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***GROWING RICE AND GROWING RICH: AGRICULTURAL PARTICIPATION AND LABOR  
MONETIZATION IN A TRANSITIONAL ECONOMY***

2008 April 17

Population Association of America Annual Meeting

Session 801 – Population, Development, and Natural Resources

## ***A. Introduction***

“Monetization” is a favorite word among sociologists, and especially demographers, attempting to describe the massive social, cultural, and economic changes transforming the populations they study, particularly in developing contexts. The term has appeared in nearly 100 demography articles in the past 3 decades in discussions about many core subjects of the discipline (Hull 2008). Core demographic subjects that infer links to monetization include fertility, mortality, migration, and many aspects of economic development (for an abridged list of these articles, see Appendix A). In all of these, it is in characterizing the “context” in which some other phenomena of interest occurs that we typically encounter the use of the term monetization. The term is used without definition and without explanation and rarely if ever developed into a meaningful part of the core discussion, relegated instead to discussions of broader connections in introductory and concluding paragraphs. Given the large number of phenomena with which monetization may be associated, as well as the subject’s interest in its own right as a fundamental transformation in the social institution of exchange, monetization deserves more thoughtful treatment than this. That it does not receive it is hardly surprising, however, given the lack of data and theory to support such investigations. In the present analysis, I use a unique data set to advance the study of monetization generally.

Monetization will be defined more explicitly below, but it is necessary to note at the outset that little agreement exists at present about the conceptual meaning of the term. This is not to say that researchers *disagree* over the meaning. Disagreement would signal engagement in scholarly debate by a community of scholars. But due to the pattern of usage described above, there are few, if any, dedicated scholars of monetization. As a result, the term is abused and confused as often as it is used. Potentially related and simultaneous phenomena that researchers associate with monetization and occasionally treat as synonymous include modernization, Westernization, commercialization, mechanization, and commodification, processes that are

argued to be occurring worldwide in formerly subsistence economies. Just as frequently, the single term monetization is applied to an overly broad collection of phenomena, ranging from discrete to continuous and from microsociological interactional scales to macroeconomic and demographic scales. In the face of such a babel, any attempt to clearly and unambiguously identify some aspect of social behavior as monetization must be modest for now. It is with this caution in mind that I aim to answer two questions of both theoretical and practical significance for regions experiencing monetization. Each is thought to be central to the economic viability and cultural identity of large populations and, I will argue, to the broader theoretical question of what is distinctive about the process of monetization *viz.* the many other “-izations” that may transform the social landscape.

The first question is which households are most likely to engage in agriculture in a predominantly subsistence economy? A bit of explanation is needed to appreciate the connections. Northeast Thailand, where the data for this study were collected, is a region in which greater than 80 or 90 percent of households have historically been engaged in subsistence rice agriculture. In recent decades, evidence has emerged that the ubiquity of rice agriculture is on the decline, at least in the study area for this research. As households face a growing list of economic choices and opportunities, they simultaneously continue to face the longstanding challenges of making a living through subsistence agriculture. Almost inevitably then, it seems some are abandoning rice agriculture. But why? This fundamental shift in the basis of economic livelihoods may be attributable to a wide range of factors operating additively, interactively, or in a mutually reinforcing ways. Life course effects are also theorized to play an important role in this process, as may simple population aging and household fragmentation or nucleation. Understanding the factors that allow a household to stay in agriculture is a precursor to understanding other agricultural decision-making. A model of the decision to grow rice or not

also has major implications for attempts to model land use and land cover change, a key direction of population and environment research in developing contexts.

The second question is, of those households that grow rice, which ones engage in monetized transactions with their workers as opposed to traditional means of compensation such as labor exchange? The act of paying workers in cash rather than exchanged labor may seem at first a trivial matter, but from a sociological point of view, it represents a fundamental transition in the economic relationships that exist between the transacting parties. Most crucially, the transaction no longer represents a transaction between just two parties, the laborer and the farmer, but between three: the laborer, the farmer, and the abstract third-party agent or government that determines what units will be used in economic accounting and which insures, formally or informally, the value of any money exchanged. Monetization also signals an underlying process of attaching a monetary value to all things. And money, once established as a new medium of exchange, often renders barter and other forms of exchange undesirable. In order for a household to monetize its transactions, it must first obtain money, which can lead it down additional paths of new behavior – out-migration for wage labor, planting cash crops, or local wage labor where available. The possibilities for obtaining cash are limited only by the creativity of households in these regions, which often far surpasses the imagination of researchers attempting to record and understand such behavior. In this paper, I attempt to understand which of several key behaviors is related to the act of paying laborers.

### ***B. Monetization***

I define “monetization” here following Hull (2008), as a process of institutional change that operates at multiple scales. At the level of the individual transaction, monetization is a discrete event, while at broader levels of aggregation (the neighborhood, the village, the economic sector, the economy, and so on) it is a continuous process of cumulating one or more distinct monetized behaviors. Monetization, at its most basic, is a change, not in the behavior of

individuals, but in the social networks that connect them. In order to successfully bridge the divide that is often presumed to exist between barter-based exchange and money-based exchange requires that additional information be inserted into existing exchange networks (Dodd 1994). This information pertains to such important questions as whether the value of a monetary instrument will be constant over time, how it may be redeemed, and who will enforce the redemption if necessary. Even if money is imposed in a virtually exogenous fashion upon a region, or spreads from one area of life to another in a population that already possesses many of the institutional aspects of money, it cannot be adopted without a corresponding change in the informational structure *with regard to the specific area of life being monetized*. While this information is frequently equated with the functions of money – as a store of value, a means of exchange, a unit of account, and so on – it in fact does not characterize money at all but rather the social institutional structures which regulate the use and flow of money. In this sense, money is the least interesting aspect of monetization. The major transformations occurring take place in the informational networks that accompany social networks of transactors. These social networks are themselves likely to be altered by a shift to monetized transactions because of the new informational requirements (some higher and others lower) of monetized exchange. For example, an improvement in the ability of transactors to store value by using money as opposed to a particular bartered item may decrease the need for a transactor to depend upon personal assessments of the exchange partner's reputation and trustworthiness. A bartered item may depreciate in value quickly for a variety of reasons, but money ought to retain its value under normal circumstance. While money is in one sense the enabler, what has really changed with monetization is the decision-making framework of the transactors. When money is used as a unit of account, its redemption is tacitly or explicitly guaranteed by a third party – a debtor, a community of traders, a state. In this sense, money is an invention that exists to overcome the myriad transaction costs associated with economic exchange. But it is not so much a

technological invention as it is a *social* invention in the same way that a mutual insurance group is a social invention designed to help its members spread the costs of unexpected loss over the entire group.

Within this general theoretical understanding of monetization, a study must be situated with respect to its specific context. Past studies discussing monetization have treated it as an aspect of context, against which other phenomena of interest occur. The present study seeks to bring monetization to the foreground as a subject of interest in its own right. This does not mean that context can be dispensed with, however. On the contrary, it becomes crucial in studying monetization to specify whether one is describing an entire economy, a sector of an economy, a single class of social or economic behavior, or even a single transaction. In addition to carefully specifying the level of analysis, it is important to take account of the many other concomitant processes of social change alluded to above. Ideally, these other factors will be incorporated explicitly into models of monetization so that they do not suffer the same fate that has befallen the study of monetization for decades – that of being continually relegated to introductory and concluding paragraphs as context, and never operationalized or included in models.

