Migration and the Overweight and Underweight Status of Children in Rural China

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Abstract: The rapid economic growth in China is accompanied by a large scale rural-to-urban migration, but over time more children are left behind in the rural. This paper studies how the overweight and underweight status of the rural children is associated with the out migration of others in their household. We find that migration is related to different nutritional outcomes for the left-behind children with the younger less likely to be overweight and the older more likely to be underweight. We also find suggestive evidence that the remaining adult household members spent less time in child care and cooking, whereas the older children take up more household chores.

Keywords: migration, children, overweight, underweight, rural China

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1. Introduction

The urban transformation is a key component of the economic growth process, and rural to urban migration is necessary for the urban transformation to occur (Taylor and Martin 2001). Recent increases in the prevalence of migration flows both within and from developing countries combined with better sources of data have sparked a renewed interest in research on both internal and international migration in the economics literature (e.g. de Haan, 2001; Beine, Docquier, and Rapoport, 2008). Due to increases in migrant flows, at least prior to the global financial crisis of 2008, it is almost certain that migration is increasingly becoming an important strategy for improving the livelihoods of households in developing countries.

Although migrants presumably leave in order to increase their personal level of well-being (e.g. Harris and Todaro, 1970), some of the most interesting effects of increasing migration occur in the source communities (e.g. Taylor, Rozelle, and de Brauw, 2003). Migrants continue to have economic interactions with the source households and communities they leave behind (Stark and Bloom, 1985; Stark, 1991). These interactions are particularly important when markets in the source communities do not function well. For example, if capital markets are thin or non-existent, migrant remittances can help households overcome credit constraints to invest in productive activities (e.g. Woodruff and Zenteno, 2007) or in the human capital of the next generation (e.g. Beine, Docquier, and Rapoport, 2008; Yang, 2008).

Important human capital investments via migration can take several forms, some of which are difficult to measure. For example, it is relatively straightforward to measure additional educational investments in children, if they exist, through the measure of years of schooling (e.g. Cox-Edwards and Ureta, 2003).[1] Other types of investments, such as nutritional or health investments in younger children and investments in terms of time, are more difficult to measure. The existing studies, Mansuri (2006) and Nobles (2007), which examine the effects of international migration from Pakistan and Mexico, respectively, on child height-for-age Z scores, find positive effects. In China, Chen (2009) has studied the relationship between migration and children'BMI but she studies earlier period and the mean of the distribution rather than measures based on the tails of the distribution, as we do here. In this paper, we study a hybrid of the latter two types of investments, nutritional investments and time allocation investments. Our primary outcome measures are whether children are more or less likely to be overweight (or underweight) when a member of the household has migrated. The effects of migration may differ depending upon the relationship of the migrant with each specific child. Parents obviously have more interactions with children than other household members, as they usually directly make decisions that affect the well-being of their children, such as what their children will eat, or where children will go to school. Therefore we would expect that parental migration could have different effects on outcomes among children than migration of other household members.

[1] The role of migration in shaping educational investments in children has also been studied from a number of different perspectives (e.g de Brauw and Giles 2007, McKenzie and Rapoport 2006).

Of interest in this paper is whether or not the quality of interactions differs when migrants are away.

We focus on the impact of parental migration on two specific nutritional outcomes among those left behind, specifically overweight and underweight status, among children in rural China. Both overweight and underweight status in children can lead to long-term health problems. In pediatric studies, research has found that obese children are at increased risk of poorer health (Hannon et al. 2005; Freedman et al. 1999) and obesity itself is shown to track from childhood to adulthood (Whitaker et al. 1997; Freedman et al. 2005). The impacts of underweight and under-nutrition on children are also well-documented. Early malnutrition leads to stunted growth and long term developmental deficits as well as adversely affecting mental development (WHO, 2002). Underweight children are at increased risk of mortality from infectious illness such as diarrhea and pneumonia. Malnutrition among children also affects school performance (Jamison, 1986, Fan and Kleinman, 2007), and productivity in adulthood (e.g. Dasgupta and Ray, 1986, Maluccio et al, 2009).[2]

We believe these outcomes are interesting to study in the context of rural China for several reasons. First, overweight status and obesity has been increasing in China over the past two decades, corresponding with China's rapid economic growth (e.g. Wang et al., 2006). As we will demonstrate using the CHNS, overweight status has been rising among children in rural China. Yet malnutrition also remains a problem in China, particularly in rural areas (Svedberg, 2007). Moreover, migrant

[2] For a comprehensive review of the impacts of child health and nutrition in developing countries, see Glewwe and Miguel (2008).

labor flows out of rural China have been increasing rapidly since labor market restrictions were loosened (Liang and Ma, 2004; Fan, 2008). But in part due to the household registration (*hukou*) system albeit changed and reformed, migrants are still largely barred from accessing education for their children in urban areas, whether legally or financially, and suffer poor housing conditions (World Bank, 2009). Therefore as more and more rural residents leave, they often leave their families behind; in the CHNS data set we use in the 2004 round, we find that nearly 20 percent of rural children are living without their parents.

The paper proceeds as follows. We first describe in more detail changes in migration and anthropometric status in rural China since economic reforms began. We next describe a conceptual framework to link migration and nutritional status among children, and in the fourth section we introduce our data set, along with the specific measures of overweight and underweight status we use in the paper. The fifth section develops the empirical model we use to measure the association between migration and nutritional status, and the sixth section provides and discusses our econometric results. The final section concludes.

2. Background

In this section, we document changes in migration and anthropometrics in rural China since reforms began. Migration behavior has changed dramatically, coinciding with changes in policies that have gradually eased rural-urban migration over time. As incomes have increased as well, it is not surprising that diet and consumption patterns have changed as well, which has implications for measures of nutrition.

2.1 Migration in China

China's labor market began to experience dramatic changes during the 1990s, as the number of rural migrants moving to urban China for employment grew rapidly. Estimates using the one percent sample from the 1990 and 2000 rounds of the Population Census and the 1995 one percent population survey suggest that the inter-county migrant population grew from just over 20 million in 1990 to 45 million in 1995 and 79 million by 2000 (Liang and Ma, 2004). These figures likely under-report the true amount of migration, as they do not account for migration that takes place over shorter periods of time (Cai, Park, and Zhao, 2007). Indeed, surveys that have been done since 2000 imply that migration flows have continued to increase.

One of the primary driving forces in the expansion of migration over the past two decades have been loosening constraints on the household registration (*hukou*) system that have occurred over time. The initial *hukou* reform, taking place in 1988, established a mechanism for rural migrants to obtain legal temporary residence in China's urban areas (Mallee, 1995). After rural migrants could obtain legal temporary residence, they became better able to establish networks that are often used to facilitate job search in distant labor markets with higher available wages (e.g. Carrington, Detragiache, and Vishnawath, 1996; Munshi, 2005). In part due to legal temporary residence status does not imply access to the same set of benefits as urban residents (e.g., subsidized education, health care, and housing), migrants keep strong ties with their home areas.[3] Whereas individuals with rural *hukou* status can now purchase non-agricultural *hukou* status from urban governments in many cases, the system continues to work against more permanent migration flows (Fan, 2008). Migration flows are further constrained by insecure land tenure. Agricultural land holdings are subject to administrative re-allocation that can be triggered by absence or leaving the land uncultivated. Even though a new law introduced in 2002 (the Rural Land Contract Law (RLCL)) stipulates that farmers' land tenure security is guaranteed for at least 30 years, the implementation of RLCL is decentralized and varies across villages (Deininger and Jin, forthcoming).

