UNIVERSITÉ DU LUXEMBOURG

The Faculty of Law, Economics and Finance

DISSERTATION

ESSAYS ON CHINESE INTERNAL MIGRANT WORKERS' CHOICES: CHILDREN'S LOCATION AND EDUCATION

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Chapter 1

Introduction

1.1 Internal Migrant Workers and Hukou System

The gradual economic opening initiated by China in 1978 has led to a tremendous number of rural-to-urban migrants. China's National Bureau of Statistics estimates that in 2017 there were about 286.5 million internal Chinese migrant workers, equivalent to about 35% of the total workforce[1]. Of these, 172 million were long distance migrants. Nearly every other long distance migrant has moved to a different province for work. High labour demand in manufacturing and service industries in urban regions together with poverty in many rural areas are the main drivers of these massive migratory flows.

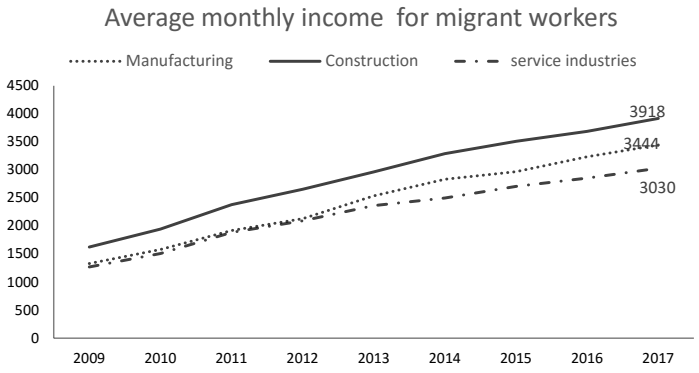
Internal migrant workers in China are defined as people who reside and work in areas other than the place where their hukou is offically registered. The hukou system [2] is a household registration system established about six decades ago to facilitate resource distribution, to control internal migration and to monitor criminal behavior. The hukou determines individuals' official place of residence and submits the right to migrate inside China to the approval of local governments. Each person is ascribed a household registration status (or hukou status) classified either as "rural" or as "urban", which ties the person to a single administrative unit. An individual must be registered in one and only one place and can only draw on welfare benefits in the place of registration. Families were originally registered where they permanently resided when the policy was first en-

[1] Unless otherwise specified, the estimates in this section are based on an annual survey of migrant workers conducted by China's National Bureau of Statistics. Results are published at `http://www.clb.org.hk/content/migrant-workers-and-their-children`.

[2] This description of the hukou system draws on Chan (2010) and Hao and Yu (2015).

forced, in the late 1950s. Subsequently children have automatically inherited the hukou status of one of their parents [3]. Children of migrants holding a rural hukou are thus still deemed rural, even if they were born in the city where their parents migrated.

Until the late 1970s the rural population was barred from moving to urban areas through the hukou system. Since the 1980s, along with economic development, the government has allowed some limited rural-to-urban mobility, but de facto migration to cities overwhelmingly surpassed officially registered moves. While the hukou policy has contributed to maintaining social stability in the face of geographically highly unequal economic growth and varying living conditions, it has confined the rural Chinese to being second-class citizens, deprived of rights to access public services and welfare programs available in more developed urban areas. The majority of migrant workers are employed in sectors such as construction, manufacturing or service industries where local urban workers do not want to work. The wage of migrant workers has been increasing in recent years (shown in Figure 1.1), however, the level is barely enough to maintain a living in China's cities [4]. Moreover, few of them have signed a formal employment contract with their employers and so are covered by social security. It is estimated that less than one quarter of migrant workers in 2017 had a basic pension or medical insurance. The Chinese central government has issued guidelines aiming to relax these discrimina-



Source: China's National Bureau of Statistics, Annual Survey of Migrant Workers (2009-2017).
The currency is in Chinese Yuan. One US dollar can be exchanged in 2017 for about 6.8 Chinese Yuan.

Figure 1.1: Average monthly income for migrant workers

tory policies against migrant workers. But as described in (ChinaLaborBulletin, 2018)

[3] Until 1998 a newborn's hukou status followed that of his mother (Chan and Buckingham, 2008).

[4] For example, in 2018, the estimated monthly cost of living excluding rent in Shanghai and in Guangzhou is around RMB 4000 ($590) and RMB 3400 ($495), respectively. RMB (renminbi) is the official currency in People's Republic of China. The figures come from an online source `https://www.numbeo.com/cost-of-living` (in the absence of official statistical estimates).

mainly small or medium-sized cities with limited social services and few decent job opportunities are implementing these guidelines. The situation of migrant workers has not improved in large cities. Converting a rural hukou to a city one remains difficult. Workers who migrate with their children face particular hardship. Without a local city *hukou*, their children have very limited access to social benefits, especially education. Restrictions on access to public education of migrant workers' children have forced millions of Chinese migrant parents to decide whether to take their children along or to leave them behind. In the following section we provide a short overview of the current situation of internal migrant workers' children.

1.2 The Children of Internal Migrant Workers

1.2.1 Migrant Children in Cities

The 1% National Population Sample Survey conducted by China's National Bureau of Statistics in 2015 showed that there were about 34.3 million children migrating to cities with their parents. Even though these children live in cities, for the lack of a local hukou, they may not draw on cities' welfare benefits, such as public education.

Enrollment in public schools in China follows the policy of *nearby enrollment*. This policy allows public schools to select students only among children who live in their neighboring area. Together with the hukou system, the *nearby enrollment policy* prevents many migrant children from attending public schools in cities.

Until 1996 migrant workers' children were prevented from enrolling in urban public schools. The central government has attempted to regulate migrant children's access to public education, most notably in the *Provisional Regulations on Schooling for Children of Migrant Populations in Cities and Townships* of 1996 and 1998. Under this policy, local governments in the rural areas were instructed to strictly limit the emigration of school-aged children. Children who have custodians in their hukou registration place were to receive the compulsory education [5] in the (rural) registration place. Only if they lacked village custodians were they allowed to register in an urban public school, often incurring extra admission fees.

[5] According to the *Compulsory Education Act of the People's Republic of China* enacted in 1986, compulsory education lasts for nine years and consists of six years of primary school and three years of junior high school.

In 2006, central policy makers attempted to relax rural-urban emigration limitations by Article 12 of the *Compulsory Education Act of the People's Republic of China*: "School-aged children or adolescents, who have parents or other legal custodians working or living in places other than the hukou-registration places, who receive compulsory education in places other than the hukou-registration places, should be provided by local governments with equal conditions in receiving compulsory education. The specific policy can be designed by provinces, autonomous regions and municipalities."

However, since the law provides them with some local autonomy, local governments do not always implement the centrally defined guidelines. For example, in Zhejiang provinces some schools continue to ask proof that no custodians exist in the home village and schools still impose special fees on migrant children (Chen et al., 2016). The public schools in Beijing require up to eight documents from migrant children's parents, some of which are very hard to get [6]. Migrant children whose parents can not offer all required documents may be accepted by public schools if migrant families can afford so-called "sponsorship fees" charged by public schools. The fees are far from insignificant. A children without Beijing hukou was force to pay per term extra fees ranging from RMB 1200($175) to more than RMB 8000($1167) (Goodburn, 2009). Shanghai is considered as the most accommodating city with regard to migrant worker's children education. Almost all migrant worker's children in Shanghai can attend a primary school, but beyond junior high school, migrant youth have little access to education if they stay there (Chen and Feng, 2013). These local policies have led to the creation of privately run low quality migrant schools, where migrant children excluded from public education are registered as a last resort.

Private migrant schools are specially designed for the numerous migrant children who cannot be accepted by public schools. They provide affordable education, but often fail to meet the standards set by regulations. With little qualified teachers and poor facilities, these schools are at the risk of being shut down by governments at any moment. For example, one of the largest migrant schools in Beijing, with a student body of about 2000, was forced by regulators to relocate further outside the city by 2018 (ChinaLaborBulletin, 2018).

The hukou system and the crackdown on private migrant schools discourage migrant workers to take their children with them. Many migrant parents choose to leave their

[6]For instance, in order to gain an *approval permit for temporary schooling*, migrant parents in Beijing need to present, among other official documents, a temporary residence permit, a migrant work permit, one parents' hukou, identity cards, population planning certificate. Few migrants can obtain all of these documents (Goodburn,2009).

children behind in rural villages.

1.2.2 Left Behind Children in Rural Villages

According to a *All-China Women's Federation* report, in 2013 about 61 million Chinese children - one out of every five in China - are left behind, three quarters of which only see their migrant parents once a year[7]. As shown in Figure 1.2, they are cared for either by one parent, by relatives (usually grandparents, who tend to be illiterate), by friends or they are enrolled in boarding schools. More than 2 million of children live alone.

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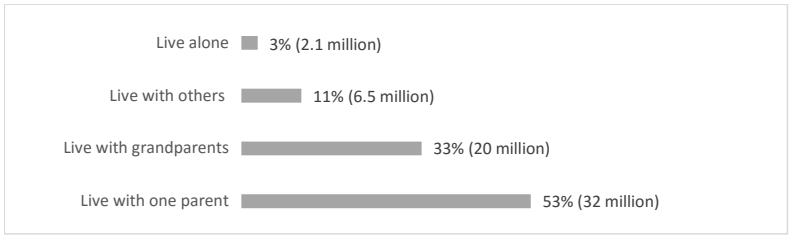

Source: All China Womens's Ferderation 2013, People's Daily, CCR CSR.

Figure 1.2: Number and share of left behind children, by living arrangements

As with left behind children in many other developing countries, Chinese rural left behind children suffer intensely from lots of tragedies. Statistics on the prevalence of tragedies are lacking, but anecdotal evidence abounds. Some examples are quoted here to illustrate the hardship these children face. In 2012, one left behind boy and three left behind girls aged between five and thirteen drank pesticide and died of poisoning in Bijie, a village in Guizhou province which is notorious for high numbers of left behind children[8]. The Economist, October 17th 2015, reported that a teacher in a boarding school in Gansu province in the north-west of China was executed for abusing 26 primary

[7]A much lower estimate of 9.02 million children left behind in rural areas was reported in November 2016 by China's Ministry of Civil Affairs. Only 360,000 of them were not under anyone's direct care. Nearly two out of three were aged between 6 and 13 years old, i.e. of compulsory school age. This discrepancy stems from the use of different definitions: whereas the All-China Women's Federation considers a child left behind if it is aged under 18 and either parent has migrated, the Ministry of Civil Affairs only includes children aged 0 to 16 left by both parents. It is the former definition that complies with the guidelines of the United Nations Children's Fund (UNICEF) and is more widely accepted (see for example The Economist, October 17th 2015, page 29-30).

[8]The story is cited from The Washinton Post, June 15th 2015.

school students and in Ningxia province, a teacher got life in prison for raping 12 of his pupils, 11 of whom were left behind. Long time parent-child separation contributes to the high suicide rate for rural youth in China, which is 3 times higher than in urban areas (R.Phillips et al., 2002).

Despite knowing that leaving their children behind may hurt their children's physical and physiological health, parents can consider migrating to the cities as the only way to escape poverty, both for themselves and for their children. If they choose to bring their children along to the city, their children cannot obtain the same educational opportunities as urban children (unless the parents obtain the local city hukou, which is very unlikely). Migrant workers must therefore face the dilemma of taking their children with them or not and must face the effect of their decision on their children's educational achievement and on their household educational expenditure.

1.3 Structure of The Dissertation

This dissertation explains the current situation and dilemma confronted by China's internal migrant workers. It provides guidance for migrant workers and political implication for governments on the issue of migrant workers' children in China's cities. We first set up a theoretical model of the optimal choice of the migrant workers on how to locate their children. Subsequently we analyze empirically the educational achievement of migrant workers' children. Finally, we focus on the education-related expenditure of households in China's cities. The three following chapters of this dissertation are self-contained works. The notations may not be consistent among chapters but are always consistent within each chapter.

Chapter 2, entitled "Migrant Workers' Choice: to Migrate with or without Children", studies where Chinese internal migrant workers should locate their school-aged children and how they should optimally invest in their children's private education. The theoretical optimum is obtained by maximizing migrant workers' utility which includes household consumption and their children's human capital accumulation. Depending on the educational investment migrant parents make and on the cost of relocating to the cities, necessary and sufficient conditions under which migrant parents should take their children with them and should invest in private education for their children are provided.

Chapter 3, "Are There School Performance Differences between Chinese Internal Migrants' Children?", examines whether the decision of migrant parents on children's mi-

gration affect the children's school performance. Empirical evidence based on a large-scale Chinese migration survey suggests that migrant children outperform left-behind children, especially for test scores in Chinese language. It is also shown that younger children having migrated with parents to the cities have an advantage over their left behind counterparts, but this gap disappears with the age of the children. Among children in junior high school, school performance of left-behind children is better than that of migrant children after controlling for family and regional characteristics.

The fourth Chapter, "Private Educational Expenditure Inequality between Migrant and Urban households in China's Cities", compares the educational expenditure of parents migrating with children to China's cities to that of local urban parents, with a special focus on the role of the hukou in shaping these inequalities. The results show that total educational expenditure of migrant households overwhelmingly exceeds that of locals after controlling for social and economic characteristics, but expenditure type is different. Migrants allocate large amounts to tuition and sponsorship fees, which are often imposed as a consequence of the hukou policy. Concerning private tutoring, local urban households spend much more than migrants.

Chapter 2

Migrant Workers' Choice: to Migrate with or without Children

2.1 Introduction

While increasing numbers of rural-to-urban migrants bring the economic benefits, the associated social challenges are daunting. Policy makers have attempted to reign migration in by perpetuating a 1950s policy of restricting each individuals' access to free public education and health care to his locality of official residence, typically that of his birth. Notwithstanding this obstacle, as well as serious psychological costs, many Chinese families have chosen to split, leaving children and old parents behind in rural villages. Other families prefer to migrate together with their children, risking to squander the potential of their offspring, as in the destination cities educational opportunities for rural children are limited.

Migrant children inherit their parents' official (rural) registration place and face barriers in accessing public services. Their chances of obtaining official city residency are slim, even later in their adult life, except if they earn a university degree, because high skilled workers are still much demanded in China's urban labor markets. Because of its pivotal role in families' long run wellbeing, the children's educational achievement is a crucial concern for parents. Consequently, assuming migrant workers utility depends on

their own, their children's and their parents' consumption, as well as the human capital of their children, we investigate what are Chinese migrant workers' optimal choices regarding the location of their school-aged children: leave them behind in rural home village or take them to the city?

Left behind children in many developing countries have been found to be at a great risk of living on the edge of society, falling victim to drug abuse, teenage pregnancy, psychosocial problems and violent behavior (Cortes, 2008). In China, existing literature suggests that parental migration has a negative impact on the growth of children who are left behind in rural village. Comparing with non-left behind children, left behind children have significantly worse height and weight (Tian et al., 2017). Using a survey in Anhui province, Yang et al. (2016) found that parental migration is associated with an increase in smoking behavior. The recent qualitative study did by Zhao et al. (2018) demonstrates that parent-child separation following migration often disrupted their relationships and left behind children were more likely to suffer from depression or psycho-social difficulties.

If brought to the city, as described in section 1.2, migrant children cannot benefit from the same opportunities as local urban children (Liu et al., 2017, Lu, 2008, Milcent, 2010, Mou et al., 2013, Sun et al., 2016, Li et al., 2010). Cost can be imposed by administrative restriction, for instance, extra fees are required to pay to be enrolled in public schools. The cost of medical care in cities is higher than that in rural areas [1]. Except for that, migrant workers often live in dormitories provided by their employers. Migrating with children may increase their financial burden on account of rent paid.

While previous empirical work indicates that both leaving children behind and migrating with them may prevent migrants from fully realizing their educational and earning potential, no study has, to the best of our knowledge, provided a theoretical framework under which conditions that migrant parents should migrate with children and under which they should leave their children behind. Even in the international migration literature, for instance, UNICEF's systematic studies about left behind and migrant children, focus either on children migrating to developed economies, such as UK (Crawley, 2009), France (Kirszbaum et al., 2009), Germany (Clauss and Nauck, 2009), Australia (Katz and Redmond, 2009), the Netherlands (De Valk et al., 2009) and Switzerland (Fibbi and Wanner, 2009), or on left-behind children in developing countries such as Indonesia, Thailand and Philippines (Bryant, 2005), Argentina, Chile and South Africa (Yaqub, 2009)

[1] A 2012 survey in the city of Cixi, Zhejiang province, found for example that 57 percent of migrant children did not have any medical insurance, see China Labor Bulletin at `http://www.clb.org.hk`.

or Mexico and Salvador (de La Garza, 2010). This chapter aims to fill this gap by studying what is the optimal choice of migrating parents on where to locate their children.

We investigate whether migrant parents can afford to take their children to the city and whether they provide their children with private education regardless their children are migrant or left behind. We consider migrant workers decide jointly on whether to migrate with their children or leave them behind and on whether they invest in their private education or not. The migrant workers' decision depends on two key parameters: the relocation cost of children and the educational investment parents are able and willing to make. The relocation cost encompasses the fees paid for enrolling children in urban schools, the extra health care costs and generally any living costs associated with children living in the city. The educational investment is the share of migrant workers' lifetime income that is invested in children's education. This share is the ratio between the importance of children's education and the whole family's consumption. Our model provides relocation cost thresholds for different income levels, which represent the necessary and sufficient conditions for migrant parents' decision to take their children to the city as opposed to leaving them behind. These thresholds increase not only with migrants' life-time income, but also with the gap in public education quality between the migrants' home rural village and their host city. In other words, the discrepancy in quality between public urban and rural education implicitly hinders migrant workers to migrate with their children.

The private education decision of migrant parents depends on the relationship between educational investment and the public education input. Not surprisingly, sufficiently high public education input discourages parents' from investing in private education. Regarding private education, the standard result in the literature is that high income parents provide more private education to their children than low income ones (de La Croix and Doepke, 2003). Our finding is that private educational input depends on *relative* income, which relies on how much parents value education and lifetime income. Thus, if all parents care about their children's education equally, the standard result in the literature holds in our setting as well. Nonetheless, for many families in rural regions in China, getting assess to higher education is considered as an effective way of getting out of poverty. Low income parents might value education more than parents who are better off. They would thus be willing to pay a higher share of their income for the private education of their children.

The rest of chapter is structured as follows. Section 2.2 builds up the model to obtain the optimal choice of consumption and private educational investment. Section 2.3 provides the theoretical answers to the original question of when migrant workers should

take their children to migrate and when they should leave their children behind. Section 2.4 discusses the dynamics and long run outcome. Finally, the last section concludes this chapter.

2.2 The Theoretical Model

In this section, we examine whether the migrant parents can afford to take their children to migrate and how should they invest in their children's private education.

2.2.1 The Model

We consider migrants who have rural hukou but work in a urban area. Suppose each individual is one household and will live for two periods: young and old. The lifetime utility of generation t is

$$U_t = u(c_t) + \beta u(d_{t+1}) + \gamma U_t^f, \tag{2.1}$$

where c_t and d_{t+1} represent consumption in young and old age respectively, with parameter $\beta(\in (0,1))$ denoting time preference. Following the concept of altruism introduced by Lucas and Stark (1985) and the Chinese tradition of children providing support for old parents, [2] we assume that individuals also take care the other family members (parents, children, siblings etc.), which is denoted by U_t^f, with $\gamma(\in (0,1))$ being the altruism parameter. For simplicity, we take

$$U_t^f = a_P u_P \left(\frac{c_{P,t}}{N}\right) + a_K u_k(c_{k,t}, h_{k,t+1}), \tag{2.2}$$

where c_p measures parents' consumption [3], N is number of siblings who share the cost of old age parents. For simplicity, we assume that, in each household, there is one child given all children are treated equally[4]. c_k and $h_{k,t+1}$ are children's consumption and

[2]The left-behinds are not only children, but also parents. The Economist August 29th 2015 reported that: *In 2009-11 people over 65 accounted for just under half of all suicides, and more in rural area: living alone in old age can be harsh anywhere, but in China it may be particularly isolating, given that so many young Chinese have left their villages, and parents, in search of work. The government has tried to enforce filial piety, passing a law in 2013 that threaten fines or jail if people fail to visit parents and feed their 'spiritual needs'.*

[3]If there are young siblings in the family, we consider their consumption as part of parents' consumption.

[4]Until 2015 China held a one child policy. However, some families who satisfied the conditions required by local governments were allowed to have a second child.

human capital accumulation. We consider that an individual care less for her parents than her children, a_P is thus less than or equal to a_K[5].