### ***C. Data***

As a result of the curious inattention to monetization in numerous disciplines, survey and interview measures of monetization are virtually non-existent, while those that do exist are frequently premised on an undertheorized, dichotomous concept of monetization. Such dichotomies prevent a full operationalization of this more nuanced theoretical construct. One notable exception to this general observation is the Nang Rong Projects, a series of three waves of large, multiscale surveys conducted in Northeast Thailand in 1984, 1994, and 2000. A number of features of the Nang Rong data set make it a highly appropriate source to use in understanding monetization better.

The period during which observations were collected was one of widespread and rapid social, cultural, and economic change – conditions under which monetized transactions are theorized to become a more attractive option. This may be true both because of the greater security and reduced information costs of monetary exchanges over barter, but also because monetization itself is likely to be an important agent of change. The prospective nature of the data allows us to record changes in a wide range of social and economic behaviors, while the long window of observation permits the exploration of long-term trends. Both of these aspects of the data are important to the study of monetization, which may have wide-ranging effects but may not be accurately recalled in retrospective interviews due to the commonplace character and large number of the economic exchanges involved.

The Nang Rong Project collected data at the individual, household, and community levels, and did so for a large sample. The large number of individuals (ranging from 34,035 in 1984 to 49,677 in 2000) and households (ranging from 5,860 households in 1984 to 8,638 in 2000) involved, and the comparatively large sample of villages (51 initial villages in 1984 that were followed as they grew) make it possible to utilize multivariate, multilevel techniques requiring many degrees of freedom and to incorporate measures of relatively rare behaviors. Additionally, the multilevel makeup of the data permits the exploration of relationships between phenomena at multiple levels of analysis.

The feature of the Nang Rong data that most recommends them for the study of monetization is a series of unique and detailed questions asked in 1994 and 2000 about labor used in harvesting rice. Harvesting rice is a labor-intensive task that is largely not amenable to mechanization and other labor-saving technologies, and thus requires even households with modest holdings to seek assistance outside their own members (Hull Forthcoming). These questions collect information about the monetization status of each discrete transaction between any two households. That is, a household utilizing workers from several other households could

(and sometimes does) pay one, exchange labor with another, and receive help for free from a third. The intense, short-lived nature of the rice harvest permits the collection of fairly complete information about all rice harvest labor transactions at a level of detail not usually available and not previously exploited in empirical research. In the year 2000 data, additional questions of a similar nature and structure were asked of households about their use of labor in harvesting sugar cane and cassava, two important cash crops in Northeast Thailand. These variables, too, will be used in the proposed research.

#### ***D. Modeling***

I propose to generate a series of models that are similar in nature, but exploit different features of the Nang Rong data. As an illustrative baseline, I present here two models, one for 1994 and one for 2000 that operationalize monetization as a dichotomous event, similar to the way it has been theorized in previous literature. To do so, I code any household that paid even one laborer as “monetized” and those paying no workers as “non-monetized” with respect to the rice harvest. Despite the fact that such a dichotomous treatment superficially resembles the status quo in many studies that discuss monetization, the fact that I specify a single class of economic exchanges as opposed to the entire economy makes even this basic analysis unique. And as will be shown, these preliminary models help to establish that significant relationships do exist among the included variables, even when measured in this simple way.

Logically, a household must first grow rice before it is at risk of joining the monetized rice labor economy by paying workers. In order to account for the fact that not all household in Nang Rong engage in rice agriculture, and that this choice is a response to a wide range of multi-level factors, I use a Heckman selection model and compute Huber-White robust standard errors. The Heckman Probit, or Heckit, model estimates a typical probit model:



$$y_j^{\text{probit}} = (y_j^* > 0) \tag{Eq. 1}$$

where

$$y_i^* = \mathbf{x}_j\beta + u_{1j} \tag{Eq. 2}$$

and where

$$u_1 \sim N(0,1)$$

In the probit, the binary outcome is represented by an underlying relationship that is linear, but unobserved or latent. Further, we only observe this binary outcome for observation  $j$  when:

$$y_j^{\text{select}} = (z_j \gamma + u_{2j} > 0) \tag{Eq. 3}$$

where

$$u_2 \sim N(0,1)$$

$$\text{corr}(u_1, u_2) = \rho$$

The model is typically estimated and presented in the opposite order as the events actually occur. Selection precedes the subsequent binary decision. Thus, in the “selection” stage of the model, the dependent variable is whether a household grew rice or did not. Only when a household grows rice can we then observe whether it paid anyone to assist with harvesting it. In theory, there is a third selection step: the decision to use any additional labor, which is accompanied either simultaneously or sequentially by the decision to pay workers. But the uncertainty and lack of empirical evidence regarding the ordering and separability of these decisions leads me to choose a more parsimonious two-stage model.

One issue in using the Heckit model is the need to impose an exclusion restriction in the form of a variable that affects selection but has no effect on the subsequent variable of interest. Without the use of such an instrument in the selection equation it is difficult to determine

whether one is observing true sample selection or simply model misspecification (Wooldridge 2003). In the models presented below, the primary instrument used is the ownership of large agricultural machinery by the household. This variable is thought to be a reasonable predictor of a household's decision to engage in agriculture from year-to-year. At the same time, as such equipment is of little utility during the labor-intensive harvest (Hull Forthcoming), ownership of such equipment should have no impact on the way in which a household obtains labor for its harvest.

In exchange for the information lost by treating the dependent variable as dichotomous, I gain the ability to compare the performance of the same model at two different points in time and to decompose the effects of competing factors. Once the selection models for 1994 and 2000 are estimated, I use a relatively common decomposition technique to examine the relative contributions of year-specific factors versus sample-specific factors to the overall proportions of rice-growing and monetized households. In this analysis, both the selection equation and the subsequent paid labor equation are of substantive interest, which distinguishes it from other studies in which selection is treated as a nuisance. This reflects the observation that one response to changing conditions in agriculture is to cease drawing income from it altogether and shift one's efforts into other economic avenues. Another is to maximize investments in agriculture. Other choices lie somewhere on this continuum between complete divestment and maximization.

### ***E. Variable Measurement***

Any time multiple waves of longitudinal data are used, the threat of measurement error can increase. This may be due to shifting meaning of concepts on the part of survey respondents, improved understanding on the part of researchers leading to adjustments in the survey instrument, or the reality that difficult decisions must be made about what items must be cut to make room for emerging research interests. Several of the variables to be used in this work are subject to concerns of this type.

One concern is the use of two different measures of land in 1994 and 2000. In 1994, households were asked to report on the amount of land that they *owned*. This was found to be a sensitive subject in the context of the study, and in 2000 the question was re-written to ask households about the amount of land that they *used*. This has at least two potential implications for the present study. First are concerns about the validity of comparing the effects of these two variables across the two models. Second is the question of whether in 2000 this amounts to having a nearly identical variable on both sides of the equation in recursive fashion and what the effects of this might be. Each household is asked if they used any land for agriculture the previous year, and if so, what they grew on that land. Responses to the latter question are used to determine whether a household engaged in rice agriculture. While households that owned no land could still be engaged in agriculture (through renting or borrowing land, for example), in principle any household answering that they used no land for agriculture in 2000 could not be growing rice. A value of “0” land would therefore exhibit a deterministic relationship with the selection equation.