Whereas migration rates in the 1990s were higher for men than women at most age ranges in rural China (Zhao 1999, Rozelle et al 1999), more recent research finds that young men and women have similar rates of migration in much of rural China(Zhang et al 2004, Du, Park, and Wang 2005, Mu and van de Walle 2009). As an extreme, Zhang et al. (2004) find that 75 percent of men and women aged 16 to 20 migrate in a sample of six provinces broadly representative sample of rural households. Du, Park and Wang (2005) specifically find that migration grows rapidly, and that male migration differs from female migration in that more educated and older men have higher migration propensities. Females who migrate for work, then, tend to be younger and therefore less likely to be married. One can therefore characterize male migrants as somewhat older and more likely to be

[3] The literature on China's migration typically focuses on the net effects of migration and remittances on households. An exception is Taylor et al. (2003), which estimates separate effects of migration and remittances on income sources. They incidentally report that remittance rates by migrants are on the order of 70 percent. More recently, Zhu et al (2009) study the effects of remittances on consumption, finding positive effects, but they do not report how frequently migrants remit.

married; male migrants are more likely to have children. Whereas these demographics are changing rapidly, from our perspective this pattern implies that more of the migration among parents is due to father migration, though not all, and when other household members migrate, a significant share of them may be older siblings of the child in question.

Nationwide migration trends are broadly reflected in the subsample of the CHNS data we will use for analysis. More and more children live in households with migrant parents between 1997 and 2006 (Table 1). In fact, the share of children in a household with at least one member who has migrated has more than tripled during this period, from 11% in 1997 to 35% in 2006. More than half of the children who are in migrant households have migrant parent(s), and the share of children with migrant parent(s) increases from 5% in 1997 to 24% in 2006. Majority of the parent(s)' migration is accounted for by father's migration which increases substantially from 2.3% to 14.6% during 1997-2006. A very small proportion of parents' migration is due to mother's migration only. The migration of both parents only becomes more substantial in later rounds (5.6% in 2004 and 6.5% in 2006). Besides parents, other household members (such as siblings, grandfathers, or other relatives) also migrate. On average, 8.7% of the children in the sample live in migrant households with non-migrant parents.

2.2. Nutrition Status of Rural Children

Economic growth is well known to be associated with improved nutritional status (Fogel, 2004), and China's experience with rapid economic growth since reforms began is no exception. Several authors have shown that measures of the nutritional status of children have improved in China. For example, Chen (2000) shows that in the National Nutritional Survey, average height-for-age, weight-for-age, and weight-for-height Z scores increased dramatically on average between 1990 and 1995 among children in China.

Accompanied by the increase in anthropometric measures, however, has been an increase in overweight status and obesity among all demographic groups. For example, according to Wang et al (2007) the combined prevalence of overweight and obesity in China increased from 14.6% in 1992 to 21.8% in 2002. The fastest increase was among men aged 18 to 44 and women aged 45 to 59 years. Such changes have also been documented among children in China. Using a cross-sectional analysis, Waller, Du, and Popkin (2003) show that 9.4% of children in China were overweight in 1997, and Monda and Popkin (2005) show this percentage rises in 2000. In a separate analysis, Popkin et al. (2006) show that while there is a lag between increases in overweight status among adults and children globally, overweight status is also increasing among children, and the gap is closing in China.[4]

Perhaps not surprisingly, though under-nutrition is declining, it has not disappeared, and if anything it is worst in rural areas (Svedberg, 2006). He finds that the stunting rate (the percentage of children with height-for-age Z scores below -2) decreased by 17.8 percentage points between 1992 and 1998 in rural areas, and another 2.5 percentage points by 2002. Despite the national achievement of more

[4] It is worth noting that the references above use the 85th percentile of the BMI distribution to define overweight rather than the calibrated definition of Cole et al (2000) used in this paper. Results are generally robust to the definition of overweight.

than halving the national stunting rate, the stunting rate in 2002 was still nearly 15 percent, indicating a substantial share of the population remains malnourished. Although stunting is a more cumulative measure of malnutrition than underweight, here we are interested in underweight status as it is a more contemporaneous measure and therefore more susceptible to being influenced by changes in migration status of household members.

Both of these trends are found among the subsample of children from the CHNS that we will use for analysis, using internationally comparable definitions of overweight and underweight discussed in section 4. At virtually all ages between 2 and 14 years (24 and 168 months), the probability of being overweight increases from 1997 to 2006 (Figure 1). Among children aged 2 to 6 years, for example, the locally weighted regression shows that around 10 percent of children were overweight in the 1997 survey round. By 2006, around 25 percent of children in the same age range were overweight. The overweight status does seem to decline with age. Trends for underweight children are somewhat harder to discern, particularly as the share of underweight children aged 2 to 5 years seemed quite low in 1997 (Figure 2). While children appear to be more likely to be underweight in 2006 in general, the differences across the entire age range are not substantial. Still, we also know that migration has increased over this time period, and therefore it is worth considering how migration is correlated with underweight status.

3. Conceptual Framework: Linking Migration and Children's Nutritional Status

There are two main channels through which migration behavior may affect nutritional status among children: one is through the effects of migration on household incomes, and the other is through the household time allocation. When a household decides to send out a migrant, the household expects that the overall income in the household will increase. Income growth along with the change in household production structure is believed to be one of the main reasons for the change of dietary behavior and nutrition outcomes (Du et al. 2004). The increase in income can affect the family diet either by increasing its size or by improving its quality. If households lacked enough food or calories for children prior to migration, we would see a decrease in underweight status correlated with the rise in income associated with migration, through remittances migrants send back. If instead households had enough food or calories prior to migration, additional income can or might be used to buy more nutritious foods after migrants leave, through substitution. So the income effect can lead to improvement of nutrition, decrease in underweight through improved diet (both quantity and quality), and also through better health care, and low morbidity. Perversely, a higher income may cause food structure shift to higher energy and fat intakes as well as increased consumption of meat and processed food, which may lead to higher overweight incidence (Guo et al. 2000). If so, then we might also see an increase in overweight status if children receive more calories than they need as a result of migration.

The second channel through which migration can broadly affect nutritional status is through the time allocation of adult household members. Clearly, if one or more household members migrate, then the remaining members must take up any of the tasks that the migrant used to do either in agricultural production (Mu and van de Walle 2009) or home production such as in child rearing, cooking, and other household tasks. In particular, less time may be allocated to either cooking or monitoring the eating habits of children, which might increase the probability of underweight or decrease the probability of overweight status, under the assumption that food or calories were adequate prior to migration.[5]

Finally, the relationship may also differ by the age of the child; younger children are more dependent on their parents or other caregivers and therefore may be more susceptible to the potential time effects, whereas older children might be asked to take on some of the household chores done by the migrant(s) in the past, increasing their activity and potentially decreasing the probability of overweight status (e.g. Monda and Popkin, 2005).

As a result, the potential relationship between migration and overweight status among children is theoretically indeterminate. We must therefore turn to the data to learn about the possible direction of the relationship. We initially do so by pooling the data and calculating a locally weighted regression of the probability of overweight status on age, by migration status (Figure 3). Somewhat interestingly, though the lines closely follow each other, children in migrant households have a

[5] Alternatively, households might choose to eat prepared foods more often, which would also potentially increase the probability of overweight status. However, prepared foods are not always available in rural China, so the hypothesis presented above is more plausible.

lower probability of being overweight than children in non-migrant households at every age in the sample. This is perhaps even more surprising as we do not control for the year of sample in this figure; children are more likely to have migrant parents later in the sample (e.g. 2004, 2006), when overweight status is generally higher. So if there were no relationship, we might have expected overweight status to be higher in migrant households than non-migrant households solely due to the sample structure. We repeat the figure for underweight status as well (Figure 4). Conversely, we find that in migrant households children at almost all ages are more likely to be underweight than children in non-migrant households. Again, as we do not control for characteristics of children, households, or communities that might also affect either migration, weight status, or both, the difference should be considered suggestive rather than as proof of a relationship.