Denote human capital of migrant workers as h_t which checks $h_t \geq h_0$ with h_0 measuring raw labor. Suppose unit human capital wage is w_t, which is given exogenously, an individual with human capital h_t earns income $w_t h_t$. This income is divided among four additive components: her current (and family's) consumption(c_t), savings s_t for old age, consumption related remittances M_t and children's private education related costs $g(e_t)$. Consumption related remittances refer to the amount of money sent back home in order to support parents' old age and the costs of raising the dependent children who are left behind. Private education-related cost include not only the regular fees paid to the school such as tuition or private tutoring cost but also the special fees existing in Chinese context. For example, many children who are left behind pay and live in their teachers' home. In some mountainous regions, considering the school is far away from the village where children live, the custodians of these children, usually the grandparents, may rent a room close to the school so that the children do not need to take long commutes to go to school every day. For those children migrating to the city with their parents, as we explain in Chapter 1, extra fees are charged to them if they would like to attend the local urban schools. The migrant worker thus faces the following financial budget constraint[6] :

$$c_t + s_t + g(e_t) + M_t = w_t h_t. \tag{2.3}$$

When the migrant is old, her consumption consists of savings when they were young with interest rate r_{t+1}, possible old age working income but with some discounted human capital ϕh_t (parameter $0 \leq \phi \leq 1$) and some exogenous transfer from her adult children or/and public pension, which we denote by $\widetilde{T_{t+1}} = \widetilde{m_{t+1}} + \widetilde{p_{t+1}}$. Thus the old-age budget constraint is

$$d_{t+1} = s_t(1 + r_{t+1}) + w_{t+1}\phi h_t + \widetilde{T_{t+1}}. \tag{2.4}$$

In equation (2.2), the utility of parents depends not only on children's consumption, but also on their children's human capital accumulation. For the special case of Chinese rural migrant workers, we modify the formulation of human capital accumulation, which

[5] The implications of this assumption will be clarified in Section 2.4.2.

[6] For the migrant families with children left behind, the remittance is assumed to cover the consumption of the migrant workers' parents and their children as well as their children's education-related cost. However, if the children migrate to the city, the migrant workers may still send money back to the rural village to support their parents' consumption. Therefore, in equation 2.3, we separate the education-related cost from the remittance.

is suggested by de Brauw and Giles (2012, 2016) and de La Croix and Doepke (2003), in the following equation:

$$h_{t+1}^j = h_0 + B_t^j(\theta_j + e_t^j)^\eta h_t^{\alpha^j}(\overline{h_t^j})^\kappa, \quad j = m, l. \tag{2.5}$$

We use j to define the location of the children's education: $j = m$ captures the case that the children receive education in the place where they migrate with their parents, while $j = l$ represents the children who are left behind and attend school in their rural village.

In this equation, h_0 is raw labor, parameter $\eta \in (0, 1)$ denotes the share of public and parents' contribution to the children's human capital outcome, α^j is parents' human capital impact, $\kappa(\in [0, 1-\eta])$ can be interpreted as the effect of the quality of school, and $\overline{h_t^j}$ is the average human capital of teachers. The positive parameter θ_j measures free public education, indicating that even if the parents do not invest private education on their children, children will still benefit from public education if they make efforts, that is, if $B_t^j > 0$.

Here B_t^j represents a learning productivity parameter, indicating children's ability, their motivation and effort to study at time t. To account for the circumstances of the *lost generation of left behind children*[7], we consider B_t^j can be equal to zero. A positive and large value for B_t^l would suggest that the left behind children are highly motivated and work hard in school, which is confirmed by some anecdotal evidence reported in the media. However, it may be more reasonable to expect B^l to be just slightly larger than zero since the left-behind children lack parental affection, supervision and discipline, they often need to undertake household chores such as cooking and washing clothes, and many of them have to take care of younger siblings or do farm work. B_t^l may vary among the children, such as their age, gender etc., reflecting that boys may suffer more from being left behind than girls, or that young children may be affected more by the separation from their parents than older ones.

B_t^m is hardly expected to be high. Many migrant children struggle with the new environment in the city and they are discriminated by schools in urban areas (Wang, 2008). Moreover, depending on the differences between the curricula of their origin and destination school, migrant children may face difficulties in following lectures.

[7]See for example, the BBC news reported on Septemper 1st 2011 at: `http://www.bbc.com/news/world-asia-pacific-14743222` and on 2nd October 2012 at: `http://www.bbc.com/news/magazine-19787240`. The article on Wall Street Journal at: `http://www.wsj.com/articles/SB10001424052702304173704579260900849637692`.

In equation (2.5) above, the term $h_t^{\alpha^j}$ captures the inter-generational human capital transfer. $\alpha^j = 1$ means that the new generation inherits the same human capital as their parents. However, given the left behind children grow up without the companionship from their parents, they may obtain little skills from their parents, which leads to the assumption that $\alpha^l = 0$. Even if the children migrate with parents, their human capital accumulation may be hindered by the unavailability of parents to supervise homework. Thus, we impose $0 \leq \alpha^j \leq 1$. Having presented each term in equation (2.5), we now turn to the assumptions needed to study the differences in human capital accumulation of the left behind and the migrant children.

Assumption 1
- *Urban schools have better education infrastructure and better teachers than those in rural regions:* $\theta_m > \theta_l$, $\overline{h_t^m} > \overline{h_t^l}$.
- *The inter-generational parameter checks:* $0 \leq \alpha^j \leq 1$, $j = m, l$.
- *The productivity parameter satisfies:* $B_t^j \geq 0$, $j = m, l$.

Assumption 2 *The private education costs follow:*

$$g(e_t) = g^j(e_t^j) = \begin{cases} (e_t^l + k_l), & \text{for left behind children } j = l, \\ (e_t^m + k_m), & \text{for migrant children } j = m \end{cases}$$

with per child relocation cost $k_m > 0$*, while staying at the original location it is normalized to* $k_l = 0$ *and* e_t^j *indicating whether migrant parents chose to offer private education to their children or not.*

Under Assumption 1 and 2, the migrant worker's optimization problem is:

$$\max_{c_t,\, s_t,\, M_t,\, e_t} U_t = u(c_t) + \beta u(d_{t+1}) + \gamma \left[a_P u_P \left(\frac{c_{P,\,t}}{N} \right) + a_K u_k(c_{k,\,t}, h_{k,\,t+1}) \right],$$

subject to the two period budget constraints (2.3) and (2.4), the children's human capital accumulation (2.5) and the remittance constraint which will be presented later.

To get explicit solutions we take the logarithm of the utility function yielding,

$$U_t = \ln(c_t) + \beta \ln(d_{t+1}) + \gamma a_P \ln \left(\frac{c_{P,\,t}}{N} \right) + \gamma a_K [\ln(c_{k,\,t}) + \widetilde{\beta_k} \ln(h_{k,\,t+1} - h_0)].$$

We assume here that parents care equally for all of their children and denote $\widetilde{\beta_k} \in [0, 1]$ a parameter that measures how much parents value children's education compared to their children's consumption. $h_{k,\,t+1} - h_0$ measures human capital, since the physical capital, parents provided for their children, is already included in the c_k term. It shows that parents pay attention to their children's consumption and education.

It is clear from the above functional form that if $B_t^j = 0$, the last term $\ln(h_{k,\,t+1} - h_0) = -\infty$, the parents thus do not have an optimal interior choice. Therefore we present two difference cases: (1) the "normal case" where children have some motivation and make some effort to study in school, that is, $B_t^j > 0$ and (2) the case of the "lost generation" where $B_t^j = 0$.

2.2.2 Theoretical Results - The Normal Case

Since the children in our study may migrate with their parents or be left behind, we treat children's and parents' consumption separately. This distinguishes our work from the classical overlapping generations literature, such as de La Croix and Doepke (2003).

As most of the left behind children are living with their grandparents, we make no difference between the children and their grandparents' consumption, that is, we assume and normalize to family consumption c_f:

$$c_k^l = c_P := c_f. \tag{2.6}$$

Then the migrant's remittance checks

$$\frac{c_{P,\,t}}{N} + c_{k,\,t}^l \leq M_t^l + \widetilde{y}, \tag{2.7}$$

which states that the consumption of left behind children and their grandparents depends on remittances and other exogenous income, $\widetilde{y}$, most likely income from agriculture or leasing farmland. Here the cost of aged parents is shared by total N siblings of the migrant adults. Thus, the migrants' utility can be rewritten as:

$$U_t = \ln(c_t^l) + \beta \ln(d_{t+1}^l) + (\gamma a_P + \Gamma_K) \ln(c_{f,t}) + \Gamma_K \widetilde{\beta_k} \ln(h_{k,\,t+1}^l - h_0), \tag{2.8}$$

with $\Gamma_K = \gamma a_K$ being the altruism factor for children.

If children migrate, the remittances will be purely supporting left behind aged parents and verify

$$\frac{c_P}{N} \leq M_t^m + \widetilde{y}. \tag{2.9}$$

The migrants' utility is

$$U_t = (1 + \Gamma_K) \ln(c_t^m) + \beta \ln(d_{t+1}^m) + \gamma a_P \ln(c_{p,t}) + \Gamma_K \widetilde{\beta_k} \ln(h_{k,\,t+1}^m - h_0). \tag{2.10}$$

Definition 1 *We call* $\{c_t^j, s_t^j, e_t^j, M_t^j\}$ *(* $j = l, m$*)* an optimal choice *if it maximizes utility (2.8) (or (2.10)) under budget constraints (2.3), (2.4), (2.7) (or(2.9)) and the children's human capital accumulation (2.5) with Assumptions 1 and 2.*

The standard first order condition yields that

$$d_{t+1}^{j} = \begin{cases} \beta(1+r)c_t^l, & j = l, \\ \dfrac{\beta(1+r)}{1+\Gamma_K}c_t^m, & j = m. \end{cases} \tag{2.11}$$

Equation (2.11) shows the relationship between the two periods' marginal utility. Taking into account the old-age consumption constraint, we obtain that the migrant's savings follow

$$s_t^j = \begin{cases} \beta c_t^l - \dfrac{\widetilde{T_{t+1}} + \phi h_t w_{t+1}}{1+r}, & j = l, \\ \dfrac{\beta}{1+\Gamma_K}c_t^m - \dfrac{\widetilde{T_{t+1}} + \phi h_t w_{t+1}}{1+r}, & j = m. \end{cases} \tag{2.12}$$

The same calculation as above yields that

$$c_f\left(\frac{1}{N}+1\right) = M_t^l + \widetilde{y} = (\gamma a_p + \Gamma_K)c_t^l \text{ or } \frac{c_P^m}{N} = M_t^m + \widetilde{y} = \frac{\gamma a_p}{1+\Gamma_K}c_t^m. \tag{2.13}$$

The intuition behind equation (2.13) is straightforward: the left-hand side is the cumulative consumption of all left-behind children and old parents, which will be covered by the remittances and the potential income left behind $\widetilde{y}$. At the same time this consumption is determined based on the migrant's own consumption corrected by the altruism factors of children and parents, γa_p and Γ_K.

The optimal choice of private education e_t^j must satisfy

$$\frac{1}{c_t^l}\left(\text{or } \frac{(1+\Gamma_K)}{c_t^m}\right) = \frac{\Gamma_K \widetilde{\beta_k}}{h_{k,\,t+1}^j - h_0} B_t^j h_t^{\alpha^j} (\overline{h^j})^{\kappa} (\theta_j + e_t^j)^{\eta-1}\eta,$$

where the left-hand side is the marginal loss of consumption due to the educational investment and the right-hand side presents the marginal gain for children's human capital accumulation. Rearranging terms in the above equation, the optimal education per child is given by:

$$e_t^j = \begin{cases} \Gamma_K \widetilde{\beta_k}\eta c_t^l - \theta_l, & j = l, \\ \dfrac{\Gamma_K \widetilde{\beta_k}\eta}{(1+\Gamma_K)}c_t^m - \theta_m, & j = m. \end{cases} \tag{2.14}$$

Substituting the above savings, remittances and private education costs into the budget constraint, it follows that for $j = l, m$,

$$c_t^l\left(or\frac{c_t^m}{1+\Gamma_K}\right)(1+\beta+\gamma a_P+\Gamma_K+\Gamma_K\widetilde{\beta_k}\eta) = w_t h_t + \widetilde{y} + \frac{\widetilde{T_{t+1}} + \phi h_t w_{t+1}}{1+r} - k_j + \theta_j,$$

with $k_l = 0$ and $k_m > 0$. We denote $W_t = w_t h_t + \widetilde{y} + \frac{\widetilde{T_{t+1}} + \phi h_t w_{t+1}}{1+r}$ the lifetime earnings composed of the labor incomes from the two periods, the potential income in the home

village, the discounted old-age social transfers and the remittance from their adult children. Thus the left-hand side is the aggregate lifetime cost, which includes consumption by taking into account young and discounted old age, parents and children's consumptions, plus the educational costs of children. The right-hand side is lifetime potential income, which includes lifetime earnings and public social transfers for education net of relocation costs of children's schooling.

From the above analysis we conclude that:

Proposition 1 *Given Assumption 1 and 2 and assuming that* $B^j > 0$ *and* $\widetilde{\beta_k} > 0$*, for migrant workers, there exists one and only one optimal choice,* $c_t^{in,j}$ *which is given by*

$$c_t^{in,j} = \begin{cases} \dfrac{(W_t + \theta_l)}{\Lambda}, & j = l, \\ \dfrac{[W_t + (\theta_m - k_m)](1 + \Gamma_K)}{\Lambda}, & j = m, \end{cases} \tag{2.15}$$

$s_t^{in,j}, e_t^{in,j}$ *are given by (2.12) and (2.14) respectively and remittances are*

$$M_t^{in,l} = (\gamma a_P + \Gamma_K) c_t^{in,l} - \widetilde{y}, \quad M_t^{in,m} = \frac{\gamma a_P}{1 + \Gamma_K} c_t^{in,m} - \widetilde{y}, \tag{2.16}$$

where

$$\Lambda = 1 + \beta + \gamma a_p + \Gamma_K (1 + \widetilde{\beta_k} \eta).$$

Finally, old-age consumption $d_{t+1}^{in,j}$ *is given by (2.11).*

Noticing that migrant's consumption, hence everyone's consumption, increases in terms of public education input, while private education cost decreases: $\frac{\partial e_t^{in,j}}{\partial \theta_j} = \frac{\Gamma_K \widetilde{\beta_k} \eta}{\Lambda} - 1 < 0$. High public education input induces parents to decrease their private educational investment. Thus, instead of providing private education to their children, parents consume that part of income. This argument may lead to the case that no private investment in education is an optimal choice. Therefore, to guarantee that in Proposition 1, $e_t^{in,j} > 0$, the following are needed.

Proposition 2 *Given Assumption 1 and 2. Assume that* $B^j > 0$ *and* $\widetilde{\beta_k} > 0$*. The optimal education investment* $e_t^{in,j} > 0$ *if and only if*

$$\frac{\Gamma_K \widetilde{\beta_k} \eta}{\lambda} (W_t - k_j) > \theta_j \tag{2.17}$$

with $\lambda = 1 + \beta + \gamma a_P + \Gamma_K$.

Condition (2.17) plays the role of Tobin's-q in investment of education, whose intuition is straightforward. The right-hand side is the total public education input of all children, while the left-hand side measures the importance from education in term of consumption and income. Ratio $\frac{\Gamma_K \widetilde{\beta_k}}{\lambda}$ measures the relative importance of education compared to the net of relocation income, $(W_t - k_j)$. Multiplied by the share, η, of educational input, the left-hand side represents total importance of education, or the optimal desired level of educational input. Proposition 2 states that there is private investment in children's education if and only if the public educational spending is lower than parents' desired level of educational input for their children.

In the following, for simplicity, we shall call $\frac{\Gamma_K \widetilde{\beta_k} \eta}{\lambda}\ W_t$ as *relative educational investment*.

Additionally, keeping all other factors constant, education is relatively more expensive for low income parents than for high income ones. Moreover, when migrant workers migrate with their children, their investment on their children's education is affected by the relocation cost (k_m) in the city. In the case of $j = l$, leaving the children in rural hometown, there is no relocation cost, that is, $k_l = 0$, it may therefore occur that

$$\frac{\Gamma_K \widetilde{\beta_k} \eta}{\lambda} W_t > \theta_l \quad \text{while} \quad \frac{\Gamma_K \widetilde{\beta_k} \eta}{\lambda} (W_t - k_m) < \theta_m. \tag{2.18}$$

If that is the case, the following results hold:

Proposition 3 *Suppose that the assumptions of Proposition 2 hold, especially, $B^j > 0$. If furthermore, condition (2.18) holds, it is optimal to invest in children's private education back home, $e_t^{in,l} > 0$.*

This proposition does not state that the migrant parents should take their children to migrate or leave them behind. It only states that if the parents leave their children behind and if condition (2.18) holds, then it is optimal to invest in their children's private education. Obviously, if they bring their children along, it is not optimal to invest in education from the point of view of migrant workers' utility maximization.

If the gap in public educational input between rural and urban areas is remarkable, θ_m is largely above θ_l, condition (2.18) can be held even though migrating with children will lead to the relocation cost k_m. However, condition (2.17) may fail in any case, which it is called as a corner solution, denoted as $e_t^{co} = 0$.

Proposition 4 *Suppose Assumption 1 and 2 hold and $B^j > 0$. If there is no private educational*

investment, $e_t^{co,j} = 0$*, the optimal consumption is*

$$c_t^{co,l} = \frac{W_t}{\lambda} \text{ and } c_t^{co,m} = \frac{(W_t - k_m)(1+\Gamma_K)}{\lambda}. \tag{2.19}$$

$S_t^{co,j}$, $M_t^{co,j}$ *and* $d_t^{co,j}$ *with* $j = l, m$ *are given by (2.12), (2.13) and (2.11), respectively. Moreover,* $e_t^{co,j} = 0$ *is an optimal choice if and only if*

$$\frac{\Gamma_K \widetilde{\beta_k} \eta}{\lambda}(W_t - k_j) \leq \theta_j, \ j = l, m. \tag{2.20}$$

2.2.3 Theoretical Results - Lost Generation

To close this section, we briefly show the results of migrant parents' choices if their children have little motivation to study. In other words, in the human capital accumulation equation, $B_t^j = 0$, we thus have $h_{k,t+1} = h_0$. These children, called *the lost generation* in China, have nothing but raw labor. In this case, the migrant parents do not have an optimal educational choice for their children. Therefore, $e_t^j = 0, j = l, m$ and the following results can be obtained:

Proposition 5 *Given Assumption 1 and 2. Assume that* $B^j = 0$ *and* $\widetilde{\beta_k} = 0$*, the unique optimal choice of migrant workers is* $e_t^{L,j} = 0$*,*

$$c_t^{L,j} = \begin{cases} \frac{W_t}{\lambda}, & j = l, \\ \frac{(W_t - k_m)(1+\Gamma_K)}{\lambda}, & j = m, \end{cases} \qquad M_t^{L,j} = \begin{cases} (\gamma a_P + \Gamma_K) c_t^{L,l} - \widetilde{y}, & j = l, \\ \frac{\gamma a_P}{1+\Gamma_K} c_t^{L,m} - \widetilde{y}, & j = m. \end{cases}$$

The utility is

$$U_t^{L,j} = \lambda \ln(c_t^{L,j}) + \beta \ln(\beta(1+r)) + (\gamma a_P + \Gamma_K) \ln\left(\frac{\gamma a_P + \Gamma_K}{2}\right).$$

Obviously, both private and public educational investment are no longer migrant parents' concern, though the relocation cost k_m still decreases migrant parents' consumption.

The difference between the corner solution presented in last subsection and lost generation case is the following. In the former case, the children make an effort to study, $B_t^j > 0$, but parents may optimally choose not to invest in education, $e^{co,j} = 0$. However, in the latter case, parents do not have a choice for their children's education. There is no private educational investment in both cases, $c_t^{L,j} = c_t^{co,j}$, but the children's human capital accumulation differs: $h_{t+1}^{L,j} = h_0$ because of $B_t^j = 0$; while $h_{t+1}^{co,j} > h_0$ given $B_t^j > 0$.

2.3 When Should Migrants Leave Their Children Behind?

Taking into account the optimal choices of migrant parents for the consumption, saving and investment in their children's private education, we turn to the question: Should these migrant parents take their children with them? What are the conditions for them to bring their children along? In this section, we answer the questions based on optimal private education investment (e_t^j) obtained from previous section as well as the relocation cost threshold, the definition of which will be provided later.

According to migrant parents' optimal choices for their children's education, four possible combinations appear: (I) invest in private education wherever their children are: $e_t^j > 0$, for both $j = l$ and $j = m$; (II) offer no private education $e_t^j = 0$ in both two cases $j = l, m$; (III) migrants invest in private education if they leave their children behind, otherwise, no investment : $e_t^l > 0$, $e_t^m = 0$ and (IV) migrant children have private education, but not the left-behind ones: $e_t^l = 0$, $e_t^m > 0$.