In fact, the situation is not as dire as it might seem. First, both “land owned” and “land used” refer to *all* land, not just rice land, meaning that the deterministic relationship above is not complete. While a household using no land cannot grow rice, a household that is not growing rice may still be using land. In 1994, approximately 94 percent of all land owned was used for rice, while in 2000, only about 74 percent of all land used was planted in rice. This suggests that while variation may be reduced somewhat for those households using no land, that this problem is not one of strictly selecting on the dependent variable. To further explore this issue, I took an empirical approach to assessing the impact of the change in wording. I plotted distributions of both variables, as well as measures from the 1984 wave asking about both land owned and land used by household (See Figure 3).

Several observations may be drawn from this analysis. The distributions of all four variables display similar shapes, ranges, and central tendencies though differences do exist. Most notably, the 2000 land-used variable displays far more instances of households using very small amounts of land, possibly renters of a few rai. The 1984 “owned” variable also displays differences toward the small end of the land used/owned axis. It is known that by 1984 most of the suitable land for growing rice was already owned and under cultivation, but the period of the 1970s and 1980s saw a dramatic expansion of landholdings in the uplands, where cash crops like cassava and kenaf (jute) were increasingly grown. The land variables ask about *all* land, and not just rice land, so it is quite possible that the 1984-1994 differences in a very similar variable reflect this expansion of landholdings by many small-time farmers. Aside from these differences, the similarities among each of the four distributions suggest that when the question is asked either way, it is capturing the same underlying concept for many of the households in the study area. It appears to be primarily at the margins of the distribution – those households using small amounts of land and those households owning large amounts of land – that wider discrepancies between these measurements exist. It should also be noted that each of these variables is measured a minimum of six years apart, meaning that the similarity between each can also be interpreted as stability. This comports with qualitative research in Nang Rong which suggests that land changes hands slowly, and most transactions take place among family members in conjunction with inheritance.

Thus, an additional means of reducing the uncertainty surrounding the measurement of the “used” variable in 2000 and at the same time of increasing the comparability across years would be to recode the two variables, land owned and land used, as ordinal categories. Although this approach sacrifices the precision of a continuous ratio variable, I hope to gain the ability to compare across models, with the following caveats in mind. Within a given year, coefficients can be meaningfully interpreted. When comparing across years, the relationship between the ordinal

categories and the signs of coefficients should be robust enough to interpret, but the coefficients should not be numerically compared across years. In the light of the considerable problems potentially posed by the inclusion of these measures in the model, it may be asked whether it is worth it at all to do so. But, try to imagine a model of rice-growing and labor use that did *not* include the amount of land planted in rice for each household. Lurking behind each significant coefficient would be the question of whether it was simply correlated with the size of landholdings. Thus, excluding these variables, however flawed, would surely be a greater act of misspecification than including them.

Other variables that present potential difficulties for comparison across years are the agricultural equipment, household asset, and the water shortage measures. In 1994, households were asked about ownership of large tractors, walking tractors, water pumps, electric generators, and threshers, while in 2000 they were asked about only tractors, small tractors, and threshers. Likewise, in 1994 households were asked about consumptive assets which included large televisions, small televisions, VCRs, and refrigerators, while in 2000 they were asked whether they owned large TVs, small TVs, VCRs, telephones, computers, microwaves, washers, one-door refrigerators, and two-door refrigerators. Some assets were considered both productive and consumptive. In 1994 these included cars and motorcycles, while by 2000 the list had been refined to include large motorcycles, small motorcycles, cars, pickups, and large trucks. Lastly, in 1994, the question about whether households had sufficient water for growing specified only rice cultivation, while in 2000 the question referred to all agriculture generally. These issues of comparability, while important to note, likely do less to impact the validity of the results than they would if they were introduced individually into the models, or if the measures constructed from them were of a continuous nature rather than binary indicator variables. Nevertheless, caution should be used in comparing across years.

As a final note, in constructing the variable measuring a households approach to obtaining rice labor, the categories of “free labor” and “exchanged labor” were collapsed. This was done on theoretical grounds, reflecting the lack of a clear distinction between these two concepts. It is appropriate to question whether any labor is ever given freely, or whether it represents a complex ongoing series of exchanges of many different valuables or goods among close associates. The respondents may rightly claim that they neither paid the laborer nor exchanged any labor, and yet this is not the same as saying that the labor was actually free. At the same time, both “free labor” and labor exchange are distinctly different from the major concept of interest: monetized labor. Collapsing these categories reduces the complexity of the modeling task and sacrifices little in the way of substantive interest.

#### ***F. Preliminary Results***

The mean numbers of workers of varying types in 1994 and 2000 are presented in Figures 1a and 1b. A comparison of these two figures displays the remarkable increase in the use of laborers in general, and paid laborers in particular, from 1994 to 2000. The increase in laborers may be due to drastically different growing conditions for rainfed rice between the two years, with 1994 being exceptionally dry and 2000 experiencing above average rainfall (see figure 2). The per-household rice yield for 1994 for the entire sample was nearly 300 *tang* (a volume measure equivalent to 20 liters), while in 2000 it was approximately 375 *tang*. But if the use of a given type of labor is dependent solely on the total labor requirements then it ought to be true that a rising tide should float all boats. Comparing Figures 1a and 1b shows us that this is clearly not the case – paid labor use increased while free and exchange labor dwindled to even lower levels. This suggests that other factors besides an increase in labor demand are needed to explain the dramatic increase in paid labor usage between the two periods. A decomposition of the effects in the models will help us further explain the contributions of these different factors.

Table 1 presents the breakdown of the two binary dependent variables: “household grows rice” and “household pays laborers” for 1994 and 2000. As suggested by Figure 1, there has been a sizeable expansion in the use of paid labor. In addition to a general increase in the average number of paid laborers used by each household, the percentage of households using paid labor rose from 29 to 58 percent over the six year period. As for the share growing rice generally, this number was about 82 percent in 1994 and fell to 76 percent in 2000, despite the much better growing conditions that appear to have existed in that year. Both of these trends support the contention that the core economic livelihood of much of Northeast Thailand may be undergoing fundamental changes. Observing that the proportion growing rice appears to have fallen at an average rate of about 1 percent per year over the past 6 years invites the question of what forces may be at work in bringing about this rapid change. But while the models that follow provide some insight into this question, conclusions about long-term trends such as that just described must be tempered by remembering that we have observations at only two points in time.

Table 2 contains descriptive statistics for both the entire sample and the rice-growing households only for 1994 and 2000. Table 3 presents the results of two Heckit regressions of the binary variable “paid any laborers” on a variety of variables theorized to be significant. To avoid overspecification of the model to the data, the original models proposed are presented here.

Table 4 shows the results of a decomposition performed by calculating the predicted probabilities of the 1994 model using the 2000 data and vice-versa. Predicted probabilities using year-matched data and models are also presented.

Three significant trends are evident in Table 2. First, average household sizes declined. Second, households actually planted *fewer* rai in rice, on average, in 2000 than in 1994. This is likely a quality/quantity distinction driven by the quite-different rainfall conditions. The magnitude of the difference in rainfall between the two years is borne out by the question asking village elders and leaders about drought hardships. While about a quarter of villages indicated

this was a problem in 2000, fully 92 percent reported insufficient water for rice in 1994. It should be recalled, however, that the 2000 measure also included other agricultural pursuits, most of which may have substantially lower water requirements than paddy rice agriculture. The third trend is towards increasing wealth and material comfort. Households greatly increased their average asset holdings and several measures of standard of living over the six-year period. Villages too, added amenities. Each of these differences may contribute to the shifts noted in Table 1.

