Children of Migrants: The Impact of Parental Migration on their Children's Education and Health Outcomes

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Abstract

China is changing from an agricultural society into a modern society and accompanying this process is the largest rural-urban migration movement in human history. Such a migration inevitably affects a large cohort of children. Currently China has more than 50 million children who are growing up without parents due to their parental migration choices. Understanding how their health and education outcomes have been affected, thus, is very important. In this paper we use a unique longitudinal data to study the impact of parental migration experience on health and education outcomes of their left-behind children in short and long run. We find that children who grew up away from mothers exhibit significantly lower height and weight, while children who grew up away from fathers indicate lower test scores in Chinese and math.

Key word: migration, children, education, health, China
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1 Introduction

Human capital development of children has long been an intensive interest of economists. This is so not only because children's education and health outcomes today have a significant implication about their social and economic wellbeing in the future, but also because children are the future of a society and how they are doing today as a group will predict the quality of human capital supply in the future.

China is currently transforming rapidly from an agricultural society to a modern society dominated by industry and services. Of the approximately 900 million workers born in the countryside (70% of the total labor force), roughly 17% (150 million) have migrated to cities to work (NBS 2009). This proportion is expected to grow rapidly in the coming years, with rural-urban migrant workers already accounting for more than half of the total labor force in some of the major cities. To date, this, perhaps, is the largest population mobility in human history.

Migration not only impacts on the current population of adults but is also very likely to affect the human capital development of future generations via the education and health outcomes of migrant children. Migration may bring higher income and hence potentially more economic resources for children's education and health investment, but at the same time it may also have adverse effects on children via lack of parental time invested on children or other factors. In China, institutional restrictions almost guarantee such adverse effect of migration. This is becuase adult migrants are often unable to bring their children with them when they choose to work in cities due to the household registration system (hukou), which provides rural migrant workers and their children with very limited access to subsidized education, health and other public services in the cities. Children who remain in rural villages either live with other family members or enroll in boarding schools, without the care and supervision by their parents. In addition, a disruption of education can also occur when some children accompany their parents (migrant workers) to cities. While these children stay with their parents, they are often excluded from the urban public school and health systems.

Available estimates suggest that in China a significant number of children are affected by parental migration. A study by the All-Women Federation China (2006) based on the 2005 mini-Census of one per cent of the national population estimates that the number of children aged 0-18 who are left-behind in rural villages due to parental migration is about 58 million (40 million 0-15 years of age), accounting for 28 per cent of all rural children. Also, our own survey of 5000 migrant households in 15 cities suggests that around 57% of the children aged 0-15 were left-behind in rural villages while the remainer 43% were accompaying their parents in cities in 2008. Based on this ratio and the estimate of 58 million of left-behind children, the number of children who migrated with their parents should be around 25 million. Thus, a total of some 83 million children may be affected the large migration movement.

There is a large body of literature on the determinants of children's development and learning processes, which clearly demonstrates the importance of parental care (see, for example Whitebook et al., 1989; Love et al., 1996; Lamb, 1998; McLanahan and Sandefur, 1994; Sigle-Rushton and McLanahan, 2002; Ginther and Pollak, 2003). The lack of parental care for the left-behind children of migrants in China, therefore, can potentially lead to the under-investment in their education, nutrition and health. There is also a literature that indicates that school quality has significant impact on a child's school performance (Rivkin, Hanushek, and Kain, 2005; Black, Smith and Daniel, 2005). This is extremely relevant to children who migrated to cities with their parents as a large proportion of them are unable to access city public school system.

Despite its importance, there is relatively scarce evidence for China on the impact of parents' migration on children's education and health. A few available studies are either descriptive in nature or based on small sample size and data from limited geographic regions. The general findings are that lack of parental care increases the mental pressure and sense of insecurity of left-behind children; enrolment rate of migrated children in cities is not only lower than that of their urban counterparts, but also lower than non-migrant children in the migrant-sending communities; and that the educational outcomes of migrant children in cities are singificantly worse than their local counterparts (Ye, Murrays and Wang, 2005; Han, 2003; Liang and Chen, 2007; Feng and Chen, 2011; and xxx). One study, however, does find no effect of change in children's educational outcomes just before and after their parents migrated using school record data (Chen, Huang, Rozelle, and Zhang, 2007).

In this paper we use a panel survey of 8000 rural households in 9 provinces from the Rural-Urban Migration in China (RUMiC) project to study the impact of parental migration on education and health outcomes of rural children. Differring from the previous studies, our study uses a more representative sample of rural households. We also have more detailed information on parental migration activities. As such, we are able to examine not only the short term health and education effect of whether the parents were away in the past year and how long were they away, but also in the past three years and beyond. In addition, we are aware of the issue of endogeneity in parental migration decision and try to mitigate the problem by adopting the Instrumental Variable (IV) approach. We find a large negative effect of mothers' absent on children's health outcome and significant negative effect of fathers' absent on children's education outcome.

The paper is structured as follows. The next section provides some institutional background which is important in understanding the issue. Section 3 discusses in detaile the data used and summary statistics. Emprical methods are presented in Section 4, which is followed by the discussion of the results. Conclusions are given in Section 6.

2 Background

Economic development inevitably leads to substantial rural-urban migration. As an economy grows, demand for labor from the moden sector increases and the income gap between rural and urban sectors enlarges, which drives more and more rural workers to cities. This is the natural process of development and urbanization. This process in China, however, takes a unique form, whereby rural workers move to cities as "guest workers". Although there are 150 million rural migrants working in cities, they are still regarded as "rural people" (Du, Gregory, and Meng, 2005).