Assumption 1, $\theta_l < \theta_m$, rules out the case (IV)[8]. Therefore, in the following, we only focus on the other three cases.

In China's rural villages, many older left behind children take responsibility for taking care of their younger brothers or sisters. In order to eliminate the effects of siblings, in the following, we take $N = 1$. In addition, considering the human capital of migrant parents transferring to their children's human capital accumulation may be very limited no matter whether parents migrate with their children or leave them behind, in the rest of this chapter, we assume that

$$h_t^{\alpha^m} = h_t^{\alpha^l}.$$

2.3.1 Positive Private Education Regardless of The Location of Children

Parents would like to offer their children optimal private education no matter where their children are living, i.e. $e_t^j > 0$, for $j = l, m$. By Proposition 2, parents' willingness to invest in their children's private education implies that migrant parents' desired level of educational input should satisfies condition (2.17), which can be rewritten as (recall

[8]This assumption may be not held for international migration.

$k_l = 0$)

$$0 < k_m < \widehat{K_m^{(I)}} \triangleq W_t - \frac{\lambda}{\Gamma_K \widetilde{\beta_k} \eta} \theta_m. \tag{2.21}$$

This condition states that migrants' educational investment must check

$$\frac{\Gamma_K \widetilde{\beta_k} \eta}{\lambda} W_t > \theta_m. \tag{2.22}$$

The utility of migrant parents is:

$$U_t^j = \Lambda \ln(c_t^{in,j}) + \Gamma_K \widetilde{\beta_k} \ln \left[B_t^j h_t^{\alpha^j} (\overline{h_t^j})^\kappa \right] + \varepsilon^j + \delta^j, \quad j = l, m \tag{2.23}$$

with

$$\varepsilon^l = \beta \ln(\beta(1+r)) + (\gamma a_p + \Gamma_K) \ln \left(\frac{\gamma a_p + \Gamma_K}{2} \right),$$

$$\varepsilon^m = \beta \ln \left(\frac{\beta(1+r)}{1+\Gamma_K} \right) + \gamma a_p \ln \left(\frac{\gamma a_p}{1+\Gamma_K} \right),$$

$$\delta^l = \Gamma_K \widetilde{\beta_k} \eta \ln \left(\Gamma_K \widetilde{\beta_k} \eta \right)$$

and

$$\delta^m = \Gamma_K \widetilde{\beta_k} \eta \ln \left(\frac{\Gamma_K \widetilde{\beta_k} \eta}{(1+\Gamma_K)} \right).$$

To see what would be the difference between leaving their children behind and migrating with them, we can easily check that:

$$\begin{aligned} U^{in,m} - U^{in,l} &= \Lambda \ln \left[\tfrac{W_t + K(\theta_m - k_m)}{W_t + \theta_l} \right] + I(a_k) \\ &\quad + \Gamma_K \widetilde{\beta_k} \left[\ln \left(\tfrac{B_t^m}{B_t^l} \right) + \kappa \ln \left(\tfrac{\overline{h^m}}{\overline{h^l}} \right) + \ln \left(\tfrac{{h_t^\alpha}^m}{{h_t^\alpha}^l} \right) \right], \end{aligned} \tag{2.24}$$

where $I(a_k)$ stands for the gains from whole family being together which is deduced from the difference in the altruistic terms:

$$I(a_k) = (1+\Gamma_K) \ln(1+\Gamma_K) + \gamma a_p \ln(\gamma a_p) + (\gamma a_p + \Gamma_K) \ln \left(\frac{2}{\gamma a_p + \Gamma_K} \right).$$

Given $0 < \gamma a_p < 1$, it shows that as long as parents care for their children no less than caring for their old age parents, that is, as long as $a_k \geq a_p$, migrants are benefited from taking children with them:

$$I(a_k) > 0. \tag{2.25}$$

It is trivial to see that if the relocation cost is sufficiently high, such as using up migrants' lifetime income: $k_m > W_t + \theta_m$, we have $U^{in,m} - U^{in,l} = -\infty$. Obviously, the only choice for migrants is leaving their children behind. At the same time, it is also easy to

check that if there is no relocation cost, that is, $k_m = 0$, we have $U^{in,m} - U^{in,l} > 0$ provided B^m is not much smaller than B^l. The whole family migrating is better off compared to leaving the children behind. By continuity, there exists positive constant

$$K_m^{(I)} = K_m^{(I)}\left(W_t, \theta_m, \theta_l, \frac{B^m}{B^l}, \frac{\overline{h^m}}{\overline{h^l}}\right) \triangleq W_t + \theta_m - \frac{W_t + \theta_l}{e^{I(a_k)/\Lambda}}\left(\frac{B^l \overline{h^l}^{\kappa} h^{\alpha^l}}{B^m \overline{h^m}^{\kappa} h^{\alpha^m}}\right)^{\Gamma_K \widetilde{\beta_k}/\Lambda}, \quad (2.26)$$

such that,

$$U^{in,m} - U^{in,l} \begin{cases} > 0 & \text{if } 0 \le k_m < K_m^{(I)}, \\ < 0 & \text{if } k_m > K_m^{(I)}. \end{cases} \quad (2.27)$$

In other words, the threshold of relocation cost, $K_m^{(I)}$, determines the gains from migrating with children. This threshold depends on the differences in quality of education among different regions: θ_j and $\overline{h^j}$, and the children's motivation B^j for $j = l, m$, given parents' human capital, and other altruistic parameters.

Additionally, the relocation cost threshold increases with the destination's public input in education, $\frac{\partial K_m^{(I)}}{\partial \theta_m} > 0$, and decreases with the public educational input in rural areas, $\frac{\partial K_m^{(I)}}{\partial \theta_l} < 0$. Similarly, we can have that $\frac{\partial K_m^{(I)}}{\partial\left(\frac{\overline{h^m}}{\overline{h^l}}\right)} > 0$. In other words, the smaller the educational gap between the original rural region and the destination city, the lower is the relocation cost threshold; thus, it is easier and more beneficial for parents to bring their children to migrate together. The larger the gap is, the higher is the relocation cost threshold and the more difficult for parents to take their children along. The last statement seems to be counterintuitive. The reason lies on the fact that migrant workers need pay higher price if they would like to bring their children to the more developed cities in which the quality of education is high. The price here is the relocation cost.

This result suggests that, with regards to the problem of left behind children, it is essential for the policy maker to take measures to increase the educational input in the poor rural regions, such that the educational gap between the rural and urban can be reduced.

Remark. We are not talking about decreasing the development gap between different rural and urban regions, which is not easy to achieve. Instead, we focus only on public educational input and training of qualified teachers, which the policy maker in China are quite possible to pursue.

We conclude the above analysis in the following:

Proposition 6 *Suppose condition (2.22) is satisfied, the migrant workers invest in their children's private education regardless of the location their children. There exits a relocation cost*

threshold which is given by (2.26). This relocation cost is decreasing in terms of the educational gap between urban and rural regions. Moreover,

- *it is optimal for migrant parents to take their children with them and pay private education in the destination (additional to the public education) city, if and only if,*

$$k_m < \min\{\widehat{K_m^{(I)}},\ \ K_m^{(I)}\};$$

- *otherwise, it is optimal for parents to leave their children behind and offer them with private education (additional to public education) in the rural hometown.*

The first part of this proposition is what we demonstrated above. And it is easy to check that the migrant parents leave their children behind with private education if and only if

$$k_m > \max\{\widehat{K_m^{(I)}},\ \ K_m^{(I)}\}.$$

Between the above two polar cases, given both $\widehat{K_m^{(I)}} \lesseqgtr K_m^{(I)}$ are possible, the conclusion is not straightforward. Nonetheless, if relocation cost checks $\widehat{K_m^{(I)}} < k_m < K_m^{(I)}$, though parents are better off by taking their children to migrate, the private investment in education can not reach to its optimal level. While if relocation cost checks $K_m^{(I)} < k_m < \widehat{K_m^{(I)}}$, migrant parents offer optimal private education to their children in the city, but they are worse off in utility than leaving their children behind at least in the short-run. Therefore, the last two cases both should belong to the second statement in the Proposition 6.

For relatively high income parents (or parents who care more for their children's education than consumption), this proposition provides a necessary and sufficient condition on which parents should take their children to migrate and provide them with private education in the destination city. Violating this condition means either parents will be worse off by taking their children to migrate than leaving their children behind, or it is not an optimal educational choice. Leaving them behind with private education is the optimal choice.

2.3.2 No Private Education Regardless of The Location of Children

The other symmetric case, $e_t^j = 0$, for $j = l, m$, is that regardless where their children are living, private education is too costly for migrant parents considering their income. By

Proposition 2, that means the migrants' relative educational investment checks

$$\frac{\Gamma_K \widetilde{\beta_k} \eta}{\lambda} W_t < \theta_l \, (< \theta_m) \, . \tag{2.28}$$

In other words, either parents' educational investment are too low compared with public educational input or the public educational input is sufficiently high so that they do not need invest privately in education. In either way, with no private education cost, the migrant workers' utility can be rewritten as

$$U_t^j = \lambda \ln(c_t^{co,j}) + \Gamma_K \widetilde{\beta_k} \, \ln \left[B_t^j \theta_j^\eta h_t^{\alpha^j} (\overline{h_t^j})^\kappa \right] + \varepsilon^j, \;\; j = l, m. \tag{2.29}$$

The high utility essentially results from high consumption and high human capital accumulation of children. Direct calculation yields that the difference in consumption between migrating with children and leaving them behind is:

$$c_t^{co,m} - c_t^{co,l} = \frac{W_t \Gamma_K - k_m(1+\Gamma_K)}{\lambda} \;\; \left(\gtreqless 0 \right) . \tag{2.30}$$

Obviously, taking the children to migrate does not automatically increase the consumption and utility. The difference in consumptions essentially lies on the relationship between altruistic gain, $W_t \Gamma_K$, and relocation cost of children, $k_m(1+\Gamma_K)$. If the gain is high enough to cover the relocation cost, everyone in the family would have higher consumption with children migrated than leaving them behind. However, when the gain is less than the cost, total consumption, including the migrant workers, their children and their parents, are less than the ones leaving the children behind. In this scenario, the only possible improvement in migrant worker's utility is children's human capital accumulation, $h_{t+1}^m - h_0$. Notwithstanding, there is no guarantee that the migrant children's human capital is better than those of being left-behind.

More precisely, similar to the previous case, direct calculation yields

$$\begin{aligned} U^{co,m} - U^{co,l} \;\; &= \lambda \ln \left[\tfrac{W_t - k_m}{W_t} \right] + I(a_k) \\ &+ \Gamma_K \widetilde{\beta_k} \left[\ln \left(\tfrac{B_t^m}{B_t^l} \right) + \kappa \ln \left(\tfrac{\overline{h^m}}{\overline{h^l}} \right) + \ln \left(\tfrac{h_t^{\alpha^m}}{h_t^{\alpha^l}} \right) + \eta \ln \left(\tfrac{\theta_m}{\theta_l} \right) \right] , \end{aligned} \tag{2.31}$$

in which the first term is always negative given $k_m > 0$ and the second and last terms are always nonnegative, provided migrant children do not decrease too much their motivation and efforts compared to being left-behind.

Similar to Case (I), there exists positive relocation cost threshold

$$K_m^{(II)} = W_t \left[1 - \left(\frac{B^l \overline{h^l}^\kappa h^{\alpha^l} \theta_l^\eta}{B^m \overline{h^m}^\kappa h^{\alpha^m} \theta_m^\eta} \right)^{\Gamma_K \widetilde{\beta_k}/\lambda} e^{-\frac{I(a_k)}{\lambda}} \right] , \tag{2.32}$$

such that,

$$U^{co,m} - U^{co,l} \begin{cases} > 0 & \text{if } 0 \leq k_m < K_m^{(II)}, \\ < 0 & \text{if } k_m > K_m^{(II)}. \end{cases} \tag{2.33}$$

Therefore, for this group of migrants, the following conclusion can be drawn:

Proposition 7 *Suppose migrant's income checks (2.28), that is, parents can not (or do not need to) afford any private education to their children regardless where their children are living. There is the relocation cost threshold, which is defined by (2.32), such that,*

- *if $k_m < K_m^{(II)}$, parents would be better off by taking their children to migrate;*
- *if $k_m > K_m^{(II)}$, it is optimal for parents to leave their children behind.*

2.3.3 Positive Private Education Only If Children Being Left Behind

$e_t^l > 0, \;\; e_t^m = 0$

Parents may realize that the quality of education in the city is better than their rural hometown and education is essentially important for their children's future. In order to let their children have better education, the migrant parents may invest in private education for their children when they leave them behind, however, no private education will be invested if these children migrate to the city. That is, via Proposition 2, public educational input checks

$$\theta_l < \frac{\Gamma_K \widetilde{\beta_k} \eta}{\lambda} W_t < \theta_m. \tag{2.34}$$

In this case, parents' utilities are:

$$U_t^{in,l} = \Lambda \ln(c_t^{in,l}) + \Gamma_K \widetilde{\beta_k} \ln \left[B_t^l h_t^{\alpha^l} (\overline{h_t^l})^\kappa \right] + \varepsilon^l + \delta^l$$

and

$$U_t^{co,m} = \lambda \ln(c_t^{co,m}) + \Gamma_K \widetilde{\beta_k} \ln \left[B_t^m \theta_m^\eta h_t^{\alpha^m} (\overline{h_t^m})^\kappa \right] + \varepsilon^m.$$

Thus, the difference is:

$$\begin{aligned} U^{co,m} - U^{in,l} &= \lambda \ln \left[\tfrac{W_t - k_m}{W_t + \theta_l} \right] + \Gamma_K \widetilde{\beta_k} \eta \ln \left(\tfrac{\theta_m}{e^{in,l} + \theta_l} \right) \\ &\quad + J(a_k) + \Gamma_K \widetilde{\beta_k} \left[\ln \left(\tfrac{B_t^m}{B_t^l} \right) + \kappa \ln \left(\tfrac{\overline{h^m}}{\overline{h^l}} \right) + \ln \left(\tfrac{h_t^{\alpha^m}}{h_t^{\alpha^l}} \right) \right], \end{aligned} \tag{2.35}$$

where $J(a_k) = \lambda \ln\left(\frac{\Lambda}{\lambda}\right) + (1+\Gamma_K)\ln(1+\Gamma_K) > 0$ and $e^{in,l} + \theta_l = \frac{\Gamma_K \widetilde{\beta_k} \eta (W_t + \theta_l)}{K\Lambda}$ by (2.14). Considering the terms in the second line are always nonnegative because of the assumptions and if the migrant children's motivation do not decrease too much compared to being left behind. The second term on the right-hand side could be positive or negative depending on the educational input ratio, $\frac{\theta_m}{e^{in,l}+\theta_l}$. If the destination's public educational input is sufficiently high, such that, $\theta_m > e^{in,l} + \theta_l$, then children migration should benefit from the public school in the destination. Nevertheless, the first term on the right-hand side is always negative due to the relocation cost. More precisely, the relocation cost threshold in this case is given by

$$K_m^{(III)} = W_t - \frac{W_t + \theta_l}{e^{J(a_k)/\lambda}} \left(\frac{B^l \overline{h^l}^{\kappa} h^{\alpha^l}}{B^m \overline{h^m}^{\kappa} h^{\alpha^m}} \left(\frac{e^{in,l} + \theta_l}{\theta_m} \right)^{\eta} \right)^{\Gamma_K \widetilde{\beta_k}/\lambda}, \tag{2.36}$$

This threshold can be positive or negative. The following conclusion can be made in this case:

Proposition 8 *Suppose condition (2.34) holds and relocation cost threshold $K_m^{(III)}$ is defined by (2.36),*

- *if $K_m^{(III)} > 0$ and if $0 < k_m < K_m^{(III)}$, migrant parents are better off by taking their children to migrate, though without private education in the destination;*
- *otherwise, if $k_m > K_m^{(III)}$, it is optimal for migrant parents to leave their children behind but invest in their private education.*

The information from the second part of this proposition is two-fold: (1) $k_m > K_m^{(III)} > 0$ and (2) $k_m \geq 0 > K_m^{(III)}$. In the first case, it is still possible that reducing the real relocation cost, k_m, to such an extend that parents are better off by taking the children to migrate, for example, changing the policy that decreasing or eliminating the extra fees charged to migrant children in public schools in the city. However, If $K_m^{(III)} < 0$, this implies that the optimal choice for parents is leaving their children behind and investing in their private education because it is too costly to migrate with their children.

2.3.4 Summary of Findings

Combining the above three cases, we summarize the findings in the Figure 2.1, which gives precise idea where Chinese internal migrant parents should locate their children.

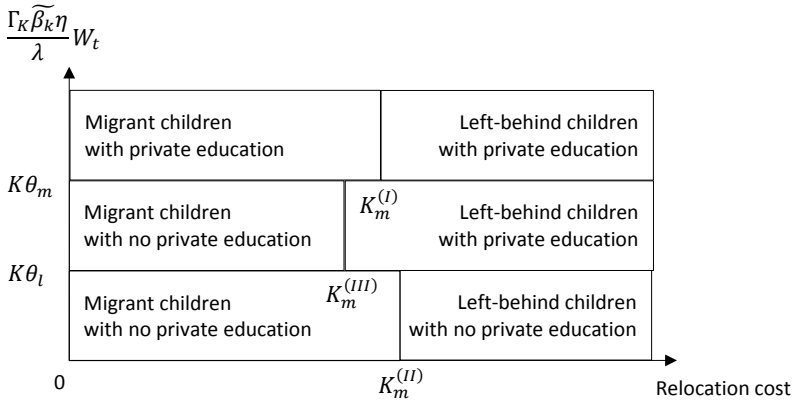

Figure 2.1: Choice of migrant parents.

The decision depends on their income, concerns of human capital accumulation of their children and relocation cost threshold.

In Figure 2.1, the horizontal axis is the relocation cost for children migration and the vertical axis presents the private educational investment of migrant parents. Recall that the educational investment is determined by mainly two parts: the lifetime income, W_t, and how parents value children's education in term of consumption, $\frac{\Gamma_K\widetilde{\beta_k}\eta}{\lambda}$. If all parents value their children's education equally, that is, $\frac{\Gamma_K\widetilde{\beta_k}\eta}{\lambda}$ is the same for everyone, then parents' decision of taking their children to migrate or leaving them behind as well as how to invest in their education, will only depend on income. Nonetheless, parents may value their children's education differently. It could happen that some high income parents do not care about their children's education due to the fact that education is not rewarded as it should be or they are just too busy to care about their children's schooling. If this is true, their private educational investment , $\frac{\Gamma_K\widetilde{\beta_k}\eta}{\lambda}W_t$, is low compared to public educational input. On the other hand, it is also possible that low income parents realize how important education is to their children and consider it as the only way to get out of poverty. They value $\frac{\Gamma_K\widetilde{\beta_k}\eta}{\lambda}$ highly, such that, $\frac{\Gamma_K\widetilde{\beta_k}\eta}{\lambda}W_t$ is high related to public educational input, though their income, W_t, is low. In other words, these parents sacrifice their consumption, and the whole family's consumption, in order to provide good education for their children.

Given the work most of Chinese internal migrants undertake,[9] the relative low income

[9]China's National Bureau of Statistics estimates that in 2015, 31% migrant workers were employed in manufacturing sector, 21% in construction sectors, 12% in sales, 11% in household services, 6% in transport and logistics, another 6% in hotel and catering services and the rest 13% took others sector jobs.

and high relocation cost may be the reason that there are so many Chinese young children being left behind. Though the decision of leaving their children behind is difficult for migrant parents, that may be the rational choice.

2.4 The Dynamics and The Long-run Outcomes

In this section, we will investigate what would be the long-run consequences from the decision of Chinese internal migrant parents on where to locate their children and on how to educate their children.

For rural children in China, except working as farmers or as migrant workers just like their parents, they have two ways of changing their hukou status: (1) individual efforts to succeed in the National College Entrance Examination (*Gaokao* in Chinese) and become skilled labor after graduation and; (2) to be lucky falling into the urbanization process.

2.4.1 Gaokao and Urbanization

If Chinese rural children successfully enter and finish university study, their high education will enable them to find a well paid job and live in the city, so will their future children and descendants. Therefore, succeeding in Gaokao is essential for the family's short- and long-run welfare. Gaokao is usually a prerequisite for the entrance into most of universities in China at the undergraduate level. Students take the exam in June at the last year of their senior high school study. The subjects of Chinese, Mathematics and English language are compulsory in most provinces, but other subjects may change across provinces. Generally, the students need to take their exam in the region where their hukou is registered, most of the migrant children thus have to return to their hometown before the Gaokao.