In summary, we find suggestive evidence of a negative relationship between migration and overweight status. Therefore it is unlikely that migrant households are using increased income to overfeed their children, creating an increase in overweight status. Rather, there are several channels by which we might find evidence of a decrease in overweight status due to migration. To do so, however, we need a multivariate framework, which we set up in the next section.

4. Data and Summary Statistics

Before we discuss an empirical strategy for identifying potential linkages between migration and nutritional status among children in China, we discuss in more detail the data set we use for analysis, and how we will use it to study the relationship between migration and nutritional status in rural China. We also further introduce the measures we use for overweight status and underweight status,.

To study the relationship between migration and nutritional outcomes, we use the 1997, 2000, 2004, and 2006 rounds of the China Health and Nutrition Survey (CHNS), conducted by the University of North Carolina at Chapel Hill.[6] The CHNS is a longitudinal survey covering nine provinces that vary substantially in geography, economic development, and access to public resources.[7] The CHNS asks a number of modules about health, nutritional status (including a consumption recall module for all foods over 3 days), and socioeconomic status. Because we are studying migration, we use the subsample of the CHNS that was clearly collected in rural areas.[8]

Importantly for this paper, the CHNS records anthropometrical measurements—height and weight—for each individual. As a result, we can easily construct a Body Mass Index (BMI) for each individual in the data set.[9] Adults with a BMI over 25 are considered overweight and adults with a BMI over 30 are considered obese, whereas adults with a BMI below 18.5 are considered underweight. Both labels can lead to types of labels are indicators of potentially poor health later in life.

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[6] See http://www.cpc.unc.edu/projects/china for further details.
[7] The nine provinces are Henan, Hubei, Heilongjiang, Liaoning, Shandong, Guizhou, Jiangsu, Guangxi, Hunan.
[8] Within what the CHNS defines as urban areas, they sampled clusters that were both urban and suburban, and rural areas, which include one township and three villages as the four clusters in each county. We only include the three villages in our analysis.
[9] BMI is calculated by dividing a person's body weight in kilograms by their height in meters squared (weight [kg]/height[m^2]). We drop all individuals with BMI-for-age z-scores below -5 or above -5, as is common practice by nutritionists; such z-scores are too low or high to generally be believed and likely reflect recording errors in the data.

Children, however, have a different distribution of body weights, and only recently have efforts been made to normalize the definitions of underweight and overweight among children. We use the definition of Cole et al (2000), who use six samples from around the world to come up with an age specific set of BMIs above which children are considered overweight, for ages 2 to 18. Each cutoff represents the 85th percentile of a healthy distribution, differs for boys and girls, and corresponds to the definition of overweight for adults, which applies to individuals aged 18 years and above. Similarly, Cole et al (2007) define underweight children for ages 2 to 18, using the same six samples to do so, and the cutoffs both track the 5th percentile of the BMI distribution among a healthy population and are calibrated so that the cutoff is a BMI of 18.5 among 18 year olds. Lastly, they also differ among boys and girls. We limit our study to children aged 2 to 14, since older children finish middle school and begin to enter the labor force (e.g. de Brauw and Giles, 2006).

Although the CHNS is an excellent data set in which to study changes in anthropometric measures among children in rural China, it was not originally conceived to study migration. Therefore the migration status of individual household members must be built up from the household roster. Starting from 1997, if an individual who was in a previous round of the CHNS is not in the current round of the survey, a question is asked regarding why this individual does not currently reside in the household. We consider any individual who has left the home to seek employment between any two waves of the survey to be a migrant. This definition differentiates migration for work from migration for other reasons but it could underestimate the migration rate because individuals who have both migrated and returned between surveys cannot be identified, not can individuals who temporarily migrated between surveys. From these two perspectives, we may underestimate the impact of parents' migration on children' weight status. That said, we also do not observe how far away each individual has gone; some individuals may be present quite nearby, and if so, they remain employed in local labor markets and likely maintain more frequent contact with the household remaining in the sample. From this perspective, we may overestimate migration. However, it is unlikely that parents would leave their children and live nearby for employment, so parental migration is likely unaffected by this measurement issue.

We also make use of several other important variables that might affect the relationship between migration and weight status in the data. We use the household survey to measure the log value of assets per capita, which we use to control for household wealth. We also use the household survey to construct a variable at the community level that measures the share of households with access to clean water. To control for other variables at the community level, we use the community survey of the CHNS. For example, it records food prices in the market in each village, and we use it to control for the changes in the prices of the commonly consumed foods—rice, flour and pork. We also use the community survey to construct an indicator variable for whether or not a health clinic is present in the village at the time of the survey.

There are 4162 observations for rural children aged 2-14 with non-missing values for the variables we use in the analysis. Among which, we drop 782 whom reside in county towns. Even though some of the county towns in CHNS are designated as "rural", we are concerned that the economic and social conditions in these towns have little resemblance to villages in the rural. We further drop 16 observations with BMI value greater than 50 or less than 10. To implement fixed effect estimation, we can only use data for the children in the 2-14 age range who appear in the surveys for at least two rounds.[10] Therefore, in the final analysis sample, we have 998 children with 2376 observations.

Panel attrition is not a concern in our sample. The primary reason for attrition is that children age out of the sample; migration is not an important factor, even in high migration areas. Young adults wait until they are 17 or 18 to migrate (de Brauw and Giles, 2006). In the CHNS, 90.2% of the children aged 2-14 remain living in the same rural household as they do in the previous survey round. For children aged 2-7, about 96% of them do so. For children aged 8-14, the number is 88%. Once we control for age and time trend, there is no significant difference in terms of initial overweight and underweight status between children who stayed in the rural and the children who moved.

5. Empirical Framework

We specify a reduced form relationship between migration and overweight status. Consider child *i* in household *h* living in village *c* at time *t*; his or her weight status can be determined by:

$$H_{ihct} = \alpha_0 + \alpha_1 M_{hct} + A'_{ihct}\alpha_2 + \alpha_3 W_{hct} + D'_{ct}\alpha_4 + Y_{p\times t} + \mu_i + \varepsilon_{ihct} \qquad (1)$$

[10] When we stratify the data by age, the 2-7 age group includes children who were 2-4 in 1997, 2-7 in 2000 and 2004; and 4-7 in 2006. The 8-14 age group include children aged 8-11 in 1997, 8-14 in 2000 and 2004, and 10-14 in 2006.

H_{ihct} is the child's overweight or underweight status in the current period. We specify migration as M_{hct} , which measures the migration status of the household at time *t*. If any household member has out-migrated, then M_{hct} takes on a value of one; it is zero otherwise. A_{ihct} is a vector representing the age and gender of the child. Since there is a pattern to estimates of nutritional status affected by age and gender, we allow the age and gender effects to vary by time to account for differential timing effects on children's growth. W_{hct} represents household wealth, measured by household assets per capita[11]. The vector of village characteristics (D_{ct}) includes variables that might affect child nutritional status. They include whether or not a health facility exists in the village, and the share of other households in the village that has tap-water. We also include the prices of rice, flour, and pork in the village market since they may affect both migration and the nutritional status of children. $Y_{p\times t}$ controls province-time fixed effects, as time-varying macro economic conditions may affect quality of health care and development of health facilities specific provinces. The individual fixed effect μ_i accounts for all time-invariant factors that could affect both the health of the child and household members' migration. ε_{ihct} is an mean zero idiosyncratic error term, which we always assume is correlated at the village level. We primarily estimate equation (1) with a linear probability model, and we estimate it with both the individual fixed effects included in estimation and excluded in some specifications.[12]

[11] The observed income change may be endogenous to children's weight status through time reallocation among household members brought out by migration, so we do not control for income in our regression.
[12] In specifications with individual effects, gender obviously drops out.

