves.

**Table 2. Sample characteristics by households' migration and remittance status in 1994**

| Variable | Non-migrant | Migrant households | Remitter households |
|---|---|---|---|
| Household and village characteristics | | | |
| Age of the household head in 84 | 32.87 | 44.97 * | 45.32 |
| No of seniors (>64 yr old) in 84 | 0.08 | 0.11 * | 0.10 * |
| No of children (<15 yr old ) in 84 | 1.78 | 3.02 * | 3.20 * |
| No of sons (≥ 15 yr old) in 84 | 0.13 | 0.67 * | 0.73 * |
| No of daughters (≥ 15 yr old) in 84 | 0.06 | 0.70 * | 0.78 * |
| Mean years of education in household in 84 | 5.20 | 6.60 * | 6.73 |
| Index of productive assets in 84 [0, 10] | 3.17 | 2.96 * | 2.94 |
| Index of consumer assets in 84 [0, 10] | 0.54 | 0.52 | 0.49 * |
| Any migrants in household prior to 84 | 0.05 | 0.19 * | 0.21 * |
| Percentage of migrants in village prior to 84 | 12.20 | 13.57 * | 13.75 |
| Time from village to district in 84 (in minutes) | 40.24 | 41.90 * | 41.59 * |
| Is there electricity in village in 84? | 0.32 | 0.33 | 0.33 |
| Number of rice mills in village in 84 | 2.86 | 2.87 | 2.85 |
| Is there a school in village in 84? | 0.32 | 0.29 * | 0.28 |
| Months of water shortage in village in 84 | 2.06 | 2.00 | 1.99 |
| Migrant household and village characteristics | | | |
| No of male migrants in household in 94 | | 1.42 | 1.55 * |
| No of female migrants in household in 94 | | 1.14 | 1.31 * |
| Average years of education among migrants in 94 | | 6.32 | 6.39 |
| Percentage of remitters in village in 94 | | 38.91 | 39.72 * |
| N | 1,173 | 3,286 | 2,302 |

*Notes:* Migrant households include at least one migrant in the 1994 survey. Remitter households include at least one migrant who has sent remittances in the 2000. * indicates that the means for a variable differ significantly ($p<0.05$, two-tailed test) in comparisons of (i) migrant and non-migrant households, or (ii) remitter and non-remitter households (among those with migrants).

*Source:* As for Table 1.