Table 3 helps us to understand the relationships among the independent variables and two binomial dependent variables at two snapshots in time. The first thing to note is that considerable stability exists for the bulk of the independent variables across time. This is in spite of the differences in measurement described above. A large number of those variables exhibiting significance in 1994 are also significant in 2000, and vice versa.

Thus, for the decision to grow rice, having more workers, more land and equipment, and greater involvement in “traditional” home industries exert a positive force in both years, while older households, those with non-remitting migrants, and greater household assets were less likely to grow rice in both years. The small number of coefficients that “lose” or “gain” significance across years for this equation are also telling. The contradictory effects of young and old dependents in a household only influence the decision to grow rice in 1994, suggesting a shift in the calculus of agricultural decision-makers away from considerations of family composition. Likewise, household involvement in cottage industries, besides diminishing from 1994 to 2000 also ceases to impact the rice decision, perhaps reflecting the fact that those households still engaging in cottage industries in 2000 do so for reasons having little to do with household decisions about agriculture.

Curiously, consumptive assets like televisions appear to matter in 1994, while productive assets like tractors appear to matter in 2000. This shift may be the result of theorized patterns of



acquisition on the part of households in developing contexts. Initially, consumptive goods are thought to be the target of cash obtained through remittances and wage labor, while over time, entrepreneurship may become a more significant force driving purchases. If this is so, we may be seeing the same wealthy non-rice growing households impacting both models through their shifting spending patterns. Lastly, lack of sufficient water did appear to impact some households' decisions to grow rice in a negative way in 1994, but not in 2000.

Turning to the model of labor compensation strategy, the same pattern of stability across the two models is apparent. In both cases, this suggests that the observed relationships are robust to the multiple observed and unobserved changes occurring in Nang Rong over the six intervening years. In contrast to the rice-growing decision, a greater number of working age adults in the households exerts a negative effect on the propensity to hire laborers, as does the number of elder household members. Both are easily explainable using the simple logic that each working-age member of a household represents one less worker that might need to be hired. And while this logic may not universally apply in the case of older members of the household, these individuals may additionally be exerting pressure to adhere to tradition or making use of long-established social networks to obtain exchange labor. Unsurprisingly, large landowners are especially likely to engage in monetized labor transactions. In contrast to the rice equation, household assets now exert a positive effect on paying laborers, as do various measures of household standard of living, such as the quality of the windows in the dwelling unit. A lack of sufficient water in 2000, curiously, made a household more likely to pay its laborers.

The significance of the inverse hyperbolic tangent of  $\rho$ , sometimes called the Inverse Mills Ratio, indicates that the error terms of the two equations are correlated, and confirms that in modeling such closely related processes it is essential to take into account the selection. A test of the null hypothesis that  $\rho$  is equal to zero was also rejected. Although interpreting  $\rho$  is risky, due to its sensitivity to model specification, at the least I can tentatively observe that  $\rho$  is

negative, meaning that selection into rice growing households is negatively related to paying laborers. That is, a household that is more likely to grow rice is actually *less* likely to pay its laborers, while a household that is less likely to grow rice would actually be *more* likely to pay its laborers if it did.

Finally, the decomposition of the effects of the structural parameters shown in Table 4 and the data suggest that the number of rice-growing households (the selection equation) is not especially sensitive to reversing the parameters and the data in the models. The same cannot be said for paid labor. Estimating the 1994 model with the 2000 data, representing a shift in the distribution of characteristics but not of structural parameters, results in only a modest increase in the predicted proportion of monetized households. On the other hand, comparing the performance of the 1994 data using first the 1994 parameters and then the 2000 parameters, equivalent to keeping the distribution of characteristics constant while positing different structural relationships, results in a jump of over 20 percent in the proportion of monetized households. Taken together, these observations suggest that structural change is occurring in the socioeconomic institutions surrounding agriculture and labor that cannot be explained by simple shifts in the distribution of characteristics.

### ***G. Discussion and Conclusions***

As I have shown thus far, a number of key social phenomena and demographic characteristics display significant relationships with the decision to grow rice and to pay laborers. While some of these relationships are quite predictable, such as the positive relationship between the number of working-age adults and growing rice, others pose intriguing new questions and hypotheses that will require further investigation and replication before they are accepted. The dual questions of who participates in the major agricultural practice of a region and who pays for additional labor have broad relevance both inside and outside of sociology. In fact, it is difficult to find an exact sub-discipline of sociology, economics, anthropology, or any other discipline

that deal precisely with questions of this type. Rather, many disciplines appear to have a small, but growing stake in the subject. It is the interdisciplinary character of the study of monetization that gives the outcomes of such research broad applicability. Two specific areas of demographic research deserve special mention.

Within population studies, the questions of which migrants are more likely to remit wages and what these wages may be spent on have been important for several decades. Monetization is highly relevant to such questions, both as a potential result of increased flows of migrant remittances into a region and as a possible cause of these same flows. In poorly monetized economies there is little to spend cash on, whereas in more monetized economies the demand for cash may increase rapidly. At the same time, an influx of money into a poorly monetized economy may spur a process of valuation of formerly non-monetized commodities in reference to a new unit of account. The intricate set of possible multi-directional influences between monetization, migration, and remittances deserves much more careful attention. An important first step is the development of a better empirical understanding of what monetization itself *is* and how it may proceed.

In economic sociology, demography, and economics proper questions about the drivers and consequences of economic development abound. In addition to measurement problems created by inadequately defining and differentiating between concepts like monetization, mechanization, commodification, commercialization, and the like, these fields all share a common threat of misspecification in models that tend to exclude monetization as a factor. But what does it mean to say that the economy of a nation-state or region is growing or developing as measured by, say, the Gross Domestic Product, when the degree of monetization in that economy is not fully known or understood. Several researchers have noted this problem, and it is one that deserves more than the footnote treatment it receives at present (Schnaiberg & Reed 1974; London & Williams 1988; Chase-Dunn, Kawano, & Brewer 2000; Bornschier, Chase-Dunn, &

Rubinson 1978; Benavot 1989; Lloyd 1991). To fully comprehend the impacts of economic development it will be necessary to assess its impacts on the nature of exchange at all levels of the economy, and in turn, what impact this shift in the conduct of exchange has for the transactors. Likewise, examining and articulating the role that monetization may play in spurring economic growth or new Capitalistic behaviors among a population would help to shed light into what is often treated at present as a black box with inputs on one side and development on the other.

### ***G. Plan for Further Analyses***

Based upon the preliminary findings of the model presented here, there are two major avenues that I propose to pursue. In subsequent extensions of this baseline set of models (one for 1994 and one for 2000), I propose to examine the impact of operationalizing monetization as a continuous variable, taking advantage of the flexibility of the data that allow me to measure it according to the number of paid workers, paid person-days, total wages paid out, or proportion of any of these. A further set of investigations to be conducted in the short-term is a replication of the two basic models presented here with three additional “sectors” of the local economy – the use of paid labor in the cultivation of two cash crops, sugarcane and cassava, and the monetization of agricultural machines.

The first set of additional analyses can be thought of as an attempt to better understand the measurement issues surrounding monetization. In 1994, additional data were collected about the number of days worked by each person or household assisting with the harvest, as well as the wages paid to each per day. These data provide an important additional level of detail about rice harvest labor that is not available in 2000. I intend to take advantage of this additional information to address whether the preliminary findings presented above are robust across different specifications of the dependent variable and to gain the additional insights that may

emerge from modeling monetization as a continuous phenomenon as opposed to a discrete, one-time shift.