Besides entering university, a person may get a city hukou (so do their descendants in the future) through the process of urbanization.

Therefore, migrant parents' decisions are not only important for their own welfare, but also essential for their children's future (the short-run effects) as well as their future descendant's economic potential (the long-run effects).

It is worth to notice that the current setting of human capital and wealth accumulation dynamics of Chinese internal migrants is similar to the seminal contribution of Galor and

Zeira (1993) and Galor and Omer (2004), where parents' wealth and bequest play roles in determining the long-run equilibrium of the economy. In their studies, the parents' bequest may limit children's ability to borrow from the credit market and hence constraint their chances of educational investment. The current study differs from their contribution in the following two aspects: (1) Chinese internal migrants usually do not rely on the financial credit market because of the limitation and imperfection of Chinese credit market, rather they rely on their own income to invest in their children's education; (2) we do not investigate from the perspective of macroeconomics, we rather focus only on the offspring of the current migrant workers by assuming that the Chinese macroeconomic environment, especially the hukou system, will not change in the short- and long-run. This does not mean the long-run Chinese macroeconomic study is not interesting, however, it is a very important topic and deserves a separated study.

2.4.2 Long-run Consequences

We start with the children with motivation to study, that is, $B^j > 0, j = l, m$. Following the theoretical finding in Figure 2.1, there are four possible outcomes from parents' decisions on where to locate their children and how to educate them: children are living in (a) city with receiving private education, (b) city without taking private education, (c) rural hometown with private education, or (d) rural hometown with no private education.

We denote that children who get private education have probabilities $p^j \in (0,1)$ ($j = l, m$) to enter university. If they do not get any private education, the probabilities of entering university are $q^j \in (0,1), j = l, m$, depending on whether they are left behind or migrant children. Mathematically, for $j = l, m$, the probability of going to university, which is measured only on final scores of the entrance exam, checks

$$P\left(h_{t+1}^j - h_0 = B_t^j(\theta_j + e_t^j)^\eta h_t^{\alpha^j}(\overline{h_t^j})^\kappa \geq h^*\right) = \begin{cases} p^j, & \text{if } e_t^j > 0, \\ q^j, & \text{if } e_t^j = 0, \end{cases}$$

where h^* is the lowest level to enter university.[10]

By assuming that the public schools in the city are better than the ones in the rural village, then with private investment in education, we can impose that

$$p^m > p^l, q^m > q^l.$$

[10]Different universities have different entry requirements. Even in the same university, the entry levels may differ among the original regions of the students.

However, it is hard to justify the magnitude between p^l and q^m, even though we assume that education in the city is better than the one in rural areas, however, migrant children may not have advantage over the left behind who receive private education, because many migrant children who study in a different province from the province where the hukou is registered, they have to return to their hometown to take Gaokao, the subjects of which may differ.

Due to the urbanization process, migrant children have probability $\tau \in (0, 1)$ of getting a city hukou during their childhood.

Combining two channels together, migrant children who receive private education have the probability $\tau + p^m$ to get a city hukou, and with the probability of $1 - \tau - p^m$ that they stay with holding a rural hukou. While for migrant children who do not receive private education, the chance to remain a rural hukou is $1 - \tau - q^m$. Considering these children grow up in the city instead of their original rural villages, they will remain as migrants just like their parents.

For the left behind children, children who take private education are more likely to enter the university ($(p^l - q^l > 0)$. Otherwise, they will remain holding a rural hukou and grow up in the rural hometown. They will face the same decision as their parents that whether go to cities to pursue a job or stay in the countryside. If they decide to migrate, they will face the same dilemma as their parents: Where will they locate their children - leave them behind or take them, provide them with private education or not?

For those children with no motivation to study, that is $B^j = 0(j = l, m)$, as demonstrated previously, the parents do not have a choice on their education. It is unlikely for these children to go to university. Nevertheless, if they migrate with their parents to the city, they have the same probability to obtain a city hukou as the other migrant children via the process of urbanization. Otherwise, they remain their rural hukou status and work as their migrant parents. For the left behind non-motivated children, they stay in rural areas and need to make the same decisions or choices as their parents have made.

We use the tree in Figure 2.2 to illustrate the above dynamics of hukou/skills changing over generations.

The above analysis demonstrates that migrant children taking private education have much more chances to obtain city hukou or get better paid jobs than the rest of the children. Therefore, if the current migrant workers take into account not only their children's human capital accumulation (short-run), but also their future descendants' economic potential (long-run), the optimal choice should take the children to migrate and provide

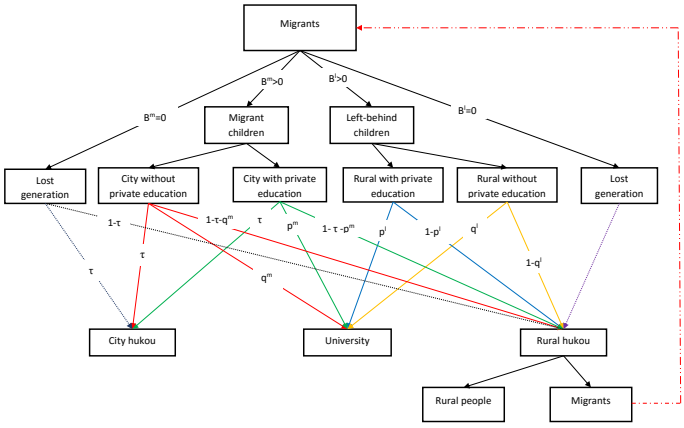

Figure 2.2: Dynamics of Migrants' hukou change

them with private education. Figure 2.1 also shows that decision depends on the relatively income. The ones, at the upper-left-corner of Figure 2.1, who have relatively high educational income and can afford to take their children to migrate and offer them with private education, their children will be better off than the other children. Thus, the inequality among different migrant families are increased over a few generations. But, if low income parents value more for their children's education than parents with relatively high income, the inequality situation may change over time.

Nevertheless, studying the macroeconomic environment and the long-run distribution of the Chinese economy is beyond the current study.

2.5 Conclusion Remarks

The aim of this chapter is to provide answers to the following questions: Where should Chinese internal migrant parents locate their children - leave them behind or take them to migrate? How should they invest in their children's education?

Even though migrant parents would like to take their children with them, however, for many families, this good wish become impossible. Therefore, leaving their children behind in their hometown becomes a rational choice.

The originality of our study is that our model demonstrates that the decision of migrant workers' on their children's location relies on the relocation cost of children's migration. The relocation cost depends on the cost such as extra school fees charged on them due to the constraint of hukou as well as educational development gaps between rural and urban regions. The larger the educational gap between rural and urban areas, the higher is the relocation cost threshold. Therefore, to facilitate the process of children migrating with their parents, some basic child-related policies and infrastructure are needed. These policy include reducing the educational gap between the regions where migrants register and the cities to which they migrate, diminishing school fees and providing public health care for migrant children or removing the barriers of children migration so as to decrease the relocation cost of migrant workers migrating with their children.

Furthermore, providing children with extra private education to complement the public school not only affects children's human capital accumulation but also influences the economic potential of their descendants in the future. The provision of private education relies on the comparison between educational investment of migrant parents and the public educational input.

The educational investment is defined as lifetime income multiplied by the education-consumption ratio, and the lifetime income also includes potential remittance from children in the future. The inequality can be decreased if the low income migrant parents value more for their children's education than the high income ones. Nonetheless, if all parents care equally for their children's education, inequality increases over generations.

It is worth noting that our theoretical results are based on a tractable model that ignores many economic and non-economic effects of Chinese internal migration, for example, we do not take into account the pension system at origin and at destination. Nevertheless, omitting these effects allows us to focus on the main concerns of the migrants workers. Future work could account for the extensions of which including the macroeconomic impacts of migrant workers. Especially, we should forecast and estimate the gain and lost in GDP when these left-behind and migrant children enter the job market. One possible further study is in line with the framework of Galor and Zeira (1993), but including migrant worker and original city residents together, to study the long-run distribution of wealth and inequality among all population. Furthermore, with the availability of new data, further empirical investigation may be implemented.

Chapter 3

Are There School Performance Differences between Chinese Internal Migrants' Children?

3.1 Introduction

In first chapter, it is said that in 2013, for Chinese internal migrant workers' children, there are 61 million children left behind, among which more than three percent (that is, more than 2.1 millions) live alone. The others migrate with their parents, the proportion of which is one out of three in urban areas, amounting to a staggering 35.81 million.

Considering an individual can draw on free public education, only in the place of registration, though there are more educational resources in cities than that in rural areas, because of hukou restriction, there is no guarantee that educational outcome of children migrating to the city is better than children who are left in the rural village. In this chapter, we estimate the effect of location on school performance of migrant worker' children.

When migrating to the city, children may either attend makeshift private migrant schools, which often lack adequate teachers, or pay high fees in order to be admitted to public schools (Liu et al., 2015, Lu and Zhang, 2004, Wang and Holland, 2011, Wong et al., 2007). Public schools prefer urban children to migrant children because the government subsidies they receive are solely based on the number of local children enrolled. Schools

may boost their revenue by charging extra fees and require donations from migrant parents, with amounts proportional to the schools' academic reputation. This strong incentive to maintain high academic standards, together with the often-held view of migrant children as being academically inferior, leads public schools to set up obstacles to admitting migrant children (Chan and Crothall, 2009). Migrant children thus often attend mediocre or low quality schools, even if they have been living in their host cities for many years.

The hukou system influences not only migrant children's enrollment in public schools, but also their results in Gaokao, the National College Entrance Examination. Children take this test in June of their last year of senior high school. Chinese and Math are mandatory subjects in all provinces, English is also commonly tested, but provinces may also add other subjects. As children are supposed to take this exam in the their hukou registration place, migrant workers' might find themselves tested in subjects they have not studied in the cities where they migrated. This means that even if migrant children successfully enrolled in better quality public urban schools, they may be disadvantaged in the Gaokao exam.

Considering these interactions between hukou system and the Gaokao policy, it is not obvious whether a rural or an urban compulsory schooling is preferable for children of migrant parents.

There have been growing number of studies on the impact of parental absence on school performance or school attainment of children in rural areas. Using data from north-eastern provinces of Hebei and Liaoning, Meyerhoefer and Chen (2011) find that parental migration is associated with a lag in grade-level attainment for left behind children compared with other rural non-left behind children, especially for girls. Lu (2012), Zhang et al. (2014), Zhao et al. (2014), Meng and Yamauchi (2015) and Lu et al. (2016) conclude that parental migration significantly lowers the grades of left-behind children relative to children whose parents have not migrated.

Notwithstanding, no consensus has been reached on the studies of educational gap between migrant and rural children. Comparing the test scores of children in migrant schools in Beijing with the test scores of children in Shaanxi's rural public schools, Lai et al. (2014) conclude that among fourth-grade students, migrant students outperform those in rural public schools. In contrast, Wang et al. (2017) find evidence showing that the fifth grade students in rural public school perform better in Math test scores than migrant counterparts in private migrate school in the city.

The existing studies on Chinese migrant workers' children mainly do comparative

analysis among young children in primary school. With the educational and psychological literature, however, parental effects on children's school performance are likely to be stronger when children are in primary school and to weaken as children grow older (Entwisle and Hayduk, 1982, 1988, Topor et al., 2010). The objective of this chapter, therefore, is to test whether this hypothesis is robust for the school performance between migrant and left behind children in China. By exploiting the 2009 Rural Urban Migration survey in China, the baseline finding is that, on average, Chinese test scores of migrant children are better than children who are left-behind in the rural village. We further demonstrate that this advantage of migrant children depends on the age of children: young children being schooled in cities show better results than their left behind peers, yet no such advantage exists at the level of junior high school.

Though much efforts being made, these results need to be interpreted with caution. Selection of children into a migrating or left-behind group may be endogenous, it may depend on some unobserved variables that cannot be controlled for. Nonetheless, this findings are consistent with educational literature that parents' involvement are positively related to young children's school performance (Entwisle and Hayduk, 1982, 1988, Topor et al., 2010).

The rest of chapter is structured as follows. Section 3.2 describes the large-scale survey of internal migrants in China and Section 3.3 presents the empirical analysis strategy and results. Section 3.4 concludes.

3.2 Data

3.2.1 The Data

Nationwide data collection regarding internal migrants in China is made very challenging by the geographical scale and temporary nature of the migration, the sheer number of persons concerned as well as the usual difficulties in defining and tracking migrants, especially unregistered migrants. However, the recent large-scale Migrant Household Survey (MHS), drawing on a random sample of rural-to-urban migrant households from the five provinces which are the largest source of migrants in China and the four most common destination provinces [1] allows some interesting insights on the outcomes of Chi-

[1]The sample covers 15 cities in nine provinces: Shanghai, Guangdong, Jiangsu, Zhejiang, Anhui, Hubei, Sichuan, Chongqing and Henan. According to the 2000 Census, two-thirds of migrant workers in China have chosen as destination cities in the provinces of Shanghai, Guangdong,

nese internal migration. The survey design and implementation are described in detail by (Kong, 2010).

The MHS is one of the three independent surveys forming the Rural Urban Migration in China (RUMiC) survey [2]. It has been initiated in 2006 by a group of universities comprising the Australian National University, the University of Queensland and Beijing Normal University as a longitudinal survey following migrant households for a period of five years. The MHS targeted the population of migrants who were registered in a rural area but lived in an urban area at the time when the survey started in 2008 (Kong, 2010).Considering these workers usually live in factory dormitories or makeshift accommodations, a sampling frame was not readily available. Instead, the survey first randomly selected workplaces within defined city boundaries and subsequently migrant workers in each workplace were randomly chosen based on their birth months. Face-to-face interviews with the selected workers and the members of their households[3] living in the city were performed.

The MHS questionnaires collect rich information on demographic and socio-economic characteristics of migrant workers, their household members in the city as well as their spouses and children who stayed behind in the home village. Parents or custodians provided answers concerning many types of expenditures, including those for education, as well as test scores obtained in school by children who were younger than 16 years old and children who were older than 16 but still in school. Parents can be assumed to have good knowledge of their children's scores because at the end of each semester they attend a parents meeting and the final test scores are also sent to parents in writing (see Meng and Yamauchi (2015) for more detail).

Despite considerable efforts of the surveying team, 64% of households could no longer be tracked after the first wave (Akgüç et al., 2014). This substantial attrition rate prevents us from relying on the panel dimension of the MHS. We exploit only the second wave of the MHS because at present it is the only publicly available wave in which scores obtained by children in school have been collected. In early 2009, 5243 households were interviewed. They had a total of 3116 children, of which 1219 children were too young

Jiangsu and Zhejiang. 47% of migrant workers stem from the Sichuan, Chongqing, Anhui, Hubei and Henan provinces (Akgüç et al., 2014).

[2]The financial support for RUMiC was obtained from the Australian Research Council, the Australian Agency for International Development (AusAID), the Ford Foundation, IZA and the Chinese Foundation of Social Sciences. The two other surveys in the RUMiC project are the Urban Household Survey (UHS) and the Rural Household Survey (RHS).

[3]A household was defined as anyone who was living with the respondent at the time of the survey, sharing income and expenditure.

to attend school and 1897 were aged between 6 and 16 or were older than 16 but still in school. 148 school-aged children who already obtained a local urban hukou were excluded from the analysis, as were the 394 children for whom Math or Chinese scores were not recorded (46 had dropped out of school altogether).

In explaining test scores earned by the children in school, selection bias may occur if children earning high scores continue education beyond the nine years of compulsory education whereas lower achieving students leave school to seek jobs. We thus restricted our analysis to children enrolled in compulsory education, i.e. enrolled in primary and junior high school. Our sample thus consists of 789 children with complete information[4], of which 415 are migrant children and 374 are left-behind children. Children whose primary residence the year before the survey was a rural village are considered left-behind children and those living in the city in the same period are defined as migrant children.

We measure school performance by the test scores earned by children both in Math and in Chinese language because these two are main subjects taught and tested in every grade of the 9-year compulsory education in accordance with the National Curriculum Standard designed by the Ministry of Education. The contents of the tests in each region must follow the National Curriculum Standard (Meng and Yamauchi, 2015), allowing comparability across provinces of China. It is widely accepted they provide a good measure of overall school performance of children (Chen et al., 2009, Zhao et al., 2014). As schools in China may use different scales in grading children's performance, we ensure comparability across schools by analysing not the raw Math and Chinese scores but standardized scores, determined as the ratio of the actual scores obtained to the maximum test score possible in the school for Math and Chinese respectively. The maximum scores were reported by the parents in the RUMiC data.

3.2.2 Descriptive Statistics

The descriptive statistics are reported in Table 3.1. The proportion of 58% boys in the sample is slightly high, but one should keep in mind in the Chinese population the sex-ratio also tends to be high (in 2005 it was estimated by China's National Bureau of Statistics at 54.25% (UNICEF, 2014)) and that in the rural population from which the migrants emerge the share of boys is known to be even higher (it was at 54.89% at the time of the 2000 census (Wang et al., 2006)). We find no evidence of a preference for migrating with sons, as had been reported in previous literature (for example, (Chen and Feng, 2013)).

[4]Observations with missing information on explanatory variables are excluded.

Migrant and left-behind children are similar in age and are equally likely to be only children. Almost half of the children in our sample are not the only child in the household. While this might seem inconsistent with the one-child policy China has long implemented, it is not surprising since the one-child policy has always allowed households holding a rural hukou to have a second child if their first child was a girl. In certain regions a family could also pay a so-called "social compensation fee" in order to have a second child.

Educational expenditure is the sum of private educational cost, regular living cost and school fees and sponsorship fees, that is the educational related cost. These private educational cost were collected under the heading “remedial costs outside of school" in the questionnaire of MHS and they correspond to cram school expenses. Cram schools provide extra classes for children in the evenings, weekends or school holidays with the stated aim of improving their school test scores. Parents who migrated with their children are more likely to spend on private education and spend on average three times more on private education than those who left their children behind. Regular living and school fees, consisting of expenses for food, accommodation and remedial classes taken in school, are similar for families who left children behind and those who migrate with children. Although China passed a law in 2008 that barred schools from charging parents with extra fees for simply accepting to enrol their children, many schools continued to demand such fees in the form of donations, called “sponsorship fees" in the MHS questionnaire. Because children with rural hukou do not have a right to enroll in urban schools, parents who have migrated with their children are more likely to incur such fees. Indeed, 28% of migrant parents reported having paid such sponsorship fees compared to only 5% of migrants who have left children behind.

In spite of these differences in sponsorship fees paid, the parents’ perception of the quality of the school their children attend is the same whether the children are left-behind or migrant. More than two thirds of parents consider their children attend “average or below" quality schools and slightly more than one quarter think their children are enrolled in “better than average" schools. Only 4% of parents report their migrant children attend schools of “the best" quality, which confirms the difficulties migrant children have in accessing good quality education in their destination cities. Yet among parents who left children behind the proportion who think their children are enrolled in “the best" quality schools is only slightly higher, at 6%.

Household income is the total income earned by family members living in the destination city. The income of families migrating with children are 19% higher than the families where children are left-behind. Consistent with our hypotheses, migrant parents remit

almost 40% more on average if their children are left-behind.

As expected, migrant parents themselves have only gained limited education: only 15% of fathers and 10% of mothers have high school education or above. For left-behind children it is most often the mother that raises the child, so her education level is particularly important for the children's learning. In families migrating with children, the proportions of higher educated fathers/mothers are slightly higher than among families where children are left-behind.

In order to control for possible regional differences in children's school performance, we introduce a set of dummies indicating the origin of migrant children and the area where left-behind children live. Ideally province-level dummies would have been used, but insufficient observations have led us to distinguish just three regions: a Central region, a Coastal region and the region of Western China. Half of the children in our sample come from the Central provinces of China, which is not surprising, because central China is at the same time less developed than the east-coast and not too far removed from the urban east-coastal areas to allow migration. Western areas are poorer than central ones, but migration from those areas is hindered by the vast distances migrants would have to travel away from home. Close to 30% of the children stem from Western areas.

Chinese and Math test scores are higher than expected, with migrant children scoring on average 86% of the maximum score and left-behind children scoring on average 83.6% of the full score. One possible explanation is the case that, at the compulsory education stage, it is generally easier for children to obtain higher test scores. The gap in Math test scores between two groups is minor, but the unconditional difference in mean Chinese test scores is 2.4 percentage point in favor of migrant children. The magnitude in Chinese test scores difference between two groups seems to be small. Nevertheless, the examination is very competitive in China, especially for the National College Entrance Examination (Gaokao). It is estimated that there were over 9 million [5] candidates in 2017 attending Gaokao. The test scores of students in the exam determine the type and status of universities to be selected (Davey et al., 2007). Therefore, the small difference in test scores can fluctuate a student's ranking in the exam and change the course of his life.

