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Abstract

Based on household panel data that tracked migrant households (with an additional survey cost of 17 percent), this article describes behavior of household relocation and quantifies the extent of attrition biases in estimating the determinants of percapita household consumption and of its growth rate. Many households relocate for non-economic reasons, and to rural destinations, while the small number of urban migrants improved their wellbeing faster than did others. Such heterogeneity among migrants may be a reason behind the negligible attrition biases caused by the omission of migrants, in the inference on the average behavioral coefficients among the original population.

JEL: C23, C42, O12, O15, J61

Key words: domestic migration, household relocation, panel data analysis, Philippines, poverty dynamics, sample attrition, urbanization

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The aim of this article is twofold: to describe behavioral characteristics of household relocation, which has been relatively understudied, and to examine whether (and why) attrition in household panel data caused by household relocation leads to significant bias in inferences regarding the original population, focusing on economic mobility as the outcome of interest. Based on a household-level panel dataset collected in rice growing villages in the Philippines, we extend the methodologies in the panel attrition literature to a dynamic context by exploring potential attrition bias in the 'behavioral' regression coefficients explaining the growth (as well as level) of household consumption. This analysis is made possible by tracking migrant households often ignored in household-level panel data.

An essential aspect of economic development, as long recognized, involves structural transformation (e.g., Timmer and Akkus 2008). The movement of labor from the rural-based agricultural sector towards the urban-based industrial sector, or the "Kuznets process," has attracted much attention as a mechanism explaining the evolution of growth, income inequality and poverty (Anand and Kanbur 1985, Ravallion and Datt 1996). Recently, household-level panel data have become increasingly available so that the processes of growth and poverty reduction have been better documented. Most household panel datasets use the household as the unit of analysis, and, with a few recent exceptions, follow-up interviews for constructing panel data are conducted by re-visiting those households who are found in the original dwellings but excluding households that migrate.[1] However, household relocation is common and likely to be selective. It would seem reasonable to expect that the omission of migrant households could lead to an underestimation of the extent of economic mobility due to selective sample attrition.[2] In addition, while this article focuses on the issue of economic mobility, household relocation could affect findings on other important outcomes in rural development, including poverty dynamics, changing inequality and agricultural productivity growth. The kinds of issues addressed in this article, therefore, could potentially be applicable to many of the core issues in rural development in the developing world.

On the other hand, empirical studies examining the extent of attrition bias in analyzing panel data, in both developing and developed country contexts, tend to conclude, rather surprisingly, that attrition bias is negligible (e.g., Fitzgerald, Gottschalk and Moffitt 1998; Alderman et al. 2001; Falaris 2003). Thus, there seems to be a puzzle: despite the plausible case for selective attrition, why has attrition bias been empirically found to be insignificant so often? Addressing this question, in turn, requires a direct focus on the process of household relocation. This article uses a unique household panel dataset that includes a tracking operation of migrant households. This dataset allows us to extend the existing analysis of attrition bias into a dynamic context and to explore possible explanations for the relatively small bias found in the literature.

Our data reveal a great deal of heterogeneity among migrant households. Some (especially better educated) migrate for economic reasons, while others (less educated) migrate for non-economic reasons, but the former are not always successful in terms of improving economic welfare despite their motive. Such systematic differences between stayers and migrant households notwithstanding, however, attrition bias in making inferences about the original population appears to be minor, in line with the findings in the attrition literature. To the extent that rural-to-urban migration leads to substantial (upward) economic mobility, as often assumed in the Kuznets process story, compared to rural-to-rural migration which may cause less economic mobility, the small bias we find may be in part due to the fact that, in this dataset, rural-to-rural relocation is more common than rural-to-urban relocation envisioned by Kuznets.[3] In addition, potential biases due to systematic heterogeneity may cancel one another out. We should also emphasize, however, that the negligible extent of attrition bias found in this paper could be also dependent on the relatively small proportion of migrant households in our dataset.

In addressing the theme of this article, two distinct strands of literature are relevant; the literature on migration and that on panel sample attrition. In the next section, we review those sets of literature in an attempt to identify the gaps which this article intends to fill. The third section describes the dataset used in this study, with a summary of the tracking operation of migrant households. The fourth section describes the findings on the behavior of household relocation. The fifth reports on a series of test results on the determinants of the level of, as well as the growth in, economic well-being (measured by per-capita consumption) among stayers and different types of migrant households, followed by tests of sample attrition bias. A similar analysis using the Indonesian Family Life Survey, a comparable dataset with a larger sample size, is carried out to check the robustness of our results. The final section concludes the article.

Literature on Migration and Panel Sample Attrition

There is a vast literature on migration in developing countries (see Lucas 1997, Taylor and Martin 2001 for surveys). However, the aspect of migration that is directly relevant for our present purposes appears to be relatively understudied. In the literature on labor migration, for example, the idea of migration as the movement of labor toward urbanized areas in search of higher expected income streams, along the lines of Sjaastad (1962) and Harris and Todaro

(1970), is well established and has withstood intense empirical scrutiny (Lucas 1997, p.738). The relatively more recent literature focuses on migration as family strategies as well as on wider contexts of social networks. Instead of viewing migration as part of an individual decision, the focus on family strategies views migration of children as a household decision to optimize investment and risk management (e.g., Lucas and Stark 1985). Rural-rural migration of daughters for marriage, for example, can be seen as an insurance strategy to manage income risks in the originating households (Rosenzweig and Stark 1989). Another aspect of migration in a household context is rural-to-foreign migration (e.g., Taylor 1987, Lalonde and Topel 1997, Taylor and Yunez-Naude 2000). While a good amount of literature exists on this aspect as well, most of the studies are in the context of labor migration rather than whole-household relocation. In addition to the relatively well studied behavior of labor migration in search of economic opportunities and the deployment of household members outside of the communities of the originating households, however, migration takes other forms: "moving house within an urban area, the wanderings of nomads, commuting to work, visiting relatives or friends, or relocating dwelling between regions"(Lucas 1997, p.723). It is the last category that is our focus.

In the context of family strategies, deployment of household members mainly concerns migration among children, while parents are typically assumed to stay in their original dwellings. In the stylized narrative by Nelson (1976) of a wide array of migration behavior over a life-cycle, for example, there seems to exist an implicitly assumed 'permanent country home' (Lucas, 1997: p.730). Even when the head (typically male) of a household migrates, a common pattern observed in the literature is for his spouse to stay behind and to maintain the household in the village of origin (Lucas 1997, p.753). Relatively little attention has been given in the literature to the kind of behavior leading to relocation of dwellings by married heads of households (together with their household members). But it is this relocation of dwellings that causes most of the sample attrition observed in developing countries. While the basic insights in the Harris-Todaro tradition are still likely to be relevant, there seems to be relatively little to draw upon as a specific theoretical framework that may be directly relevant for our current purposes.

The majority of household relocation found in the data used here is rural-rural migration. The literature suggests that rural-rural migration could potentially arise as a result of a household strategy for risk diversification as noted above (*a la* Rosenzweig and Stark 1989). Another possibility is that agricultural laborers (and their households) migrate across rural areas in response to wage differences arising from differential rates of technology adoption (e.g., new rice varieties, farm mechanization, water pump irrigation) as observed in the rural Philippines by David and Otsuka (1994). According to Lucas (1997, 728), "[t]he extent of rural-rural migration is not well documented…Where analysis proves possible, the rate of rural-rural migration typically proves far higher than of rural-urban migration." On the other hand, however, urban destination is found to be more common among migrants from rural Mexico (e.g., Mora and Taylor 2006). On balance, rural-rural migration, compared to rural-urban migration, has been relatively neglected in both theoretical and empirical studies (Lucas 1997, p.728). For those reasons, as well as because of the relatively small sample size we have of migrant households, this article attempts to describe the observed pattern of behavior leading to household relocation in broad terms, rather than to test specific hypotheses.

On the other hand, there has been a distinct literature focusing on the consequences of sample attrition in panel household (or individual-level) analysis. There are large variations in attrition rates among panel household surveys in developing countries, ranging between one percent and 33 percent per annum (Falaris 2003; Alderman et al. 2001).[4] Among the most striking findings in this literature, however, is the following; even when significant observable differences exist between 'attritors' and stayers, sample attrition does not significantly affect the parameter estimates of regression models explaining many household (or individual) outcomes of interest, including anthropometric measures, reproduction behavior, and labor market outcomes (Fitzgerald, Gottschalk and Moffitt 1998; Alderman et al. 2001; Falaris 2003).[5]

While those findings are comforting to empirical researchers who regularly rely on panel datasets containing attrition, there are a few major limitations in this literature. First, it is not clear why attrition bias is found to be insignificant so often even when attrition is relatively high. The literature has thus far been silent about behavioral explanations of such empirical findings. Secondly, the issue of potential difficulties in finding suitable exclusion restrictions remains. It is now standard in the attrition literature to distinguish between 'selection on unobservables' and 'selection on observables.'[6] The difficulty of finding suitable instruments in 'selection on unobservables' models has been recognized by Fitzgerald, Gottschalk and Moffitt (1998) and others, leading to the development of 'selection on observables' models. Lagged outcome variables have been suggested as the prime candidates for instruments in estimating those models. However, if one is interested in analyzing dynamic behavior, which is a main reason for analyzing panel data in the first place, implementing the 'selection on observables' model may be no easier than implementing the 'selection on unobservables' model. The neoclassical growth model we examine in our empirical analysis is an example of this.

Thirdly, the conclusions on sample attrition bias obtained by the studies mentioned above are based on cross-section relationships *in the baseline year* by detecting the effects of attritors on parameter estimates. Typical uses of panel data, however, are for analyzing changes over time or static relationships controlling for unobservables. As noted by Falaris (2003, p.136), relying on the main conclusions in the literature of insignificant attrition bias found in the baseline data to justify the use of panel data (with attrition) in such contexts would require additional assumptions, which cannot be tested with typical panel data: that attrition bias be absent in *every* round of the surveys in order for a dynamic analysis to be valid, and that attrition bias be constant in every round in order for a panel analysis of static relations to be valid. Testing for these additional assumptions, previously not possible, is a major focus of this article.

In light of such gaps in the literature, this article extends the approaches for testing attrition bias in two directions. First and foremost, unlike the majority of previous studies on attrition (e. g., Alderman et al. 2001; Falaris 2003) but similar to Thomas, Frankenberg and Smith (2001), we use a dataset containing tracking interviews of migrant households. This allows us to directly examine the behavior of migrant households before and after migration. Secondly, we then examine the consequences of sample attrition for estimating not only static relationships in the baseline year but also dynamic relationships.

The Household Panel Data in the Rural Philippines and Tracking Procedures

The dataset used in this study was collected in the rural Philippines by the International Rice Research Institute (IRRI). Four sample villages were selected purposefully to represent different rice-ecosystem conditions in the country, and every household in the sample villages at the time of the survey was interviewed in each round (Hossain, Gascon and Marciano 2000; Fuwa, Marciano and Reaño 2005). In this article we analyze the consumption expenditure data in the household panel collected in 1996 and 2003. A special feature of the 2003 survey was its experimental module tracking those households that were interviewed in 1996 but subsequently migrated. The tracking operation proceeded in the following manner. During the visits to the sample villages in 2003, we first identified the households interviewed in 1996 based on the 1996 household heads as the reference persons.[7] For those households that were interviewed in 1996 but were no longer located in the sample villages in 2003,[8] we obtained current addresses from neighbors or relatives, and the migrant households were subsequently interviewed in their current locations.