The second set of analyses seek to expand the scope of processes under investigation from the rice harvest to two other, less central forms of agricultural labor that may also be undergoing monetization. The first, cassava cultivation, has become an important source of income for many households in Nang Rong in recent decades. The second, sugar cane cultivation, is largely conducted in a large, industrial fashion rather than by smallholders, but may well be subject to similar pressures to monetize. This analysis will provide an opportunity to observe whether monetization occurs simultaneously across multiple sectors of agricultural labor, each timed to a different set of biophysical conditions and presenting different labor demands to the farmer. But in addition, each of these crops also presents different opportunities for the mechanization and rationalization of various phases of growing and processing. On the one hand, finding similar results would increase the external validity of the findings beyond rice agriculture, but at the same time, a finding of notable differences should not suggest that the rice findings are invalid. Rather, it might indicate different roles for monetization and mechanization than previously theorized. The results of this analysis may suggest what these different roles are.

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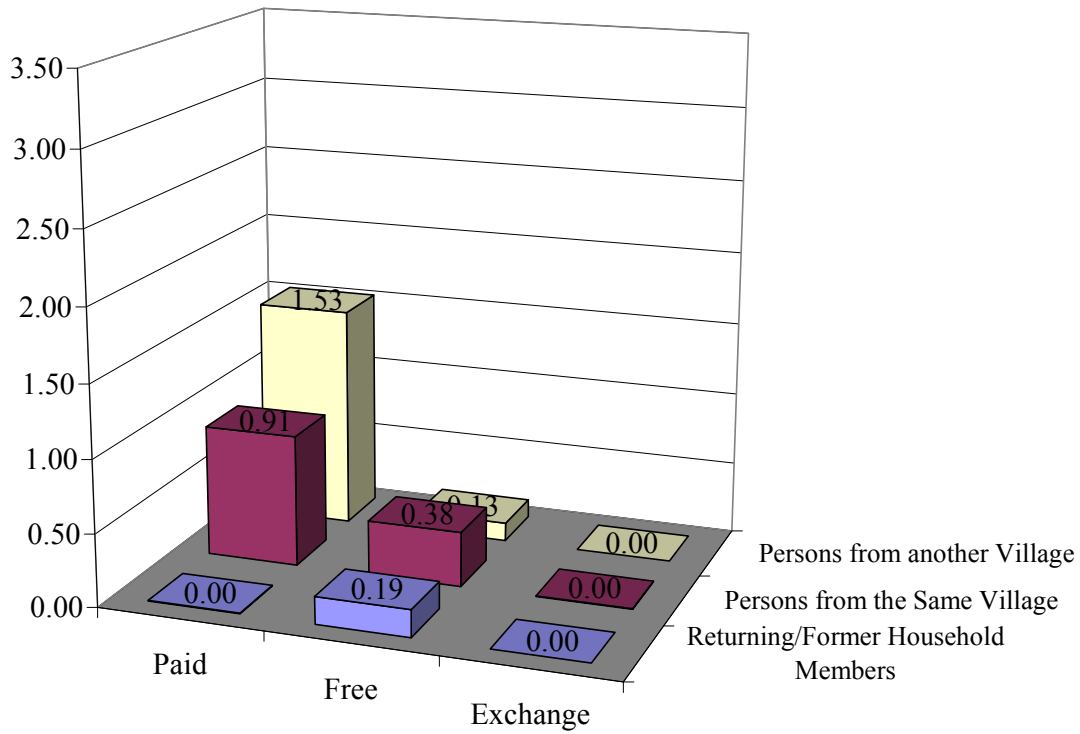
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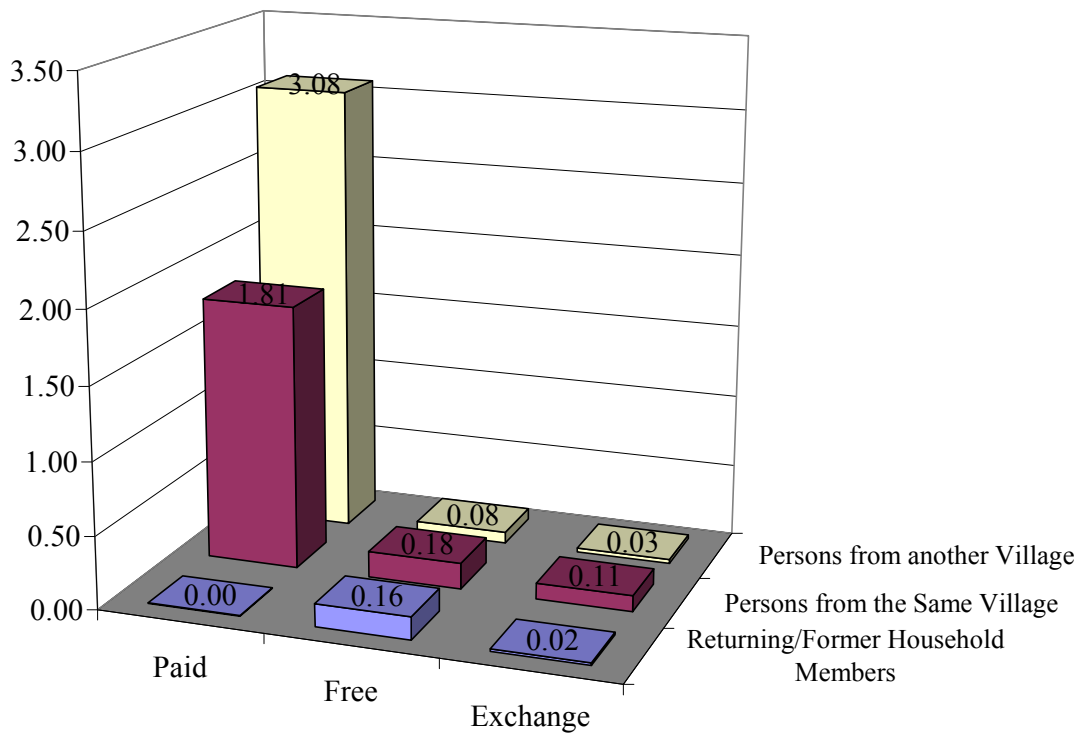
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**Figures 1a-1b: Mean Number of Persons Providing Labor to Household in 1994 and 2000, by Source and Type of Labor**