As discussed above, it is possible that parental migrants have different effects on the nutrition status of children than migrants who are not parents. To test this hypothesis, we also estimate a modified version of equation (1):

$$H_{ihct} = \alpha_0 + \alpha_1 P_{hct} + \beta_1 O_{hct} + A'_{ihct}\alpha_2 + \alpha_3 W_{hct} + D'_{ct}\alpha_4 + Y_{p\times t} + \mu_i + \varepsilon_{ihct} \qquad (2)$$

where P_{hct} is an indicator variable for the presence of a parental migrant, and O_{hct} is an indicator variable for the presence of another household member who is a migrant.

A primary concern with including any measure of migration on the right hand side of a reduced form equation for estimation is that unobservable factors about the outcome of interest (here, the overweight or underweight status of children) may be correlated with the migration decision. For example, one might think that if children are not well, for reasons of malnutrition, family members might be less likely to migrate. In this example, one would underestimate the relationship between migration and underweight status. A solution for estimating the causal effect of migration on overweight or underweight status would be to find instruments that are correlated with migration, but are only plausibly related to nutritional status through their effect on migration.

Unfortunately, because the CHNS was not designed to study migration, there are no obvious or good instruments available in the CHNS for migration.[13] In the absence of good, plausible instruments, we do the following. First, we primarily rely on the fixed effects versions of our model for interpretation. That is, we include

[13] Out of concern that the use of "bad" instruments would bias our results in a relative sense more than the OLS results, we do not try to find what might be considered bad instruments (e.g. McKenzie, Gibson, and Stillman, 2006).

child level fixed effects, which account for any child level unobservables that are fixed over time. As a result, the only unobservables that we must be concerned about are unobservables that change over time, such as unobserved income shocks. Second, we never interpret our regression results as causal; rather, we interpret them as conditional correlations. Third, in the discussion of results we consider factors that could undermine the sign of the results; that is, we attempt to think through which direction obvious biases might work, and whether or not they would affect the interpretation of the results.[14]

6. Results

6.1 Impacts of Migration on Children's Overweight and Underweight Measures

We initially estimate equation (1) using overweight status as the dependent variable on the whole sample of children aged 2-14 years (Table 2), clustering standard errors at the community level in all regressions.[15] In general, the estimator performs well, in that the signs and magnitudes of most coefficients are stable across specifications. However, few of the estimated coefficients on the control variables are not statistically different from zero. It could be that the most important factor driving the increase in overweight status is simply time, and we have partialed out province-year effects from all of the presented regressions.

We find that when we do not control for individual fixed effects, migration appears to have a negative, statistically significant relationship with overweight status (Table 2, column 1, row 1). However, when we control for individual fixed

[14] A final concern might be that children are negatively selected into the village; that is, healthy children might migrate with their parents. We believe this concern is minimal as few children migrate in China before the age of 14, and we do not include older children in estimation.

[15] See Appendix Table 1 for descriptive statistics on all variables used in regressions in the paper.

effects (column 2), we find that the magnitude of the coefficient declines from -0.041 to -0.013 and the statistical significance is lost. Since the model that controls for individual fixed effects is able to control for more unobservable heterogeneity, we focus on these results rather than the OLS results, though we present OLS results throughout the paper for reference purposes.

Next, we explore whether or not the results differ for younger and older children. In columns 3 and 4, we present results for children aged 2 to 7, and in columns 5 and 6, we present results for children aged 8 to 14. Although all of the estimated coefficients are negative, the fixed effects coefficients are not significantly different than zero. As a result, to this point we have very weak evidence of a relationship between household level migration and overweight status.

However, as discussed above parental migration may affect children differently from migration by other household members. Therefore, we next break up the migration variable into two variables, and we estimate equation (2), again using overweight status as the dependent variable and both OLS and fixed effects methods (Table 3). The overall findings (columns 1 and 2) show that at the very least, point estimates are quite different for parents (row 1) than for other household members (row 2). The point estimates for parental migrants are both negative, whereas with fixed effects the point estimate for the other household members variable is actually positive. The negative, significant coefficient in column 1 of Table 2 seems also to be driven by parental migration, as the two estimates are quite similar.

We find more revealing results when we break up the sample into younger and older children, as in Table 2 (Table 3, columns 3-6). We find a large, negative coefficient on the parental migration variable when we are using fixed effects (-0.23). The coefficient is significant at the 5 percent level. The OLS coefficient is somewhat smaller and also significant. These results suggest that younger children are in fact less likely to be overweight when their parents migrate. Meanwhile, the estimated coefficient on the parental migration variable is positive and not statistically significant for older children. Therefore this finding must apply to younger but not older children.

We next use underweight status as the dependent variable, again initially specifying one variable to denote migrant households (Table 4). Unlike the results for overweight status, we initially find that the fixed effects estimate for the whole sample is both positive and weakly statistically significant (column 2, row 1; significant at the 10 percent level). The estimate indicates that migrant households are associated with more underweight children. When we break up the sample into younger and older children, we find that the estimated coefficient is only again weakly significant among older children, and not among younger children. This finding indicates that potentially households are turning to older children to do additional work around the households when migrants leave, since activity is related to weight status. If these children already had low BMI-for-age, they might be at risk for becoming underweight.

We find consistent results when we break up the migration variable by parents and others (Table 5). We find a significant, positive coefficient for the whole sample on other household members, but the subsample estimates are not significant, making this finding appear spurious. Whereas the estimated coefficient on parental migration is not significant for the whole sample (column 2), it is significant at the 5 percent level for older children (aged 8-14; column 6) and implies nearly a 7 percentage point increase in the probability of being underweight. Given that some work might shift to these children, this finding is quite plausible.

Before exploring potential explanations for these findings within the conceptual framework we presented above, it is first worthwhile considering what impact the endogeneity of migration might have on our findings. We must be concerned that some unobservable shock affects both migration and children's nutritional status, and therefore might bias our findings. The primary concern would be specific types of shocks, such as health or income shocks.[16] However, the literature on China's migration has not shown a significant relationship between income shocks and migration; by far, the more important driving force behind the expansion of migration has been the growth of migrant networks. If this bias exists, once we control for community characteristics it would likely be quite small.

Continuing to think through potential biases, we might expect that if unobservable health shocks affected the child between surveys, we likely underestimate the effects of migration on weight status. To explain why, consider how unobservable health shock to an adult might affect households. If an adult became sick, it likely decreases the probability of migration (Giles and Mu, 2007), and also decreases the probability of overweight status, as the total time available to

[16] Though income is measured in the CHNS, measurement error in composite variables such as income make it unlikely we could actually measure income shocks, and they may occur in between surveys as well.

the household to allocate to household tasks by adults will also decrease. Therefore the overall bias is positive, and we could be underestimating the effect of parental migration on overweight status.

Shocks to children's health work in a similar manner. We cannot directly test how health shocks could bias our results. We can, however, show that the initial nutritional status of children is not related to the household migration decision (Table 6). We compare the mean HAZ score, overweight status indicator, and underweight status indicator in the previous survey round for all observations in the fixed effects regressions, to learn whether there are obvious differences between children in migrant households and children in non-migrant households. In the first panel, we test whether the three nutritional indicators are equivalent for children aged 2 to 7 in the two groups, and then we repeat the tests for children in parental migrant versus non-migrant households. The second panel repeats the tests for children aged 8 to 14. Since we focus our results on the discussion of children with migrant parents, here we note that there are no statistical differences between the lagged average HAZ scores, overweight status, or underweight status among children with and without migrant parents, in both age ranges. This exercise provides suggestive evidence that children's nutrition is unlikely to affect subsequent migration decision of their household members.

Therefore, we believe that while we are not claiming a causal relationship between migration and weight status, we have found a robust relationship that would not be subject to various omitted variable biases.