**Table 3. Covariate balance before and after matching**

| Variable | Sample | Mean for treated | Mean for control | % \|bias\| | % reduction in \|bias\| | Variance ratio[1] |
|---|---|---|---|---|---|---|
| **A. Treated: Migrants in poor households** | | | | | | |
| Age of the household head in 84 | Unmatched | 44.37 | 32.87 | 90 | | |
| | Matched | 34.78 | 33.41 | 11 | 88 | |
| No of seniors (>64 yr old) in 84 | Unmatched | 0.09 | 0.08 | 2 | | |
| | Matched | 0.02 | 0.02 | 0 | 100 | |
| No of children (<15 yr old ) in 84 | Unmatched | 3.15 | 1.78 | 94 | | |
| | Matched | 2.81 | 2.59 | 15 | 84 | |
| No of sons (≥ 15 yr old) in 84 | Unmatched | 0.64 | 0.13 | 75 | | |
| | Matched | 0.08 | 0.08 | 0 | 100 | |
| No of daughters (≥ 15 yr old) in 84 | Unmatched | 0.67 | 0.06 | 91 | | |
| | Matched | 0.02 | 0.02 | 0 | 100 | |
| Mean years of education in household in 84 | Unmatched | 6.08 | 5.20 | 37 | | |
| | Matched | 4.74 | 4.46 | 12 | 68 | |
| Index of productive assets in 84 [0, 10] | Unmatched | 2.66 | 3.17 | 30 | | |
| | Matched | 2.19 | 2.20 | 1 | 98 | |
| Index of consumer assets in 84 [0, 10] | Unmatched | 0.30 | 0.54 | 27 | | |
| | Matched | 0.16 | 0.16 | 0 | 99 | |
| Any migrants in household prior to 84 | Unmatched | 0.19 | 0.05 | 42 | | |
| | Matched | 0.01 | 0.01 | 0 | 100 | |
| Percentage of migrants in village prior to 84 | Unmatched | 14.89 | 12.20 | 43 | | |
| | Matched | 14.27 | 14.20 | 1 | 98 | |
| Time from village to district in 84 (in minutes) | Unmatched | 45.02 | 40.24 | 20 | | |
| | Matched | 45.17 | 45.05 | 1 | 98 | |
| Is there electricity in village in 84? | Unmatched | 0.34 | 0.32 | 5 | | |
| | Matched | 0.30 | 0.30 | 0 | 100 | |
| Number of rice mills in village in 84 | Unmatched | 2.84 | 2.86 | 1 | | |
| | Matched | 2.94 | 2.94 | 0 | 83 | |
| Is there a school in village in 84? | Unmatched | 0.26 | 0.32 | 15 | | |
| | Matched | 0.23 | 0.23 | 0 | 100 | |
| Months of water shortage in village in 84 | Unmatched | 2.13 | 2.06 | 3 | | |
| | Matched | 2.00 | 1.98 | 1 | 75 | |
| Propensity score | Unmatched | 0.75 | 0.26 | 200 | | |
| | Matched | 0.49 | 0.43 | 22 | 89 | 1.2 |
| **B. Treated: Migrants in medium-wealth households** | | | | | | |
| Propensity score | Unmatched | 0.70 | 0.25 | 179 | | |
| | Matched | 0.37 | 0.33 | 17 | 91 | 1.1 |
| **C. Treated: Migrants in rich households** | | | | | | |
| Propensity score | Unmatched | 0.75 | 0.23 | 208 | | |
| | Matched | 0.42 | 0.33 | 36 | 83 | 1.2 |
| **D. Treated: Remitters in poor households** | | | | | | |
| Propensity score | Unmatched | 0.80 | 0.57 | 117 | | |
| | Matched | 0.74 | 0.68 | 27 | 77 | 1.0 |
| **E. Treated: Remitters in medium-wealth households** | | | | | | |
| Propensity score | Unmatched | 0.76 | 0.54 | 109.8 | | |
| | Matched | 0.66 | 0.64 | 12.8 | 88.4 | 0.9 |
| **F. Treated: Remitters in rich households** | | | | | | |
| Propensity score | Unmatched | 0.77 | 0.59 | 99.3 | | |
| | Matched | 0.69 | 0.63 | 28.6 | 71.2 | 1.1 |

*Notes:* **p<0.01 and *p<0.05 (two-tailed difference-of-means test comparing migrants to non-migrants or remitters to non-remitters). Poor, medium-wealth and rich categories are based on the tertiles of the productive asset index in 1994. Results are based on one-to-one nearest neighbor matching with caliper=2 for migration models and caliper=5 for remittance models. In migration (remittance) models, the controls include all non-migrants (non-remitters among migrants).

*Source:* As for Table 1.

[1] The ratio of the variances of the propensity score in the treated and control groups. The ratio should be close to 1 for adequate balance according to Rubin's (2001) rule-of-thumb.