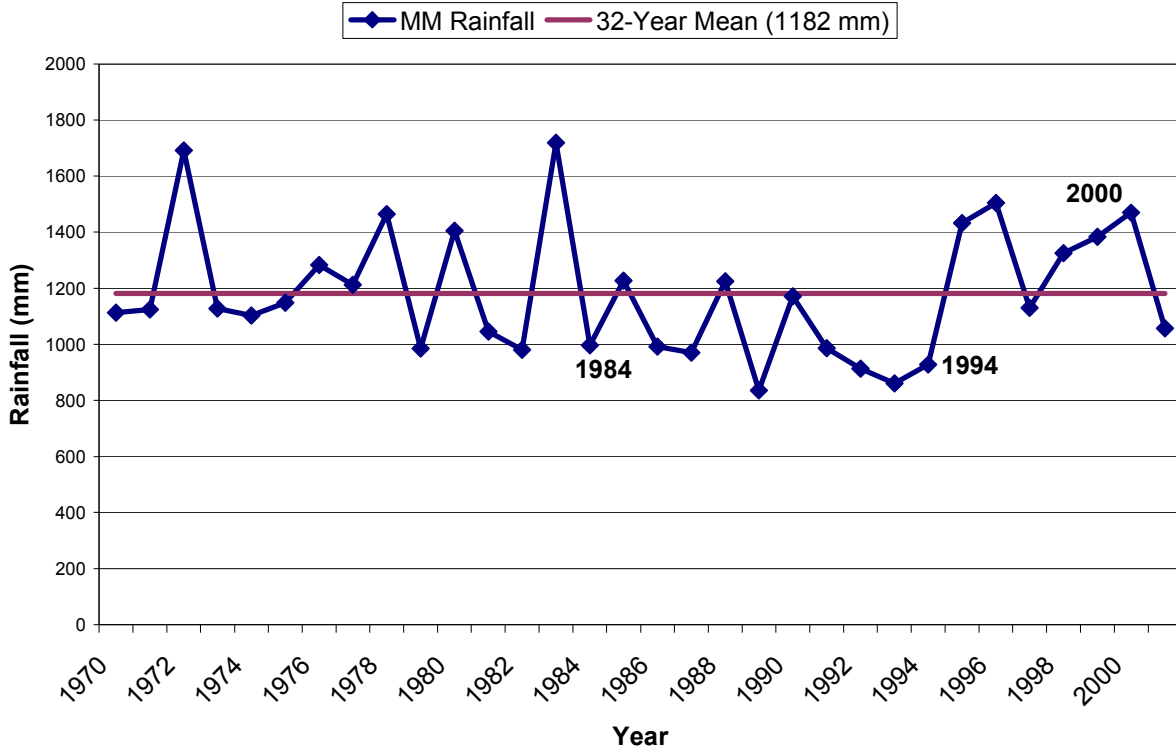
**1994 (n=4203):**



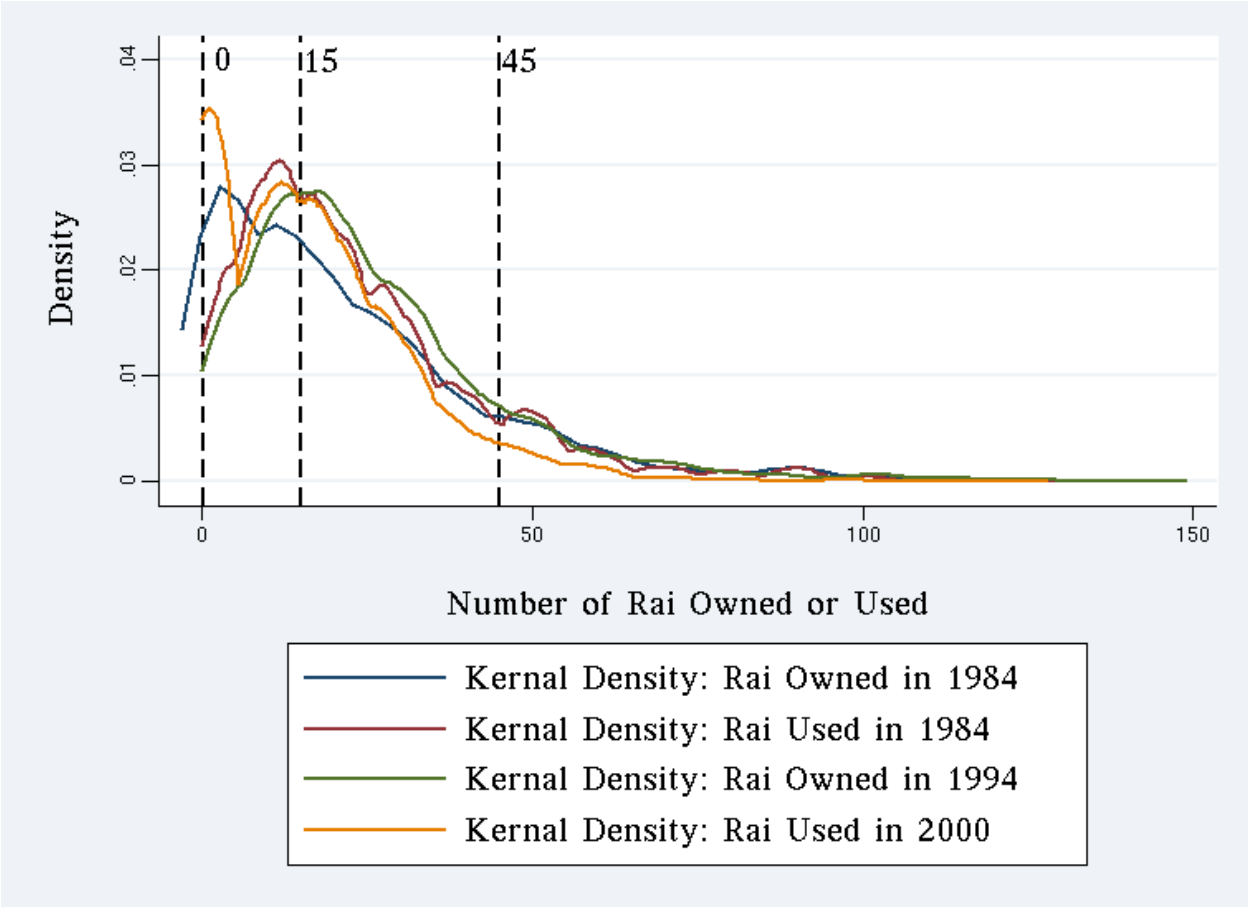
**2000 (n=5279):**



**Figure 2: Annual Rainfall (mm) at Nang Rong Station Plotted Against 32-year Mean**



**Figure 3: Density Distributions of Land Owned (1984 and 1994) and Used (1984 and 2000) by household with cut points shown (*n varies*)**



**Table 1: Dependent Variable Frequencies and Percentages**

	1994: All Households		1994: Rice-Growing Households		2000: All Households		2000: Rice-Growing Households	
Did Not Grow Rice	949				1643			
	18.42%				23.74%			
Grew Rice	4203				5279			
	81.58%				76.26%			
Did Not Use Paid Labor			2973				2223	
			70.72%				42.12%	
Used Paid Labor			1230				3056	
			29.28%				57.88%	
Total	5152	4203			6922	5279		
	100.00%	100.00%			100.00%	100.00%		