Summary of Tracking Outcomes

The results of our tracking attempts are summarized in table 1. A total of 940 households were interviewed in 1996. Upon our initial re-visit in 2003, 840 households were located and interviewed in the sample villages, with initial attrition of 100 households (11 % of the 1996 sample). Out of the 100 attritors, 18 (2 %) were found to have 'dissolved', namely, either all the household members passed away (typically, single member households or elderly couples) or the household was merged with another existing household also interviewed in 1996. Of the remaining 82 households, 58 (71 %) were successfully tracked and 24 (29 %) were 'missed.'[9] Thus, 898 households (96 %) were eventually interviewed, resulting in the final attrition rate of 4 %. The coverage rate of 96 % (or annual attrition rate of 0.7%) is exceptionally high for a panel household survey, comparing favorably with the 1 % annual attrition rate of IFLS2.

One of the purposes of the experimental tracking module was to assess the additional cost of such an operation. The additional cost mainly consists of traveling to and searching for the current dwellings of migrants (transportation, accommodation and the wages of enumerators), amounting to 17% of the total survey cost without tracking. The average per-household cost of the survey including(excluding) the tracking operation was about US$13.9(12.4).[10] The per-household cost of tracking migrants was US$45.3. Interestingly, Thomas, Frankenberg and Smith (2001) also report the additional cost of tracking in IFLS2 to be 20% of the total cost, although the scale of their operation is much larger. Despite the similarity between the two cases, the tracking cost is likely to vary in other country contexts depending on migrants' destinations (e.g., more cases involving urban, or even international, destinations) and other factors.

Household Relocation Behavior: Destinations, Motives and Determinants

Out of the 58 migrant households interviewed, 2 were found in Metro Manila, 6 in urban areas outside Metro Manila (consisting of major provincial cities and municipal towns) and 50 in rural areas (areas outside municipal towns); the majority of attrition, therefore, is due to rural-rural, rather than rural-urban, migration.[11] In terms of distance of move, 27 were found in the same municipalities as their original locations, 15 were outside the municipalities but in the same provinces, and 16 were outside the original provinces.

Table 2 summarizes the primary reasons for migration, as stated by the respondents. About half of the total migrants moved due to changes in household demographics or social/ personal reasons (e.g., death or separation of spouse or personal disputes with neighbors), and the rest migrated for economic reasons (e.g., looking for jobs or moving closer to work). No strong relationship is found between the reason for migration and the destination (urban/rural): 50% of urban migrants cited economic reasons as their main motive while 42%

of rural migrants did so.

In addition to their (initial) motives, we also asked migrants whether they preferred the current or original locations as of 2003. About 60% of all migrants responded that they preferred the current to the original locations while 35% preferred the original locations. A significant proportion (roughly 40%) of those who migrated for economic reasons were not as happy as they had initially hoped. This implies that migration seeking better economic opportunities is risky, with nearly half ending up regretting their move.[12]

Comparing Stayers and Migrants

Following the literature on attrition, table 3 reports a bivariate comparison of observed household characteristics between stayers and different types of migrant households. On average, migrant households were significantly younger, smaller in size and had smaller landholdings as of 1996. In addition, there were fewer farmers and more households with stable non-agricultural occupations among migrants. While the difference between migrants and stayers became much less pronounced by 2003 (except in age and the share of the regularly employed), it could reflect life-cycle development; for example, migrant households, which tend to be younger, may well catch up with their older counterparts in terms of family size and landholdings over time.

The baseline (in 1996) per-capita consumption was not significantly different, on average, between stayers and migrants as a whole. However, per-capita consumption in 1996 was significantly higher among those migrating for economic than non-economic reasons, although the difference appears to have vanished by 2003. On the other hand, mean per-capita consumption was significantly higher among urban than rural migrants in 2003, although there was no significant difference in 1996. Also, rather surprisingly, the heads of urban migrant-households were older, not younger, than those of other migrants and of stayers. The heads of households migrating for economic reasons were significantly better educated than their counterparts migrating for personal reasons. While the rate of consumption growth was significantly higher among migrant households (as a whole) than among stayers, this difference appears to be mostly driven by urban migrants; mean consumption growth was significantly faster among urban migrants than among stayers or among rural migrants, as expected from the Kuznets process story.

Correlates of Migration Behavior

Table 4 reports the regression results in an attempt to identify significant correlates, among the 1996 household characteristics, of the household decision to relocate. The first column reports a binomial probit regression, in which the dependent variable takes on the value of 0 (stay) or 1 (relocate). The results are reported in terms of marginal effects evaluated at sample means. Household relocation is significantly associated with smaller household size, larger number of female children (below age 15) and village dummies (villages 3 an 4). While not statistically significant at the conventional level, landholdings are negatively associated with migration (p-value = 0.11). In line with the existing literature on attrition the explanatory power of the model appears to be quite weak (pseudo-R squared equals 0.08).

The 2nd and 3rd columns report the results of a multinomial logit regression which distinguishes between urban and rural destinations, and the results in the 4th and 5th columns disaggregate household relocation decisions by the main (stated) reason for relocation. We find that some of the household characteristics have different effects on different types of migration. While it has been previously found in the literature that migrants with different characteristics select into different destinations (e.g., Mora and Taylor 2006), we obtain similar findings regarding the reason for migration. In particular, the estimated coefficients on schooling of the household head are of opposite signs between those migrating for economic and personal reasons, as well as between urban migrants and rural migrants. The results indicate that household heads tend to be better educated among urban migrants (p-value = 0.05), in line with the findings from Bukidnon Province in the Philippines by Quisumbing and McNiven (2005). Household heads are also better educated among those relocating for economic reasons (p-value = 0.11), but they are less educated among those migrating for personal reasons (although the latter correlation is not statistically significant). That the effects of education on migration depend on destination is also in line with Mora and Taylor (2006), who compared domestic and international migration from rural Mexico.

Village 3 (the poorest village) residents are more likely to migrate for economic reasons and to urban destinations, after controlling for household characteristics, while village 4 (a better-off village outside Luzon) residents are more likely to migrate to rural destinations. In general, household characteristics of rural migrants and of those migrating for non-economic reasons tend to be similar to those of stayers except for age and household size. Our results suggest that while the modeling of attrition is often crafted in a binomial context (attrit versus not attrit), such modeling exercises could potentially be improved by making further distinctions by destinations or by motives.

As is well-known, among the underlying assumptions of the multinomial logit model is the IIA (independence from irrelevant alternatives) property. It is potentially possible that the difference between ‘migration for economic reasons’ and ‘migration for personal reasons’ is not as distinct in the minds of respondents as the difference between the ‘stay’ option and migration (for whatever reason), suggesting possible violation of IIA. Table 4(b) reports the results of Hausman test for the validity of IIA; we find that IIA is not rejected. In addition, as an additional check on robustness, we estimated multinomial probit models using similar specifications as the multinomial logit models but allowing for correlations among error terms. The qualitative results tend to remain similar, including the positive effects of education on both urban migrants and those migrating for economic reasons (both coefficients now statistically significant). However, the correlations between the error terms for the alternative migration choices (i.e., economic versus personal reasons, or rural versus urban destinations) tend to be poorly estimated, and the possibility of zero-correlation cannot be rejected. As a result, we stick with the multinomial logit results above and the details of the multinomial probit results are not reported further here.[13]

Analyzing Household Relocation and Economic Mobility: the Methodology

In examining whether tracking migrants makes a significant difference in the analysis of household consumption and of its growth over time, we follow the 'comparison method' by Falaris (2003) and proceed in two steps: (1) we start with a comparison of the behavioral coefficients between stayers and migrant households (as a group), as well as among different types of migrant households; (2) next, we examine whether exclusion or inclusion of migrant households significantly affects our inferences regarding the behavior of the original population. Our first step is to compare the regression coefficients between stayers and different types of migrant households in 1996 and 2003 (separately):

(1) $LnC_{it} = \mathbf{X}'_{it}\mathbf{B}_t + A_{1i}\mathbf{X}'_{it}\mathbf{\Gamma}_{1t} + A_{2i}\mathbf{X}'_{it}\mathbf{\Gamma}_{2t} + \varepsilon_{it}$ (for t=1996, 2003),

as well as in the household panel (1996 and 2003 combined):

(2) $LnC_{it} = \mathbf{X}'_{it}\mathbf{B} + A_{1i}\mathbf{X}'_{it}\mathbf{\Gamma}_1 + A_{2i}\mathbf{X}'_{it}\mathbf{\Gamma}_2 + \mu_i + \varepsilon_{it}$,

where the dependent variable (LnC_{it}) is the natural logarithm of per-capita consumption expenditure of household i in year t (t = 1996, 2003), μ_i represents unobserved household-level fixed-effects, ε_{it} is a random error term, and the vector of right hand side variables ($\mathbf{X}_{it}$) includes: age of the household head, age squared, household size, size of landholdings, years of schooling of the household head, value of non-land household assets, demographic composition (number of household members in specific age-gender categories), and village dummies.[14] A_{1i} is a dummy taking on a value of one if household i is a migrant household, while A_{2i} is an additional dummy representing a subset of migrant households; in one specification type, A_{2i} equals one if household i relocated for an economic reason; in another type, A_{2i} equals one if household i relocated to an urban destination. In equations (1) and (2), coefficient vector $\mathbf{\Gamma}_{kt}$ or $\mathbf{\Gamma}_k$ (t = 1996, 2003; k = 1, 2) measures the difference in the behavioral coefficients between stayers and different types of migrants.[15]

We also investigate household-level economic mobility during 1996-2003. The average annual rate of growth of (real) per-capita consumption was 1.0% across all the sample households.[16] A possible starting point for analyzing consumption growth is to examine whether there is 'convergence' across households, as predicted by neoclassical growth models (e.g., Barro and Sala-i-Martin 2000). We in fact observe a pattern of absolute convergence of household-level consumption (figure 1). We thus follow Jalan and Ravallion (2002) and Dercon (2004), and estimate a household-level growth regression model:

$$(3) \qquad dLnC_i = \beta_0 LnC_{i,1996} + \gamma_1 A_{1i} LnC_{i,1996} + \gamma_2 A_{2i} LnC_{i,1996} + \mathbf{X}'_{i,1996}\mathbf{B} + A_{1i}\mathbf{X}'_{i,1996}\mathbf{\Gamma}_1 + A_{2i}\mathbf{X}'_{i,1996}\mathbf{\Gamma}_2 + \varepsilon_i$$

where $dLnC_i$ ($=LnC_{i,2003}-LnC_{i,1996}$) is the growth rate of per-capita consumption between 1996 and 2003 and the right hand side variables include the log of the initial level of per-capita consumption and the vector of initial conditions ($\mathbf{X}_{i,1996}$) as defined earlier, interpreted as the determinants of the steady-state consumption level. Parameter β_0 measures the rate of 'beta-convergence' among stayer households, and γ_1 and γ_2 represent the difference in the (conditional) rate of convergence between stayers and different types of migrant households.