6.2 Mechanisms: Migration and Children's Nutritional Outcomes

To this point, we have found a robust negative relationship between migrant parents and overweight status among younger children and a robust positive relationship between migrant parents and underweight status among older children. To help us explain these results, we turn back to the CHNS data, which includes detailed information about dietary intakes by individual and time allocation by household tasks. We specifically want to test whether we observe changes in diet among children associated with migration, and whether or not time allocations change within the household in response to migration, based on the hypotheses from the conceptual model described in Section 3.

We initially replace the dependent variable in equations (1) and (2) with four variables measuring individual food intakes: total calories consumed; and the shares of calories that are fats, proteins, and carbohydrates, respectively (Table 7). We find weak evidence that among both children who are aged 2 to 7 and children aged 8 to 14 that caloric consumption increases when migrants leave the household (row 1) and more specifically when parental migrants leave (row 2). The estimated coefficients, particularly in the fixed effects regressions, are positive, but not significantly different than zero. As a result, we can conclude that increases in incomes from migration are not changing the amount children are eating, at least at the mean.

When we look at the calorie composition, we find one interesting pattern, among 8 to 14 year olds. We find that the calories from protein in the diet decreases by 0.7%. Given that the mean percentage in the sample was 11.4%, we find that protein intakes decrease by about 7 percent from the mean. In other words, the quality of the diet may suffer somewhat with migration, particularly given that protein intakes are not high on average to begin with.

Next, we replace the dependent variable in equations (1) and (2) with three specific variables that measure time allocations. First, we use the total time spent by the household on child care for those aged 6 and younger; next, the total time spent by the household preparing and cooking food; and finally, the total time spent buying food (Table 8). Though we do not find very robust results on the amount of time spent on child care, the results on time spent preparing, cooking, and buying food are quite striking. For example, in households with children aged 2-7, we find that the total amount of time spent on preparing and cooking food is 3.8 hours per week lower in migrant households, *ceteris paribus*, and 4.8 hours per week lower in households in which parents are migrants (Panel B, rows 1 and 2). The total time spent buying food shows a similar pattern; it is also 1.4 hours lower in households with migrants and/or migrant parents among children aged 2 to 7 (Panel C, rows 1 and 2). These results indicate a clear channel through which younger children of migrant parents are less likely to be overweight. Less time is spent by household members on food preparation in such households, and because rural households are not likely to eat prepared foods or food otherwise prepared outside the home, it is possible that such children are getting lower quality food to eat. Although we do not find evidence in the caloric intake measures that this is true, we are both looking at averages across the sample in that table, and the measures were based on only three days of consumption, which may not be representative of the child's true diet.

We next look at household chores that might be performed by children in this age range, since their participation in these activities might explain their higher incidence of underweight. In Table 9, the dependent variable is measured at the child, not the household level (as in Table 8). In fact, we find some evidence that children aged 8 to 14 are both more likely to be doing chores and more likely to be cooking meals themselves. In column 1, we observe that children aged 8-14 in migrant households are 6.7 percentage points more likely to perform any chores around the house, though the estimate is only significant at the 10 percent level and we do not find the same when we break up migrants by parents or not (column 1). There is no evidence of an effect among hours worked either (column 3). Perhaps the most interesting finding is in column 4, as we find that children in migrant households spend half an hour more per week cooking the household meals. It seems that older children in migrant households are asked to take on more of the burden of cooking meals for the household, and one could reason that taking on the cooking actually leads such children to become more likely to be underweight. Finally, we also find a negative coefficient on the weekly hours of child care performed by these children (column 6); it could be that children are simply less cared for in migrant households than non-migrant households.

In summary, we find that parental migration is negatively correlated with overweight status among younger children and positively correlated with overweight status among older children, holding individual level fixed effects constant. When we turn to the data to find suggestive evidence that children receive less time from their parents, we find results consistent with the idea that parents spend less time cooking for and buying food among younger children, which may lower the prevalence of overweight status. Older children in migrant households are more likely to actually do the cooking, which suggests that their own cooking may be related to the increase in underweight status. In both cases, however, there appears to be a distinct allocation of time away from caring for children as a result of migration, which may be related to the consequences for weight status that we find.

7. Conclusion

In this paper, we have explored the relationship between migration and nutritional status, using a repeated cross-sectional data set collected in rural China. In the overall sample, we found no discernable impacts on nutritional status. However, when we broke the data into two subsamples of younger and older children, we find that younger children (aged 2 to 7 years) are less likely to be overweight when parents migrate, and migration is associated with more older children (aged 8 to 14 years) of underweight status. As a suggestive explanation for these findings, we find that in migrant households with younger children, adults spent less time on food preparation and purchase than in other households. In other words, less time seems to be allocated to raising children when a parent leaves. Although the reduction in the probability of overweight status seems to be a positive externality of this reduction in time spent on children, it would be worth exploring in further research whether or not parental migration is associated with other problems, such as psychosocial problems, related to child development.

Suggestive of other potential problems, we also find that older children are more likely to be underweight when their parents are migrants, and in general in migrant households such children are more likely to do additional cooking. As children get older, they can perform more tasks within households, but parents still need to monitor the development of their children and ensure that the tasks being performed are not detrimental to their continued development.

Because we do not have the data to make causal inferences, our paper also begs further research. In a context like that of China, where parents are likely to continue to migrate and leave their children behind, it is important to better understand the effects of migration on the children left behind, not just on their nutritional status but on their health more directly. While we find evidence of a potentially unexpected benefit of migration for some children (a reduction in the probability of overweight status), other costs of migration may be more hidden and deserve policy attention in rural China. Furthermore, our results do not speak to potential effects of migration on particularly young children (e.g. those under 2 years old) for whom nutritional investments are most important. Studying such outcomes is impossible with the CHNS because of the lag time (at least two years) between rounds. These results suggest that a survey similar to the CHNS designed to understand whether migration affects changes in anthropometric measures for young children in China could be worthwhile.