**TABLE 2: Descriptive Statistics For Full Sample and Sub-Sample Of Rice-Growing Households, All Independent Variables**

Equation:	Variable Description	Analysis Sample				Full Sample			
		1994 Mean	n=4203 StdDev	2000 Mean	n=5279 StdDev	1994 Mean	n=5152 StdDev	2000 Mean	n=6922 StdDev
Selection: Rice Paid Labor	<b>Potential Labor Available to Household</b>								
	Count of Males Age 13-55 in Household	1.38	0.97	1.33	0.90	1.27	0.98	1.20	0.92
	Count of Females Age 13-55 in Household	1.48	0.88	1.40	0.81	1.40	0.89	1.28	0.85
	Count of Children under Age 13 in Household	1.07	1.06	1.02	0.96	1.03	1.06	0.96	0.96
	Count of Persons over Age 55 in Household	0.67	0.81	0.65	0.81	0.70	0.81	0.69	0.81
	Count of Former Household Members Living Nearby	0.03	0.19	0.01	0.11	0.02	0.19	0.01	0.12
	Count of Household Migrants who Remitted Goods or Money Last Year	0.66	1.01	0.43	0.77	0.66	1.02	0.43	0.77
	Count of Household Migrants who Did Not Remit Goods or Money Last Year	0.39	0.79	0.42	0.83	0.42	0.83	0.45	0.88
	Mean Age of All Household Members	32.48	10.45	33.04	10.71	33.84	12.22	34.84	12.99
	<b>Potential Labor Needed During Rice Harvest</b>								
	Number of Rai Planted with Rice By Household Last Season	23.44	22.42	20.05	25.42	21.39	22.75	15.26	23.76
	Proportion of All Land Owned or Used by Household Devoted to Rice (a)	1.08	15.35	0.97	0.12	0.96	13.87	0.74	0.43
	Total Number of Persons Household Used to Plant Rice	2.65	5.51	6.63	6.85	2.16	5.09	5.05	6.61
	<b>Potential to Engage in Agriculture of Any Kind</b>								
	Indicator: Household Owned or Used Between 15 and 45 Rai of Land (a)	0.59	0.49	0.55	0.50	0.53	0.50	0.42	0.49
	Indicator: Household Owned or Used More Than 45 Rai of Land (a) (Household Owned Between 0 and 15 Rai)	0.14	0.35	0.06	0.24	0.13	0.34	0.05	0.21
	Indicator: Household Owned some Type of Large Agricultural Equipment (b) (Household Owned No Large Agricultural Equipment)	0.26	0.44	0.50	0.50	0.22	0.41	0.38	0.49
	<b>Household Income and Wealth</b>								
	Indicator: Household Grows Cash Crop (Cassava) (Household Does Not Grow Cassava)	0.15	0.35	0.10	0.30	0.13	0.33	0.08	0.27
	Indicator: Household Participates in a Cottage Industry (c) (Household Does Not Participate in Any Cottage Industries)	0.22	0.41	0.09	0.28	0.19	0.40	0.08	0.27
	Indicator: Household Raises Large Livestock (Buffalo, Cows, Pigs) (Household Does not Raise any Large Livestock)	0.69	0.46	0.40	0.49	0.61	0.49	0.34	0.47

**TABLE 3 (cont'd)**

X	X	Indicator: Household Makes Charcoal (Household Does not Make Charcoal)	0.64	0.48	0.80	0.40	0.59	0.49	0.72	0.45
X	X	Indicator: Household Relies on a "New" Source of Fuel (d) (Household Relies on a "Traditional" or no Source of Fuel)	0.02	0.15	0.03	0.18	0.03	0.18	0.06	0.23
X	X	Indicator: Household Has Water Piped into Home (Household Has No Water Piped into Home)	0.13	0.34	0.38	0.48	0.13	0.34	0.38	0.48
X	X	Indicator: Household Dwelling Unit has Glass Windows or Window Frames (Household Dwelling Unit Has No Glass Windows or Window Frames)	0.59	0.49	0.68	0.46	0.59	0.49	0.69	0.46
X	X	Total Consumptive Assets Household Possesses (e), in 1,000 Baht	7.01	5.10	8.00	6.83	7.18	5.53	8.43	8.02
X	X	Total Productive Assets Household Possesses (f), in 1,000 Baht	13.83	30.09	38.47	55.47	11.81	28.68	30.09	52.71
X	X	Total Productive/Consumptive Assets Household Possesses (g), in 1,000 Baht	28.56	112.56	59.17	144.93	38.32	144.69	71.30	197.25
X	X	Household Wages Earned Locally in Non-Ag Labor Past 3 months, in 1000 Baht	0.41	2.26	0.91	4.00	0.50	2.96	1.07	5.11
<b>Characteristics of the Village</b>										
X	X	Count of Persons Age 13-55 Living in Village	481.17	159.58	522.51	175.32	482.13	159.56	524.33	173.22
X	X	Count of Total Number of Rai Devoted To Rice Agriculture in Village	2195.50	896.79	2071.67	890.51	2189.34	907.89	1931.02	852.44
X	X	Count of Total Number of Rai Devoted To <i>Any</i> Agriculture in Village	2629.74	1060.58	1949.67	848.56	2626.85	1069.41	2054.30	895.41
X	X	Indicator: Village Elders Reported Insufficient Water for Rice/Agriculture (h) (Village Elders Reported Sufficient Water for Rice/Agriculture)	0.92	0.28	0.26	0.44	0.92	0.27	0.25	0.44
X	X	Indicator: Village Had at Least One Telephone (Village Had No Telephone)	0.12	0.33	0.35	0.48	0.13	0.34	0.38	0.48

**Notes:**

- (a) 1994: Number of Rai *owned*; 2000: Number of Rai *used*
- (b) 1994: Large Tractor, "Walking" Tractor, Water Pump, Electric Generator, Thresher; 2000: Tractor, Small Tractor, Thresher;
- (c) Cottage Industries: Silk weaving, Silk worm raising, Cloth weaving
- (d) "Old" Fuel Sources: Wood, Charcoal, No Fuel; "New" Fuel Sources: Propane, Electric, Other
- (e) 1994 Consumptive Assets: Large Television, Small Television, VCR, Refrigerator; 2000 Consumptive Assets: Large TV, Small TV, VCR, telephone, computer, microwave, washer, one-door refrigerator, two-door refrigerator
- (f) 1994 Productive Assets: Itan, Large Tractor, Small Tractor, Sewing Machine; 2000 Productive Assets: Itan, Large Tractor, Small Tractor, Sewing Machine
- (g) 1994 Productive/Consumptive Assets: Car, Motorcycle; 2000 Productive/Consumptive Assets: Large Motorcycle, Small Motorcycle, Car, Pickup, Large Truck;
- (h) 1994: Sufficient Water for *rice cultivation*; 2000: Sufficient Water for *agriculture*;

**TABLE 3: Bivariate Probit Regression of Paid Labor Use on All Independent Variables (With Heckman Sample Selection for Rice-Growing Households and Huber-White Robust Standard Errors at Village Level)**

<u>Variable</u>	<u>1994 Coeff</u>	<u>1994 StdDev</u>	<u>2000 Coeff</u>	<u>2000 StdDev</u>
<b>Selection Equation:</b>				
<b>Potential Labor Available to Household</b>				
Males 13-55	0.252 ***	0.040	0.189 ***	0.036
Females 13-55	0.141 ***	0.040	0.215 ***	0.034
Children	-0.098 **	0.036	-0.046	0.037
Elderly	0.104 *	0.041	0.041	0.039
Former Members	0.199	0.149	-0.095	0.181
Remitting Migrants	-0.016	0.026	0.010	0.035
Non-Remitting Migrants	-0.056 *	0.028	-0.058 *	0.023
Mean Age	-0.021 ***	0.004	-0.016 ***	0.003
<b>Potential to Engage in Agriculture of Any Kind</b>				
15-45 Rai of Any Land	0.726 ***	0.063	2.579 ***	0.212
45+ Rai of Any Land (0-15 Rai of Any Land)	0.437 ***	0.099	1.271 ***	0.332
Agricultural Equipment (No Agricultural Equipment)	1.601 ***	0.185	2.459 ***	0.194
<b>Household Income and Wealth</b>				
Cottage Industry (No Cottage Industry)	0.322 ***	0.087	0.143	0.101
Livestock (No Livestock)	0.774 ***	0.051	0.440 ***	0.069
Charcoal (No Charcoal)	0.357 ***	0.057	0.458 ***	0.056
"New" Fuel "Traditional" Fuel	-0.285	0.137	-0.227 *	0.098
Piped Water (No Piped Water)	0.055	0.098	0.041	0.068
Actual Windows (No Windows)	-0.050	0.066	-0.093	0.066
Consumptive Assets, in 1000 Baht	-0.025 ***	0.005	-0.008	0.006
Productive Assets, in 1000 Baht	-0.003	0.002	-0.003 ***	0.001
Productive/Consumptive Assets, in 1000 Baht	-0.001 ***	0.000	-0.001 ***	0.000
Non-Agricultural Wages, in 1000 Baht	-0.023	0.012	0.000	0.000
<b>Characteristics of the Village</b>				
Village Agricultural Land, in 1000 Rai	-0.047	0.036	-0.043	0.047
Insufficient Water (Sufficient Water)	-0.291 *	0.115	-0.004	0.098
Village Telephone (No Village Telephone)	-0.095	0.135	-0.123	0.081
Constant	0.784 ***	0.236	0.156	0.190
<b>Paid Labor Equation:</b>				
<b>Potential Labor Available to Household</b>				
Males 13-55	-0.079 **	0.026	-0.153 ***	0.024