**Table 4. Logit models predicting household migration and remittance outcomes in the 1994 survey**

| Variable | (1) Migration | | (2) Remittances | |
|---|---|---|---|---|
| Household and village characteristics | | | | |
| Age of the household head in 84 | 1.05 | ** | 1.01 | |
| | (0.00) | | (0.01) | |
| No of seniors (>64 yr old) in 84 | 0.70 | * | 0.68 | * |
| | (0.10) | | (0.12) | |
| No of children (<15 yr old ) in 84 | 2.19 | ** | 1.20 | ** |
| | (0.08) | | (0.06) | |
| No of sons (≥ 15 yr old) in 84 | 1.87 | ** | 0.87 | |
| | (0.18) | | (0.09) | |
| No of daughters (≥ 15 yr old) in 84 | 4.49 | ** | 1.47 | ** |
| | (0.59) | | (0.16) | |
| Mean years of education in household in 84 | 1.16 | ** | 0.99 | |
| | 0.03 | | 0.04 | |
| Index of productive assets in 84 [0, 10] | 0.87 | ** | 0.94 | |
| | (0.02) | | (0.04) | |
| Index of consumer assets in 84 [0, 10] | 0.88 | * | 0.75 | ** |
| | (0.05) | | (0.05) | |
| Percentage of migrants in village prior to 84 | 1.04 | ** | 0.99 | |
| | (0.01) | | (0.01) | |
| Any migrants in household prior to 84 | 2.22 | ** | 1.02 | |
| | (0.39) | | (0.19) | |
| Time from village to district in 84 (in minutes) | 1.00 | | 0.99 | ** |
| | (0.00) | | (0.00) | |
| Is there electricity in village in 84? | 0.99 | | 0.94 | |
| | (0.11) | | (0.15) | |
| Number of rice mills in village in 84 | 1.03 | | 1.00 | |
| | (0.03) | | (0.05) | |
| Is there a school in village in 84? | 0.86 | | 1.13 | |
| | (0.08) | | (0.17) | |
| Months of water shortage in village in 84 | 0.99 | | 0.97 | |
| | (0.02) | | (0.03) | |
| Migrant household and village characteristics | | | | |
| No of male migrants in household in 94 | | | 1.23 | * |
| | | | (0.10) | |
| No of female migrants in household in 94 | | | 2.04 | ** |
| | | | (0.19) | |
| Average years of education among migrants in 94 | | | 1.11 | ** |
| | | | (0.04) | |
| Percentage of remitters in village in 94 | | | 1.05 | ** |
| | | | 0.01 | |
| Village dummies | | | | |
| N | 4,459 | | 2,602 | |
| Pseudo-$R^2$ | 0.37 | | 0.14 | |

*Notes:* **p<0.01, *p<0.05. The dependent variable in column 1 (2) is whether a household sent any migrants (received remittances) in 1994 or 2000. Results are presented in odds ratios. Standard errors are in parentheses. Asset indices are standardized to mean 0 and standard deviation 1. Coefficients estimates are robust to the addition of village dummies.

*Source:* As for Table 1.

**Table 5. The effect of having a migrant or remitter in the 1994 survey on the change in productive household assets from 1994 to 2000, estimates from alternative methods**

| Method | Migration | | | Remittances | | |
|---|---|---|---|---|---|---|
| | Poor | Medium-wealth | Rich | Poor | Medium-wealth | Rich |
| **A. Change in productive assets** | | | | | | |
| OLS regression | 0.38 ** # | -0.20 ** # | -0.36 ** | 0.45 ** # | -0.12 # | -0.32 ** |
| | (0.05) | (0.05) | (0.06) | (0.07) | (0.06) | (0.08) |
| N | 2401 | 2141 | 2263 | 1173 | 979 | 1050 |
| Nearest-neighbor matching[1] | 0.33 ** | -0.29 ** | -0.39 ** | 0.56 ** | -0.12 | -0.38 * |
| | (0.11) | (0.11) | (0.12) | (0.15) | (0.18) | (0.17) |
| N (matched pairs) | 294 | 204 | 220 | 151 | 88 | 114 |
| % of migrants or remitters matched | 23% | 20% | 20% | 15% | 11% | 13% |
| Instrumental variables using sibling and village network[2] | 0.42 ** | -0.15 | -0.35 * | 0.72 ** | -0.40 | -0.61 |
| | (0.15) | (0.19) | (0.18) | (0.25) | (0.29) | (0.39) |
| First-stage F-statistic on instrument | 25.56 ** | 3.74 * | 3.40 * | 18.66 ** | 8.81 ** | 7.68 ** |
| N | 2181 | 1941 | 2060 | 1150 | 951 | 1015 |
| **B. Change in consumer assets[3]** | | | | | | |
| OLS regression | 0.04 | -0.004 | 0.02 | 0.08 | 0.06 | 0.07 |
| | (0.05) | (0.05) | (0.06) | (0.07) | (0.08) | (0.08) |
| Nearest-neighbor matching[1] | 0.06 | -0.12 | 0.21 | -0.09 | 0.05 | -0.02 |
| | (0.11) | (0.11) | (0.11) | (0.15) | (0.17) | (0.18) |
| Instrumental variables using sibling and village network[c] | -0.29 * | 0.07 | -0.07 | -0.10 | -0.17 | -0.59 |
| | (0.15) | (0.21) | (0.18) | (0.28) | (0.36) | (0.41) |