Figure 1. Probability of Being Overweight, CHNS, 1997-2006 rounds, by Age

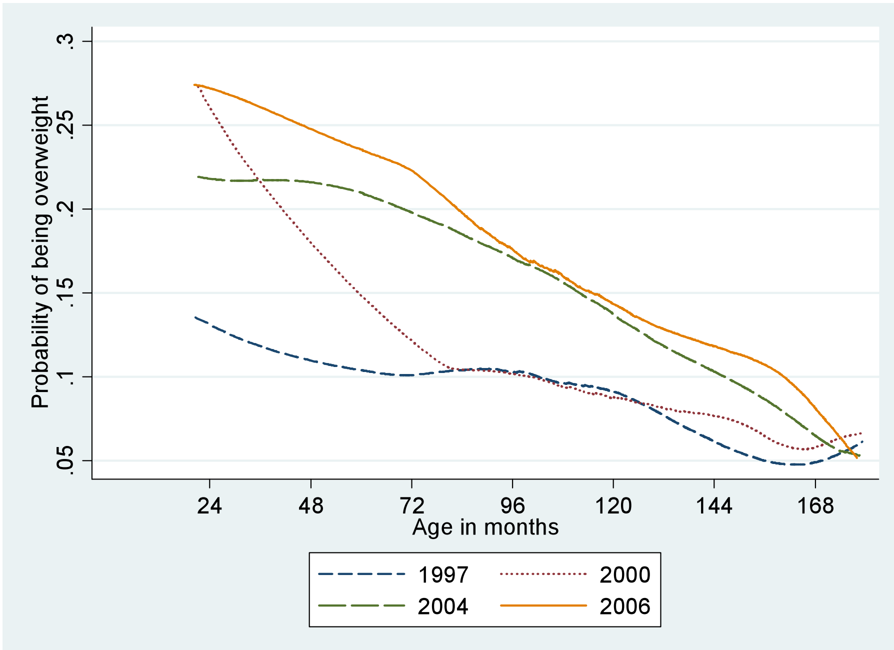

Figure 2. Probability of being underweight, CHNS, 1997-2006 rounds, by Age

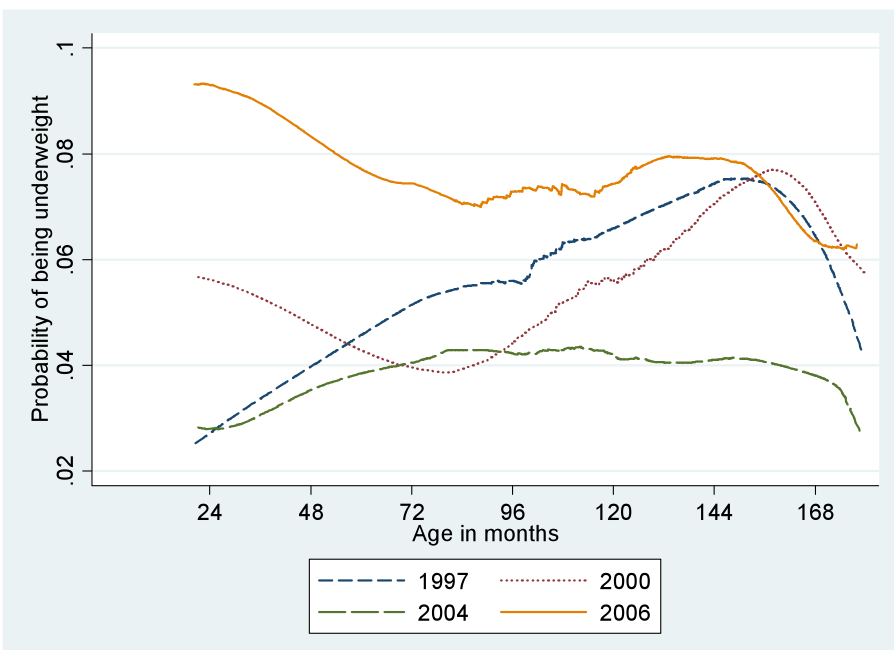

Figure 3. Probability of Being Overweight, by Migrant Household Status, pooled 1997-2006 CHNS data

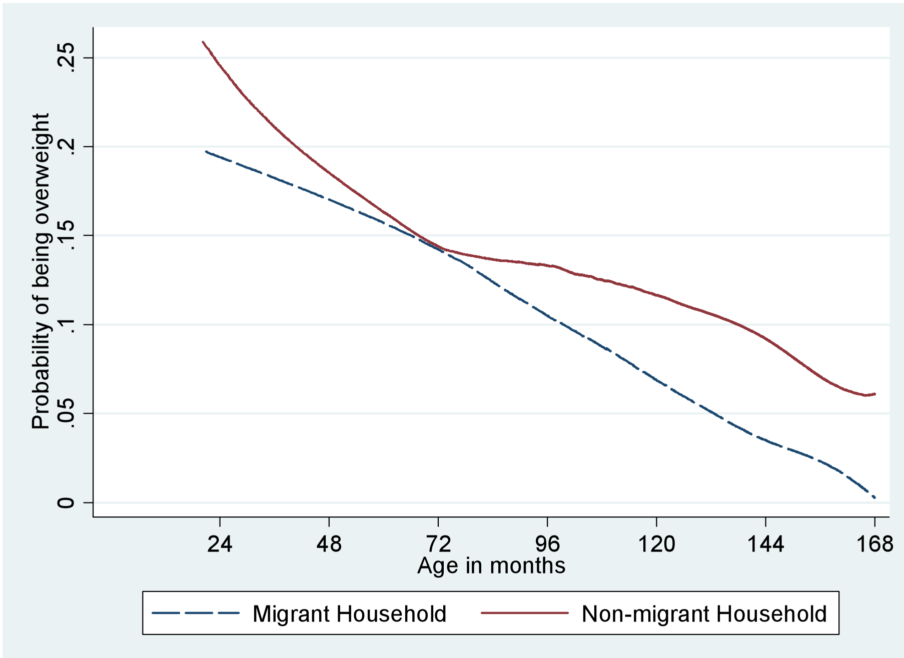

Figure 4. Share of Children that are Underweight, by Migration Status, pooled 1997-2006 CHNS data

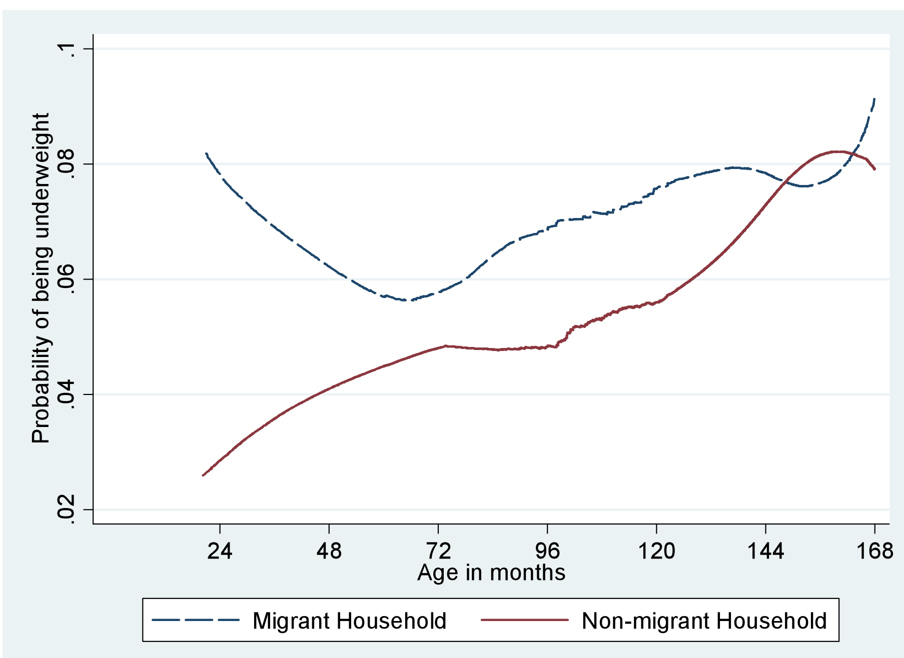

Table 1. Migration rate of household members by year

	All	1997	2000	2004	2006
Migrant Household	0.229	0.086	0.199	0.340	0.403
	(0.420)	(0.280)	(0.400)	(0.474)	(0.491)
Migrant Parent	0.133	0.042	0.084	0.242	0.264
	(0.340)	(0.201)	(0.277)	(0.429)	(0.441)
Other Household Member Migrated	0.096	0.044	0.116	0.099	0.139
	(0.295)	(0.205)	(0.320)	(0.298)	(0.347)
Number of Obs.	2376	641	873	517	345

Note: Standard errors are in parentheses. Samples include children who stayed in the survey for at least three consecutive rounds.