[5]The figure comes from an online source: `http://www.xinhuanet.com//english/2017-06/06/c_136344855.htm`.

Table 3.1: Summary statistics

	Migrant children	Left-behind children	All children		
	Mean	Mean	Mean	Min	Max
Standardized test scores					
Chinese	0.860	0.836	0.849	0.24	1
	(0.106)	(0.121)	(0.114)		
Mathematics	0.868	0.855	0.862	0.20	1
	(0.118)	(0.120)	(0.119)		
Age of children	10.877	11.345	11.099	6	18
	(2.87)	(2.91)	(2.90)		
Grade of children	4.52	5.01	4.75	1	9
	(2.50)	(2.54)	(2.53)		
Proportion of boys	0.58	0.59	0.58		
Proportion of households with an only child	0.470	0.409	0.441		
Educational expenditure	2.04	1.45	1.76	0	18.30
	(2.38)	2.23	2.33		
of which					
Private education cost	0.112	0.037	0.077	0	4.50
	(0.438)	(0.223)	(0.357)		
Regular living and school fees	1.44	1.33	1.39	0	15
	(1.87)	(2.00)	(1.93)		
Having paid a sponsorship fee	0.282	0.045	0.170		
(1= having paid a sponsorship fee; 0 otherwise)					
Household income	38.97	31.76	35.56	7.20	12
	(20.30)	(17.03)	(19.15)		
Remittance	3.83	5.31	4.53	0	50
	(6.16)	(6.49)	(6.36)		
Perceived quality of school					
Average or below	0.680	0.676	0.678		
Better than average	0.282	0.259	0.271		
The best	0.039	0.064	0.051		
Father's level of education	0.159	0.139	0.150		
(1 = high school and above; 0 otherwise)					
Mother's level of education	0.104	0.088	0.096		
(1 = high school and above; 0 otherwise)					
Region of origin					
Central	0.523	0.484	0.504		
Coastal	0.198	0.222	0.209		
Western	0.280	0.294	0.286		
Observations	415	374	789		

Source of data: RUMiC data. MHS wave 2009. Notes: Standard deviations are reported in parenthesis. Educational expenditure, private education cost, regular living and school fees, household income and remittance are measured in thounsands of RMB per year. The Coastal region includes the provinces of Fujian, Guangdong, Jiangsu, Liaoning, Shandong, Zhejiang and Shanghai. The Central region inlcudes migrants from the provinces of Anhui, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangxi and Shanxi. The Western region regroups Chongqing, Gansu, Guangxi, Guizhou, Ningxia, Qinghai, Shaanxi, Sichan, Xinjiang and Yunan.

3.3 Empirical Strategy and Results

3.3.1 Empirical Strategy

The baseline model is written as:

$$S_{ih} = \alpha + \beta_1 M_h + \beta_k X_{kih} + \epsilon_{ih}, \tag{3.1}$$

where S_{ih} stands for the standardized Chinese or Math test scores of child i in household h. M_h is equal to 1 if children in household h are migrant and 0 if they are left-behind. X_{kih} is a vector of k control variables refering to characteristics of children, parents, households and region of origin, such as gender and age of the children, the perceived quality of the school children attend, yearly household expenditures on education, amount remitted per year etc.. ϵ_{ih} is the error term.

The migration status of the children in the sample varies across households[6]. We report standard errors clustered at the household level to correct for the fact that children within the same household are expected to have more similar school performances than children chosen at random from the population. The error term ϵ_{ih} is assumed to be independent across households.

3.3.2 Empirical Results

Table 3.2 reports baseline regression parameter estimates. The results show that migration has a significant impact on the Chinese scores. Migrant children significantly outperform left-behind children by 1.9 percentage point, after controlling for individual, family and region characteristics. The magnitude is slightly narrowed compared to the unconditional Chinese score gap reported in Table 3.1. In terms of standardized Math score, the advantage of migrant children is not statistically significant.

In Eq.3.1, β_1 captures migrant/left-behind children school performance gap after controlling for their individual, family and region characteristics, but according to existing experimental and empirical studies, parental effects on children's school performance are likely to be stronger when children are in primary school and to weaken as children grow older (Entwisle and Hayduk, 1982, 1988, Topor et al., 2010). In other words, at different

[6]Only 4 households in our sample report having migrated with some children and left others behind.

Table 3.2: Baseline regression results for school performance in Chinese and Math

	Standardised Chinese scores	Standardised Math scores
	(1)	(2)
Migrant children	0.019 (0.009)**	0.005 (0.009)
Age	−0.007 (0.002)***	−0.008 (0.002)***
Boys	−0.023 (0.008)***	−0.009 (0.008)
Only child	0.002 (0.008)	0.005 (0.009)
Educational expenditure	0.000 (0.002)	−0.000 (0.002)
household income	0.000 (0.0002)	0.001 (0.000)**
Perceived quality of School (ref: Average or below)		
Better than average	0.033 (0.009)***	0.044 (0.009)***
Best	0.068 (0.015)***	0.069 (0.017)***
Father's level of education	−0.002 (0.011)	−0.005 (0.012)
Mother's level of education	0.020 (0.010)*	0.015 (0.011)
Region dummies	yes	yes
Number of household clusters	609	609
Observations	789	789

Source of data: RUMiC data. MHS wave 2009. Notes: Educational expenditure is the sum of private education cost, regular living and school fees and sponsorship fees. Standard errors in parentheses correct for clustering at the household level. All regressions include the constants.*p<0.1; **p<0.05; ***p<0.01.

ages school performance gap between two groups may go different directions and cancel each other out in overall sample. In order to explore whether migrant/left-behind children school performance differential varys across the age, following the technique of Case et al. (2002) who study the impacts of household income on the health of children at different ages, we therefore interact migration status of children M_h with the age Age_{ih}, the regression model is:

$$S_{ih} = \alpha + \beta_1 M_h + \beta_2 Age_{ih} + \beta_3 M_h * Age_{ih} + \beta_k X_{kih} + \epsilon_{ih}, \tag{3.2}$$

Table 3.3: Regression results for school performance in Chinese and Math

	Standardised Chinese scores	Standardised Math scores
	(1)	(2)
Migrant children	0.118 (0.035)***	0.113 (0.036)***
Age	−0.003 (0.002)	−0.003 (0.002)
Migrant children * age	−0.009 (0.003)***	−0.010 (0.003)***
Boys	−0.022 (0.008)***	−0.008 (0.008)
Only child	0.001 (0.008)	0.004 (0.009)
Educational expenditure	−0.000 (0.002)	−0.001 (0.002)
Household income	0.000(0.000)	0.001(0.000)**
Perceived quality of School (ref: Average or below)		
Better than average	0.032 (0.009)***	0.043 (0.009)***
Best	0.066 (0.015)***	0.067 (0.017)***
Father's level of education	−0.001 (0.011)	−0.004 (0.011)
Mother's level of education	0.018 (0.010)*	0.013 (0.011)
Region dummies	yes	yes
Number of household clusters	609	609
Observations	789	789

Source of data: RUMiC data. MHS wave 2009. Notes: All regressions include the constants.*p<0.1; **p<0.05; ***p<0.01.

When the interaction term is introduced, displayed in Table 3.3, the result is consistent with the hypothesis. Ceteris paribus, migration has a significant impact both on the Chinese score and the Math score that children obtain: at young ages migrant children outperform left-behind children, but around at the end of the compulsory education

this trend is reversed. Migrant children aged 6 have Chinese test scores on average 6.4 percentage points higher than the left-behind children of the same age, whereas among migrants of age 16 the left-behind earn Chinese test scores on average 2.6 percentage points higher than their migrant counterparts. Math scores are on average 5.4 percentage points higher among migrants of age 6 than among left-behind children of the same age. Among 16 year-old, the left-behind score 4.6 percentage points higher in Math than the migrant children. For children of age 13, the Chinese test score is the same whether children migrate to the city or are left-behind.

Regarding the effects of control variables, the perceived quality of the school substantially improves both Chinese and Math scores. Girls' scores in Chinese are 2.0 percentage points higher on average than those of boys, but no differences exist regarding Math scores.

Only the mother's education level influences the children's Chinese test scores. A father's with high education does not improve Chinese scores and Math scores of his children. This might be the consequence of Chinese migrant workers having to work very long hours [7], leaving them too little time for helping their children study.

To gauge robustness of our result that the differences in school performance between migrant children and left-behind children are age related, we further divide children into two groups on the basis of their grade, i.e. children in primary school and children in junior high school, we then repeat our analysis in each group. The results in Table 3.4 indicate that, in the group of primary school, migrant children are outperforming left-behind children in both Chinese and Math subjects. After controlling for all other variables, Chinese and Math test scores of migrant children are 3.1 percentage points and 2.6 percentage point, respectively, higher than left-behind counterparts. Concerning children in the junior high school, there is no statistically significant discrepancy in Chinese test scores, Math scores of left-behind however are 5.1 percentage point higher than migrant children. This is consistent with the findings drawn on in Table 3.3, at young ages of children, migrant ones get the advantage of school performance over left-behind children while this advantage is weaken among children in the junior high school.

The above analysis concludes that young migrant children's school performance are better than those left-behind. But this trend is reversed for junior high school children. Though the precise reason for this result is not known, one possible explanation is that

[7] Migrants worked on average 25.2 days a month an 8.7 hours a day in 2015. 85 percent of them worked in excess of 44 hours per week. See China Labour Bulletin at `http://www.clb.org.hk/content/migrant-workers-and-their-children`.

Table 3.4: Results for children in primary school and in junior high school

	Dependent variable:			
	Primary School		Junior high School	
	Chinese	Math	Chinese	Math
	(1)	(2)	(3)	(4)
Migrant children	0.031***	0.026***	−0.019	−0.051***
	(0.010)	(0.010)	(0.016)	(0.018)
Age	0.0004	0.001	−0.005	−0.005
	(0.002)	(0.002)	(0.006)	(0.006)
Boys	−0.015	0.003	−0.040***	−0.032*
	(0.009)	(0.009)	(0.015)	(0.016)
Only child	0.001	0.008	0.006	0.0001
	(0.010)	(0.010)	(0.015)	(0.017)
Educational expenditure	0.004*	0.002	−0.0005	−0.0002
	(0.002)	(0.002)	(0.002)	(0.002)
Household income	0.000	0.0002	0.0009*	0.0013***
	(0.0002)	(0.0002)	(0.0005)	(0.004)
Perceived quality of School (ref: Average or below)				
Better than average	0.034***	0.039***	0.028	0.052***
	(0.009)	(0.009)	(0.019)	(0.018)
Best	0.054***	0.043**	0.090***	0.112***
	(0.018)	(0.020)	(0.019)	(0.022)
Father's level of education	−0.002	−0.007	0.009	0.015
	(0.013)	(0.013)	(0.020)	(0.023)
Mother's level of education	0.021*	0.020*	0.012	−0.005
	(0.011)	(0.011)	(0.025)	(0.024)
Region dummies	yes	yes	yes	yes
Observations	552	552	237	237
Number of household clusters:	504	504	221	221

Source of data: RUMiC data. MHS wave 2009. Notes: Standard errors in parentheses correct for clustering at the household level. *p<0.1; **p<0.05; ***p<0.01. Each regression includes a constant.

it is harder for adolescence to adjust to the new environment than for younger children. Therefore, some unobserved factors may pull down migrant children's school performance. Constraint by data, analysing this effect is beyond the scope of this chapter. Nonetheless, if children are too young that migrant parents have to be involved in their young children's school activities, parental involvement may counteract negative effect trigged by unequal treatment in the city. As children's age increasing, migrants parents, due to heavy work schedules, spend less time taking care of their children even if their children migrate with them, therefore, migrant children's advantage being with parents weakened.

3.3.3 Further Discussion

Based on the above analysis, concerning children's school performance, young migrant children behave much better than left-behind children, but this trend is reverted among children in junior high school. Nevertheless, much caution is needed in interpreting the estimated effects of children's migration on test scores for several reasons. The parents decision to migrate with a child or to leave him or her in the home village may depend on the school performance of the child, creating a problem of reverse causality. Important determinants of the school performance such as the general ability of children or their study effort are unobserved, yet they may be correlated with the migration status of the children and causing our estimates to be both biased and inconsistent. Selection bias may also affect our results, as for a non-negligible share of children in the sample the Math and Chinese scores are not reported. In the Chinese context it can be assumed that some parents might feel ashamed to report a low school performance for their children and might prefer to simply not answer the survey question. If such a pattern was indeed followed in reporting test scores, the average of test scores would be overestimated and the variance of the test scores reduced. Finally, test scores as well as educational expenditure and household income are likely plagued by measurement error. Minimum values of these variables are surprisingly low, which contrasts to the general idea that children of wealthier parents generally receive more and better schooling (Bowles and Gintis, 2002, Case et al., 2002).

Despite these problems, our findings are in line with educational and psychologic literature that child's academic success has been found to be positively related to parents' involvement in children's early school education(Entwisle and Hayduk, 1988, Hara and Burke, 1998, Hill and Craft, 2003, Topor et al., 2010). Furthermore, using the same survey, Meng and Yamauchi (2015) also find an evidence that parental involvement has a

positive effect on their children's Chinese and Math test scores in rural villages in China. By exploiting the China Family Panel Survey (CFPS) and the Rural–Urban Migration in China (RUMiC) survey, Zhang et al. (2015) reach the similar conclusion by comparing the educational performance of rural children, children of rural-to-urban migrants, and local urban children.

For the current study, the mechanisms through which this positive influence of migrant parents on their young children's school performances may not be an endogenous process. Taking care of young children, who are too young to take care of themselves, may indirectly provide chances for parents' involvement in their young children's school activities. While with the children's age increasing, the busy working parents are less involved in their children school activities, hence the migrant children's advantage being with parents weakened.

3.4 Concluding Remarks

The novelty of this current study is showing that there are school performance differences between left-behind and migrant children. By using large-scale Migrant Household Survey Data that was collected in nine provinces in China, we examine school performance of these migrant workers' children. Comparing test scores of children having migrated to the city to those of children having left-behind, we conclude that migrant children outperforms left-behind children, especially for Chinese test scores.

This chapter explores age effect on the school performance differential: at young ages of children, migrant children have significant advantage over their left-behind counterparts in rural hometown, but among children who are in junior high school, math test score of left-behind children is higher than that of migrant children.

Beyond the classical idea of facilitating the procedures of migrant children being enrolled in urban pubic school and increasing investment on the migrant children's education, our findings also suggest that policy maker could regulate migrant workers' working time and protect parental time of taking care their school age children.

Because of data limitation, especially the high mobility of migrant workers, further empirical (and theoretical) studies are needed before more proper policy can be recommended. "Take your child with you to migrate" is one of the suggestions from scholars to the migrant job seeking parents. However, in Chinese case, the reality is far more complicated than this simple slogan.

Chapter 4

Private Educational Expenditure Inequality between Migrant and Urban Households in China's Cities

4.1 Introduction

China's spatially unequal economic development motivates many Chinese parents to move from rural to urban areas and from poorer cities to more affluent ones. In their endeavor to secure a better life for their children, migrant households have an incentive to invest into their offspring's education. The amount they invest is doubly constrained: on the one hand the household income caps what households can afford to spend, and on the other hand, administrative hurdles hampering the enrollment of their children in free public schools spurs education-related costs for them. By comparing educational expenditure of migrant households to that of local residents, this chapter aims to shed light on whether the taste of migrant parents for educating their children differs from that of local residents in China's cities.

In the wake of Becker's seminal 1963 book introducing the human capital theory, a vast economic literature has established that investment in education and training increases

productivity and labor market earnings (Becker, 1993). It is especially high school and university level education that has been shown to increase individuals' subsequent earnings. Thus it is rational for parents, whether migrants or locals, to invest so that their children achieve the highest level of education they can afford.

In the Chinese context, admission to university is decided primarily by the ranking of pupils' scores in the National College Entrance Examination, known as Gaokao. Pupils may participate in the Gaokao after graduating from 3 years of non-compulsory senior high school education. Enrollment in senior high school education is itself conditioned by the successful completion of 9 years of compulsory education (the first six of which are considered primary education, the subsequent ones constituting junior high school education).

The types of costs incurred by families to educate their children depend on the level of education their offspring is attending, on the household's official registration status (hukou), as well as on the choice of school that families make. According to Compulsory Education Law of the People's Republic of China, enacted in 1986, no tuition may be charged to pupils enrolling in compulsory education at the public school situated in the neighborhood of their official (hukou) residence. Private schools are however free to set tuition fees as they see fit, irrespective of the level of education they offer. Some private schools are able to charge tuition fees because they provide better education than local public schools, catering especially to pupils residing officially in cities. However other private schools offer poorer education, but are able to extract tuition fees from migrant families who lack a local hukou and whose children are consequently barred from free public education.

So-called "sponsorship" or "school selection" fees may be demanded of households who want their child to join a public school other than the nearby school. Families holding a local hukou may choose not to enroll their offspring in the public nearby school presumably because the local school's quality is deemed unsatisfactory. Migrant families, the vast majority of whom do not have a local hukou in the city they migrated to, are charged sponsorship fees or are forced to offer "donations" to the public schools where they register their children, mirroring tuition fees that are demanded by private schools. Sponsorship fees tend to be higher in more affluent cities (Zhang, 2017) and they are far from insignificant: according to Goodburn (2009), a child without a local residence permit in Beijing was required to pay per term extra fees ranging from RMB 1200($175) to more than RMB 8000 ($1167).

Education-related expenditures also arise for households from the hiring of private

tutors, a practice which is very common in China's cities regardless of the educational level attended by the pupils. Zhang and Liu (2016) estimate that in 2004 around 74 % of students in elementary schools, 66 % of junior high school students and 54 % of senior high school students in urban China received private tutoring. Many parents see academic private tutoring as a supplement to school-provided education that can enhance the chances of admission to (most prestigious) universities. Private tutoring is often provided by teachers as one-to-one instruction tailored to the needs of the individual pupil, but also in the form of optional after-school classes aimed to consolidate the lessons learned in class or as optional supplementary classes in cram schools, whose stated aim is to improve the children's test scores in school. Private tutoring also extends to non-academic skills, since mastering foreign languages and having artistic or athletic skills also count among the acceptance criteria used by prestigious higher education institutions.

Finally a more modest category of education-related expenditures borne by households spring from buying books and other school material, uniforms, food provided at the school, etc. The 2015 version of the Law on Compulsory Education stipulates that only slim profits may be drawn in China from selling textbooks used in public schools (OECD, 2016).

It is apparent from the above depiction of the broad categories of education-related costs that households dwelling in China's cities must sustain possibly very different levels of investment in order for their children to reach to the same level of educational achievement. Households' total education-related expenditure can be expected to increase with expected private returns to education. Since some evidence suggests that private returns to education are smaller for migrant households than for non-migrant households (Yao et al., 2018), migrant households are expected to invest less than urban households. The total spending gap might at the same time be narrowed by virtue of the hukou policy, which restricts the benefit of public spending on education solely to urban households who enroll their children in nearby public schools and generates costs for migrant families whose children join the same local public schools. The choice of private or public schools by local and migrant households might both mitigate or enhance the spending gap: richer households may choose to pay for good quality private or public schooling instead of contenting themselves with the local free public school, whereas migrants may turn unwillingly to low quality private schools simply because they are unable to afford attending the public schools.

By comparing the total education-related expenditures of households holding a local city hukou to that of households lacking a local hukou, we assess the net effect of both

household's choices and the impact of the administrative hurdles they face. A subsequent comparison of migrant families holding a local hukou with urban families could be considered to better reflect the tastes of families, since institutional arrangements for these families are the same. Beyond the analysis of total spending on education, comparisons of the three broad categories of educational expenditures, namely tuition fees, sponsorship fees and private tutoring fees allows us to gauge explanations for the patterns of total spending we observe.

Drawing on the first wave of the Rural-Urban Migration Survey in China (RUMiC), we show that migrant households with children migrating to cities have higher educational expenditure than urban households, after controlling for social and economic characteristics. It appears from the more detailed analysis of subcategories of educational expenditure that migrant households spend large amounts on tuition and sponsorship, which are a consequence of the hukou policy. Private tutoring expenditure on the other hand is much larger for urban households. The comparison among households having the same hukou status and differing in migration background leads to the conclusion that the latter spend less than the former. Tuition expenditure is lower for permanent migrants than for urban local households but the opposite is true for sponsorship and no differences are observed for private tutoring expenditure.