If the elements of coefficient vectors $\mathbf{\Gamma}_1$, $\mathbf{\Gamma}_2$, $\mathbf{\Gamma}_{1t}$, $\mathbf{\Gamma}_{2t}$, γ_0 and γ_1 are not significantly different from zero, then no attrition bias would arise. If the behavioral coefficients are significantly different between stayers and migrant households, then the next step should be to look into whether the estimation results of the behavioral coefficients on the entire sample are significantly affected by the inclusion or exclusion of migrants in estimating behavioral equations. This involves a comparison of the estimated coefficients $\mathbf{B}_t$ (t=1996, 2003), $\mathbf{B}$ and β_0 using the sample including both stayers and migrants against the estimates excluding migrants.[17]

How Do Different Types of Migrants Differ from Stayers in Economic Mobility?

The results of estimating equation (1) by OLS (with robust standard errors) are shown in table 5, where $\mathbf{B}_t$ coefficients are reported in the first and 5th columns, for t = 1996 and 2003 respectively, while $\mathbf{\Gamma}_{kt}$ coefficients are reported in the 2nd through 4th (for 1996) and 6th through 8th columns (for 2003).[18] In order to focus on the differential behavior between those migrating for economic and personal reasons (Spec (2) and (5)), we can examine the $\mathbf{\Gamma}_{2t}$ vector, which measures the difference in each of the slope coefficients between the two types of migrants. For disaggregation by urban/rural destinations (Spec (3) and (6)), however, due to the relatively small number of urban migrants, differential slope coefficients ($\mathbf{\Gamma}_{2t}$) are examined only for the key household assets (household size, education, landholdings and non-land assets). Generally, the estimated $\boldsymbol{B}_t$ coefficients have the expected signs and are statistically significant except for many of the demographic composition variables. While most of the coefficient estimates are similar between 1996 and 2003, relative living standards among villages apparently changed over the period.

The $\boldsymbol{\Gamma}_{kt}$ coefficients reveal that as of 1996, the returns to land were significantly higher and the strain of larger household size was felt more severely among migrant than stayer households, with no indication of qualitative differences in the effects of those variables among different types of migrant households. In contrast, the returns to education were significantly lower among those migrating for personal reasons (but not among those migrating for economic reasons) than among stayer households, while a similar difference was not found between urban and rural migrants. By 2003, in contrast, the difference in the coefficients between stayers and migrant households (as a whole) became mostly insignificant, suggesting that the differences in the slope coefficients between stayers and migrants dissipated over time as the latter group of households matured in their life cycle. However, the intercept was significantly higher in 2003 among urban migrants than among rural migrants, and the returns to land were lower among those migrating for economic reasons than among those migrating for personal reasons, although the latter difference is only marginally significant (p-value=0.12).

While suggestive, those cross-section correlations may not necessarily reflect causality*,* due to potential endogeneity. Fixed-effects specifications can control for time-invariant, unobserved heterogeneity at the household level (e.g., genetic traits or preferences shared among family members), the results of which are reported in the 9th through 12th columns of table 5. While the additional negative impact of larger household size among migrants is still observed (except for those migrating for economic reasons) after controlling for fixed effects, the seemingly higher returns from land among migrant households observed in the 1996 cross-section regression appear to be picking up household-level unobservables (such as ability), and compared with stayer households, the returns to land appear to be lower among those migrating for personal reasons and among urban migrants. The results also suggest that returns to education tend to be lower among those relocating for non-economic reasons and also among rural migrants.[19] It appears that those migrating for non-economic reasons tend to be less educated and also that their returns to education are lowered by household relocation.

The coefficient estimates of the growth equation (3) are reported in table 6. The rate of (conditional) convergence over the 7 year period among stayer households was 67.5%, or 9.6 % per annum (1st column).[20] The finding of household-level convergence (within the village) is consistent with Dercon (2004) and Jalan and Ravallioin (2002). The initial (as of 1996) level of schooling of the head, as well as of non-land assets, positively affects subsequent consumption growth after controlling for the initial level of per-capita consumption. The initial size of landholdings is not significantly associated with consumption growth. Thus, combining this and the fixed-effects estimation above, we see that the marginal contribution of larger lands is insignificant, a finding roughly in line with other micro-level studies finding that the returns to land have declined after the 1980s (e.g., Estudillo, Sawada and Otsuka 2008; Fuwa 2007).

The 2nd through 4th columns in table 6 report the difference in the estimated coefficients between stayers and different types of migrants (Γ_k). While the rate of convergence (γ) is not significantly different between stayers and migrant households as a whole, the results diverge once migrant households are disaggregated by type. The rate of convergence is significantly faster both among those migrating for economic reasons (p-value = 7%) and among urban migrants (p-value = 0%) than among stayer households.[21] Also, schooling of the head is associated with higher consumption growth among those migrating for economic reasons (though only marginally significant at 11%: not shown in table). Size of landholdings is significantly and negatively associated with the rate of consumption growth among migrant households as a whole, suggesting that households with larger land holdings (possibly with high sunk costs) may have more to lose from migration than do less landed households. However, returns to land are positive among urban migrants, who may have sold lands (the returns to which were declining) and converted them into other productive assets upon their relocation. In sharp contrast with urban migrants, consumption growth tends to be slower among rural migrants, than among stayers, once one controls for household characteristics and the initial level of consumption.

The joint hypothesis that all the regression coefficients are the same between stayers and migrants (as a whole), as well as between different types of migrant households (i.e., between those migrating for economic vs. personal reasons, and between rural vs. urban migrants), is rejected in most of the cross-section, fixed-effects and growth regression models, with only a few exceptions (urban vs. rural migrants in the cross-section; economic vs. personal reasons in the fixed-effects). Thus, we generally find that the behavioral coefficients explaining both the level and growth of per-capita consumption are significantly different between stayers and migrant households as a whole and among different types of migrants. This is broadly consistent with Maluccio (2004) and Thomas et al. (2010) but contrasts with many studies in the attrition literature in developed (e.g., Fitzgerald, Gottschalk and Moffitt

1998) and developing (e.g., Alderman et al. 2001) countries.

In sum, migrants tend to be younger (except for urban migrants) and to have smaller family size and smaller landholdings. Compared to stayer households, they have lower marginal returns from household size, and they have larger landholdings, both of which may raise the cost of relocation. Our results are *partially* consistent with poverty reduction through the 'Kuznets' process; those (relatively few) households relocating to urban destinations tend to have higher rates of consumption growth and of convergence, after controlling for household characteristics. Urban migration is also selective: households relocating to urban destinations are headed by better educated and older persons, who may have made better use of their lands by converting them into assets that are more productive in urban settings, and more of them come from the poorest village.

There is an additional source of systematic heterogeneity among migrant households, namely their motives for migration. Those households relocating for economic reasons, many of whom move to rural destinations, tend to be better educated (while those migrating for non-economic reasons may be less educated) and better-off than stayer households, on average, before migration. They are also more likely to come from the poorest village and have a faster rate of income convergence. While their returns to education also appear to be also higher on average, the overall rate of consumption growth is not systematically higher among those migrating for economic reasons than those migrating for non-economic reasons. This may reflect high risks involved in attempts to improve economic welfare through relocation.

Results on Attrition Bias: Does Sample Attrition Significantly Bias Behavioral Estimates of the Original Population?

We have found significant differences in behavioral coefficients between stayers and different types of migrant households in both cross-section and dynamic analyses. We now shift our attention from migrant households to the original population as a whole, as reflected in the baseline survey. Does the failure to include migrant households lead to significant biases in the behavioral estimates of interest among the population (i.e., both stayers and migrants)? If so, are these biases large enough to warrant investment in tracking migrant households in panel household surveys?

We compare the results of estimating cross-section and growth regressions with two sets of samples, one including only stayers and the other including both stayers and migrants. The ***B*** coefficient estimates applying to the 'stayer only' sample are found in the 1st (1996 cross-section) and 5th (2003 cross-section) columns of table 5 and also in the 1st column of table 6 (growth regression). The ***B*** coefficient estimates obtained from the entire sample (including both stayers and migrants) are reported in the last two columns of table 5 (cross-section results) and the final column of table 6 (growth regression). All the results show that the point estimates are similar between the two sets of estimates. For example, the rate of consumption convergence is 67.5 % excluding migrants while it is slightly higher, 68.7 % (or 9.8 % per annum), including migrants.

The Wald test statistics show that the coefficients are jointly *not* different between the two samples at the conventional significance levels in any of the regression models. While the regression coefficients are significantly different between different types of migrants and stayers, the magnitude of selection bias is relatively small; thus, the average behavior of the population may reasonably be inferred in the absence of migrant households.

Why Do Attrition Biases Tend to Be So Small?

The relatively small magnitude of attrition bias, despite systematic differences in behavior between stayers and migrant households, may be due to the heterogeneity among different types of migrant households. A number of regression coefficients are significantly different between stayers and particular types of migrants, but such differences in the behavioral parameters often disappear when all migrants are lumped together. In some cases, the directions of potential biases are likely to cancel each other out among different types of migrant households. For example, while per-capita consumption grew faster among urban migrants than among stayers or among rural migrants, consistent with the 'Kuznets process,' urban migration accounts for a relatively small minority of all household migration, and the average per-capita consumption among rural migrants grew more slowly than even that among stayers. Similarly, those migrating for economic reasons tend to be better educated, while those relocating for non-economic reasons are less educated, than stayer households.

Diminishing coefficient differentials between 1996 and 2003 between stayers and migrants in the per-capita consumption (cross-section) regressions, together with the trend of (absolute) consumption convergence during this period, could suggest that heterogeneity among different types of households is narrowing over time. Another possible explanation is that migration is a rather risky strategy for economic mobility and that not all migrants with economic motives may be successful; the average per-capita consumption among those migrating for economic reasons did *not* grow faster than that of those migrating for non-economic reasons, a finding consistent with the fact that 40 % of those migrating for economic reasons end up preferring their locations before relocation.

Finally, we should emphasize that the proportion of migrant households is quite small

(6.5%) in our dataset, and the insignificant attrition bias found in our analysis is likely to be dependent, at least in part, on this fact. A significant attrition bias may arise when attrition rates become substantially higher.

Robustness and Potential Limitations of Our Results[22]

It is comforting to know that the common finding in the literature of insignificant attrition bias in the estimation of behavioral coefficients appears to extend into the context of economic mobility as well. However, it is also important to recognize some potential limitations of the present study and not to over-generalize the results. In this section, we explore two potential concerns: (1) whether the insignificance result is mainly due to the relatively small sample size for this study; and (2) whether tracking be done at the household or at the individual-level.

Is the Small Sample Size Driving the Results?: A comparison with IFLS

While our finding that attrition bias is of minor quantitative importance is in line with the existing literature, there may be a concern that the relatively small sample size, especially of the tracked migrants, could potentially be driving our main empirical results. In order to examine to what extent our empirical findings may be due to the small sample size, we conducted a parallel analysis using a similar household panel dataset with a much larger sample size. The Indonesian Family Life Survey (IFLS) collected by RAND Corporation appears to be an ideal dataset for such a purpose, for several reasons. First, Indonesia is a neighboring country belonging to insular Southeast Asia. Secondly, successful tracking operations to follow and interview those households who migrated were conducted during the follow-up survey. Thirdly, the IFLS panel has a roughly comparable attrition rate (as we saw earlier). Fourthly, the IFLS panel contains a set of household-level variables similar to those in our Philippine data, including aggregate consumption at the household level.[23] Finally, and most importantly, the sample size is substantially larger than that of our dataset. We utilize the 1993-1997 household panel of IFLS, which has been well documented (e.g., Frankenberg et al. 2000) and is available on the web.