Ever since the Communist Party rose to power in 1949, China has had segregated rural and urban economies. Rural-urban migration was strictly restricted before the mid 1980s. As market oriented economic reform deepened, demand for unskilled labor in cities increased. To meet this demand, the government gradually relaxed the migration restrictions, but up until today migrants are still treated differentially from urban local people. In particular, migrant workers are restricted in the type of job they can obtain and in access to urban social welfare and social services, such as education, health care, unemployment benefits, and pensions (Meng and Manning, 2010). These restrictions prevent migrant workers from staying in cities for long and from bringing their families to cities. They often work in the cities for a few months to a few years, depending on their personal and family circumstances and then go back to their country home. Sometimes, they migrate back and forth.

As access to schools and health care in cities are very costly, many migrants leave their children behind in rural villages. Sometimes, one of the parents stays behind to look after the children, while other times children are left-behind with grandparents or other relatives, who may not be able to pay full attention to their needs. In, yet, other cases children of migrants are sent to stay in boarding schools, where living conditions are extremely poor and dorms are poorly managed. It is reported that "the quality of the facilities and the nature of the management (of the boarding schools) might best be described as horrific. The safety, hygiene, supervision, diet and nutrition are all serious problems to these boarding schools (REAP, 2009). A resent study has reported that boarding school students in rural areas are 9 centimeters shorter than the relevent mediam height set by WHO (Shi and Zhang, 2010). Another study finds boarding has a negative impact on school performance as well (Mo, Yi, Zhang, Shi, Rozelle, and Medina, 2012).

For children who travelled with their parents to cities, migration itself is a shock to their education continuity and to their normal family life. Many cities in China treat migrant children unfavorably, and restrict them from attending local public schools. As a result, migrants had to set up their own schools where the teachers are themselves migrants. For example, it was reported that among all the cities in China, Shanghai was one of the best in supporting education of migrant children. Even in Shanghai in 2011, though, there were still 30% of migrant children could not attend local public schools and were enrolled in Migrant Schools (Feng and Chen, 2011). In Beijing, number of students in migrant schools has increased by four-fold between 2001 and 2007 (Rozelle, Ma, Zhang, and Liu, 2009). Consequently, the quality of the education and health care received by migrant children is often compromised. While the average quality of education and health care in cities is probably higher than that in rural areas, the quality of migrant school education could be inferior to that of rural education. The study by Rozelle *et. al.* (2009) compared standardized math and Chinese test scores of 931 fourth grade children from 23 migrant schools in Beijing with 2692 same aged children in 67 rural schools in poor Shaanxi provicne and they find that students in Beijing migrant schools are doing worse than their counterparts in schools of poor rural areas. Feng and Chen (2011) find that on average migrant children enrolled in local public schools are 7.2 and 10 percentage points better off than migrant children enrolled in Migrant Schools in Shanghai with regard to the Chinese and maths test scores.

3 Data

3.1 Data, Variables, and Sample

The analysis is drawn from the 2008-2010 Rural-Urban Migration in China (RUMiC) Study, which is an annual longitudinal survey of migrants and non-migrants in China. The survey covers 10 provinces or municipalities that are major sending or receiving areas of rural-to-urban migration. In each province, a random sample of 8000 rural households, 5000 urban local households, as well as a sample of 5000 urban migrant households were drawn. In this paper we utilize the sample of rural households.

The rural surveys were conducted in around 800 rural villages between March and June each year by National Bureau of Statistics. All household members who are officially registered in the household, including those who have migrated to cites, are included in the survey. Information on household members who were not present at the time of the survey was reported by other household members. The attrition rate for the rural sample is very low. Over the three years we lost only 36 households, and gained 27 new households.

The RUMiC Study has a very rich set of data. It includes adults' education, employment and demography. In addition, it contains detailed information on parental migration experience, children's school test scores, height, weight, and parental/gardians' evaluation of children's health condition.

Our outcome variables are children's health status and educational achievement. Health status is measured by height, weight, general health and disability conditions. Educational achievement is measured by the test scores in Chinese and math attained in last school term, as well as the child's performance at school. The health outcomes are available for all the children aged 0-15 years, and the sample of children aged 6-15 is used for the anlysis of the educational outcomes. All the outcome variables were self-reported by main caretakers. Note that most Chinese primary schools give each student a booklet recording his/her test scores (Chen et. al., 2007). Thus, parents usually have good knowledge of their children's test scores. In addition to these individual scores, information on the full score was collected. Thus, even though rural schools across different provinces may use different scoring systems, we are able to obtain the proportion of the individual test score over the full score, which should be comparable across different schools and regions. Information on the test scores is only included in the 2009 and 2010 surveys. For the child's height and weight, we excluded observations with outliers which are suggested to be biologically implausible by the World Health Organization; that is, those that are more than four standard deviations away from the median based on the U.S. age- and gender-specific growth chart.

The main independent variable of interest is parental migration. Using the RUMiC Study, we define recent and historical parental migration; that is, the duration in which parents were away from rural home in the short run and in the long run. First, recent migration is defined to be the number of months in which parents were away in the previous year. This information is extracted from each wave of the RUMiC Study, which asked all the household members in the roster about how many months they were away from home in the previous year. From the 2008-2010 waves, we are able to obtain data on the duration of migration in 2007-2009.