The rest of chapter is structured as follows. Section 4.2 outlines a theoretical framework. Section 4.3 describes the data and the descriptive statistics. Section 4.4 presents the empirical strategy. The results are discussed in Section 4.5. Section 4.6 compares the difference in educational expenditure between permanent migrant families and local urban families. The last section concludes.

4.2 The Model

We consider only households living in urban China and their expenditure decision regarding children's education. Suppose households of generation t, indexed by i (with $i = u$ indicating urban households and $i = m$ being migrant households) differ in their origin (and thus hukou status), in their human capital endowment h_t^i and in their taste children's human capital accumulation.

Thus a household i at time t faces the following optimization problem:

$$\max_{e_t^i} h_{t+1}^i = \begin{cases} \mu \left[\theta^u + g^u(e_t^u)\right]^\eta (h_t^u)^\alpha (\overline{h_t})^{(1-\alpha)}, & \text{if } \ i = u, \\ \mu \left[g^m(\theta^m, e_t^m)\right]^\eta (h_t^m)^\alpha (\overline{h_t})^{(1-\alpha)}, & \text{if } \ i = m, \end{cases} \tag{4.1}$$

which is a modification of the classical human capital accumulation formulation such as Glomm and Ravikumar (1992) and de La Croix and Doepke (2003).

In equation (4.1), h^i_{t+1} is children's human capital, $\overline{h_t}$ is human capital of the teacher, parameter $\mu > 0$ is the productivity of children, which we assume to be the same for all children, and $\eta,\ \alpha \in (0,1)$. $\theta^u > 0$ captures the facts that children with urban hukou enrolling in public schools gain human capital even without private education investment, while $\theta^m \geq 0$ captures the situation that migrant children with rural hukou may not benefit from the public education if private investment is absent. $g^i(e^i_t)$ represents household i's private education investment which essentially depends on the hukou statute of the household. Thus we can assume

$$g^m(\theta^m, 0) = 0 \ \text{ and } \ g^m(0, e^{m,r}_t) \geq 0 \ \text{ if } \ e^m_t \geq 0.$$

Obviously, this model can be easily solved via the standard first order condition, provided we know the private education investment functions, $g^u(e^u_t)$ and $g^m(\theta^m, e^m_t)$. However, as mentioned by Yuan and Zhang (2015), some households' investment in their children's education is a substitute to public spending, other household's spending is a complement to public spending and for some households expenditure is both a supplement and a complement. Therefore, instead of solving as in Chapter 2 the straightforward first order condition by assuming some given education investment functions, we devote to the empirical test the differences among private education investment of households with different hukou status.

4.3 Data and Descriptive Statistics

The data used in this study come from large-scale Urban Household Survey (UHS) and Migrant Household Survey (MHS) for the year 2008. The UHS and MHS are two of the three independent surveys forming the Rural Urban Migration in China (RUMiC) survey. The two surveys, started in the early 2008, were carried out in 15 cities in 9 provinces : Shanghai, Guangdong, Jiangsu, Zhejiang, Anhui, Hubei, Sichuan, Chongqing and Henan. The sample of UHS was randomly drawn on the basis of urban residents' permanent address, whereas the survey for migrants first randomly selected workplace within defined boundary and subsequently migrant workers in each workplace were randomly chosen based on their birth months[1]. Face-to-face interviews with the selected in-

[1] A detailed description of the sampling method for migrants is provided by Kong (2010) and Akgüç et al. (2014).

dividuals and the members of their households were performed. Households are defined as persons living together at the time of the survey and sharing income and expenditure.

The questionnaires of both surveys collect rich information on demographic and socio-economic characteristics of household members living in the city. Data on broad household expenditure categories is also collected. Parents or custodians declare the education-related expenditure they incurred the year before the survey separately for each child.

Beside households' total educational expenditure, we consider four categories of expenditure related to education that were collected in the MHS and UHS. They are tuition fees, private tutoring expenditure, sponsorship expenditure and other educational expenditure (such as cost of school uniform, etc.). As described before, tuition fees are not charged in the public schools during the period of compulsory education, private schools may charge them. Expenditure for private tutoring at school and outside school is collapsed together. School selection fees and donation fees are joined together and labeled sponsorship expenditure. Migrant families without local city hukou have to pay sponsorship fees in order for their children be enrolled in public schools. Both migrant and urban households pay donation fees or school selection fees if they want to register their children in schools other than the neighboring public school.

The MHS and UHS cover 5007 and 5002 households respectively, of which 2159 migrant households and 2748 urban households reported having at least one child who was no older than 16 or was older than 16 but still in school. Our analysis is limited to the 632 households migrating with at least one child who is in education and the 1795 local urban households with at least one child still studying[2]. Migrants in this chapter are defined as individuals who did not hold the local city hukou at the time when the survey started.

For the main analyses we aggregated educational expenditure at the household level. This is reasonable because of China's one child policy, robustness checks represented in section 4.4.3 show conclusions to be similar if individual level data are used [3].

We report as main empirical results the findings on absolute expenditure of households. But the conclusions we draw would not change if the budget share would be

[2]We excluded households with children that were younger than 6, older than 25 or aged between 16 and 25 but not in school. Children who had dropped out of school (26 urban children and 9 migrant children) are not included. We also removed migrant households who left all their children behind. 32 migrant households and 286 local urban households who had missing values on our control variables were also dismissed.

[3]Only 28 migrant households in our sample reported having taken only one child and leaving another behind.

analyzed instead (see section 4.4.3).

Table 4.1 compares migrant and local urban households in terms of education-related expenditure and income. The yearly total educational expenditure of households is on average spend RMB 3232 ($471), significantly lower than RMB 3791 ($550) paid by local urban residents. However, migrant's expenditure on education constitutes a larger share of their household income than local's expenditure on education. Tuition fees account for more than half of households' total educational expenditure, both for migrant households (60%) and for local urban households (57%), but the difference is not significant at the 1% significant level. The similar tuition fees paid by local and migrant parents are most likely due to the fact that local parents prefer to pay tuition for admission in better quality private schools (rather than free-charging public school) whereas migrants' children are rejected by public schools in destination cities and thus have no other choice than paying tuition fees to private migrant schools.

Migrants allocate about RMB 363 (11% of their total expenditure) to private tutoring and RMB 676 (20%) to sponsorship fees. The trend is opposite for local households, who allocate about RMB 1064 (28%) to private tutoring and RMB 342 (9%) to sponsorship fees. The sizable gap in private tutoring expenditure is accounted for especially by private tutoring expenditure outside school (cram schools, tutoring for private lessons etc.), where local families invest almost five times as much as migrant ones. The lower expenditure of migrants for private tutoring is mirrored by the higher sponsorship expenditure of these households in comparison with local ones. The sponsorship expenditure of migrant households is almost double.

No difference is observed in other educational expenditure among migrant and local urban households.

Table 4.1: Yearly educational expenditure and income by household hukou status

	Households migrating with children	Local urban households	t-value difference
Total educational expenditure	3233	3791	**2.81**
	(3742)	(5585)	
of which			
Tuition	1936	2175	1.53
	(2647)	(4928)	
Private tutoring expenditure			
Private tutoring expenditure at school	209	255	1.69
	(498)	(774)	
Private tutoring expenditure outside school	154	809	**13.72**
	(557)	(1791)	
Sponsorship expenditure	676	342	**-3.51**
	(2198)	(1560)	
Other educational expenditure	266	210	-1.73
	(569)	(668)	
Household income per capita	13085	19324	**11.02**
	(10308)	(16551)	
Observations	632	1795	

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Standard deviations are reported in parenthesis. Total educational expenditure, tuition, private tutoring at school, private tutoring outside school, other educational expenditure and household income per capita are measured in RMB per year. Bold numbers indicate statistical significance at 1% level.

Per capita household income of local urban residents is on average 1.5 times higher than that of migrants. Panel A in Table 4.2 shows that more than half of migrant households cluster in the first two quintiles of the household income distribution and only 8% of migrant households are in the top quintile. By contrast, a quarter of urban households are in the top income quintile.

To gauge the relationship between educational expenditure and income, Panel B in Table 4.2 displays the average educational expenditure of different types across the income quintiles. As we move up in the income distribution, the total educational expenditure, the tuition as well as the private tutoring expenses also increase. This pattern does not hold true of sponsorship fees, which are higher in the first quintile than in the second or in the fourth income quintile, suggesting that households may not be able to choose sponsorship fees according to their income and must pay the fees fixed by schools (provided they afford them). Average expenditure on private tutoring for the families in the richest quintile is about 4 times higher than that of the households in the bottom quintile, whereas tuition fees are only about 2.2 times higher.

Table 4.2: Average household educational expenditure across household income quintiles

Income quintile	$1st$	$2nd$	$3rd$	$4th$	$5th$
Panel A:					
Share of households					
Households migrating with children	0.324	0.217	0.223	0.155	0.081
Local urban households	0.157	0.194	0.192	0.216	0.242
Panel B:					
Total educational expenditure	2393	3147	3430	3906	5354
	(2878)	(3930)	(3631)	(4009)	(8735)
Tuition expenditure	1354	1890	1907	2388	3027
	(1900)	(3221)	(2926)	(3307)	(8008)
Private tutoring expenditure	437	651	815	1003	1503
	(1055)	(1149)	(1689)	(1830)	(2571)
Sponsorship expenditure	443	399	480	311	512
	(1696)	(1299)	(1740)	(1250)	(2497)

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Standard deviations are reported in parenthesis. Educational expenditure, tuition, private tutoring expenditure are measured in RMB per year.

The other relevant characteristics of households as well as the characteristics of household heads are summarised in Table 4.3. Migrants are more likely than locals to send their children to private schools. Based on the available data, we are unable to distinguish between private schools which are of better quality than public schools (most likely used by local urban households) and poor quality private schools used by migrants unable to attend public schools. The per household number of children in school is slightly higher for migrants compared to urban households, which is expected because the "one-child policy" in China has always allowed households holding a rural hukou to have a second child if their first child was a girl.

Consistent with literature, household heads tend to be male in both types of households. As expected, the heads of migrant households are younger and much less likely to have gained a high school or higher degree. Only one in four migrant household heads hold at least high school education, compared to 70% of their urban counterparts.

Consequently, 82% of migrant heads of household report working either in blue collar or in service occupations and only 8.7% work in white collar occupations. The proportions for urban households are 52% and 27% respectively. These occupation categories have been defined following China's Bureau of Statistics: service occupations includes the lowest level of occupations, for instance in the hotel or catering industry, followed by blue collar occupations which are manual occupations in sectors such as manufacturing and construction. The white collar occupations are highest in the hierarchy occupations.

To control for possible regional heterogeneity in households' educational expenditures, we introduce a set of dummies of geographic distribution of the households. Ideally provinced-level dummies would have been used, but insufficient observations in each category have lead us to regroup them as just three regions: the Central region includes the provinces of Anhui, Henan, Hubei. The Coastal region includes the provinces of Guangdong, Jiangsu, Zhejiang and Shanghai. The Western region regroups Chongqing and Sichuan.

Table 4.3: Household characteristics by household hukou status

	Households migrating with children	Local urban children households	t-value difference
Number of children in school	1.31	1.05	**-11.35**
(per household)	(0.549)	(0.228)	
Having children enrolling in private schools	0.144	0.054	**-6.05**
(1=yes; 0 otherwise)	(0.351)	(0.225)	
Household head's age	38.27	44.80	**21.10**
	(5.61)	(9.07)	
Household head's gender	0.739	0.617	**-5.84**
(1=male; 0 otherwise)	(0.44)	(0.486)	
Household head's level of education	0.237	0.704	**23.26**
(1 = high school and above; 0 otherwise)	(0.426)	(0.457)	
Household head's occupation			
Service occupation	0.555	0.198	**-16.30**
Blue-collar occupation	0.271	0.330	**2.86**
White-collar occupation	0.087	0.279	**12.42**
Other	0.087	0.193	**7.25**
Region			
Central	0.467	0.314	**-6.75**
Coastal	0.337	0.487	**6.75**
West	0.196	0.199	0.176
Observations	632	1795	

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Standard deviations are reported in parenthesis. Bold numbers indicate statistical significance at 1% level.

4.4 Empirical Strategy

4.4.1 OLS Regression of Total Educational Expenditure

We begin the analysis by investigating the difference in total educational expenditure of migrant households and local urban households. The regression is written as :

$$lnY_h = \beta_0 + \beta_1 M_h + X_h\gamma + \epsilon, \tag{4.2}$$

where Y_h is the total household educational expenditure. To mitigate the concerns of heteroscedasticity, we use the natural logarithmic transformation of educational expenditure as the dependent variable [4]. M_h is a dummy variable taking a value of 1 for migrant households and 0 for local urban households[5]. X_h is a vector of control variables referring to characteristics of households and heads of households, such as private or public types of school, household per capita income, per household number of children in school, gender, age, level of education and occupation of household head. We also include regional dummies in the regression in order to capture region fixed effects. ϵ is the i.i.d error term.

4.4.2 Tobit Regression of Types of Expenditure

In order to understand the heterogeneity in patterns of education-related expenditure, we analyzed, beyond the total spending on education, the three previously defined subcategories of educational expenditure, namely tuition fees, sponsorship fees and private tutoring expenditure. In these analyses, large numbers of households in our sample have reported zero amounts of expenditure, making OLS estimation inappropriate. We rely instead on tobit models in the remainder of this section y will stand in turn for the three subcategories of educational expenditure.

The standard equation for the tobit model is the following :

[4] For the 42 households in the sample who reported having no educational expenditure, a value of 1 is assigned.

[5] Some households may prefer not to report their low levels of educational expenditure. However, the survey did not explore the nature of these zero expenses, we therefore are not able to distinguish the real reported zero expenditure from the others.

$$y^* = X\boldsymbol{\beta} + \epsilon, \qquad \epsilon|X \; Normal(0, \sigma^2) \tag{4.3}$$

$$y = max(0, y*) \tag{4.4}$$

where y^* is a latent variable. X is a vector of explanatory variables with the first element being unity. $\boldsymbol{\beta}$ is a column vector of coefficients. The conditional expectation of $E(y|X, y > 0)$ is equal to:

$$E(y|X, y > 0) = X\boldsymbol{\beta} + \sigma[\phi(X\boldsymbol{\beta}/\sigma)/\Phi(X\boldsymbol{\beta}/\sigma)]. \tag{4.5}$$

The expectation of $E(y|x)$ follows :

$$E(y|X) = \Phi(X\boldsymbol{\beta}/\sigma)X\boldsymbol{\beta} + \sigma\phi(X\boldsymbol{\beta}/\sigma). \tag{4.6}$$

For a continuous explanatory variable, the equations of marginal effects and of marginal effects conditional on being uncensored are given by:

$$\frac{\partial E(y|X)}{\partial x_j} = \Phi(X\boldsymbol{\beta}/\sigma)\beta_j, \tag{4.7}$$

$$\frac{\partial E(y|X, y > 0)}{\partial x_j} = \beta_j\{1 - \lambda(X\boldsymbol{\beta}/\sigma)[X\boldsymbol{\beta}/\sigma + \lambda(X\boldsymbol{\beta}/\sigma)]\}. \tag{4.8}$$

where $\lambda(X\boldsymbol{\beta}/\sigma) = \phi(X\boldsymbol{\beta}/\sigma)/\Phi(X\boldsymbol{\beta}/\sigma)$ is the inverse Mills ratio. ϕ and Φ are the probability and cumulative density functions, respectively.

In our case, the variable of key interest is the binary variable M_h. We report two estimates of the effect of migration status on educational expenditure. The first is estimated including censored and uncensored observations as: $E(y|X_h, M_h = 1) - E(y|X_h, M_h = 0)$ (as in equation 4.6). The second one is estimated using only the uncensored observations as: $E(y|X_h, y > 0, M_h = 1) - E(y|X_h, y > 0, M_h = 0)$ (as in equation 4.5).

As the reference by Wooldridge (2010), for example, if we define, $\hat{w}_{h1}$ is the estimated index for a migrant household h and $\hat{w}_{h0}$ is the estimated index for a urban children household h. The estimated difference is obtained by

$$N^{-1}\sum_{n=1}^{N}\{[\Phi(\hat{w}_{h1}/\hat{\sigma})\hat{w}_{h1} + \hat{\sigma}\phi(\hat{w}_{h1}/\hat{\sigma})] - [\Phi(\hat{w}_{h0}/\hat{\sigma})\hat{w}_{h0} + \hat{\sigma}\phi(\hat{w}_{h0}/\hat{\sigma})]\}$$

where $\hat{w}_{h1} = \hat{\beta}_0 + \hat{\beta}_1 + X_h\gamma$ and $\hat{w}_{h0} = \hat{\beta}_0 + X_h\gamma$.

As total household educational expenditure, tuition, private tutoring expenditure and sponsorship expenditure are analyzed in logarithmic transformation.

4.5 Estimation Results

In this section we first assess the heterogeneity in total educational expenditure between migrant households and local urban households. We then report the results regarding tuition fees, private tutoring and sponsorship expenditure. A series of checks are reported to gauge the robustness of our results.

4.5.1 Estimation Results of Total Educational Expenditure and Three Subcategories

Table 4.4 displays results estimated according to the strategy described in the previous section. Column (a) presents OLS regression coefficients of the log transformation of total educational expenditure on explanatory variables. Columns (b) to (d) report the maximum likelihood Tobit regression coefficients of the log transformation of three subcategories of educational expenditures on the same explanatory variables.

According to the first row of column (a), the null hypothesis that there is no difference in total educational expenditure between migrant households and local urban households is rejected at the 1% significance level. After controlling for family and regional characteristics, migrant households are found to spend 36% [6] more than urban households on their children's education in 2007. This reverses the conclusion reached based on the unconditional mean difference reported in Table 4.1. Household spending on education is highly related to household income, with households in the top income quintile spending 66% more than those in the 1st quintile.

As expected, the total spending on education for households with children studying in private schools is higher than the one of families whose children are enrolled in public schools. Every extra child increases the household's educational expenditure by 55%. Regarding the characteristics of household heads, expenditure on education raises around 14.6% if the head of family is female. The age of the household head has a significant and positive effect. The household heads who have earned at least a high school degree spend more on their children's education. However, the heads' occupation influences little the family's educational expenditure everything else being equal. Households in the Coastal region have the highest educational expenditure, which might be explained by the fact that some areas of China's east-coast are better developed and many high-quality private schools are located there. Parents therefore have more choices for their children's

[6] $Exp(0.309) - 1 = 1.36 - 1 = 0.36$.

private education.

Table 4.4: Regression coefficients for household educational expenditure and its subcategories

	OLS coefficients	*Tobit maximum likelihood coefficients*		
Dependent variables in natural logarithm	Total educational expenditure	Tuition expenditure	Private tutoring expenditure	Sponsorship expenditure
Variables	(a)	(b)	(c)	(d)
Migrant households migrating with children	0.309***	0.848***	-1.79***	5.49***
	(0.089)	(0.139)	(0.355)	(0.908)
Per capita household income (ref : first quintile)				
Second quintile	0.269***	0.102	1.04***	0.034
	(0.102)	(0.154)	(0.392)	(1.01)
Third quintile	0.365 ***	0.242*	1.03***	0.883
	(0.10)	(0.155)	(0.395)	(1.01)
Fourth quintile	0.399***	0.353**	0.716*	-0.013
	(0.106)	(0.160)	(0.407)	(1.08)
Fifth quintile	0.504***	0.047	1.51***	1.32
	(0.119)	(0.170)	(0.429)	(1.15)
Having children enrolled in private schools	0.349***	0.694***	0.124	2.03*
(1= yes; 0 otherwise)	(0.117)	(0.460)	(0.265)	(1.11)
Per household number of children in school	0.443***	0.511***	-0.235	0.950
	(0.082)	(0.140)	(0.365)	(0.835)
Household head's age	0.035***	0.074***	-0.065***	-0.140**
	(0.005)	(0.006)	(0.016)	(0.045)
Household head's gender	-0.146**	-0.408***	0.046	0.953
(1=male; 0=female)	(0.071)	(0.105)	(0.265)	(0.722)
Household head's level of education	0.273***	0.211*	1.13***	-0.671
(1 = high school and above; 0 otherwise)	(0.076)	(0.112)	(0.284)	(0.761)
Household head's occupation				
(ref: Blue-collar occupation)				
White-collar occupation	0.039	0.135	-0.232	-0.717
	(0.084)	(0.136)	(0.339)	(0.954)
Service sector occupation	0.008	0.038	0.012	-0.03
	(0.080)	(0.130)	(0.328)	(0.862)
Other occupation	-0.481 ***	-0.896 ***	0.374	1.32
	(0.112)	(0.165)	(0.416)	(1.11)
Region (ref: Central region)				
Coastal	0.501***	0.478***	0.652**	- 3.03**
	(0.079)	(0.117)	(0.296)	(0.808)
Western	0.439***	0.852***	0.380	0.694
	(0.089)	(0.135)	(0.343)	(0.868)
Constant	4.76***	1.92***	3.68***	-6.99***
	(0.248)	(0.361)	(0.914)	(2.43)
Observations	2427	2427	2427	2427

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Total educational expenditure is the sum of tuition, private tutoring expenditure, sponsorship expenditure and other educational expenditure. Yearly total educational expenditure, tuition, private tutoring expenditure and sponsorship expenditure are measured in RMB. Standard errors are reported in parenthesis. Number of left-censored observations at ln(tuition)=0: 194. Number of left-censored observations at ln(private tutoring expenditure)=0: 1063. Number of left-censored observations at ln(sponsorship expenditure)=0 : 2035. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

To refine our findings that migrants spend more than local residents on their children's education, we estimated the impact of the same set of explanatory variables on migrants' and locals' expenditure for tuition, sponsorship and private tutoring separately. The Tobit maximum likelihood coefficients reported in columns (b) to (d) of Table 4.4 not being directly interpretable, we show in Table 4.5 the average difference between the expenditure of migrants and locals for the three subcategories. Full regression coefficient tables are presented in Appendix.