*Notes:* **p<0.01 and *p<0.05. The dependent variable in panel A (B) is the change in the index of productive (consumer) assets from 1994 to 2000 (standardized to mean 0 and standard deviation 1). Standard errors are in parentheses. Poor, medium-wealth and rich categories are based on the tertiles of the productive asset index in 1994.

#p<0.05. Test of difference when the coefficient is compared to that in the subsequent wealth category (computed for the OLS estimates only).

*Source:* As for Table 1.

1 Caliper is set to 2 (5) for the migration (remittance) models. Standard errors are bootstrapped.

2 The instruments in the migration (remittance) model are (i) the percentage of migrants (remitters) in a household's sibling network in 1984, and (ii) the percentage of migrants (remitters) in an individual's village in 1984. The sibling network includes all households where the individual has at least one sibling (often due to marriage) in 1994. The network excludes siblings younger than 35 in 1984 (i.e., those who may still be living in the ego individual's household in 1984). The network also excludes individuals whose siblings remit to other households than their own in 1984. (These siblings may be remitting to the ego individual's household, and contributing to asset gain, thus rendering our assumption about the exogeneity of the instrument questionable.)

3 The number of observations for each model and wealth group, as well as the first-stage F-statistic for IV model, are identical to those in Panel A.

**Table A1. The effect of having a migrant or remitter in the 1994 survey on the change in household assets from 1994 to 2000, matching estimates with alternative wealth categories[a]**

| | Migration | | | Remittances | | |
|---|---|---|---|---|---|---|
| Wealth categories based on…. | Poor | Medium-wealth | Rich | Poor | Medium-wealth | Rich |
| **A. Change in productive assets** | | | | | | |
| 33rd-67th percentiles of the productive asset index in 94 | 0.33 ** | -0.29 * | -0.39 ** | 0.56 ** | -0.12 | -0.38 * |
| | (0.11) | (0.11) | (0.12) | (0.15) | (0.18) | (0.17) |
| 25th-75th percentiles of the productive asset index in 94 | 0.33 ** | -0.21 | -0.59 ** | 0.56 ** | -0.07 | -0.55 ** |
| | (0.11) | (0.12) | (0.16) | (0.16) | (0.18) | (0.20) |
| 33rd-67th percentiles of household land in 94 | -0.20 | -0.03 | 0.04 | 0.00 | 0.32 * | -0.60 |
| | (0.12) | (0.12) | (0.13) | (0.21) | (0.15) | (0.17) |
| Sum of assets in 94 (land>10rai +tractor + itan + car)[1] | -0.12 | 0.14 | -0.62 ** | 0.17 | 0.18 | -0.03 ** |
| | (0.10) | (0.10) | (0.15) | (0.22) | (0.15) | (0.20) |
| **B. Change in consumer assets** | | | | | | |
| 33rd-67th percentiles of the productive asset index in 94 | 0.06 | -0.12 | 0.21 | -0.09 | 0.05 | -0.02 |
| | (0.11) | ### | (0.21) | (0.14) | (0.22) | (0.19) |
| 25th-75th percentiles of the productive asset index in 94 | 0.06 | -0.03 | 0.13 | -0.09 | 0.03 | 0.07 |
| | (0.11) | ### | (0.13) | (0.13) | (0.14) | (0.22) |
| 33rd-67th percentiles of household land in 94 | -0.07 | 0.14 | 0.03 | 0.14 | -0.08 | -0.09 |
| | (0.10) | (0.14) | (0.03) | (0.21) | (0.16) | (0.16) |
| Sum of assets in 94 (land>10rai +tractor + itan + car)[1] | -0.04 | 0.04 | 0.17 | 0.08 | -0.08 | 0.05 |
| | (0.08) | (0.04) | (0.17) | (0.21) | (0.12) | (0.26) |