Second, in order to construct a measure for historical parental migration, we use the following two pieces of information. One is which adults (aged 16 and above) have ever migrated for work, and if they have, when they first migrated. The other information is available for respondents who were away from home in 2008 for three months or more. For these respondents, it was asked in which month and year that 2008 episode (spell) of migration had started. Using these two pieces of information, we consider how many months parents were away from home after the child was born. Based on this, a variable is created indicating the share of the child's life time in which parents were away from rural home: i.e., (the number of months in which parents were away since the child was born) / (the total number of months since the child was born).

For example, if a parent has never migrated, the enumerator takes the value of zero. If the initial year of migration (or the start of the 2008 migration spell) was before the birth year of the child, we compute the number of months in which parents were away from rural home between the child's birth year and the end of 2006, assuming that parents were away in all the months during that period. Then this duration is added to the number of months away from home between 2007 and 2009 to obtain the enumerator. We do not include parental time away from home before the child was born because that is not relevant to the development of the child.

The assumption that parents were away in all the months during the period up to the end of 2006 is likely to be plausible when the start of the 2008 migration spell is used. However, when the start of the initial migration is used, there might have been intervals in which parents were at home. To the extent this is the case, the duration of historical parental migration is overstated in this measure. On the other hand, the period based on the 2008 migration spell understate the duration of historical parental migration if parents migrated since the birth of the child until the end of 2006, and yet stayed home in 2008. In this case, we are unable to include the pre-2007 duration of migration because the question on the start of the spell was asked only for those who migrated more than two months in 2008.

If the initial year of migration (or the start of the 2008 migration spell) was after the child's birth year, we compute the number of months in which the parent was away from home between the beginning of migration and the end of 2006 and add that to the duration of migration between 2007 and 2009. Finally, the enumerator is divided by the child's age measured in months (see Data Appendix for more details).

There are 4758, 4468, and 4198 children aged 0-15 years in each of the three waves, respectively. The sample of about 3414 children per wave provides necessary data for explanatory variables such as parental migration and basic child and parental characteristics. This sample, which pools three waves, is used for the analysis of the relationship between recent parental migration and child outcomes. For the analysis of historical parental migration, we focus on the sample of 2846 children whose information is available in all the three waves. We check whether basic characteristics (age, gender, birth weight, and the distance to public facilities) differ between the whole sample and the sample used in the paper (Appendix Table). The results with village fixed effects suggest that the analysis sample is older and more likely to include boys. However, the average birth weight and distance to public facilities do not differ significantly.

3.2 Summary Statistics

Table 1 shows the summary statistics of the outcome and explanatory variables used for the pooled regression analysis. Children in the sample are 9 years old on average, and 36 percent of them are reported to have excellent health. They score about 84 percent for the Chinese and math test scores, and their performance at school is reported to be somewhere between 2 ("good") and 3 ("average"). In the previous year, fathers were away for 3.6 months and mothers were away for 2.3 months on average. About 37 percent of fathers and 22 percent of mothers were away for at least on month in the previous year. Among those parents, the average duration was 9 months for both fathers and mothers.

The summary statistics of the outcome and explanatory variables used for the analysis of historical parental migration are shown in Table 2. Since the observations are from the 2010 survey, height, weight, and age are higher than the statistics shown in Table 1. Other characteristics do not differ much. The indicator for historical parental migration since the start of the 2008 migration spell suggests that, for the average child the father was away from home for 38 percent of their life time, and the mother was away for 25 percent of their life time. The alternative indicators for historical parental migration since the start of the initial migration spell exhibit higher values: for the average child, the father (mother) was away from home for 58 (37) percent of the child's life time. This is not surprising because the alternative indicators are more likely to overestimate the true duration of parental migration since the birth of the child.

Based on the indicator for historical parental migration based on the start of the 2008 migration spell, the father stayed home throughout their lives for about a half of the children, and the mother stayed home throughout their lives for 34 percent of children. Among those children whose father was away for at least a month since they were born, the average duration of the father's absence from home amounts to 75 percent of the child's life time. The equivalent figure for the mother is 74 percent. These statistics indicate that both fathers and mothers spend about the same time away from home once they leave home, although mothers are less likely to do so.

4 Estimation Strategy

4.1 OLS

We first employ the Ordinary Least Squares (OLS) method to estimate the relationship between the duration of recent parental migration and child outcomes. The following specification is used:

$$Y_{ijt} = \beta_1 M_{ijt} + \beta_2 X_{ijt} + \lambda_t + \theta_j + \epsilon_{ijt}, \tag{1}$$

where Y_{ijt} is the health or educational outcome for child i, in village j, in year t. M_{ijt} contains the two variables indicating the duration of migration measured in months by the mother and father in the previous year. The analysis period, t, ranges between 2008 and 2010. Thus, the previous year refers to 2007, 2008 and 2009. X_{ijt} is a vector of child-, household-, and village-level characteristics. These characteristics include the set of dummy variables interacting between the child's age and gender (gender specific age controls), the child's birth weight, the parents' age and height, as well as their number of years of schooling. Since eight percent of children stayed outside home at least one month in the previous year, the number of months the child was away is also controlled. The results do not change much when the sample is limited to those who stayed in rural home in the previous year. In addition, we control for the year fixed effects, λ_t, and the village fixed effect, θ_j. The error term, ϵ_t, is allowed to be correlated across time and among siblings within a household. About 28 percent of households have more than one child, as the one-child policy is not strictly implemented in rural areas.