According to Thomas, Frankenberg and Smith (2001), 7,224 households were interviewed in the baseline data in 1993. During its follow-up survey in 1997, 6,752 households were interviewed while 472 households were not interviewed[24]. The re-interview rate in this 4 year panel was 93% (which is comparable to the re-interview rate of 96% in the Philippine data).

We conducted an analysis comparable to the one reported in the previous section by estimating equations (1), (2) and (3) using the 1993-1997 panel of IFLS data. Table 7 summarizes the results, which are comparable to table 5 and 6 based on the Philippine data. In all the specifications, the right hand side variables include: age of the household head and its square, female headship dummy, household size, years of schooling of the household head, value of land owned, value of non-land assets, demographic composition of household members, and village, municipality and province dummies. In order to ensure the comparability with the Philippine data, the IFLS sample used for our analysis was restricted to those households located in rural areas during the 1993 baseline survey.[25] This subset of the IFLS sample consists of 3,587 panel households, of which 170 are migrant households successfully interviewed in 1997.

The difference in the coefficients on the household characteristics (but excluding community, municipality and province dummies) between the stayer-only and full sample (including migrants) is not statistically significant at the conventional level in the consumption growth equation (p-value = 0.61), nor in the cross-section equations for the level of consumption in 1993 (p-value = 0.07) and 1997 (p-value = 0.16). A similar analysis using the sample including both urban and rural households produced qualitatively similar results; the p-values for the tests of the coefficient difference are 0.04, 0.51 and 0.39 for the 1993 cross-section, 1997 cross-section and 1993-1997 consumption growth equations, respectively.[26] IFLS data appear to yield differential coefficient estimates (between the stayer only sample and the entire sample) that are marginally significant in some of the cross-section equations (though not in the consumption growth equation). As seen in table 7, however, the quantitative differences in the coefficient estimates appear to be small. It appears reasonable to conclude that the small number of tracked households in the Philippine data is not likely to be the main driving force for our inference that potential attrition bias is small even when the behavior of stayers and migrants is significantly different, at least, at the level of attrition rates that we are looking at (i.e., around 10% or less).

Household-level versus Individual-level Tracking

Both our Philippine data and IFLS use the household, rather than the individual member of the household, as the unit of tracking. In other words, individual members who left their original households are ignored insofar as the original households are found in their original locations.[27] More recently, there have been attempts to construct panel data by tracking individual migrants (rather than households). The Kagera Health and Development Survey (KHDS) in Tanzania is one such example (Beegle, De Weerdt and Dercon 2010). Compared to the Philippine dataset, the KHDS panel over the period 1991-2004 has a comparable sample size in its baseline survey (914 households), and a similarly high level of re-contact rate at the household level after tracking (93% of the original households re-contacted). A major difference, however, appears to be a higher rate of migration than found in our Philippine data; only one half of the original households were found in their original communities after 13 years (translating into a 5% annual rate of migration, compared to 1.3% in our data).

A key characteristic of KHDS is that KHDS tracked individual migrants, with a striking consequence that the 2004 follow-up survey interviewed 2,700 households (up from the original 914). Tracking individuals appears to be substantially more costly than tracking households. Similar to our findings, Beegle, De Weerdt and Dercon (2010) find in KHDS that income growth of migrants was significantly faster than that of non-migrants. However, their study does not examine the extent of attrition bias in the behavioral coefficient estimates in ways typically found in the attrition literature. In general, to the extent that migrants who leave the original households (e.g., children leaving their parents' households) become better-off than those who were left behind, and if those migrants' improved living standards are not completely shared with their former co-residents left behind, any dataset (including our data) that fails to track all the individuals in the original households could yield biased estimates when behavioral equations explaining economic mobility (or any other outcome) are estimated. The extent of such potential bias, however, appears to remain largely unknown in the existing literature, although Beegle, De Weerdt and Dercon (2010) do provide suggestive evidence that transfers from migrants to the non-migrants in the households left behind are relatively limited in KHDS. The act of balancing the potential benefits and costs of tracking individual household members in constructing a panel dataset is an issue of practical importance, and there appears to exist a critical knowledge gap that still needs to be filled by future research.

Conclusions

Relatively little has been known in the literature about relocation of households (rather than of individuals) in developing countries. This article utilized a unique panel dataset that included a tracking operation of migrant households in the context of household panel surveys over a 7 year interval. The initial attrition rate of 11% was reduced to 4% after tracking, with the additional cost of tracking equal to 17% of the total survey cost without tracking.

The information obtained from migrant households indicates a great deal of heterogeneity in terms of destinations and reasons for migration. Some (especially better educated) migrate for economic reasons, while others (less educated) tend to migrate for non-economic reasons, but the former are not necessarily successful in terms of improving economic welfare despite their motive. We also observe a selective 'Kuznets process,' in which the living standards of households relocating to urban destinations (who also tend to be older and better educated) grow significantly faster than those of stayer households. Urban migration, however, is a relatively small minority in our dataset; the great majority of household relocation occurs in the context of rural-rural migration. Migrant households are also self-selected in terms of variables that explain both the level and the change in household well-being. These findings are in sharp contrast with earlier findings of insignificant differences between stayers and attritors in regression coefficients explaining a range of human capital and labor market outcomes in the attrition literature.[28]

Despite the evidence indicating selective migration, however, the estimated behavioral coefficients among the original population are not affected significantly by whether or not 'attritor' households are included in the analysis. Therefore, with this particular dataset, the average behavior of the original population explaining the level of well-being and economic mobility can be inferred based on the stayer-only sample without serious bias. A similar analysis using the Indonesian Family Life Survey, a comparable dataset with a much larger sample size, suggests that this conclusion is not mainly due to the small sample size of the tracked migrants in our data. While the conclusion above is broadly consistent with the existing literature on panel attrition, our data further suggest that the relatively small attrition bias may result from the heterogeneity among migrant households, as well as from the relatively small proportion of migrant households in our sample. In sum, based on our analysis, researchers need not worry much about attrition biases due to whole-household migration while conducting empirical rural economic analysis, provided that attrition rates are of the magnitude found in this study (i.e., around 10%).

Footnotes

[1] A few notable exceptions in recent years include: Indonesia Family Life Survey (Thomas, Frankenberg and Smith 2001), Kagera Health and Development Survey in Tanzania (Beegle, De Weerdt and Dercon 2010), Bukidnon Survey in Mindanao, Philippines (Quisumbing and McNiven 2005), among others.

[2] To what extent sample attrition should be a concern depends on the population of interest as defined by researcher. Those who move out may not be of concern, if the population of interest is the residents of a particular *geographical area* at any point in time. On the other hand, however, if the population of interest is a set of *people* who happen to reside in a particular place at one point in time, then changes in the lives of those people over time, no matter where they reside subsequently, are of interest. Assessing the effects of a particular intervention project on its initial beneficiaries would be one such context.

[3] We hasten to add, however, that rural industrialization could also cause Kuznets process-type upward mobility and so could international migration.

[4] Among developing country datasets, the LSMS in Peru experienced attrition rate of 70 % over 3 years (33 percent annual attrition) while the household panel data with the greatest success in reducing attrition is perhaps the Indonesian Family Life Surveys (IFLS) fielded by RAND, which, with one percent annual attrition rate, compares favorably to Panel Study of Income Dynamics (PSID) in the US.

[5] There have also been a small number of studies that identify significant effects of attrition bias, for example, in the US (e. g., Hausman and Wise 1979) and in South Africa (e. g., Maluccio 2004).

[6] Appendix 1 provides a brief summary of alternative approaches to panel sample attrition.

[7] This includes the cases where the 1996 household heads did not reside in the original villages in 2003 due to labor migration but were considered as the household heads by respondents. In addition, in the cases where the household head (as of 1996) was deceased but the household was headed by one of its 1996 members (often his/her spouse, or one of children) was located in the same house, we consider it as “the same household.”

[8] Our focus on the household as the unit of analysis with the household head as the reference for tracking bypasses the issue of household division, which could be important if extended family co-residence is common (e.g., Foster and Rosenzweig 2002). In the case of the Philippines, however, nuclear family is by far the most prevalent residence unit (e.g., Anderson 1964), and the issue of household division is likely to be relatively less of a concern. In 1996, for example, only 7 percent of the households contained married couples spanning two or more generations.

[9] Some may be concerned that the 24 'missed' households may be more likely to be longer-distance movers than those tracked, and this does hold true in the case of the 2 households falling in the category "New address obtained but too far" in table 1; one was in the US and the other in a remote island in the Philippines. In addition, as an attempt to examine whether those households who we were not able to interview were systematically different from those households who were successfully tracked, we compared the household characteristics between those two groups of households as of 1996 and found little indication of any systematic difference. Maluccio (2004) used the 'quality of interview' variables as identifying instruments for controlling for the potential non-randomness in the failure to re-interview. Unfortunately, however, we do not have similar information in our dataset.

[10] This includes wages and other expenses of enumerators but not the IRRI staff who supervised them.

[11] While this finding is in line with the general claim by Lucas (1997, 728), as quoted earlier, it is not immediately clear whether this is a typical phenomenon in the rural Philippines. The Indonesia Family Life Survey data, which we will utilize in a later section, reveal that the destinations of rural migrants during 1993-1997 were 86% rural and 14% urban. On the other hand, the pattern of individual migration (rather than household relocation) found in the rural Bukidnon province in the Philippines shows that rural-urban migration was more common than rural-rural migration (Quisumbing and McNiven 2005). The individual-based migration data, however, are unlikely to be directly comparable with our household-based relocation data (for example, it is commonly observed that young unmarried children temporarily migrate to urban destinations for work without leading to relocation of the households of their origin).

[12] It may take some time for migrants to start feeling the returns from the investments in migration, and those 'regretters' may be those who have not spent sufficient time in their new locations, although we have failed to find evidence to support this conjecture (e.g., the average years of relocation are about the same between the 'regretters' (1998.4) and non-regretters (1998.8)).

[13] In addition, a few alternative specifications of nested multinomial logit models (NMNL) are also estimated, as an alternative approach to relaxing the IIA assumption. Again, the tests for IIA based on NMNL specifications (i.e., the coefficients on the inclusive values being equal to one) cannot reject the validity of IIA.

[14] Descriptive statistics of the variables used in regressions are summarized in Appendix 2.

[15] This is what Fitzgerald, Gottschalk and Moffitt (1998) referred to as "Becketti, Gould, Lillard, Welch (BGLW) Test 1" (referring to Becketti et al. 1988). Alternative models and tests of attrition bias that have been proposed in the literature are briefly summarized in Appendix 1.

[16] This rate coincides with the average annual growth rate of real per-capita GDP in the same period (World Bank).

[17] This is what Fitzgerald, Gottschalk and Moffitt (1996) refer to as "BGLW Test2."