Table 2. Estimating the Relationship between Migrant Households and Children's Probability of Being Overweight, Aged 2-14, CHNS 1997-2006

Sample, Estimation Method	**age 2-14 OLS**	**age 2-14 FE**	**age 2-7 OLS**	**age 2-7 FE**	**age 8-14 OLS**	**age 8-14 FE**
Migrant Household	-0.035**	-0.007	-0.061	-0.084	-0.015	0.019
	(0.016)	(0.020)	(0.046)	(0.066)	(0.015)	(0.024)
Assets per capita (log)	0.001	-0.000	-0.014	0.031	0.001	-0.004
	(0.005)	(0.010)	(0.015)	(0.039)	(0.005)	(0.011)
Gender (1=male)	-0.025*		-0.039		-0.021	
	(0.015)		(0.038)		(0.019)	
Share of HHs with Tap Water	-0.001	-0.025	-0.078	-0.062	0.025	0.069
	(0.023)	(0.039)	(0.058)	(0.099)	(0.020)	(0.046)
Village has Health Clinic	0.029	-0.017	0.047	-0.003	0.000	-0.044
	(0.028)	(0.033)	(0.078)	(0.102)	(0.025)	(0.043)
Free Market Price, Rice	0.007	0.003	0.017	-0.001	-0.001	-0.001
	(0.005)	(0.004)	(0.016)	(0.011)	(0.004)	(0.005)
Free Market Price, Wheat Flour	-0.005	0.002	-0.018	-0.002	0.003	0.006
	(0.007)	(0.007)	(0.015)	(0.019)	(0.007)	(0.008)
Free Market Price, Pork	0.001	0.000	-0.000	0.002	0.000	-0.000
	(0.003)	(0.003)	(0.008)	(0.012)	(0.003)	(0.003)
Mother's age	0.000		0.005		-0.001	
	(0.001)		(0.006)		(0.002)	
Mother's years of schooling	-0.001		-0.002		-0.000	
	(0.001)		(0.003)		(0.001)	
Child Age Dummies	Included	Included	Included	Included	Included	Included
Province-Year Dummies	Included	Included	Included	Included	Included	Included
Number of children	998	998	208	208	678	678
Number of observations	2,376	2,376	416	416	1,386	1,386

Notes: Standard errors clustered at the community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Estimating the Relationship between Migrant Households, by Parental/Non-Parental Migration, and Children's Probability of Being Overweight, Aged 2-14, CHNS 1997-2006

	age 2-14 OLS	**age 2-14 FE**	**age 2-7 OLS**	**age 2-7 FE**	**age 8-14 OLS**	**age 8-14 FE**
Parent of Child is a Migrant	-0.051***	-0.032	-0.114**	-0.211***	-0.026	0.029
	(0.017)	(0.027)	(0.054)	(0.080)	(0.018)	(0.032)
Other Household Member is a Migrant	-0.013	0.024	0.016	0.074	-0.001	0.009
	(0.022)	(0.024)	(0.064)	(0.076)	(0.019)	(0.025)
Assets per capita (log)	0.001	-0.000	-0.014	0.038	0.001	-0.004
	(0.005)	(0.010)	(0.015)	(0.037)	(0.005)	(0.010)
Gender (1=male)	-0.025*		-0.035		-0.021	
	(0.015)		(0.038)		(0.019)	
Share of HHs with Tap Water	0.000	-0.024	-0.078	-0.066	0.026	0.069
	(0.023)	(0.039)	(0.059)	(0.096)	(0.020)	(0.046)
Village has Health Clinic	0.031	-0.018	0.059	0.007	0.001	-0.044
	(0.027)	(0.032)	(0.078)	(0.106)	(0.025)	(0.043)
Free Market Price, Rice	0.007	0.003	0.016	-0.001	-0.001	-0.000
	(0.005)	(0.004)	(0.016)	(0.012)	(0.004)	(0.005)
unbleached flour: free market price	-0.005	0.002	-0.018	-0.001	0.003	0.006
	(0.007)	(0.007)	(0.015)	(0.019)	(0.007)	(0.008)
pork(fatty&lean): free market price	0.001	0.000	0.001	0.006	0.000	-0.000
	(0.003)	(0.003)	(0.008)	(0.012)	(0.003)	(0.003)
Mother's age	-0.000		0.003		-0.002	
	(0.001)		(0.006)		(0.002)	
Mother's years of schooling	-0.001		-0.002		-0.000	
	(0.001)		(0.003)		(0.001)	
Child Age Dummies	Included	Included	Included	Included	Included	Included
Province-Year Dummies	Included	Included	Included	Included	Included	Included
Number of children	998	998	208	208	678	678
Number of observations	2,376	2,376	416	416	1,386	1,386

Notes: Standard errors clustered at the community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Estimating the Relationship between Migrant Households and Children's Probability of Being Underweight, Aged 2-14, CHNS 1997-2006

Sample, Estimation Method	**age 2-14 OLS**	**age 2-14 FE**	**age 2-7 OLS**	**age 2-7 FE**	**age 8-14 OLS**	**age 8-14 FE**
Migrant Household	0.026*	0.032**	-0.005	0.023	0.037*	0.050**
	(0.014)	(0.015)	(0.023)	(0.050)	(0.020)	(0.021)
Assets per capita (log)	0.002	0.004	0.016**	0.004	-0.002	-0.003
	(0.003)	(0.006)	(0.007)	(0.021)	(0.005)	(0.009)
Gender (1=male)	0.029***		0.026		0.032**	
	(0.010)		(0.022)		(0.015)	
Share of HHs with Tap Water	-0.001	-0.010	0.009	-0.006	0.007	-0.041
	(0.011)	(0.032)	(0.026)	(0.044)	(0.016)	(0.056)
Village has Health Clinic	0.013	0.021	0.015	0.153***	0.022	0.001
	(0.023)	(0.026)	(0.049)	(0.054)	(0.033)	(0.046)
Free Market Price, Rice	-0.003	-0.004	-0.003	0.002	-0.002	-0.002
	(0.002)	(0.003)	(0.003)	(0.005)	(0.002)	(0.003)
Free Market Price, Wheat Flour	0.002	-0.002	0.003	0.022*	0.001	-0.005
	(0.002)	(0.004)	(0.007)	(0.013)	(0.003)	(0.004)
Free Market Price, Pork	0.002	0.000	-0.009*	-0.012**	0.005**	0.004
	(0.002)	(0.002)	(0.005)	(0.005)	(0.002)	(0.003)
Mother's age	0.000		0.005		-0.002	
	(0.001)		(0.005)		(0.002)	
Mother's years of schooling	-0.000		-0.000		-0.001	
	(0.001)		(0.002)		(0.001)	
Child Age Dummies	Included	Included	Included	Included	Included	Included
Province-Year Dummies	Included	Included	Included	Included	Included	Included
Number of children	998	998	208	208	678	678
Number of observations	2,376	2,376	416	416	1,386	1,386

Notes: Standard errors clustered at the community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Estimating the Relationship between Migrant Households, by Parental/Non-Parental Migration, and Children's Probability of Being Underweight, Aged 2-14, CHNS 1997-2006

	age 2-14 OLS	**age 2-14 FE**	**age 2-7 OLS**	**age 2-7 FE**	**age 8-14 OLS**	**age 8-14 FE**
Parent of Child is a Migrant	0.010	0.018	-0.038	-0.026	0.040	0.061**
	(0.017)	(0.015)	(0.025)	(0.044)	(0.026)	(0.027)
Other Household Member is a Migrant	0.048**	0.051**	0.043	0.083	0.033	0.037
	(0.024)	(0.025)	(0.045)	(0.075)	(0.031)	(0.037)
Assets per capita (log)	0.002	0.004	0.015**	0.007	-0.002	-0.003
	(0.004)	(0.006)	(0.007)	(0.021)	(0.005)	(0.009)
Gender (1=male)	0.028***		0.029		0.032**	
	(0.010)		(0.021)		(0.015)	
Share of HHs with Tap Water	0.000	-0.010	0.010	-0.008	0.007	-0.041
	(0.011)	(0.033)	(0.026)	(0.041)	(0.015)	(0.057)
Village has Health Clinic	0.014	0.021	0.023	0.157***	0.022	0.001
	(0.023)	(0.026)	(0.050)	(0.053)	(0.033)	(0.046)
Free Market Price, Rice	-0.003	-0.004	-0.003	0.002	-0.002	-0.002
	(0.002)	(0.003)	(0.004)	(0.005)	(0.002)	(0.003)
unbleached flour: free market price	0.002	-0.003	0.003	0.023*	0.001	-0.005
	(0.002)	(0.003)	(0.007)	(0.013)	(0.003)	(0.004)
pork(fatty&lean): free market price	0.002	0.000	-0.009*	-0.011**	0.005**	0.004
	(0.002)	(0.002)	(0.005)	(0.005)	(0.002)	(0.003)
Mother's age	-0.000		0.004		-0.002	
	(0.001)		(0.005)		(0.002)	
Mother's years of schooling	0.000		-0.000		-0.001	
	(0.001)		(0.002)		(0.001)	
	0.010	0.018	-0.038	-0.026	0.040	0.061**
Child Age Dummies	Included	Included	Included	Included	Included	Included
Province-Year Dummies	Included	Included	Included	Included	Included	Included
Number of children	998	998	208	208	678	678
Number of observations	2,376	2,376	416	416	1,386	1,386