Next, we examine the relationship between the child outcomes and historical parental migration using the OLS method as follows:

$$Y_{ij2010} = \beta_1 SM_{ij} + \beta_2 X_{ij2010} + \theta_j + \epsilon_{ij2010} \tag{2}$$

For this exercise, the outcome is limited to those observed in 2010. The variable of interest, SM_{ij}, is the share of a child's life time during which his/her parents migrated. The same set of control variables as Equation 1 is included, except for the year dummies. The duration of the child's stay outside home village is also not controlled in this specification because information is lacking on how much time children spent throughout their lives outside the village. The error term, ϵ_t, is allowed to be correlated among siblings within a household.

4.2 Instrumental Variable Method

The first two specifications provide a big picture on how parental migration is associated with child outcomes. However, the results do not provide a clear answer to whether parental migration has changed child outcomes, or parents whose children have a certain level of ability and innate health tend to migrate. In order to investigate the causal relationship, we use the Instrumental Variable (IV) method.

The instruments for the duration of recent parental migration are (1) the average hourly income earned by male and female migrants in potential destinations for rural individuals considering migration and (2) the average wage rate for daily laborer in the origin county. Alternatively, we use the difference between (1) and (2). Intuition behind the use of these instruments is that, the larger the gap in the wage rate is between a possible destination city and the origin county, the more likely that a potential individual moves to the city for work. Potential destination cities are defined to be three cities that are geographically closest to the origin county and the provincial capital city.

One might think that individuals with high ability or good health are more likely to be located in counties closer to cities with better economic opportunities because of their geographic mobility; and therefore, their children are more likely to exhibit higher educational achievement and good health. However, this is unlikely to be the case in China, where a change in one's residence or hometown has been restricted under the *hukou* system for more than 60 years. It is more likely that the income level in nearby cities is uncorrelated with unobserved traits of individuals. Therefore, the exclusion restrictions, one of the conditions for the instrumental variables, is likely to be met: i.e., migrants' hourly income in nearby cities is uncorrelated with unobserved factors affecting the outcomes of children in rural areas (such as their innate health and cognitive ability).

The data on the monthly income and number of work hours for migrants living in cities are extracted from the 2005 Population Census. The nearest three cities are identified based on the travel distance for each origin county. The data on the wage rate in the origin county in 2007, 2008, and 2009 are available in the RUMiC surveys. Using these data, we will investigate the correlation between the average hourly income in 2005 and the duration of parental migration in 2007-2009.

The instrument for the duration of historical parental migration is the average income earned by male and female workers in sectors that are likely to hire migrants in the potential destinations prior to the start of one's migration. We utilize the fact that the higher the wage rate in cities around the time when parents considered to migrate is likely to have affected their decision over staying in the home county or moving to an urban area. For example, if parents migrated between 1990 and 1999, the hourly urban income observed in 1990 in nearby cities are assigned. Since historical data do not offer information on migration status or the number of work hours among workers in cities, we use alternative measures for urban economic opportunities. One is the income of workers in sectors such as construction and services, which tend to hire migrants. This is available in the Urban Household Income and Expenditure Survey by the National Bureau of Statistics, which is an annual, repeated cross-section survey. The other is the per-employee wage bill, which can be obtained from the Statistical City Yearbook. This contains information on the total wage bill and total number of employee in each city. While these indicators might be less ideal than the hourly income of migrants extracted from the 2005 Population Survey, they could provide proxies for the level of economic opportunities in urban areas for potential rural migrants during the 1990s and 1980s, when parents were considering whether they migrate to cities for work. While data on the wage rate in the origin county prior to 2007 are unavailable, the set of dummy variables at the county level is likely to control for differential wage levels across different origins.

The method discussed above assigns the income level in nearby cities just before parents first migrated. A concern might arise that, among two individuals of the same age and origin, the one who started migrating earlier could be more ambitious and motivated, and their children might have higher cognitive ability and better health (alternatively, if early movers are more risk-loving, their children might have poorer health). If the income level in cities has a certain time trend (e.g., it was lower in earlier years and gradually increased, or it was high in earlier years and gradually decreased), then this instrument is correlated with unobserved traits related to children's educational achievement and health. In order to address this issue, we construct another instrument for historical parental migration. That is, we assign the urban income level when parents were at certain age (for instance, 16, 18, and 20) regardless of their actual timing of initial migration. This instrument is not subject to the endogeneity with respect to individual choice over the timing of migration, and is likely to provide a way to test the robustness of the IV results for historical parental migration.

5 Results

5.1 The relationship between child outcomes and recent parental migration

Table 3 exhibits the results of estimating the relationship between child outcomes and recent parental migration.[1] No health outcomes are significantly correlated with the duration of recent parental migration. The only significant association is found for the math test score (Column 6). An additional month in which the father is away from rural home is correlated with a 0.2 percentage point lower score in math. One interpretation is that fathers, who are more likely to report on the child's school performance if the mother was away in the previous year, are more likely to strictly evaluate the child's performance. On the other hand, maternal migration is positively correlated with the math test score.