[18] Alternatively, regression coefficients can be estimated by Least Absolute Deviation (LAD) estimation technique, which has desirable robustness properties against heteroskedasticity and outliers (Deaton 1997, 78-85). Qualitative conclusions are mostly similar to the OLS results reported here, except that the difference in all the coefficients between stayers and migrants is not rejected for the 1996 cross-section estimation, and that the rate of consumption convergence is not significantly different between stayers and those migrating for economic reasons.

[19] This result needs to be interpreted with care, however, since education returns to household heads in the fixed-effects context are identified by the (relatively small number of) observations where the household heads changed due to changes in the household composition.

[20] This convergence rate is roughly comparable to the rate of conditional consumption convergence (9%) found based on the provincial-level data in the Philippines (Balisacan and Fuwa 2003).

[21] This inference is based on a separate test, not shown in table 6.

[22] I would like to thank an anonymous referee for suggesting the analysis reported in this section.

[23] In the analysis that follows, we used the household consumption aggregates published at the RAND website (www.rand.org/FLS/IFLS) and documented by Witoelar (2009), rather than constructing consumption aggregate anew based on the raw data.

[24] Among 472, all the household members had died in 69 households, 74 households refused and 329 households had migrated and were not able to be tracked.

[25] A parallel analysis using the entire sample (both rural and urban households in 1993) yield qualitatively similar results, as we see below.

[26] Those estimation results are not reported in the table.

[27] In fact, apart from the household tracking operation, IFLS also tracked a subset of individuals who migrated (split-off) as well. The baseline (1993) IFLS collected detailed information on the household head and her/his spouse, up to two of their children (age 0-14) randomly selected and a randomly selected member age 50 or older, called "target" individuals. Attempts were made during the 1997 IFLS to track those "target" individuals if they were found to have migrated (Thomas et al. 2010). In order to ensure comparability with our Philippine case, however, those tracked individuals were not included in our analysis. After this article was written, a new paper by Thomas et al. (2010) became available. Thomas et al. (2010) conduct an individual-level (rather than

household-level) analysis using the 1993 and 2007 rounds of IFLS including the "target" respondents successfully interviewed. Their analysis, however, does not contain a comparison of regression analyses based on the stayer-only and full samples.

[28] The results are somewhat in line with Rosenzweig (2003) who documents selective household division in Bangladesh.

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Table 1. Outcome of Tracking

Total interviewed in 1996	**940**	**100%**	
Interviewed in original location in 2003	**840**	**89.4%**	
Not interviewed in original location: potential attritors	**100**	**10.6%**	
[Dead (dissolved)	18	1.9%]	
[Out-movers	82	8.7%]	
Out-movers	82	8.7%	
outmovers not interviewed	24	2.6%	(100%)
New address not available	20		(83.3%)
New address obtained but not located	2		(8.3%)
New address obtained but too far	2		(8.3%)
outmovers tracked and interviewed	**58**	**6.2%**	
Total households interviewed in 2003(original location +tracked)	**898**	**95.5%**	**(840 + 58)**
Total Not-interviewed in 2003	**42**	**4.5%**	(100%)
Dead (dissolved)	18	1.9%	(42.9%)
Outmovers not interviewed	24	2.6%	(57.1%)

Table 2. Reasons for Migration [total out-movers interviewed = 58]

Reasons	number of households	(%)
Demographic		
Change in household composition (death of spouse, divorce or separation, (re-)marriage, joining family or relative's residence)	14	24.14%
Child's schooling	2	3.45%
Asked by relative/ friend to take care of house, land, other property	6	10.34%
Disputes/personal problems with family, relatives or neighbors	7	12.07%
Economic		
Eviction from house or house lot by owner	5	8.62%
Looking for jobs, found a new job in new the location	10	17.24%
To live closer to workplace, farm, etc.	13	22.41%
Unknown	1	1.72%
Total	58	100%

Table 3. Comparing Household Characteristics between Stayers and Different Types of Migrants

	Difference between Stayer vs. migrants (all types)			Difference between Migrants by destination			Difference between Migrants by motives		
	stayers	migrants	t-stat	rural	urban	t-stat	personal	economic	t-stat
1996									
age of the head	46.6	40.3	3.54***	38.8	46.6	1.43	39.1	40.6	0.37
years of schooling of the household head	6.9	7.2	-0.75	7.2	8.3	0.85	6.6	8.1	1.53
Household size	4.8	4.4	1.97**	4.5	4.3	0.32	3.5	4.4	0.06
Share of female headed households	0.12	0.122	-0.05	0.10	0.30	1.20	0.13	0.12	0.06
Average land owned (ha)	1.28	0.87	1.63*	0.88	0.72	0.54	0.77	0.91	0.58
Per-capita consumption (peso)	14,313	12,489	1.42	12,421	11.003	0.33	9,018	16.335	2.53**
Share of farmer	0.38	0.27	1.98**	0.22	0.38	0.94	0.22	0.24	0.19
Share of casual laborer	0.24	0.30	-1.25	0.32	0.38	0.30	0.28	0.40	0.93
Share of traders/shop owners	0.03	0.01	1.02	0.02	0.00	0.40	0.00	0.04	1.13
Share of transport operators	0.03	0.05	-0.64	0.04	0.00	0.57	0.06	0.00	1.27
Share of construction workers	0.06	0.06	-0.14	0.06	0.00	0.70	0.06	0.04	0.37
Share of regularly-employed	0.09	0.15	-1.76*	0.20	0.00	1.39	0.16	0.20	0.42
2003									
Age of the household head	51	45	2.82***	43.6	56.0	2.67***	45.4	44.8	0.20
years of schooling of the household head	7.1	7.6	-0.95	7.6	8.2	0.47	6.6	8.8	2.43**
Household size	4.9	4.9	-0.23	4.96	4.75	0.27	5.19	4.52	1.26
Share of female headed households	0.15	0.16	-0.06	0.12	0.38	1.87*	0.19	0.12	0.68
Average land owned (ha)	1.1	1.0	0.22	0.27	0	1.44	0.15	0.36	1.60
Per-capita consumption (peso)	15,449	16,093	-0.39	14,154	29,176	3.27***	15,463	17,516	0.58
Share of farmer	0.35	0.17	2.73***	0.2	0.0	1.39	0.16	0.20	0.42
Share of casual laborer	0.20	0.26	-0.98	0.28	0.13	0.92	0.34	0.16	1.57
Share of traders/shop owners	0.04	0.07	-1.22	0.06	0.13	0.66	0.03	0.08	0.81
Share of transport operators	0.08	0.14	-1.51	0.14	0.13	0.11	0.16	0.12	0.38
Share of construction workers	0.06	0.10	-1.20	0.12	0.00	1.03	0.09	0.12	0.32
Share of regularly-employed	0.10	0.07	0.66	0.06	0.13	0.66	0.03	0.12	1.30
consumption growth rate 1996-2003	0.06	0.25	2.28**	0.170	0.727	2.14**	0.338	0.148	1.00

Table 4-(a). Marginal Effects of Household Characteristics on Relocation Probability by Type of Migration (z-statistics in parentheses)

independent variables	Probit 1=attritor, 0=stayer	Multinomial logit by destination[a]		Multinomial logit by reasons for migration[a]	
	dp/dx: marginal effects of the covariates on migration probability, evaluated at the sample mean (z-statistics in parentheses)				
		Rural migration	Urban migration	migration for personal reasons	migration for economic reasons
Age	-0.0037 (1.31)	-0.00297 (1.56)	0.0002 (0.51)	-0.0003 (0.21)	-0.0019 (1.94)*
Age squared	0.0025 (0.90)	0.0022 (1.11)	-0.0001 (0.21)	-0.0005 (0.34)	0.0022 (2.26)**
Household size	-0.0234 (2.19)**	-0.0103 (1.55)	-0.0010 (----0.79)	-0.0066 (1.51)	-0.0051 (1.14)
Schooling of head	-0.0011 (0.41)	-0.0011 (0.57)	0.0006 (1.96)**	-0.0017 (1.38)	0.0015 (1.58)
Male 0-15	0.0079 (0.60)	0.0012 (0.13)	0.0007 (0.42)	0.0018 (0.32)	0.0011 (0.19)
Male 56-	0.0125 (0.47)	-0.0092 (0.38)	-0.0014 (0.41)	0.0002 (0.01)	-0.0117 (0.76)
female 0-15	0.0295 (2.17)**	0.0151 (1.70)*	0.0009 (0.49)	0.0084 (1.46)	0.0068 (1.17)
Female 15-55	0.0101 (0.56)	-0.0017 (0.13)	0.0014 (0.66)	-0.0038 (0.66)	0.0043 (0.54)
female 56-	-0.0302 (1.03)	-0.0217 (0.97)	-0.0001 (0.01)	0.0052 (0.36)	-0.0266 (1.85)*
Non land assets	-0.0786 (1.55)	-0.0373 (1.20)	-0.0147 (1.15)	-0.0206 (0.76)	-0.0195 (1.30)
Land	-0.0177 (1.52)	-0.0081 (1.16)	-0.0021 (0.88)	-0.0101 (1.54)	-0.0034 (0.92)
Village 2 dummy	0.0361 (1.50)	0.0024 (0.17)	0.0043 (0.85)	-0.0008 (0.09)	0.0079 (0.81)
Village 3 dummy	0.0764 (2.38)**	0.0247 (1.06)	0.0154 (0.95)*	0.0026 (0.21)	0.0406 (1.65)*
Village 4 dummy	0.0480 (1.79)*	0.0312 (1.57)	-0.0007 (0.20)	0.0150 (1.23)	0.0111 (0.85)
Pseudo-R^2log likelihood	PseudoR^2: 0.0841	Pseudo R^2 : 0.1011		Pseudo R^2 : 0.1074	
No. of obs	919	919		919	

Note: * statistically significant at 10%, ** statistically significant at 5%,, *** statistically significant at 1%.
[a]Marginal effects on the probability of staying in each estimation model are not reported in order to save space.

Table 4-(b). Hausman Test of IIA (independence from irrelevant alternatives) assumption (Multinomial logit models)

H_0: odds ratios are independent of other alternatives.