The estimates in the first row in Table 4.5 show that, after controlling for all family and regional characteristics, the spending of migrant households on tuition is substantially higher than that of local urban households and statistically significant at the 1% level. Migrant households are shown to spend 133% more on tuition than urban ones (in column (a))[7]. The significantly higher amounts spent on tuition by migrants reflect the unequal accessibility of public schools among children of local and migrant parents: many migrants who fail to access public school education turn to private migrant schools, where tuition fees are often set at levels more reasonable than those charged by public schools for migrant students. This in line with results found by other studies such as Lai et al. (2014).

Table 4.5: Difference in natural logarithm of tuition, sponsorship and private tutoring expenditure

	$E(ln(y)\|X, M_h = 1)$- $E(ln(y)\|X, M_h = 0)$	$E(ln(y)\|X, y > 0, M_h = 1)$- $E(ln(y)\|X, y > 0, M_h = 0)$
	(a)	(b)
Tuition expenditure	0.844***	0.821***
	(0.14)	(0.135)
Sponsorship expenditure	1.03***	1.18***
	(0.20)	(0.205)
Private tutoring expenditure	-1.10***	-0.781 ***
	(0.208)	(0.148)

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Tuition, sponsorship and private tutoring expenditure are measured in RMB per year. Standard errors are reported in parenthesis. Number of left-censored observations at ln(tuition)=0: 194. Number of left-censored observations at ln(sponsorship)=0 : 2035. Number of left-censored observations at ln(private tutoring in total)=0: 1063. *p<0.1; **p<0.05; ***p<0.01.

The gap between migrants' and locals' spending is even larger when it comes to the sponsorship expenditure as shown in second row of Table 4.5. Consistent with literature and with our expectation, households holding a local city hukou spend much less on sponsorship fees than those lacking one. Goodburn (2009) also found that migrant children were charged 5 or 6 times the fees charged to local students during the stage of compulsory education.

[7] $Exp(0.844) - 1 = 2.33 - 1 = 1.33$.

By contrast, migrants spend overwhelmingly less than locals on private tutoring (see third row of Table 4.5). Drawing on households who report positive private tutoring expenditure (column (b)), we estimate the spending of migrants to be 54% lower than that of locals. One possible explanation is that tuition and sponsorship fees account for large shares of migrants households' income so that budge constraint prevents them from affording private tutoring.

4.5.2 Robustness of The Estimated Coefficients

A series of robustness checks are performed to verify the validity of the results presented above. The estimated coefficients for the variable of interest M_h are reported in Table 4.6 and in Table 4.7. The full tables can be found in the Appendix.

First, in panel A, we present estimates obtained by using expenditure on each individual child as opposed to household expenditure. In these estimations we also control for the birth order of the child, the gender of the child, the grade and the quality of school (as assessed by the parents). In panel B, we only include as migrants the households with non-local rural hukou. This excludes migrant children holding city hukou but coming from other cities, as these children might be able to attend public schools and might have a better social status (Chen and Feng, 2013). Finally, in panel C, we restrict our sample to local and migrant families having children in compulsory education because children are supposed to receive free public education during that period.

The regression coefficients in Panel A are slightly larger in magnitude compared to those estimated at the household level, but neither the sign nor the statistical significance of the results change. The results drawn from both the set of coefficients in panel B and in panel C are in line with the one presented by our baseline estimations.

Table 4.6: Robustness checks

	OLS coefficients (a)	Tobit maximum likelihood coefficients (b)	$E(ln(y)\|X, M = 1)$- $E(ln(y)\|X, M = 0)$ (c)	$E(ln(y)\|X, y > 0, M = 1)$- $E(ln(y)\|X, y > 0, M = 0)$ (d)
Panel A. Individual level data				
Sample size: 2654				
Total educational expenditure	0.388***			
	(0.082)			
Tuition		0.790 ***	0.787 ***	0.768 ***
		(0.115)	(0.115)	(0.112)
Private tutoring		-1.65 ***	-0.981***	-0.709***
		(0.315)	(0.179)	(0.130)
Sponsorship expenditure	6.16***	1.22***	1.32***	
		(0.793)	(0.178)	(0.179)
Panel B. Only include migrant households with rural hukou				
Sample size: 2268				
Total educational expenditure	0.322***			
	(0.092)			
Tuition		0.906***	0.902***	0.877***
		(0.153)	(0.152)	(0.149)
Private tutoring		-2.02***	-1.24***	-0.88***
		(0.386)	(0.220)	(0.156)
Sponsorship expenditure		6.13***	1.15***	1.30***
		(1.034)	(0.235)	(0.237)
Panel C. Only include households with children in compulsory education				
Sample size: 1639				
Total educational expenditure	0.380***			
	(0.104)			
Tuition		0.976***	0.966***	0.920***
		(0.164)	(0.163)	(0.156)
Private tutoring		-1.75***	-1.22***	-0.871***
		(0.366)	(0.248)	(0.176)
Sponsorship expenditure		6.51***	1.69***	1.60***
		(0.904)	(0.262)	(0.233)

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

We also examine the difference between migrants and local residents in the budget share they allocate to total educational expenditure, tuition, sponsorship expenditure and private tutoring expenditure. The budget share is calculated by dividing the corresponding education expenditure to the household total consumption. The estimated coefficients, presented in Table 4.7, lead to the same conclusions as those drawn using the absolute educational expenditure.

Table 4.7: The budget share spent on education-related expenditure

	OLS coefficients (a)	Tobit maximum likelihood coefficients (b)	$E(ln(y)\|X, M=1)$- $E(ln(y)\|X, M=0)$ (c)	$E(ln(y)\|X, y>0, M=1)$- $E(ln(y)\|X, y>0, M=0)$ (d)
Sample size: 2383				
Total educational expenditure	0.034 ***			
	(0.007)			
Tuition		0.04 ***	0.03 ***	0.022 ***
		(0.005)	(0.004)	(0.003)
Private tutoring		-0.024 ***	-0.011 ***	-0.008 ***
		(0.005)	(0.002)	(0.002)
Sponsorship expenditure		0.069***	0.012***	0.014***
		(0.016)	(0.003)	(0.003)

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

The share spent on tuition by migrant households is 3% higher than that of local urban households. This gap is narrowed to 2.2% if we consider only uncensored sample. In terms of sponsorship expenditure, the share spent by migrants is 1.2% larger than that spent by locals. However, the share allocated by migrants to private tutoring expenditure is 1.1% lower than that of locals.

4.6 The Educational Expenditure Gap between Permanent Migrant Households and Urban Households

By comparing educational expenditure of migrant households who have obtained a local city hukou to that of local urban households, we investigate the difference between migrants and locals in cases when the hukou related barriers do not exist. It is hard but possible for migrants to obtain a local city hukou, and thus become permanent migrants, either through education or through employment. In our sample there are 351 households who reported having changed their hukou to a local city one. These permanent migrant households would draw on the same welfare benefits as local urban residents, including access to free public education in the nearby school for their children.

The regression coefficients, estimated using the same strategy as the one descibed in section 4.4.1 and the same control variables as the one in the analysis in section 4.5, are displayed in Table 4.8.

Table 4.8: Regression coefficients on the educational expenditure of permanent migrant households

	OLS coefficients (a)	Tobit maximum likelihood coefficients (b)	$E(ln(y)\|X, PM = 1)$- $E(ln(y)\|X, PM = 0)$ (c)	$E(ln(y)\|X, y > 0, PM = 1)$- $E(ln(y)\|X, y > 0, PM = 0)$ (d)
Sample size: 1795				
Total educational expenditure	-0.148*			
	(0.09)			
Tuition		-0.522***	-0.516***	-0.490***
		(0.156)	(0.154)	(0.145)
Private tutoring		-0.188	-0.130	-0.092
		(0.353)	(0.242)	(0.171)
Sponsorship expenditure		3.03**	0.382**	0.55**
		(1.22)	(0.171)	(0.23)

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. The full tables can be found in the Appendix. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

After controlling for economic and social characteristics, a permanent migrant household would spend 14.8% less on children's education than a urban household who never change their hukou. The lower overall educational expenditure of permanent migrant households is mainly due to the lower tuition fees paid. However, the sponsorship fees they pay are 38.2% higher than that of local urban residents. These results suggest that families with migration background pursue with different means the same aim of providing their children with good education as local families: local households may pay higher tuition in private good quality schools whereas permanent migrants choose to pay higher sponsorship fees in schools of better quality.

An important difference compared to the previous results is that private tutoring expenditure is now not different between the two groups. This suggests that when institutional arrangements are the same, so migrants do not need to substitute public spending with private expenditure, their taste for the children's private tutoring does not differ.

4.7 Concluding Remarks

This chapter explores how the hukou status, the family characteristics and the region of residence determine household expenditure on the children's education.

Because of the hukou system, children migrating to China's cities with their parents have limited access to free public schools. They may either pay fees to go to migrant schools or pay to be enrolled in public schools.

Using the 2008 wave of RUMiC data, we compare the educational expenditure of migrant households to that of local urban households. We find that the total educational expenditure of migrants overwhelmingly exceeds that of locals after controlling for social and economic characteristics, both in absolute amounts and as in budget shares. More detailed analysis of three subcategories of the education-related expenditure shows that migrant households spend more on tuition and sponsorship compared to households with local city hukou, but much less on private tutoring.

Though there is still a debate whether private tutoring benefits children's school performance in the field of educational studies, Zhang and Liu (2016) examined the effects of private tutoring on educational performance of children in China, he found significantly positive effects of private tutoring on children's language and math test scores. Existing literature has suggested that in China, urban children's school performance is better than the migrant worker's children (Zhang et al., 2015). Hence the low educational investment in private tutoring may provide an explanation of the educational performance inferiority of migrant children to urban children.

We also find different patterns of education-related expenditure between migrant households who have obtained a local city hukou and local urban households who did not change their hukou. When hukou barriers do not matter, we find no difference between permanent migrants and locals.

Private educational expenditure of households in China's cities reflects both willingness to investment in human capital and institutional constraints. Our results suggest the hukou policy at least the way it was implemented in 2007 put financial burdens on migrant parents. To the extend that China would like to guarantee equal educational opportunities for all children relaxing or providing more funding to schools who accept migrant workers' children are policy options.

4.8 Appendix

Table 4.9: Tobit coefficients for tuition fees

Dependent variable : Natural logarithm of tuition expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	0.848***	0.844***	0.821***
	(0.139)	(0.138)	(0.135)
Per household number of children in school	0.511***	0.508***	0.492***
	(0.140)	(0.140)	(0.135)
Household head's age	0.0739***	0.0735***	0.0711***
	(0.006)	(0.007)	(0.006)
Household head's gender	-0.408***	-0.406***	-0.394***
(1=male; 0=female)	(0.105)	(0.105)	(0.102)
Having children enrolled in private schools	0.694***	0.691***	0.674***
(1=private school; 0 otherwise)	(0.182)	(0.181)	(0.178)
Per capita household income (ref : first quintile)			
Second quintile	0.102	0.101	0.0978
	(0.154)	(0.153)	(0.147)
Third quintile	0.242	0.240	0.232
	(0.155)	(0.154)	(0.149)
Fourth quintile	0.353*	0.352*	0.341*
	(0.159)	(0.158)	(0.154)
Fifth quintile	0.047	0.047	0.045
	(0.170)	(0.169)	(0.163)
Household head's level of education	0.211 *	0.199	0.192
(1 = high school and above; 0 otherwise)	(0.112)	(0.111)	(0.108)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	0.135	0.134	0.131
	(0.136)	(0.135)	(0.131)
Service sector occupation	0.038	0.037	0.036
	(0.130)	(0.129)	(0.125)
Other	-0.896***	-0.888***	-0.850***
	(0.165)	(0.163)	(0.155)
Region (ref: Central region)			
Coastal	0.468***	0.465***	0.448***
	(0.117)	(0.117)	(0.112)
Western	0.852***	0.848***	0.822***
	(0.135)	(0.135)	(0.131)
Constant	1.92***		
	(0.361)		
Observations	2427	2427	2427

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Tuition) =0: 194. Number of uncensored observations: 2233. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.10: Tobit coefficients for household private tutoring expenditure

Dependent variable : Natural logarithm of private tutoring expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	-1.79***	-1.10***	-0.782***
	(0.356)	(0.208)	(0.148)
Per household number of children in school	-0.235	-0.151	-0.108
	(0.365)	(0.235)	(0.167)
Household head's age	-0.065***	-0.042***	-0.030***
	(0.017)	(0.011)	(0.008)
Household head's gender	0.046	0.030	0.021
(1=male; 0=female)	(0.265)	(0.170)	(0.121)
Having children enrolled in private schools	0.124	0.080	0.057
(1=private school; 0 otherwise)	(0.460)	(0.299)	(0.213)
Per capita household income (ref : first quintile)			
Second quintile	1.04**	0.647**	0.459**
	(0.392)	(0.244)	(0.173)
Third quintile	1.03**	0.641**	0.454**
	(0.395)	(0.246)	(0.174)
Fourth quintile	0.716	0.438	0.311
	(0.407)	(0.249)	(0.177)
Fifth quintile	1.52***	0.967***	0.686***
	(0.429)	(0.274)	(0.195)
Household head's level of education	1.14***	0.727***	0.515***
(1 = high school and above; 0 otherwise)	(0.284)	(0.179)	(0.127)
Household head's occupation (ref: Blue-sector occupation)			
Other occupation	0.374	0.245	0.174
	(0.416)	(0.274)	(0.195)
White-collar occupation	-0.232	-0.147	-0.105
	(0.339)	(0.214)	(0.153)
Service sector occupation	0.012	0.008	0.005
	(0.328)	(0.211)	(0.150)
Region (ref: Central region)			
Coastal	0.652*	0.418*	0.297*
	(0.296)	(0.189)	(0.134)
Western	0.380	0.240	0.170
	(0.343)	(0.218)	(0.155)
Constant	3.683***		
	(0.914)		
Observations	2427	2427	2427

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Private tutoring expenditure) =0: 1063 . Number of uncensored observations: 1364. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.11: Tobit coefficients for household sponsorship expenditure

Dependent variable : Natural logarithm of sponsorship expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	5.49***	1.07***	1.18***
	(0.908)	(0.200)	(0.205)
Per household number of children in school	0.950	0.161	0.192
	(0.835)	(0.141)	(0.169)
Household head's age	-0.140**	-0.024**	-0.028**
	(0.045)	(0.008)	(0.009)
Household head's gender	2.03	0.382	0.430
(1=male; 0=female)	(1.11)	(0.232)	(0.247)
Having children enrolled in private schools	0.124	0.080	0.057
(1=private school; 0 otherwise)	(0.460)	(0.299)	(0.213)
Per capita household income (ref : first quintile)			
Second quintile	0.034	0.005	0.007
	(1.014)	(0.163)	(0.201)
Third quintile	0.883	0.150	0.179
	(1.01)	(0.172)	(0.204)
Fourth quintile	-0.013	-0.002	-0.003
	(1.08)	(0.173)	(0.213)
Fifth quintile	1.32	0.231	0.271
	(1.15)	(0.204)	(0.236)
Household head's level of education	-0.723	-0.123	-0.147
	(0.762)	(0.130)	(0.155)
Household head's occupation (ref: Blue-sector occupation)			
Other occupation	1.32	0.242	0.277
	(1.11)	(0.211)	(0.236)
White-collar occupation	-0.717	-0.115	-0.142
	(0.954)	(0.152)	(0.188)
Service sector occupation	-0.030	-0.005	-0.006
	(0.862)	(0.145)	(0.174)
Region (ref: Central region)			
Coastal	-2.95***	-0.474***	-0.585***
	(0.807)	(0.131)	(0.160)
Western	0.694	0.141	0.152
	(0.868)	(0.178)	(0.191)
Constant	-7.0**		
	(2.43)		
Observations	2427	2427	2427

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Sponsorship expenditure) =0: 2035 . Number of uncensored observations: 392. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.12: Tobit coefficients for tuition expenditure - individual level data

Dependent variable : Natural logarithm of tuition expenditure	Tobit	$E(y\|X)$	$E(y\|X, y>0)$
	(1)	(2)	(3)
Migrant households migrating with children	0.790***	0.787***	0.768***
	(0.116)	(0.112)	(0.110)
Birth order of children	-0.207	-0.206	-0.20
	(0.115)	(0.119)	(0.116)
Grade of children	0.127***	0.127***	0.123***
	(0.005)	(0.005)	(0.005)
Children's gender	0.127	0.127	0.123
(1=male; 0 =female)	(0.082)	(0.082)	(0.08)
Household head's gender	-0.175	-0.175	-0.170
(1=male; 0 =female)	(0.105)	(0.105)	(0.102)
Having children enrolled in private schools	0.733***	0.731***	0.716***
(1=private school; 0 otherwise)	(0.166)	(0.159)	(0.157)
Quality of school of children (ref: best in areas)			
Better than average	-0.243	-0.242	-0.236
	(0.130)	(0.127)	(0.124)
Average	-0.284*	-0.283*	-0.276*
	(0.139)	(0.135)	(0.131)
Worse than average	-0.511	-0.509	-0.494
	(0.530)	(0.495)	(0.478)
Per capita household income (ref : first quintile)			
Second quintile	-0.001	-0.001	-0.001
	(0.141)	(0.133)	(0.129)
Third quintile	0.119	0.119	0.116
	(0.132)	(0.135)	(0.132)
Fourth quintile	0.123	0.123	0.119
	(0.149)	(0.143)	(0.139)
Fifth quintile	-0.174	-0.173	-0.168
	(0.174)	(0.151)	(0.146)
Household head's level of education	0.239*	0.238*	0.231*
(1 = high school and above; 0 otherwise)	(0.105)	(0.010)	(0.09)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	0.092	0.092	0.090
	(0.133)	(0.120)	(0.117)
Service sector occupation	0.079	0.0790	0.077
	(0.116)	(0.112)	(0.109)
Other occupation	-0.029	-0.0290	-0.028
	(0.143)	(0.133)	(0.130)
Region of destination (ref: Central region)			
Coastal	0.420***	0.418***	0.405***
	(0.111)	(0.102)	(0.010)
Western	0.835***	0.831***	0.810***
	(0.107)	(0.119)	(0.116)
Constant	4.536***		
	(0.238)		
Observations	2654	2654	2654

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Tuition) =0: 223. Number of uncensored observations: 2431. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.13: Tobit coefficients for private tutoring expenditure - individual level data