Other results suggest that children who stayed away from home are talker and heavier. Since age and gender are controlled, this is likely to reflect the tendency for those children to be away from home, the positive effect of urban environment, or the combination of both. These children are also more likely to score high in math, but are less likely to be reported by the parents that they do well at school. Parental height is positively correlated with children's height and weight, and paternal schooling is positively associated with the two other indicators for the child's health and the test scores. To the extent that parental schooling and height are positively correlated with the income level they can attain, these positive associations are likely to be due to higher household income.[2] Children of older mothers tend to be talker and heavier, while children of older fathers are less likely to indicate excellent health and to score low on the Chinese and math tests.

The results are robust against excluding children who were away from home in the previous year at least one month (Appendix Table 2, Panel C). When village fixed effects are replaced with county-level fixed effects (Panel B) or province-level fixed effects (Panel A), the results for the math test score remain unchanged. Additional negative correlations emerge for the child's height, weight and the Chinese test score. However, these are unlikely to be robust as they are not found under the preferred specification with village-level fixed effects.

[1]The number of observations differs across regressions due to varying numbers of missing values in the outcome variables

[2]We do not include household income as a regressor because it is likely to be jointly determined with migration. Since there are not enough number of instruments that can separately identify the effect of income and migration, we focus on the effect of migration which include both the effect of increased income and decreased parental time inputs.

5.2 The relationship between child outcomes and historical parental migration

The negative correlation between recent parental migration and the current child outcomes might partly reflect the effect of being away from the parents for a long time. The relationship between historical parental migration and child outcomes is shown in Table 4. The results indicate that, the more a child has been away from the mother, the shorter and the lighter the child is as in 2010 (Columns 1 and 2). A 10 percentage point increase in the share of a child's life time in which the mother was away from home is associated with 0.17cm lower height and 0.11kg lower weight. On the other hand, having been away from the father is associated with lower test scores. A 10 percentage point increase in the share of a child's time in which the father was away from home is correlated with a 0.3-percentage-point reduction in the Chinese test score and a 0.2-percentage-point reduction in the math test score. In other words, if we compare a child whose father stayed at home for the average share of the child's life time (38 percent) and another child whose father stayed away from home for a one-standard-deviation longer (79 percent = 38 percent + 41 percent), the latter child exhibits 1 percentage point lower score (0.025*0.41=0.01) on a Chinese test.

Similarly to the results in Table 3, the child's birth weight and parental height are positively correlated with the child's height and weight as in 2010. Older mothers tend to have children with higher weights, and older fathers are more likely to have children with lower test scores.

The results based on the alternative indicator for historical parental migration is shown in Appendix Table 3, Panel C. As the indicator is likely to be an overestimate for the true duration of historical parental migration, the coefficients are likely to be a lower bound for the true correlation between historical parental migration and child outcomes. Though none of the estimates are statistically significant, negative association is found between historical maternal migration and the child's height and weight. The results based on the indicator used in Table 4 with county-level or province-level fixed effects are shown in Panels A and B. They indicate qualitatively similar results as those depicted in Table 4.

6 Conclusion

The preliminary results based on the OLS estimation indicate that parental migration is negatively associated with the outcomes of the child that are relatively objectively measured, such as the test scores and height and weight. Both recent and historical migration by the father is found to be correlated with lower test scores. These results might reflect the fact that fathers, who are likely to have attained higher education than mothers, are considered to be responsible for disciplining children and taking care of their educational achievement. On the other hand, no significant association is found between recent parental migration and children's health outcomes. A significant association is found between historical maternal migration and and the child's height or weight. This is not surprising given that height is an indicator for the long-run health conditions. Also, these results are not inconsistent with the hypothesis that mothers are more responsible for the health of children. For instance, without the mother at home, children may not receive as good treatment as they could have in terms of the calorie intake, the balance of diet, hygiene conditions, and so on. Nevertheless, it is still unclear how much of these correlations represent causal relationships. In order to address this issue, we plan to extend the current analysis by conducting the IV method.

References

[1] Chen, Xinxin, Qiuqiong Huang, Scott Rozelle, and Linxiu Zhang, "Migration, money and mother: The effect of migration on children's educational performance in rural China", Paper presented at the American Agricultural Economics Association Annual Meeting, Portland, OR, July 29-August 1, 2007.

[2] Feng, Shuaizhang and Yuanyuan Chen, "School type and education of migrant children: Evidence from Shanghai", (in Chinese), 2011,xxx.

[3] REAP, 2009, Boarding Schools, http://reap.stanford.edu/docs/boarding_schools/

[4] Shi, Yaojiang and Linxiu Zhang, "Boarding school management (and PTAs) in China's poor rural areas",

[5] Meng, Xin and Junsen Zhang, "The Two Tier Labor Market in Urban China: Occupational and Wage Differentials Between Residents and Rural Migrants in Shanghai," Journal of Comparative Economics, 2001, 29(3), 485-504.

[6] Zhao, Zhong, "Migration, Labor Market Flexibility, and Wage Determination in China: A Review," The Developing Economies, Jul. 2005, 43(2), 285-312.

Data Appendix

- The share of child life in which parents were away: The RUMiC Study provides two types of information. One is the number of months in the previous year during which parents were away from home. This information is available from all the waves. Thus, we know the number of months parents were away in 2007, 2008, and 2009. The other piece of information is when parents started migration. This was asked only in the 2009 wave for individuals who reported to have been away in 2008. In order to construct the number of months parents were away since the beginning of migration asked in the 2009 survey till the end of 2009, we first aggregated the number of months in which parents were away in 2007 through 2009. For individuals who answered that their migration had started before 2007, we have added the number of months between the beginning of the migration till the end of 2006.