**Table 4 (Cont'd)**

Females 13-55	-0.075 **	0.026	-0.132 ***	0.025
Children	0.009	0.029	-0.022	0.030
Elderly	-0.104 **	0.035	-0.124 ***	0.027
Former Members	-0.054	0.094	-0.110	0.151
Remitting Migrants	0.032	0.024	0.014	0.020
Non-Remitting Migrants	-0.018	0.027	-0.056 *	0.022
Mean Age	0.007	0.004	0.001	0.003
<b>Potential Labor Needed During Rice Harvest</b>				
Rai Planted to Rice, in 10s	0.056 ***	0.014	0.111 ***	0.026
Proportion of all land in Rice	-0.066	0.144	-0.123	0.230
Number of People used to Plant Rice	0.065 ***	0.010	0.067 ***	0.008
<b>Household Income and Wealth</b>				
Cassava	0.027	0.101	0.009	0.092
(No Cassava)				
Cottage Industry	0.146 *	0.070	0.006	0.078
(No Cottage Industry)				
Livestock	-0.088	0.081	0.056	0.044
(No Livestock)				
Charcoal	-0.075	0.063	-0.058	0.056
(No Charcoal)				
"New" Fuel	0.258	0.146	0.048	0.131
"Traditional" Fuel				
Piped Water	0.183 **	0.066	0.049	0.057
(No Piped Water)				
Actual Windows	0.189 ***	0.052	0.189 ***	0.045
(No Windows)				
Consumptive Assets, in 1000 Baht	0.027 ***	0.005	0.030 ***	0.004
Productive Assets, in 1000 Baht	0.001	0.001	0.001 *	0.001
Productive/Consumptive Assets, in 1000 Baht	0.000	0.000	0.001 ***	0.000
Non-Agricultural Wages, in 1000 Baht	0.002	0.011	0.007	0.007
<b>Characteristics of the Village</b>				
Village Adults 13-55, in 100s	0.032	0.030	-0.027	0.024
Village Rice Land, in 1000 Rai	-0.019	0.052	0.034	0.050
Insufficient Water	0.028	0.109	0.175 **	0.059
(Sufficient Water)				
Village Telephone	0.128	0.077	0.066	0.064
(No Village Telephone)				
Constant	-1.111 ***	0.299	-0.207	0.286
<b>Model Characteristics:</b>				
Inverse hyperbolic Tangent of $\eta$	-0.530 **	0.172	-0.272 **	0.095
$\eta$	-0.485 *	0.132	-0.266 **	0.089
N Obs	5152		6922	
Censored Obs	949		1643	
Uncensored Obs	4203		5279	
Wald $\eta^2$	311 ***		536 ***	
L-PseudoL	-3836		-4963	

Notes: \*  $p \leq 0.05$ , \*\*  $p \leq 0.01$ , \*\*\*  $p \leq 0.001$

**Table 4: Decomposition Using Predicted Probabilities**

<b>Grew Rice</b>		
Pr(y select=1)	94 DATA	00DATA
94 MODEL	81.51%	77.40%
00 MODEL	85.68%	76.21%

<b>Used Paid Labor</b>		
Pr(y probit=1 y select=1)	94 DATA	00DATA
94 MODEL	27.01%	36.78%
00 MODEL	50.43%	53.00%

**APPENDIX A: THEMATIC AREAS OF DEMOGRAPHIC ARTICLES USING TERM  
“MONETIZATION” IN CONNECTION WITH SOME OTHER KEY VARIABLE OF INTEREST**

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**I. Fertility, Marriage, and the Family**

***A. Demographic Transition Theory, Fertility Decline***

Mason Weinstein & Laslett 1987; Jones 1990; Greenhalgh 1988; Cleland and Wilson 1987; Cleland 2001; Caldwell 1978; Caldwell & Caldwell 1978; Caldwell, Reddy, & Caldwell 1982

***B. Caldwell’s Wealth Flow Theory, Cost of Children***

Stark 1981; Simmons 1996; Knodel, Harranon, & Pamualratana 1984; Khawaja 2000; Freedman 1979; Fargues 1997; Caldwell 1976; Caldwell 1981; Caldwell *et al.* 1999; Birdsall 1983

***C. Population Growth***

McNicoll 1984

***D. Family Planning***

Weinreb 2001; Sirageldin & Hopkins 1972; Schellstede & Ciszewski 1984; Mita & Simmons 1995; Lewis 1986; Freedman 1987; Frank & McNicoll 1987; Berelson & Lieberman 1979

***E. Marriage Patterns, Bridewealth, Dowries***

Mensch, Grant, & Blanc 2006; Fricke & Teachman 1993; Caldwell, Orubuloye, & Caldwell 1991; Caldwell, Reddy, & Caldwell 1983a; Boomgaard 2003

***F. Children as Insurance, Fertility Preferences***

Montgomery 2000; Mason & Taj 1987; Axinn & Yabiku 2001; Boserup 1989

***G. Child Care in Industrial Nations***

Angrist & Lave 1973

***H. Care for Elderly***

Freedman 1986; Axinn & Levin 1972

**II. Mortality**

***A. Mortality differentials by region***

Meegama 1969

***B. Spread of AIDS***

Caldwell & Caldwell 1993

***C. Nutrition and Disease***

Caldwell, Reddy, & Caldwell 1983b

**III. Migration**

***A. Determinants of Migration***

Roberts 1982; Arizpe 1981

***B. Consequences of Migration***

Haberkorn 1992; Guilmoto 1998

***C. Remittances***

Kirwan 1981

***D. Immigrant enterprise***

Waldinger 1986

***E. Migrant Labor***

Roberts 1997

#### **IV. Economic and Agricultural Development, Inequality**

##### ***A. Shifting locus of production, household production***

Thonton & Fricke 1987; Stecklov 1997; McNicoll 1989; Horan & Hargis 1991;  
Gartrell 1981; Arthur & McNicoll 1978

##### ***B. Inequality***

Walder 2002

##### ***C. Food production and Agricultural Change***

Simon 1980; Jodha 1989

##### ***D. Household consumption***

Schnaiberg 1970

##### ***E. Collectivization***

McNicoll & Cain 1989

##### ***F. Patron-Client Relationship***

McNicoll 1980; Keyfitz 1985

##### ***G. Market Transitions***

Haas 1999

##### ***H. Foreign Investment and Differing Sectors***

Crenshaw 1991; Boserup 1985

##### ***I. Development Theory***

Boserup 1996

##### ***J. Changes in Adolescence***

Caldwell *et al.* 1998