Omitted 'choice'	Test statistic (chi^2(14))	p-value	Inference on IIA
(1) alternative migration type by reason for migration			
'stay'	0.58	1.00	H_0 not rejected
'personal reason'	-0.06	1.00	H_0 not rejected
'economic reason'	0.51	1.00	H_0 not rejected
(2) alternative migration type by destination			
'stay'	1.12	1.00	H_0 not rejected
'rural migration'	1.62	1.00	H_0 not rejected
'urban migration'	-0.02	1.00	H_0 not rejected

Table 5. Correlates of Per-capita Consumption, 1996 and 2003: Comparisons between Stayers vs. Migrant Households (dependent variable = Log(per-capita consumption); OLS and Fixed-effects estimation; robust standard errors in parentheses)

independent variables	1996 cross-section (OLS)				2003 cross-section (OLS)				1996-2003 panel (fixed effects model)				(OLS)testing attrition biases: (common slope coefficients among stayer & migrant households)	
	(common across all specifications (1)~(3))	difference in coefficients between stayers and migrants			(common across all specifications (4)~(6))	difference in coefficients between stayers and migrants			(common across all specifications (7)~(9))	difference in coefficients between stayers and migrants				
		Spec (1) All migrants	Spec (2) reason for migration	Spec (3) urban or rural		Spec (4) All migrants	Spec (5) reason for migration	Spec (6) urban or rural		Spec (7) All migrants	Spec (8) reason for migration	Spec (9) urban or rural	Spec (10)	Spec (11)
	stayers	interaction terms coefficients:			stayers	interaction terms coefficients:			stayers	interaction terms coefficients:			1996	2003
	B_{1996}	Γ_{1996}	$\Gamma_{l,1996}$	$\Gamma_{l,1996}$	B_{2003}	Γ_{2003}	$\Gamma_{l,2003}$	$\Gamma_{l,2003}$	B	Γ	Γ_{l}	Γ_{l}	B_{1996}	B_{2003}
Age	0.023	-0.008	-0.005	-0.003	0.009	-0.005	-0.070	-0.018	0.0051	0.025	0.064	0.066	0.022	0.009
	(0.008)***	(0.024)	(0.026)	(0.023)	(0.01)	(0.031)	(0.060)	(0.036)	(0.0083)	(0.044)	(0.055)	(0.050)	(0.008)***	(0.009)
Age squared	-0.0002	0.0001	-0.0001	0.00003	-0.00003	0.0001	0.001	0.0002	-0.00004	-0.0003	-0.0007	-0.0008	-0.0002	-0.00003
	(0.0001)***	(0.0002)	(0.0003)	(0.0002)	(0.00001)	(0.0003)	(0.001)	(0.0004)	(0.0001)	(0.0004)	(0.0006)	(0.0005)	(0.0001)***	(0.00001)
Household size	-0.121	-0.191	-0.195	-0.210	-0.125	-0.076	0.115	0.003	-0.154	-0.228	-0.489	-0.162	-0.124	-0.128***
	(0.020)***	(0.091)**	(0.080)**	(0.090)**	(0.018)***	(0.135)	(0.314)	(0.140)	(0.012)***	(0.116)*	(0.177)***	(0.123)	(0.020)***	(0.018)
Land	0.056	0.226	0.267	0.236	0.096	-0.163	0.286	-0.117	0.064	-0.101	-0.204	0.173	0.059	0.089***
	(0.023)***	(0.119)*	(0.094)***	(0.122)**	(0.020)***	(0.112)	(0.342)	(0.124)	(0.017)***	(0.164)	(0.243)	(0.194)	(0.022)***	(0.020)
Schooling of head	0.036	-0.009	-0.044	-0.010	0.034	-0.023	-0.033	-0.024	0.006	-0.045	-0.065	-0.084	0.037	0.032***
	(0.006)***	(0.018)	(0.014)***	(0.020)	(0.006)***	(0.020)	(0.039)	(0.021)	(0.008)	(0.025)**	(0.030)**	(0.029)***	(0.006)***	(0.006)
Non land assets	0.002	-0.001	5.46e-06	-0.0003	0.005	0.002	-0.0001	0.011	-0.0002	0.011	0.011	0.029	0.002	0.005***
	(0.0006)***	(0.008)	(0.009)	(0.008)	(0.001)***	(0.002)	(0.002)	(0.009)	(0.0005)	(0.003)***	(0.003)***	(0.016)*	(0.001)***	(0.001)
Male 0-15	-0.035	0.178	0.211	0.201	0.011	0.032	-0.087	-0.047	-0.021	0.226	0.450	0.179	-0.031	0.012
	(0.023)	(0.104)*	(0.096)**	(0.105)	(0.025)	(0.152)	(0.331)	(0.158)	(0.022)	(0.147)	(0.200)**	(0.152)**	(0.022)	(0.024)
Male 56-	0.006	0.159	0.260	0.184	-0.029	0.118	-0.419	0.091	-0.042	0.423	0.755	0.056	0.014	-0.019
	(0.057)	(0.133)	(0.120)**	(0.140)	(0.040)	(0.206)	(0.368)	(0.189)	(0.040)	(0.274)	(0.389)*	(0.320)	(0.054)	(0.039)
female 0-15	-0.032	0.130	0.129	0.138	-0.026	0.033	-0.172	-0.005	0.011	0.268	0.478	0.272	-0.031	-0.024
	(0.024)	(0.095)	(0.099)	(0.097)	(0.023)	(0.147)	(0.314)	(0.148)	(0.028)	(0.138)*	(0.178)***	(0.139)**	(0.023)	(0.022)
Female 15-55	0.055	0.201	0.270	0.207	0.040	-0.025	-0.174	-0.060	0.020	0.081	0.395	-0.090	0.062	0.038
	(0.031)*	(0.106)*	(0.107)**	(0.111)*	(0.029)	(0.231)	(0.419)	(0.224)	(0.031)	(0.171)	(0.234)*	(0.182)	(0.030**)	(0.028)
female 56-	0.017	0.033	0.017	0.057	0.010	-0.137	-0.001	-0.095	0.046	0.011	0.163	0.288	0.014	0.008
	(0.050)	(0.196)	(0.164)	(0.197)	(0.036)	(0.192)	(0.235)	(0.176)	(0.044)	(0.241)	(0.279)	(0.263)	(0.048)	(0.035)
Village 2 dummy	-0.206	0.103	0.271	0.105	0.086	-0.063	-0.024	-0.120	--	--	--	--	-0.202	0.086***
	(0.042)***	(0.178)	(0.122)***	(0.181)	(0.037)***	(0.203)	(0.262)	(0.211)					(0.040)***	(0.037)
Village 3 dummy	-0.212	-0.090	0.043	-0.124	0.139	0.016	-0.131	-0.114	--	--	--	--	-0.221	0.154**
	(0.048)***	(0.202)	(0.173)	(0.199)	(0.047)***	(0.224)	(0.312)	(0.223)					(0.045)***	(0.047)
Village 4 dummy	0.020	-0.057	-0.046	-0.085	0.293	-0.343	-0.599	-0.390	--	--	--	--	0.011	0.272***
	(0.045)	(0.187)	(0.125)	(0.192)	(0.050)***	(0.193)*	(0.341)*	(0.191)**					(0.043)	(0.048)
Intercept (dummy)	9.112	0.371	0.058	0.341	9.191	0.669	1.632	0.790	9.946	0.377	0.034	-0.285	9.105	9.229***
	(0.164)***	(0.452)	(0.468)	(0.454)	(0.234)***	(0.811)	(1.298)	(0.887)	(0.220)***	(1.119)	(1.292)	(1.165)	(0.157)***	(0.223)

			additional interactions: $\Gamma_{2,1996}$				additional interactions: $\Gamma_{2,2003}$				additional interactions: Γ_2			
additional interactions			economic reasons:	urban migrants:			economic reasons:	urban migrants			economic reasons:	urban migrants:		
Intercept (dummy)			0.246	-0.850			0.344	0.868			---			
			(1.235)	(0.570)			(1.866)	(0.470)*						
Age			0.027	--			0.032				-0.110			
			(0.048)				(0.071)				(0.110)			
Age squared			-0.0005	--			-00005				0.001			
			(0.0005)				(0.001)				(0.001)			
Household size			-0.070	0.161			-0.152	-0.152			0.592	-0.246		
			(0.227)	(0.158)			(0.355)	(0.071)**			(0.234)**	(0.170)		
Land			-0.114	-0.160			-0.635				-0.246	-1.796		
			(0.271)	(0.429)			(0.389)*				(0.314)	(0.705)**		
Schooling of head			0.094	-0.003			-0.011	-0.005			0.174	-1.971		
			(0.033)***	(0.041)			(0.084)	(0.033)			(0.102)*	(0.705)**		
Non-land assets			0.004	0.032			0.005	-0.009			-0.002	-0.015		
			(0.013)	(0.019)**			(0.009)	(0.009)			(0.009)	(0.017)		
Male 0-15			-0.154	--			0.035				-0.605			
			(0.236)				(0.377)				(0.264)**			
Male 56-			0.514	--			0.579				-0.440			
			(0.270)*				(0.699)				(0.511)			
female 0-15			0.020	--			0.220				-0.831			
			(0.209)				(0.343)				(0.339)**			
Female 15-55			-0.085	--			-0.003				-0.967			
			(0.174)				(0.514)				(0.397)**			
female 56-			0.871	--			-0.411				-1.099			
			(0.343)**				(0.561)				(0.917)			
Village 2 dummy			-0.582	--			0.267				--			
			(0.459)				(0.426)							
Village 3 dummy			0.758	--			-0.070				--			
			(0.425)*				(0.520)							
Village 4 dummy			-0.423	--			0.185				--			
			(0.436)				(0.526)							
R^2	(0.356)	0.3687	0.3867	0.3699	(0.4355)	0.4392	0.4465	0.4426	(0.236)	0.2605	0.2674	0.2677	0.3603	0.4267
sample size	(837)	912	912	912	(840)	899	899	899	(1677)	1811	1811	1811	912	899
P-value for Ftest: Γ_1=0		4.0%	0.0%	7.2%	—	0.0%	0.0%	26.6%	—	0.0%	0.0%	1.1%	—	—
P-value for F test: $\Gamma_2=0$			0.0%	39.9%	—	—	3.0%	15.1%	—	—	71.7%	7.9%	—	—
P value for F test: $\Gamma_1=0$ & $\Gamma_2=0$			0.0%	5.8%	—	—	0.0%	0.0%	—	—	0.1%	0.0%	—	—
Wald (χ^2)test: ***B*** is the same, with vs. without migrants: χ^2 (11) / [p-value]				—	—	—	—	—	—	—	—	—	14.71 / [19.60%]	7.07 / [79.32%]

Note: * statistically significant at 10%, ** statistically significant at 5%,, *** statistically significant at 1%,

Table 6. Correlates of Per-capita Consumption Growth 1996-2003: Comparisons between Stayers vs. Migrant Households (OLS estimation; robust standard errors in parentheses)