- Individual test scores were asked for the previous semester, together with the perfect score. The ratio of the individual score over the perfect score is used as our outcome variables.

- Disability includes both types which do and do not affect individual daily activities.

- Distance to public facilities is coded using five categories: 1:¡2km, 2:2-5 km, 3:5-10 km, 4:10-20 km, 5:¿20km.

Table 1: Summary statistics for pooled cross-section analysis

	N	Mean	SD
Outcome variables			
Child's height (cm)	8164	129.87	25.59
Child's weight (kg)	9452	32.70	13.14
1 if the child's health condition is "excellent"	10244	0.36	0.48
1 if the child has disability	10241	0.02	0.13
Chinese test score in the previous semester (%)	3796	0.83	0.15
Math test score in the previous semester (%)	3780	0.84	0.13
Performance at school (5-scale, from 1[very good] to 5[very bad])	6490	2.50	0.69
Migration variables			
Number of months in the previous year during which father was away	10244	3.60	4.78
Number of months in the previous year during which mother was away	10244	2.27	4.24
Number of months in the previous year during which the child was away	10244	0.62	2.35
Control variables			
Child's age	10244	8.97	4.34
1 if the child is boy	10244	0.56	0.50
Child's birth weight	10244	3213.02	545.10
Father's height	10244	168.62	5.55
Mother's height	10244	160.50	5.49
Father's years of schooling	10244	8.39	1.98
Mother's years of schooling	10244	7.67	2.15
Father's age	10244	36.78	6.38
Mother's age	10244	35.27	6.22
Distance to the nearest primary school	10244	1.28	0.54
Distance to the nearest junior high school	10244	2.02	0.86
Distance to the nearest bus station	10244	2.14	1.16
Distance to the nearest clinic	10244	1.37	0.64

Sources: 2008, 2009, and 2010 Rural Urban Migration in China (RUMiC) Study

Table 2: Summary statistics for 2010 analysis

	N	Mean	SD
Outcome variables			
Child's height (cm)	2365	134.20	22.38
Child's weight (kg)	2628	35.28	12.80
1 if the child's health condition is "excellent"	2846	0.34	0.47
1 if the child has disability	2843	0.02	0.13
Chinese test score in the previous semester (%)	1700	0.84	0.11
Math test score in the previous semester (%)	1696	0.85	0.11
Performance at school (5-scale, from 1[very good] to 5[very bad])	1946	2.54	0.66
Migration variables			
Share of child life father was away since the start of 2008 migration spell	2846	0.38	0.41
Share of child life mother was away since the start of 2008 migration spell	2846	0.25	0.38
Share of child life father was away since the start of initial migration	2845	0.58	0.45
Share of child life mother was away since the start of initial migration	2844	0.37	0.44
Control variables			
Child's age	2846	9.35	3.84
1 if the child is boy	2846	0.56	0.50
Birth weight	2846	3211.13	423.04
Father's height	2846	168.54	5.01
Mother's height	2846	160.50	4.75
Father's years of schooling	2846	8.41	1.97
Mother's years of schooling	2846	7.72	2.11
Father's age	2846	37.22	6.02
Mother's age	2846	35.77	5.86
Distance to the nearest primary school	2846	1.31	0.57
Distance to the nearest junior high school	2846	2.03	0.87
Distance to the nearest bus station	2846	2.14	1.17
Distance to the nearest clinic	2846	1.37	0.66

Sources: 2008, 2009, and 2010 Rural Urban Migration in China (RUMiC) Study

Table 3: Child outcomes and recent parental migration in China (2008-2010)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Height	Weight	1 if excellent health	1 if has disability	Chinese test score	Math test score	School perfor-mance
Number of months father was away	-0.063	-0.018	-0.000	-0.000	-0.001	-0.002**	0.001
	(0.040)	(0.027)	(0.002)	(0.000)	(0.001)	(0.001)	(0.003)
Number of months mother was away	-0.044	-0.005	0.002	0.000	-0.000	0.002***	-0.004
	(0.044)	(0.031)	(0.002)	(0.000)	(0.001)	(0.001)	(0.004)
Number of months child was away	0.183***	0.126***	0.003	-0.001	-0.000	0.002**	-0.016***
	(0.054)	(0.038)	(0.002)	(0.001)	(0.002)	(0.001)	(0.004)
Child's birth weight	0.001***	0.000**	0.000	0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Father's height	0.185***	0.068***	0.002**	0.000	0.000	0.001*	-0.003
	(0.027)	(0.016)	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)
Mother's height	0.096***	0.084***	0.001	-0.000	0.000	0.000	-0.004
	(0.027)	(0.018)	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)
Father's years of schooling	0.060	0.005	0.009***	-0.002**	0.003**	0.003*	-0.041***
	(0.088)	(0.057)	(0.004)	(0.001)	(0.001)	(0.001)	(0.007)
Mother's years of schooling	-0.073	-0.054	-0.000	-0.001	0.000	0.001	-0.007
	(0.083)	(0.054)	(0.003)	(0.001)	(0.001)	(0.001)	(0.007)
Father's age	0.036	-0.011	-0.005**	0.001	-0.002**	-0.002**	0.010**
	(0.052)	(0.036)	(0.002)	(0.001)	(0.001)	(0.001)	(0.005)
Mother's age	0.135***	0.109***	0.001	-0.000	0.000	0.000	-0.004
	(0.052)	(0.036)	(0.002)	(0.001)	(0.001)	(0.001)	(0.005)
Distance to the nearest primary school	0.626	0.146	-0.006	-0.003	0.007	-0.002	-0.008
	(0.473)	(0.270)	(0.021)	(0.005)	(0.007)	(0.007)	(0.039)
Distance to the nearest junior high school	-0.080	0.060	-0.001	0.004	-0.004	-0.004	0.016
	(0.383)	(0.238)	(0.021)	(0.005)	(0.006)	(0.007)	(0.031)
Distance to the nearest bus station	-0.792**	-0.197	0.028*	-0.001	0.001	0.007	-0.018
	(0.345)	(0.224)	(0.017)	(0.006)	(0.006)	(0.006)	(0.034)
Distance to the nearest clinic	0.706	0.016	-0.002	0.003	-0.006	-0.005	0.045
	(0.431)	(0.305)	(0.020)	(0.006)	(0.008)	(0.007)	(0.032)
N	8164	9452	10244	10241	3796	3780	6490
R-sq	0.886	0.807	0.385	0.143	0.398	0.403	0.314
N clust	3059	3229	3302	3301	2058	2055	2468
F	697.76	428.19	2.09	1.21	6.74	5.52	5.07