*Notes:* **p<0.01 and *p<0.05. The dependent variable in panel A (B) is the change in the index of productive (consumer) assets from 1994 to 2000 (standardized to mean 0 and standard deviation 1). Results are based on one-to-one nearest neighbor matching with caliper=2 for migration models and caliper=5 for remittance models. Bootstrap standard errors with N=100 replication samples are in parentheses.

*Source:* As for Table 1.

[1] Sum of assets is top coded at 2 to create three categories (0,1,2).

**Table B1. The effect of having a migrant or a remitter in the 1994 survey on the change in household productive assets from 1994 to 2000, sensitivity of the matching estimates to caliper size**

| Caliper | Poor | | Medium-wealth | | Rich | |
|---|---|---|---|---|---|---|
| | coef. (s.e.) | N[b] (%) | coef. (s.e.) | N[1] (%) | coef. (s.e.) | N[1] (%) |
| **A. Migration** | | | | | | |
| 1.25 | 0.31 ** (0.11) | 232 | -0.10 (0.14) | 158 | -0.35 * (0.15) | 168 |
| 1.50 | 0.32 ** (0.09) | 277 | -0.14 (0.12) | 192 | -0.33 * (0.14) | 206 |
| 1.75 | 0.32 ** (0.11) | 309 | -0.16 (0.12) | 221 | -0.35 ** (0.13) | 238 |
| 2.00 | 0.38 ** (0.11) | 345 | -0.16 (0.10) | 247 | -0.34 ** (0.11) | 259 |
| 2.25 | 0.37 ** (0.09) | 370 | -0.19 (0.12) | 267 | -0.35 ** (0.12) | 279 |
| 2.50 | 0.37 ** (0.10) | 399 | -0.20 (0.10) | 297 | -0.36 ** (0.11) | 304 |
| 2.75 | 0.34 ** (0.11) | 435 | -0.20 * (0.10) | 319 | -0.38 ** (0.12) | 340 |
| **B. Remittances** | | | | | | |
| 4.00 | 0.51 * (0.22) | 115 | -0.09 (0.25) | 64 | -0.40 (0.20) | 84 |
| 4.25 | 0.56 ** (0.16) | 136 | -0.09 (0.20) | 78 | -0.34 (0.19) | 94 |
| 4.50 | 0.57 ** (0.16) | 154 | -0.08 (0.14) | 89 | -0.35 (0.20) | 113 |
| 4.75 | 0.55 ** (0.14) | 174 | -0.06 (0.17) | 96 | -0.36 * (0.16) | 136 |
| 5.00 | 0.53 ** (0.13) | 188 | -0.12 (0.19) | 109 | -0.34 * (0.14) | 146 |
| 5.25 | 0.49 ** (0.14) | 198 | -0.08 (0.14) | 125 | -0.37 * (0.15) | 159 |
| 5.50 | 0.52 ** (0.13) | 216 | -0.15 (0.15) | 137 | -0.38 * (0.15) | 175 |

*Notes:* **p<0.01 and *p<0.05. The dependent variableis the change in the index of productive assets from 1994 to 2000 (standardized to mean 0 and standard deviation 1). Bootstrap standard errors with N=100 replication sample are in parentheses. Poor, medium-wealth and rich categories are based on the tertiles of the productive asset index in 1994.

*Source:* As for Table 1.