	Dependent variable =Consumption growth (= $LnPCCONS_{2003}$ - $LnPCCONS_{1996}$) All sample including migrant households				testing attrition biases (common slope coefficients among stayers & migrant households)
Independent variables (= initial conditions in 1996)	(common across all specifications (1)~(4)) stayers	Difference in coefficiednts between stayers and migrants: Spec (1) All migrants	Spec (2) reason for migration	Spec (3) urban or rural	
		Coefficients on interaction terms:			
	β_0,B	Γ	Γ_1	Γ_1	β_0,B
Age	-0.001 (0.007)	0.073 (0.033)**	0.002 (0.044)	0.055 (0.028)**	-0.0004 (0.007)
Age squared	0.0001 (0.0001)	-0.001 (0.0003)**	-0.0001 (0.0005)	-0.001 (0.0003)**	0.0001 (0.0001)
Household size	-0.009 (0.021)	-0.078 (0.134)	-0.272 (0.157)*	-0.036 (0.124)	-0.012 (0.021)
Land	0.006 (0.019)	-0.984 (0.128)***	-0.884 (0.230)***	-0.972 (0.151)***	-0.00005 (0.019)
Schooling of head	0.038 (0.006)***	0.007 (0.017)	0.014 (0.035)	-0.002 (0.021)	0.035 (0.006)***
Non land assets	0.001 (0.001)**	-0.001 (0.008)	-0.001 (0.025)	0.003 (0.010)	0.001 (0.0006)**
Male 0-15	0.0002 (0.024)	-0.112 (0.127)	0.133 (0.144)	-0.138 (0.110)	-0.012 (0.024)
Male 56-	-0.008 (0.053)	1.145 (0.280)***	1.628 (0.320)***	1.074 (0.279)***	-0.001 (0.053)
female 0-15	-0.018 (0.026)	0.022 (0.117)	0.232 (0.171)	0.0001 (0.112)	-0.018 (0.025)
Female 15-55	0.043 (0.031)	0.431 (0.170)***	1.351 (0.293)***	0.494 (0.171)***	0.047 (0.031)
female 56-	0.087 (0.056)	0.360 (0.191)**	1.186 (0.294)***	0.483 (0.152)***	0.106 (0.055)*
Village 2 dummy	0.157 (0.043)***	-0.059 (0.167)	-0.054 (0.209)	0.021 (0.167)	0.145 (0.041)***
Village 3 dummy	0.186 (0.052)***	0.575 (0.208)***	0.532 (0.352)	0.451 (0.178)**	0.210 (0.052)***
Village 4 dummy	0.333 (0.055)***	-0.338 (0.183)*	-0.142 (0.230)	-0.156 (0.169)	0.321 (0.052)***
log(per-capita consumption)	-0.675 (0.043)***	-0.018 (0.126)	0.078 (0.269)	0.080 (0.108)	-0.687 (0.042)***
Constant	5.814 (0.432)***	-1.264 (1.159)	-1.436 (2.402)	-1.867 (1.047)*	5.984 (0.418)***
			additional interaction terms: Γ_2		
Intercept dummy			3.823 (3.012)	11.579 (2.326)***	
Age			0.106 (0.057)*		
Age squared			-0.001 (0.0006)*		
Household size			-0.131 (0.229)	-0.580 (0.131)***	
Land			0.229 (0.297)	2.011 (0.453)***	
Schooling of head			0.038 (0.047)	0.009 (0.040)	
Non-land assets			-0.003 (0.026)	0.029 (0.017)*	
Male 0-15			-0.082 (0.213)		
Male 56-			-0.831 (0.464)*		
female 0-15			-0.006 (0.200)		
Female 15-55			-0.929 (0.330)***		
female 56-			-1.380 (0.420)***		
Village 2 dummy			-0.346 (0.325)		
Village 3 dummy			-0.513 (0.403)		
Village 4 dummy			-0.599 (0.350)*		
log(per-capita consumptio)			-0.456 (0.336)	-1.036 (0.245)***	
R^2	(0.388)	0.4176	0.4264	0.4258	0.3757
P-value for F test: Γ_1=0		0.0%	0.0%	0.0%	-------
P-value for F test: $\Gamma_2=0$		-------	0.0%	0.0%	-------
P value for F test: $\Gamma_1 =0$ & $\Gamma_2=0$		-------	0.0%	0.0%	-------
Wald (χ^2)test: B is the same, with vs. without migrants		-------	-------	--------	χ^2 (12) = 17.83 P-value =12.10%
Sample size	(819)	874	874	874	874

Note: * statistically significant at 10%, ** statistically significant at 5%,, *** statistically significant at 1%

Table 7. Indonesia Family Life Survey Data 1993-97: Correlates of Per-capita Consumption and Consumption Growth: Comparisons between Stayers vs. Migrant Households (robust standard errors in parentheses)

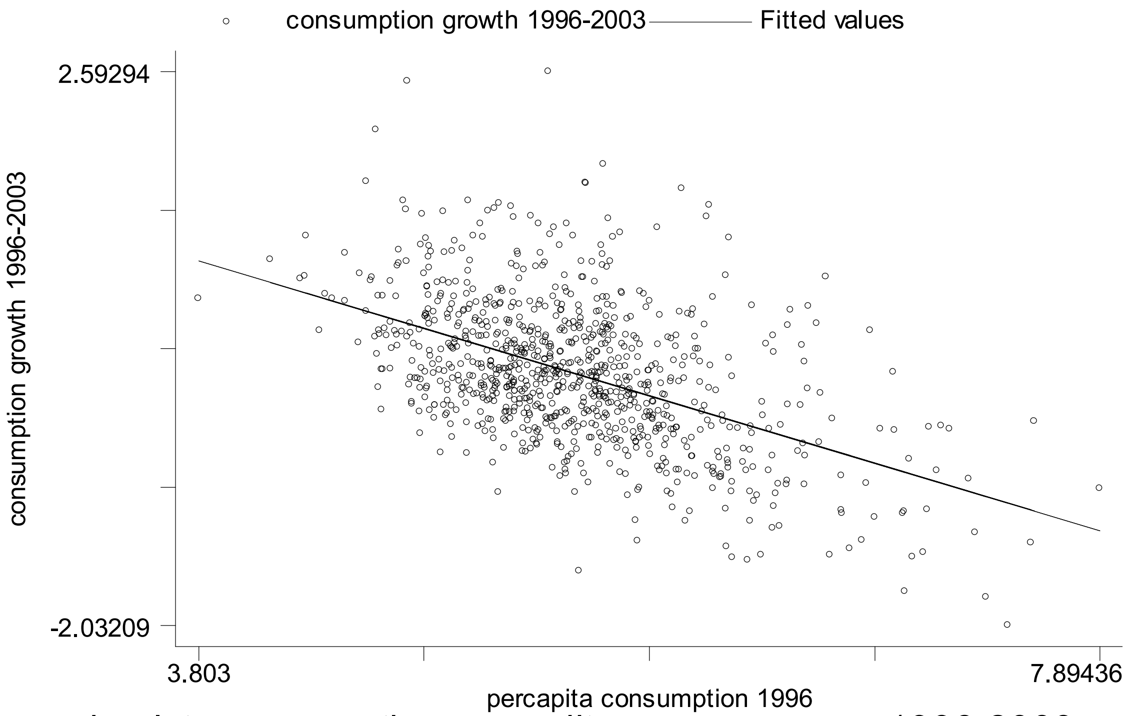
Variable	1993 cross-section (OLS) stayers B_{1993}	1993 cross-section (OLS) interation terms(all migrants): Γ_{199}	1997 cross-section (OLS) stayers B_{1997}	1997 cross-section (OLS) interation terms (all migrants): Γ_{199}	1993-7 panel (fixed-effects) stayers B	1993-7 panel (fixed-effects) interation terms (all migrants): Γ	testing attrition bias (OLS) 1993 cross section B_{1993}	testing attrition bias (OLS) 1997 cross section B_{1997}	1993-7 growth equation (OLS) stayers β_0, B	1993-7 growth equation (OLS) Interation terms (all migrants) Γ	1993-7 growth equation (OLS) testing attrition bias (common slope coefficients among stayer & migrants) β_0, B
age	0.026	0.002	0.010	-0.005	0.040	0.040	0.025	0.012	0.005	-0.053	0.003
	(0.004)***	(0.020)	(0.005)*	(0.013)	(0.008)***	(0.042)	(0.004)***	(0.004)***	(0.005)	(0.023)**	(0.005)
age squared	-0.0002	0.00002	0.0001	0.0001	-0.0003	-0.001	-0.0002	-0.0001	0.00002	0.001	4.643e-06
	(0.00005)***	(0.0002)	(0.0001)*	(0.0002)	(0.0001)***	(0.0005)	(0.00004)***	(0.00004)**	(0.0001)	(0.0003)**	(0.00005)
female head	0.009	0.012	0.076	0.040	0.289	0.082	0.009	0.076	0.024	0.240	0.029
	(0.037)	(0.166)	(0.036)**	(0.112)	(0.051)***	(0.224)	(0.034)	(0.030)**	(0.039)	(0.161)	(0.037)
household size	-0.130	-0.243*	-0.072	-0.288	0.321	-0.242	-0.146	-0.072	-0.052	0.096	-0.052
	(0.028)***	(0.140)	(0.029)**	(0.112)***	(0.042)***	(0.355)	(0.026)***	(0.024)***	(0.030)*	(0.195)	(0.028)*
schooling	0.056	-0.037	0.042	-0.015	0.023	0.009	0.053	0.045	0.029	0.014	0.029
	(0.003)***	(0.011)***	(0.004)***	(0.009)	(0.006)***	(0.032)	(0.003)***	(0.003)***	(0.004)***	(0.013)	(0.003)***
land	1.523e-09	-9.934e-09	1.482e-09	-2.609e-09	1.966e-10	3.782e-08	1.543e-09	1.686e-09	5.123e-10	1.938e-08	5.233e-10
	(7.98e-10)*	(2.39e-08)	(6.51e-10)**	(1.60e-09)	(4.43e-10)	(2.79e-08)	(3.86e-10)***	(4.78e-10)***	(3.89e-10)	(3.57e-08)	(4.07e-10)
non land assets	4.168e-11	2.527e-08	0.000	-4.688e-09	-1.995e-10	2.059e-08	4.760e-11	1.553e-09	2.235e-10	4.872e-09	2.234e-10
	(1.48e-10)	(8.50e-09)***	(0.000)***	(1.69e-09)***	(1.75e-10)	(7.65e-09)***	(1.34e-10)	(2.49e-10)***	(2.46e-10)	(5.22e-09)	(1.44e-10)
male 0-15	-0.008	0.257	-0.092	0.380	-0.475	0.285	0.007	-0.084	-0.006	0.006	-0.002
	(0.030)	(0.146)*	(0.031)***	(0.124)***	(0.052)***	(0.376)	(0.028)	(0.026)**	(0.033)	(0.206)	(0.030)
male 16-55	0.067	0.207	0.051	0.323	-0.278	0.249	0.080	0.055	0.059	0.045	0.064
	(0.033)**	(0.155)	(0.031)	(0.116)***	(0.054)***	(0.401)	(0.031)***	(0.027)**	(0.034)*	(0.219)	(0.033)*
male 56-	0.026	-0.036	-0.002	0.294	-0.137	0.092	0.031	0.005	0.002	-0.188	0.005
	(0.046)	(0.233)	(0.044)	(0.145)**	(0.072)*	(0.493)	(0.044)	(0.040)	(0.048)	(0.278)	(0.048)
female 0-15	0.004	0.192	-0.068	0.325	-0.419	0.148	0.014	-0.068	0.004	-0.036	0.008
	(0.029)	(0.153)	(0.030)**	(0.119)***	(0.044)***	(0.388)	(0.028)	(0.026)***	(0.032)	(0.212)	(0.030)
female 16-55	0.031	0.206	0.026	0.299	-0.210	0.286	0.045	0.029	0.025	0.008	0.023
	(0.028)	(0.139)	(0.029)	(0.115)***	(0.040)***	(0.359)	(0.027)*	(0.025)	(0.032)	(0.194)	(0.028)

Table 7 (continued)

Variable	1993 cross-section: stayers B_{1993}	1993 cross-section: interation terms(all migrants): Γ_{1993}	1997 cross-section: stayers B_{1997}	1997 cross-section: interation terms (all migrants): Γ_{1997}	1993-7 panel (fixed-effects): stayers B	1993-7 panel (fixed-effects): interation terms (all migrants): Γ	testing attrition bias: 1993 cross section B_{1993}	testing attrition bias: 1997 cross section B_{1997}	1993-7 growth equation: stayers β_0, B	1993-7 growth equation: Interation terms (all migrants) Γ	1993-7 growth equation: testing attrition bias β_0, B
intercept	9.376	0.260	10.965	-0.328	8.250		9.429	10.891	6.974		7.156
(dummy)	(0.207)***	(0.479)	(0.173)***	(0.327)	(0.536)***		(0.142)***	(0.182)***	(0.232)***		(0.239)***
log(per-capita consumption)									-0.643	-0.069	-0.651
									(0.020)***	(0.093)	(0.018)***
									0.000	0.458	0.000
R^2	(0.367)	0.383	(0.346)	0.408	(0.098)	0.127	0.365	0.373	(0.348)	0.367	0.350
p-value for F test: Γ=0[a]	---	1.9%	---	0.2%	---	0.0%	---	---	---	2.5%	---
Wald test : B is the same, with vs. without migrants	---	---	---	---	---	---	χ^2 (12) = 17.26 P-value =6.87%	χ^2 (12) = 15.63 P-value =15.56%	---	---	χ^2 (12) = 0.86 P-value =58.75%
Sample size	(3458)	3748	(3417)	4097	(9388)	10180	3748	(4097)	(3392)	3587	3587

Note: * statistically significant at 10%, ** statistically significant at 5%,, *** statistically significant at 1%

[a] Household characteristics only (and interaction terms for community and provincial fixed-effects are excluded from the test)



absolute consumption expenditure convergence 1996-2003

Figure 1.