Sources: 2008, 2009, and 2010 Rural Urban Migration in China (RUMiC) Study
Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 4: Child outcomes and historical parental migration (2010)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Height	Weight	1 if excellent health	1 if has disability	Chinese test score	Math test score	School perfor-mance
Share of child life father was away	0.545	1.069*	-0.007	-0.002	-0.025**	-0.018*	0.043
	(0.67)	(1.88)	(-0.25)	(-0.18)	(-2.54)	(-1.69)	(0.74)
Share of child life moather was away	-1.745*	-1.083*	0.042	0.001	0.015	0.017	-0.036
	(-1.95)	(-1.76)	(1.28)	(0.09)	(1.42)	(1.53)	(-0.53)
Child's birth weight	0.001*	0.001**	0.000	-0.000	0.000	0.000	-0.000
	(1.68)	(2.49)	(0.85)	(-0.76)	(0.14)	(0.57)	(-0.81)
Father's height	0.188***	0.036	-0.001	0.001	0.000	-0.000	-0.004
	(3.30)	(0.81)	(-0.43)	(0.99)	(0.40)	(-0.59)	(-0.86)
Mother's height	0.169**	0.154***	-0.001	-0.002**	0.001	0.001	-0.009
	(2.56)	(3.07)	(-0.39)	(-2.39)	(1.11)	(1.07)	(-1.55)
Father's years of schooling	0.049	-0.010	0.012*	0.000	0.001	0.002	-0.041***
	(0.30)	(-0.09)	(1.83)	(0.14)	(0.77)	(1.13)	(-3.26)
Mother's years of schooling	0.016	-0.006	-0.002	-0.001	0.000	0.001	0.002
	(0.10)	(-0.05)	(-0.38)	(-0.71)	(0.25)	(0.34)	(0.14)
Father's age	0.103	0.011	-0.001	0.002	-0.003*	-0.004**	0.016*
	(0.96)	(0.16)	(-0.13)	(1.48)	(-1.89)	(-2.27)	(1.78)
Mother's age	0.092	0.142**	-0.001	-0.001	0.001	0.002	-0.005
	(0.87)	(2.17)	(-0.17)	(-0.88)	(0.85)	(0.87)	(-0.57)
N	2365	2628	2846	2843	1700	1696	1946
R-sq	0.885	0.808	0.603	0.428	0.579	0.563	0.533
N clust	1943	2110	2251	2248	1454	1452	1661
F	169.84	97.43	0.84	0.73	3.36	2.69	2.18

Sources: 2008, 2009, and 2010 Rural Urban Migration in China (RUMiC) Study

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Appendix Table 1: Differences in basic characteristics between the whole sample and the analysis sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Age	1 if boy	Birth weight	Distance to the nearest:			
				primary school	junior high school	bus stop	clinic
A. Province fixed effects							
1 if observation is in the sample	0.636***	0.025	12.988	-0.012	-0.078***	-0.027	-0.107***
	(0.129)	(0.016)	(13.486)	(0.017)	(0.028)	(0.035)	(0.022)
N	4431	4431	4431	4431	4431	4431	4431
R-sq	0.021	0.002	0.081	0.097	0.041	0.109	0.023
N clust	3343	3343	3343	3343	3343	3343	3343
F	9.42	1.28	33.50	44.63	15.42	41.73	10.13
B. County fixed effects							
1 if observation is in the sample	0.781***	0.025	16.889	-0.028	-0.027	0.031	-0.014
	(5.15)	(1.54)	(1.01)	(-1.40)	(-0.86)	(0.91)	(-0.60)
N	4431	4431	4431	4431	4431	4431	4431
R-sq	0.073	0.022	0.140	0.272	0.269	0.455	0.263
N clust	3343	3343	3343	3343	3343	3343	3343
F	26.54	2.38	1.02	1.97	0.74	0.83	0.36
C. Village fixed effects							
1 if observation is in the sample	0.831***	0.035*	18.951	-0.003	-0.027	0.013	-0.001
	(4.75)	(1.84)	(1.16)	(-0.22)	(-1.57)	(0.73)	(-0.06)
N	4431	4431	4431	4431	4431	4431	4431
R-sq	0.268	0.171	0.444	0.853	0.894	0.914	0.857
N clust	3343	3343	3343	3343	3343	3343	3343
F	22.54	3.40	1.34	0.05	2.45	0.54	0.00