Notes: Standard errors clustered at the community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. Comparing Initial Health Conditions by Household Migration Status

	Age 2-7		
	Migrant HH (1)	**Non-migrant HH (2)**	**(1)-(2)**
Lagged height for age z-score	-1.253	-1.367	0.114
	(1.469)	(1.491)	(0.497)
Lagged overweight	0.155	0.147	0.009
	(0.365)	(0.355)	(0.152)
Lagged underweight	0.034	0.04	-0.006
	(0.184)	(0.197)	(-0.19)
	Migrant Parent (1)	**Non-migrant Parent (2)**	**(1)-(2)**
Lagged height for age z-score	-1.253	-1.367	0.114
	(1.469)	(1.491)	(0.497)
Lagged overweight	0.155	0.147	0.009
	(0.365)	(0.355)	(0.152)
Lagged underweight	0.034	0.04	-0.006
	(0.184)	(0.197)	(-0.19)
	Age 8-14		
	Migrant HH (1)	**Non-migrant HH (2)**	**(1)-(2)**
Lagged height for age z-score	-1.217	-1.012	-0.205
	(1.233)	(1.219)	(-2.576)
Lagged overweight	0.07	0.11	-0.039
	(0.256)	(0.313)	(-2.236)
Lagged underweight	0.044	0.045	-0.001
	(0.205)	(0.207)	(-0.049)
	Migrant Parent (1)	**Non-migrant Parent (2)**	**(1)-(2)**
Lagged height for age z-score	-1.253	-1.367	0.114
	(1.469)	(1.491)	(-0.497)
Lagged overweight	0.155	0.147	0.009
	(0.365)	(0.355)	(-0.152)
Lagged underweight	0.034	0.04	-0.006
	(0.184)	(0.197)	(-0.19)

Note: Standard deviations in parenthesis in columns 1 and 2. In column 3, we present t-statistics that test the hypothesis that the two sample means are equal; the test statistics are in parenthesis in the third column.

Table 7. Estimating the Relationship between Migration and Nutrition Intakes, Aged 2-14, CHNS 1997-2006

	age 2-14 OLS	age 2-14 FE	age 2-7 OLS	age 2-7 FE	age 8-14 OLS	age 8-14 FE
			Total Energy Consumed (Kcal/Day)			
Migrant Household	30.161	27.428	77.939	42.157	16.271	21.749
	(27.334)	(47.326)	(49.295)	(88.092)	(38.553)	(61.125)
Parent of Child is a Migrant	96.992***	120.398**	101.117	125.267	99.714**	136.604*
	(30.452)	(47.418)	(70.524)	(115.235)	(41.487)	(71.211)
Other Household Member is a Migrant	-66.578*	-88.700	47.316	-54.183	-97.143*	-98.387
	(39.781)	(67.279)	(66.440)	(118.470)	(53.671)	(83.325)
			Share of Fat in Total Energy Consumed			
Migrant Household	0.002	-0.002	0.002	0.026	-0.002	-0.007
	(0.008)	(0.009)	(0.011)	(0.019)	(0.009)	(0.011)
Parent of Child is a Migrant	0.009	0.003	0.013	0.052*	0.004	-0.008
	(0.010)	(0.012)	(0.016)	(0.029)	(0.012)	(0.014)
Other Household Member is a Migrant	-0.009	-0.009	-0.014	-0.004	-0.010	-0.006
	(0.009)	(0.011)	(0.014)	(0.025)	(0.010)	(0.015)
			Share of Protein in Total Energy Consumed			
Migrant Household	-0.003*	-0.002	-0.006**	0.003	-0.002	-0.003
	(0.002)	(0.002)	(0.003)	(0.006)	(0.002)	(0.003)
Parent of Child is a Migrant	-0.006***	-0.007***	-0.012***	-0.006	-0.006**	-0.007**
	(0.002)	(0.002)	(0.003)	(0.005)	(0.002)	(0.004)
Other Household Member is a Migrant	0.002	0.003	0.002	0.013	0.002	0.001
	(0.003)	(0.003)	(0.004)	(0.008)	(0.003)	(0.004)
			Share of Carbohydrate in Total Energy Consumed			
Migrant Household	0.001	0.005	0.004	-0.029	0.004	0.011
	(0.007)	(0.009)	(0.011)	(0.021)	(0.009)	(0.011)
Parent of Child is a Migrant	-0.003	0.004	-0.002	-0.046	0.002	0.016
	(0.010)	(0.011)	(0.016)	(0.030)	(0.011)	(0.014)
Other Household Member is a Migrant	0.008	0.006	0.012	-0.009	0.008	0.005
	(0.008)	(0.010)	(0.014)	(0.026)	(0.010)	(0.015)

Notes: Other control variables in Table 2-5 are included and not reported. Standard errors clustered at the community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8. Estimating the Relationship between Migration and Time for Child Care and Making Meals Aged 2-14, CHNS 1997-2006

	age 2-14 OLS	age 2-14 FE	age 2-7 OLS	age 2-6 FE	age 8-14 OLS	age 8-14 FE
Total Time Spent on Care of Children Aged 6 and Younger (hours/week)						
Migrant Household	-0.304	-0.623	-1.002	-5.738*	-0.104	-0.143
	(0.564)	(0.922)	(1.424)	(2.979)	(0.410)	(0.644)
Parent of Child is a Migrant	-0.920	0.066	-2.814	-4.331	-0.172	-0.156
	(0.780)	(1.152)	(1.740)	(3.149)	(0.666)	(0.826)
Other Household Member is a Migrant	0.455	-1.098	1.241	-7.451*	-0.026	-0.151
	(0.868)	(1.136)	(2.221)	(4.001)	(0.591)	(0.801)
Total Time Spent on Preparing and Cooking Food (hours/week)						
Migrant Household	-0.984**	-1.864***	-1.116	-3.821**	-0.993**	-1.257*
	(0.439)	(0.587)	(0.751)	(1.547)	(0.458)	(0.751)
Parent of Child is a Migrant	-1.761***	-2.506***	-2.411**	-4.857**	-1.419**	-1.854*
	(0.590)	(0.728)	(1.048)	(1.999)	(0.557)	(0.946)
Other Household Member is a Migrant	-0.051	-0.985	0.822	-2.120	-0.664	-0.304
	(0.566)	(0.790)	(0.892)	(2.368)	(0.636)	(1.029)
Total Time Spent on Buying Food (hours/week)						
Migrant Household	-0.564***	-0.948***	-0.512**	-1.418***	-0.578***	-0.541*
	(0.150)	(0.216)	(0.226)	(0.504)	(0.174)	(0.283)
Parent of Child is a Migrant	-1.064***	-1.400***	-1.018***	-1.566**	-1.079***	-0.902**
	(0.150)	(0.253)	(0.270)	(0.619)	(0.188)	(0.380)
Other Household Member is a Migrant	0.147	-0.497	0.236	-1.277**	0.125	-0.243
	(0.247)	(0.339)	(0.335)	(0.639)	(0.303)	(0.385)

Notes: Other control variables in Table 2-5 are included and not reported. Standard errors clustered at the community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.