APPENDIX 1: Alternative Modeling and Testing Approaches to Selective Attrition

A few alternative approaches to modeling, testing and correcting for potential attrition biases have been proposed in the literature. Sample attrition can be formulated in the following two period framework:

(A1) $y_{i0} = \mathbf{x}_{i0}'\boldsymbol{\beta}_0 + \varepsilon_{i0}$, y_{i0} and $\mathbf{x}_{i0}$ observed for all i

(A2) $y_{i1} = \mathbf{x}_{i1}'\boldsymbol{\beta}_1 + \varepsilon_{i1}$, y_{i1} and $\mathbf{x}_{i1}$ observed only if A_i=0

(A3) $A^*_i = \mathbf{x}_{i0}'\boldsymbol{\delta}_x + \mathbf{z}_{i0}'\boldsymbol{\delta}_z + \upsilon_{i0}$

(A4) $A_i = 1$ if $A^*_i \geq 0$ ('mover'/'attritor' households)

$= 0$ if $A^*_i < 0$. ('stayer' households)

Equation (A1) and (A2) represent (cross-section) behavioral relationships of main interest, where y_{it} is the outcome variable (such as the level of well-being, schooling outcome, etc.) of individual or household i at time t (t =0, 1), $\mathbf{x}'_{it}$ is a vector of exogenous characteristics of individual or household i, and ε_{it} is an error term. Equation (A3) specifies the process determining sample attrition, where A^*_i is a latent variable determining whether household (or individual) i remains in the sample or drops out in period 1, with the indicator variable A=0 indicating that the household i remains in the sample. In period 0, y_{i0} and $\mathbf{x}_{i0}$ are observed for all households(or individuals) i. $\mathbf{z}_{i0}$ is a vector of exogenous variables affecting sample attrition but not included in vector $\mathbf{x}'_{it}$, and υ_{it} is an error term. Additional assumptions concerning υ_{i0}, ε_{i1} and $\mathbf{z}_{i0}$ are the focus of alternative modeling approaches to sample attrition.

It has become common in the literature on panel attrition to make a distinction between two types of attrition: 'selection on unobservables' and 'selection on observables.' 'Selection on unobservables' is said to occur when $\mathbf{z}_{i0}$ and ε_{i1} are independent (conditional on vector $\mathbf{x}_{i1}$) but υ_{i0} and ε_{i1} are correlated; i.e., unobserved factors affecting sample attrition also influence the outcome of interest (y_{i1}). A classic example of this type of sample attrition was analyzed by Hausman and Wise (1979), for example. It has been recognized, however, that finding convincing instrumental variables (i.e., vector $\mathbf{z}_{i0}$) often turns out to be quite difficult, since most of the household (or individual) characteristics affecting attrition are also likely to affect the outcome variable (y_{i1}). With this recognition, Fitzgerald, Gottschalk and Moffitt (1998) propose an alternative modeling approach called 'selection on observables,' which is defined to occur when ε_{i1} and υ_{i0} are independent (conditional on $\mathbf{x}_{i1}$) but $\mathbf{z}_{i0}$ and ε_{i1} are correlated. Vector $\mathbf{z}_{i0}$ affects both sample attrition *and* the outcome variable of interest (y_{i1}) but does not enter as a determinant of y_{i1} in equation (1). As a candidate for z, Fitzgerald, Gottschalk and Moffitt (1998) propose the use of lagged values of y (y_{i0}). In the case of 'selection on observables' the parameter of interest (i.e., $\boldsymbol{\beta}_1$) can be consistently estimated with an application of weighted least squares (WLS) estimation, using the weight function defined as: $w(\mathbf{z}_{i0}, \mathbf{x}_{i1}) = Prob(A_i = 0 \mid \mathbf{x}_{i1})/Prob(A_i = 0 \mid \mathbf{z}_{i0}, \mathbf{x}_{i1})$.

A widely implemented form of testing for potential attrition bias has been proposed by Becketti et al (1988), often called 'BGLW test,' which involves estimating, using the baseline data (at t=0):

(A5) $y_{i0} = \mathbf{x}_{i0}'\boldsymbol{\beta}_{0M} + \varepsilon_{i0}$, with 'mover(attritor)' households only (i.e., A_i=1), and

$y_{i0} = \mathbf{x}_{i0}'\boldsymbol{\beta}_{0S} + \varepsilon_{i0}$, with 'stayer' households only (i.e., A_i=0),

followed by a test of the null hypothesis H_0: $\boldsymbol{\beta}_{0S} = \boldsymbol{\beta}_{0M}$. $\boldsymbol{\beta}_{0S}$ and $\boldsymbol{\beta}_{0M}$ are 'behavioral parameters' determining y_{i0} for stayers and migrants, respectively. The 'BGLW test' has been implemented, for example, by Alderman et al. (2001), Falaris (2003), and Maluccio (2004), among others, as well as by Becketti et al. (1988). Fitzgerald, Gottschalk and Moffitt (1998) adopted a slightly modified version of the 'BGLW test' by estimating

(A6) $y_{i0} = \mathbf{x}_{i0}'\boldsymbol{\beta}_{0M} + \varepsilon_{i0}$, with 'mover(attritor)' households only (i.e., A_i=1), and

$y_{i0} = \mathbf{x}_{i0}'\boldsymbol{\beta}_{0} + \varepsilon_{i0}$, with all household (including both 'stayer' and 'mover' households (i.e., A_i=0 and A_i=1),

followed by a test of the null hypothesis H_0: $\boldsymbol{\beta}_{0S} = \boldsymbol{\beta}_0$. Falaris (2003) proposed a two step procedure of combining both versions of the 'BGLW test,' which he calls 'comparison method'; by first examining the difference in the behavioral parameters between migrants and stayers (i.e., testing $\boldsymbol{\beta}_{0S} = \boldsymbol{\beta}_{0M}$), and then, if they are indeed significantly different, by proceeding to test the difference in the behavioral parameters between the case where all households are included and the case where migrant households are excluded (as typically happens at t=1), i.e., testing $\boldsymbol{\beta}_{0S} = \boldsymbol{\beta}_0$.

As shown by Fitzgerald, Gottschalk and Moffitt (1998), the 'BGLW test' can be seen as a test of sample attrition arising from the 'selection on observables' model. A sufficient condition for the 'selection on observables' to be 'ignorable' is either: (a) $\mathbf{z}_{i0}$ does not affect A^*_i in equation (3), or (b) $\mathbf{z}_{i0}$ is independent of y_{i0} conditional on $\mathbf{x}_{i0}$ and A^*_i=0 (see also Alderman et al. 2001). Since condition (b) can be tested by regressing y_{i0} on $\mathbf{x}_{i0}$ and A_i and testing the significance of A_i, the 'BGLW' test as described above (which includes the full interaction terms of the attrition dummy A_i and all the exogenous determinants $\mathbf{x}_{i0}$) can be seen as such a test. It follows then, as shown also by Fitzgerald, Gottschalk and Moffitt (1998), an alternative but equivalent test of sample attrition due to 'selection on observables' can be implemented by testing for condition (a), which involves estimating:

(A7) $A^*_i = \mathbf{x}_{i0}'\boldsymbol{\delta}_x + \delta_y y_{i0} + \upsilon_{i0}$

followed by a test of the null hypothesis H_0: $\delta_y = 0$. Alderman et al. (2001) also implement this test in developing country contexts.

As shown by Fitzgerald, Gottschalk and Moffitt (1998), potential attrition biases due to 'selection on observables' can be tested by examining whether the (suspected) 'z' variable is significantly associated with attrition; we find that per-capita consumption (i.e., our 'z' variable) tends to be significantly associated with the probability of migration in most of the specifications examined. This suggests that the potential bias due to selective attrition 'on observables' is not 'ignorable.' The problem in our case, however, as noted earlier, is that we cannot use per-capita consumption in 1996 as our identifying 'instrument' and proceed to weighted least square estimation, as suggested by Fitzgerald, Gottschalk and Moffitt (1998).

APPENDIX 2: Descriptive Statistics of the Variables Used in Regression Analyses

Variable	No of Obs.	Mean	Std. Dev.	Min	Max
		<u>1996</u>			
per-capita consumption (peso)	931	14156.19	10987.9	2152.108	128741.2
Age	940	46.01064	15.2689	18	96
Household size	940	4.788298	1.917597	1	13
Land (hectare)	940	0.596128	1.092177	0	13
Years of schooling of head	940	6.892021	3.35387	0	16
Male 0-15	940	0.951064	1.057328	0	5
Male 56-	940	0.217021	0.439924	0	2
female 0-15	940	0.888298	1.013892	0	5
Female 15-55	940	1.176596	0.809084	0	5
female 56-	940	0.255319	0.484832	0	3
Non land assets (peso/1000)	919	15.58547	37.46873	0	424
		<u>2003</u>			
per-capita consumption	899	15490.85	12367.49	2509.714	140958.8
Age	899	50.32036	13.57425	20	103
Household size	899	4.87208	2.045226	1	13
Land (hectare)	940	0.434942	0.873493	0	8
Years of schooling of head	899	7.164071	3.368935	0	16
Male 0-15	899	0.840934	0.988944	0	5
Male 56-	899	0.288098	0.508702	0	4
female 0-15	899	0.844271	1.035128	0	7
Female 15-55	899	1.202447	0.876032	0	5
female 56-	899	0.332592	0.545844	0	4
Non land assets (peso/1000)	940	11.60813	25.90925	0	302.25
Per-capita consumption growth rate, 1996-2003	891	0.073283	0.598904	-2.03209	2.592939
Village 2 dummy	940	0.311702	0.463435	0	1
Village 3 dummy	940	0.178723	0.383325	0	1
Village 4 dummy	940	0.241489	0.428214	0	1