Sources: 2008, 2009, and 2010 Rural Urban Migration in China (RUMiC) Study
Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Appendix Table 2: Robustness check for the relationship between child outcomes and recent parental migration in China (2008-2010)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Height	Weight	1 if excellent health	1 if has disability	Chinese test score	Math test score	School perfor-mance
A. Province fixed effects							
Number of months father was away	-0.077*	-0.046*	0.002	-0.000	-0.002***	-0.002***	0.007**
	(0.040)	(0.025)	(0.002)	(0.000)	(0.001)	(0.001)	(0.003)
Number of months mother was away	-0.063	-0.030	-0.003	-0.000	0.001	0.002**	-0.005
	(0.046)	(0.029)	(0.002)	(0.000)	(0.001)	(0.001)	(0.004)
N	8164	9452	10244	10241	3796	3780	6490
R-sq	0.855	0.754	0.065	0.006	0.079	0.100	0.078
Unique number of households	3059	3229	3302	3301	2058	2055	2468
F	840.94	623.29	7.11	2.22	13.43	10.80	8.61
B: County fixed effects							
Number of months father was away	-0.087**	-0.041	0.002	-0.000	-0.002	-0.001**	0.005
	(0.040)	(0.026)	(0.002)	(0.000)	(0.001)	(0.001)	(0.003)
Number of months mother was away	-0.061	-0.024	-0.001	0.000	0.000	0.001*	-0.007**
	(0.045)	(0.030)	(0.002)	(0.000)	(0.001)	(0.001)	(0.004)
N	8164	9452	10244	10241	3796	3780	6490
R-sq	0.861	0.764	0.120	0.027	0.147	0.182	0.116
Unique number of households	3059	3229	3302	3301	2058	2055	2468
F	916.72	604.44	1.97	1.64	10.77	7.63	6.58
C: Village fixed effects only with the sample of children who were not away from home in the previous year							
Number of months father was away	-0.067	-0.017	-0.000	-0.000	-0.001	-0.002**	0.001
	(0.042)	(0.028)	(0.002)	(0.000)	(0.001)	(0.001)	(0.003)
Number of months mother was away	-0.018	0.002	0.001	0.000	0.000	0.002***	-0.005
	(0.046)	(0.032)	(0.002)	(0.000)	(0.001)	(0.001)	(0.004)
N	7527	8724	9473	9470	3525	3509	5936
R-sq	0.886	0.807	0.391	0.157	0.483	0.411	0.321
Unique number of households	2917	3091	3167	3166	1951	1948	2353
F	648.91	390.87	1.80	1.16	6.35	4.71	4.41

Sources: 2008, 2009, and 2010 Rural Urban Migration in China (RUMiC) Study
Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Appendix Table 3: Robustness check for the relationship between child outcomes and historical parental migration (2010)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Height	Weight	1 if excellent health	1 if has disability	Chinese test score	Math test score	School perfor-mance
A. Province fixed effects							
Share of child life father was away	-0.240	0.194	-0.006	-0.002	-0.026***	-0.023***	0.092**
	(-0.37)	(0.44)	(-0.21)	(-0.32)	(-3.41)	(-2.77)	(2.05)
Share of child life moather was away	-1.384*	-1.287***	0.021	-0.000	0.014*	0.013	-0.056
	(-1.88)	(-2.59)	(0.63)	(-0.00)	(1.66)	(1.39)	(-1.13)
N	2365	2628	2846	2843	1700	1696	1946
R-sq	0.797	0.685	0.124	0.028	0.161	0.138	0.101
Unique number of households	1943	2110	2251	2248	1454	1452	1661
F	245.21	173.30	6.47	0.88	9.01	7.12	5.24
B. County fixed effects							
Share of child life father was away	-0.157	0.419	-0.005	-0.003	-0.016**	-0.013	0.075
	(-0.23)	(0.91)	(-0.17)	(-0.53)	(-2.16)	(-1.52)	(1.61)
Share of child life moather was away	-1.275*	-1.065**	0.037	-0.002	0.012	0.014	-0.033
	(-1.73)	(-2.10)	(1.12)	(-0.33)	(1.55)	(1.57)	(-0.64)
N	2365	2628	2846	2843	1700	1696	1946
R-sq	0.814	0.706	0.228	0.178	0.278	0.247	0.175
Unique number of households	1943	2110	2251	2248	1454	1452	1661
F	246.60	161.77	0.90	0.85	7.07	5.39	2.92
C. Village fixed effects using the alternative mesure for historical parental migration							
Share of child life father was away	0.266	0.626	-0.012	0.007	0.002	0.003	-0.039
	(0.38)	(1.33)	(-0.48)	(1.10)	(0.19)	(0.26)	(-0.72)
Share of child life moather was away	-0.607	-0.381	-0.006	-0.001	0.000	-0.005	-0.035
	(-0.82)	(-0.78)	(-0.20)	(-0.08)	(0.04)	(-0.40)	(-0.55)
N	2839	3186	3507	3502	1899	1896	2171
R-sq	0.901	0.829	0.581	0.421	0.567	0.553	0.513
Unique number of households	2258	2468	2657	2653	1585	1584	1815
F	287.50	169.68	0.84	0.79	3.47	3.19	2.07

Sources: 2008, 2009, and 2010 Rural Urban Migration in China (RUMiC) Study

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01