Dependent variable : Natural logarithm of private tutoring expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	-1.65***	-0.981***	-0.709***
	(0.315)	(0.179)	(0.130)
Birth order of children	-1.912***	-1.173***	-0.852***
	(0.355)	(0.217)	(0.158)
Grade of children	-0.189***	-0.116***	-0.0841***
	(0.015)	(0.009)	(0.006)
Children's gender	-0.45**	-0.29**	-0.203**
(1=male; 0=female)	(0.225)	(0.138)	(0.100)
Household head's gender	-0.227	-0.140	-0.102
(1=male; 0=female)	(0.251)	(0.155)	(0.113)
Having children enrolled in private schools	0.272	0.169	0.123
(1=private school; 0 otherwise)	(0.439)	(0.276)	(0.200)
Quality of school of children (ref: best in areas)			
Better than average	-0.327	-0.208	-0.150
	(0.346)	(0.222)	(0.161)
Average	-0.842*	-0.521*	-0.378*
	(0.369)	(0.233)	(0.169)
Worse than average	-3.128*	-1.697**	-1.249*
	(1.466)	(0.657)	(0.503)
Per capita household income (ref : first quintile)			
Second quintile	1.187**	0.700**	0.508**
	(0.374)	(0.220)	(0.159)
Third quintile	1.197**	0.706**	0.512**
	(0.379)	(0.222)	(0.161)
Fourth quintile	0.931*	0.541*	0.393*
	(0.401)	(0.232)	(0.169)
Fifth quintile	1.535***	0.923***	0.669***
	(0.419)	(0.252)	(0.183)
Household head's level of education	-0.400	-0.244	-0.177
(1 = high school and above; 0 otherwise)	(0.366)	(0.222)	(0.161)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	-0.255	-0.156	-0.114
	(0.327)	(0.201)	(0.146)
Service sector occupation	-0.077	-0.048	-0.035
	(0.310)	(0.192)	(0.140)
Other occupation	-0.400	-0.244	-0.177
	(0.366)	(0.222)	(0.161)
Region of destination (ref: Central region)			
Coastal	0.867**	0.530**	0.384**
	(0.283)	(0.172)	(0.125)
Western	0.525	0.315	0.228
	(0.329)	(0.199)	(0.144)
Constant	4.980***		
	(0.693)		
Observations	2654	2654	2654

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Private tutoring expenditure) =0: 1225. Number of uncensored observations: 1429. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.14: Tobit coefficients for sponsorship expenditure - individual level data

Dependent variable : Natural logarithm of sponsorship expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	6.16***	1.22***	1.33***
	(0.793)	(0.178)	(0.179)
Birth order of children	0.314	0.055	0.064
	(0.733)	(0.129)	(0.149)
Grade of children	-0.396***	-0.069***	-0.081***
	(0.048)	(0.009)	(0.010)
Children's gender	0.592	0.103	0.120
(1=male; 0=female)	(0.573)	(0.10)	(0.116)
Household head's gender	0.573	0.099	0.116
(1=male; 0=female)	(0.658)	(0.112)	(0.132)
Having children enrolling in private schools	0.884	0.162	0.184
(1=private school; 0 otherwise)	(1.033)	(0.199)	(0.219)
Quality of school of children (ref: best in areas)			
Better than average	-2.41**	-0.483*	-0.521*
	(0.921)	(0.201)	(0.207)
Average	-2.70**	-0.531*	-0.579**
	(0.971)	(0.208)	(0.216)
Worse than average	-3.06	-0.589	-0.649
	(3.016)	(0.493)	(0.594)
Per capita household income (ref : first quintile)			
Second quintile	0.267	0.045	0.053
	(0.905)	(0.152)	(0.180)
Third quintile	0.922	0.161	0.187
	(0.927)	(0.162)	(0.188)
Fourth quintile	0.039	0.006	0.008
	(1.02)	(0.168)	(0.201)
Fifth quintile	1.354	0.244	0.278
	(1.074)	(0.196)	(0.222)
Household head's level of education	-0.732	-0.128	-0.149
(1 = high school and above; 0 otherwise)	(0.704)	(0.123)	(0.143)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	-0.497	-0.085	-0.100
	(0.895)	(0.153)	(0.180)
Service sector occupation	0.045	0.008	0.009
	(0.786)	(0.140)	(0.161)
Other occupation	-0.149	-0.026	-0.030
	(0.970)	(0.170)	(0.197)
Region of destination (ref: Central region)			
Coastal	-2.231**	-0.376**	-0.447**
	(0.736)	(0.124)	(0.147)
Western	0.472	0.095	0.102
	(0.807)	(0.163)	(0.175)
Constant	-6.05***		
	(1.717)		
Observations	2654	2654	2654

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Sponsorship expenditure) =0: 2211. Number of uncensored observations: 443. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.15: Tobit coefficients for tuition expenditure - only include migrant households with rural hukou

Dependent variable : Natural logarithm of tuition expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	0.848***	0.844***	0.821***
	(0.139)	(0.138)	(0.135)
Per household number of children in school	0.451**	0.449**	0.433**
	(0.154)	(0.153)	(0.148)
Household head's age	0.0778***	0.076***	0.074***
	(0.007)	(0.007)	(0.006)
Household head's gender	-0.467***	-0.464***	-0.449***
(1=male; 0=female)	(0.110)	(0.110)	(0.106)
Having children enrolling in private schools	0.717***	0.714***	0.695***
(1=private school; 0 otherwise)	(0.191)	(0.190)	(0.187)
Per capita household income (ref : first quintile)			
Second quintile	0.025	0.025	0.024
	(0.155)	(0.154)	(0.149)
Third quintile	0.206	0.205	0.198
	(0.171)	(0.170)	(0.164)
Fourth quintile	0.353*	0.351*	0.340*
	(0.170)	(0.169)	(0.164)
Fifth quintile	-0.014	-0.014	-0.013
	(0.180)	(0.179)	(0.172)
Household head's level of education	0.217	0.216	0.208
(1 = high school and above; 0 otherwise)	(0.117)	(0.116)	(0.112)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	0.128	0.127	0.123
	(0.140)	(0.139)	(0.135)
Service sector occupation	0.027	0.027	0.026
	(0.137)	(0.136)	(0.132)
Other occupation	-1.01***	-0.996***	-0.949***
	(0.171)	(0.168)	(0.159)
Region of destination (ref: Central region)			
Coastal	0.492***	0.489***	0.470***
	(0.122)	(0.121)	(0.116)
West	0.910***	0.905***	0.875***
	(0.144)	(0.143)	(0.139)
Constant	1.92***		
	(0.379)		
Observations	2268	2268	2268

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Tuition) =0: 187. Number of uncensored observations: 2081. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.16: Tobit coefficients for private tutoring - only include migrant households with rural hukou

Dependent variable : Natural logarithm of private tutoring expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	-2.02***	-1.24***	-0.881***
	(0.386)	(0.220)	(0.158)
Per household number of children in school	0.147	0.096	0.068
	(0.389)	(0.254)	(0.180)
Household head's age	-0.065***	-0.042***	-0.03***
	(0.017)	(0.011)	(0.008)
Household head's gender	0.121	0.078	0.056
(1=male; 0=female)	(0.272)	(0.177)	(0.126)
Having children enrolled in private schools	0.254	0.167	0.119
(1=private school; 0 otherwise)	(0.472)	(0.315)	(0.224)
Per capita household income (ref : first quintile)			
Second quintile	1.10**	0.687**	0.487**
	(0.391)	(0.243)	(0.172)
Third quintile	1.03*	0.643*	0.456*
	(0.426)	(0.266)	(0.189)
Fourth quintile	0.999*	0.624*	0.442*
	(0.427)	(0.265)	(0.188)
Fifth quintile	1.53***	0.985***	0.698***
	(0.447)	(0.287)	(0.203)
Household head's level of education	1.25***	0.802***	0.568***
(1 = high school and above; 0 otherwise)	(0.291)	(0.185)	(0.131)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	-0.192	-0.123	-0.0875
	(0.342)	(0.219)	(0.156)
Service sector occupation	0.067	0.043	0.031
	(0.339)	(0.221)	(0.157)
Other occupation	0.502	0.334	0.238
	(0.423)	(0.283)	(0.202)
Region of destination (ref: Central region)			
Coastal	0.679*	0.440*	0.312*
	(0.302)	(0.195)	(0.138)
West	0.457	0.293	0.208
	(0.358)	(0.231)	(0.164)
Constant	3.00**		
	(0.940)		
Observations	2268	2268	2268

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Private tutoring) =0: 978. Number of uncensored observations: 1290. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.17: Tobit coefficients for sponsorship expenditure - only include migrant households with rural hukou

Dependent variable : Natural logarithm of sponsorship expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	6.13***	1.15***	1.30***
	(1.03)	(0.235)	(0.237)
Per household number of children in school	1.01	0.156	0.197
	(0.965)	(0.149)	(0.188)
Household head's age	-0.133**	-0.021**	-0.026**
	(0.049)	(0.008)	(0.009)
Household head's gender	0.846	0.128	0.164
(1=male; 0=female)	(0.795)	(0.119)	(0.153)
Having children enrolled in private schools	1.74	0.293	0.352
(1=private school; 0 otherwise)	(1.23)	(0.227)	(0.259)
Per capita household income (ref : first quintile)			
Second quintile	-0.048	-0.007	-0.009
	(1.09)	(0.149)	(0.202)
Third quintile	2.22	0.354	0.438
	(1.19)	(0.192)	(0.235)
Fourth quintile	0.594	0.085	0.112
	(1.21)	(0.175)	(0.230)
Fifth quintile	2.07	0.327	0.407
	(1.28)	(0.206)	(0.253)
Household head's level of education	-0.546	-0.085	-0.107
(1 = high school and above; 0 otherwise)	(0.837)	(0.130)	(0.164)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	-0.917	-0.136	-0.176
	(1.02)	(0.150)	(0.196)
Service sector occupation	-0.540	-0.082	-0.105
	(0.961)	(0.145)	(0.186)
Other occupation	1.48	0.256	0.302
	(1.20)	(0.215)	(0.248)
Region of destination (ref: Central region)			
Coastal	-3.24***	-0.481***	-0.624***
	(0.878)	(0.134)	(0.170)
West	0.805	0.154	0.172
	(0.978)	(0.189)	(0.210)
Constant	3.00**		
	(0.940)		
Observations	2268	2268	2268

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Sponsorship) =0: 1933. Number of uncensored observations: 335. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.18: Tobit coefficients for tuition expenditure - only include households with children in compulsory education

Dependent variable : Natural logarithm of tuition expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	0.976***	0.966***	0.920***
	(0.164)	(0.163)	(0.156)
Per Number of children in school	0.831***	0.821***	0.775***
	(0.132)	(0.130)	(0.122)
Household head's age	0.016	0.015	0.015
	(0.008)	(0.008)	(0.007)
Household head's gender	-0.295*	-0.292*	-0.276*
(1=male; 0=female)	(0.128)	(0.127)	(0.120)
Having children enrolling in private schools	0.873***	0.866***	0.829***
(1=private school; 0 otherwise)	(0.205)	(0.204)	(0.198)
Per capita household income (ref : first quintile)			
Second quintile	-0.163	-0.161	-0.152
	(0.185)	(0.183)	(0.173)
Third quintile	-0.031	-0.030	-0.029
	(0.190)	(0.188)	(0.178)
Fourth quintile	-0.036	-0.036	-0.034
	(0.197)	(0.194)	(0.184)
Fifth quintile	-0.321	-0.317	-0.299
	(0.215)	(0.212)	(0.200)
Household head's level of education	0.330*	0.326*	0.307*
(1 = high school and above; 0 otherwise)	(0.139)	(0.137)	(0.129)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	-0.025	-0.025	-0.023
	(0.171)	(0.169)	(0.160)
Service sector occupation	-0.037	-0.036	-0.034
	(0.156)	(0.155)	(0.146)
Other occupation	-0.348	-0.343	-0.323
	(0.205)	(0.202)	(0.189)
Region of destination (ref: Central region)			
Coastal	0.401**	0.395**	0.370**
	(0.144)	(0.142)	(0.133)
Western	1.22***	1.21***	1.15***
	(0.163)	(0.162)	(0.155)
Constant	3.22***		
	(0.422)		
Observations	1639	1639	1639

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Tuition) =0: 176. Number of uncensored observations: 1463. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.19: Tobit coefficients for private tutoring expenditure - only include households with children in compulsory education

Dependent variable : Natural logarithm of private tutoring expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	-1.75***	-1.22***	-0.871***
	(0.366)	(0.248)	(0.176)
Per household number of children in school	-0.359	-0.256	-0.185
	(0.300)	(0.214)	(0.155)
Household head's age	-0.003	-0.002	-0.001
	(0.018)	(0.013)	(0.009)
Household head's gender	-0.557*	-0.401	-0.291
(1=male; 0 otherwise)	(0.282)	(0.205)	(0.149)
Having children enrolling in private schools	-0.192	-0.136	-0.098
(1=private school; 0 otherwise)	(0.461)	(0.324)	(0.234)
Per capita household income (ref : first quintile)			
Second quintile	1.01*	0.685*	0.490*
	(0.418)	(0.282)	(0.202)
Third quintile	1.53***	1.06***	0.763***
	(0.426)	(0.294)	(0.211)
Fourth quintile	1.35**	0.929**	0.666**
	(0.441)	(0.303)	(0.217)
Fifth quintile	1.35**	0.929**	0.667**
	(0.479)	(0.331)	(0.237)
Household head's level of education	1.05***	0.746***	0.537***
(1 = high school and above; 0 otherwise)	(0.307)	(0.219)	(0.157)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	-0.154	-0.112	-0.0812
	(0.371)	(0.269)	(0.195)
Service sector occupation	-0.277	-0.199	-0.145
	(0.346)	(0.249)	(0.181)
Other occupation	-0.716	-0.505	-0.365
	(0.453)	(0.316)	(0.228)
Region of destination (ref: Central region)			
Coastal	0.695*	0.496*	0.358*
	(0.318)	(0.227)	(0.164)
West	0.324	0.227	0.164
	(0.363)	(0.255)	(0.184)
Constant	2.66**		
	(0.938)		
Observations	1639	1639	1639

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Private tutoring) =0: 628. Number of uncensored observations: 1011. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.20: Tobit coefficients for sponsorship expenditure - only include households with children in compulsory education

Dependent variable : Natural logarithm of sponsorship expenditure	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	6.51***	1.69***	1.60***
	(0.904)	(0.262)	(0.233)
Per household number of children in school	1.48*	0.347*	0.346*
	(0.652)	(0.153)	(0.153)
Household head's age	-0.046	-0.011	-0.011
	(0.046)	(0.011)	(0.011)
Household head's gender	0.098	0.023	0.023
(1=male; 0=female)	(0.709)	(0.166)	(0.166)
Having children enrolled in private schools	1.22	0.305	0.295
(1=private school; 0 otherwise)	(1.03)	(0.271)	(0.256)
Per capita household income (ref : first quintile)			
Second quintile	0.675	0.155	0.157
	(0.971)	(0.223)	(0.225)
Third quintile	0.998	0.235	0.234
	(1.02)	(0.238)	(0.238)
Fourth quintile	-0.282	-0.061	-0.064
	(1.08)	(0.234)	(0.244)
Fifth quintile	1.18	0.280	0.279
	(1.19)	(0.286)	(0.282)
Household head's level of education	-0.180	-0.042	-0.042
(1 = high school and above; 0 otherwise)	(0.766)	(0.179)	(0.179)
Household head's occupation (ref: Blue-sector workers)			
White-collar occupation	-1.39	-0.306	-0.316
	(1.00)	(0.216)	(0.225)
Service sector occupation	0.104	0.025	0.025
	(0.838)	(0.203)	(0.200)
Other occupation	-0.047	-0.011	-0.011
	(1.13)	(0.271)	(0.268)
Region of destination (ref: Central region)			
Coastal	-1.97*	-0.439*	-0.451*
	(0.802)	(0.178)	(0.183)
Western	1.04	0.280	0.262
	(0.866)	(0.238)	(0.220)
Constant	-9.11**		
	(2.39)		
Observations	1639	1639	1639

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Sponsorship) =0: 1277. Number of uncensored observations: 362. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.21: Tobit coefficients for the budget share spent on tuition

Dependent variable : Natural logarithm of tuition expenditure share	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	0.040***	0.03***	0.022***
	(0.005)	(0.004)	(0.003)
Per household number of children in school	0.016**	0.012**	0.008**
	(0.006)	(0.004)	(0.003)
Household head's age	0.003***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)
Household head's gender	-0.014***	-0.011***	0.013***
(1=male; 0=female)	(0.004)	(0.003)	(0.002)
Having children enrolled in private schools	0.023***	0.017***	-0.008***
(1=private school; 0 otherwise)	(0.007)	(0.006)	(0.002)
Per capita household income (ref : first quintile)			
Second quintile	0.0004	0.0003	0.0002
	(0.006)	(0.005)	(0.003)
Third quintile	-0.006	-0.004	-0.003
	(0.006)	(0.005)	(0.003)
Fourth quintile	-0.003	-0.002	-0.002
	(0.006)	(0.005)	(0.003)
Fifth quintile	-0.020**	-0.015**	-0.011**
	(0.007)	(0.004)	(0.003)
Household head's level of education	0.001	0.001	0.001
	(0.004)	(0.003)	(0.002)
Household head's occupation (ref: Blue-sector occupation)			
White-collar occupation	-0.002	-0.002	-0.001
	(0.005)	(0.004)	(0.003)
Service sector workers	-0.011*	-0.008*	-0.006*
	(0.005)	(0.004)	(0.003)
Other occupation	-0.046***	-0.032***	-0.023***
	(0.006)	(0.004)	(0.003)
Region of destination (ref: Central region)			
Coastal	0.010*	0.007*	0.005*
	(0.005)	(0.004)	(0.002)
Western	0.014**	0.01**	0.008**
	(0.005)	(0.004)	(0.002)
Constant	-0.091***		
	(0.014)		
Observations	2383	2383	2383

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(tuition) =0: 194. Number of uncensored observations: 2189. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.22: Tobit coefficients for the budget share spent on private tutoring

Dependent variable : Natural logarithm of private tutoring share	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	-0.024***	-0.012***	-0.009***
	(0.005)	(0.002)	(0.002)
Per household number of children in school	-0.004	-0.002	-0.002
	(0.005)	(0.002)	(0.002)
Household head's age	-0.000*	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)
Household head's gender	-0.006	-0.001	-0.001
(1=male; 0=female)	(0.006)	(0.002)	(0.001)
Having children enrolled in private schools	-0.002	-0.003	-0.002
(1=private school; 0 otherwise)	(0.003)	(0.002)	(0.002)
Per capita household income (ref : first quintile)			
Second quintile	0.009	0.005	0.003
	(0.005)	(0.003)	(0.002)
Third quintile	0.004	0.002	0.001
	(0.005)	(0.003)	(0.002)
Fourth quintile	-0.001	-0.001	-0.000
	(0.005)	(0.003)	(0.002)
Fifth quintile	0.002	0.001	0.001
	(0.005)	(0.003)	(0.002)
Household head's level of education	0.015***	0.008***	0.006***
	(0.004)	(0.002)	(0.001)
Household head's occupation (ref: Blue-sector occupation)			
Other occupation	-0.003	-0.001	-0.001
	(0.005)	(0.003)	(0.002)
White-collar occupation	-0.007	-0.004	-0.003
	(0.004)	(0.002)	(0.002)
Service sector occupation	0.000	0.000	0.000
	(0.004)	(0.002)	(0.002)
Region of destination (ref: Central region)			
Coastal	0.005	0.003	0.002
	(0.004)	(0.002)	(0.001)
Western	-0.001	-0.000	-0.000
	(0.004)	(0.002)	(0.002)
Constant	0.023*		
	(0.012)		
Observations	2383	2383	2383

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(Private tutoring expenditure) =0: 1034 . Number of uncensored observations: 1349. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table 4.23: Tobit coefficients for the budget share spent on sponsorship

Dependent variable : Natural logarithm of sponsorship share	Tobit	$E(y\|X)$	$E(y\|X, y > 0)$
	(1)	(2)	(3)
Migrant households migrating with children	0.069***	0.012***	0.014***
	(0.013)	(0.003)	(0.003)
Per household number of school-aged children	0.028*	0.004*	0.006*
	(0.012)	(0.002)	(0.002)
Household head's age	-0.002**	-0.000**	-0.000**
	(0.001)	(0.000)	(0.000)
Household head's gender	0.011	0.002	0.002
(1=male; 0 otherwise)	(0.011)	(0.002)	(0.002)
Having children enrolled in private schools	0..028	0.005	0.006
(1=private school; 0 otherwise)	(0.016)	(0.003)	(0.004)
Per capita household income (ref : first quintile)			
Second quintile	0.011	0.002	0.002
	(0.015)	(0.002)	(0.003)
Third quintile	0.016	0.003	0.003
	(0.015)	(0.002)	(0.003)
Fourth quintile	-0.003	-0.001	-0.001
	(0.016)	(0.002)	(0.003)
Fifth quintile	0.011	0.002	0.002
	(0.017)	(0.003)	(0.003)
Household head's level of education	-0.013	-0.002	-0.003
	(0.011)	(0.002)	(0.002)
Household head's occupation (ref: Blue-sector occupation)			
Other occupation	0.023	0.004	0.005
	(0.016)	(0.003)	(0.003)
White-collar occupation	-0.005	-0.001	-0.001
	(0.014)	(0.002)	(0.003)
Service sector occupation	0.006	0.001	0.001
	(0.013)	(0.002)	(0.002)
Region of destination (ref: Central region)			
Coastal	-0.045***	-0.007***	-0.009***
	(0.012)	(0.002)	(0.002)
Western	0.002	0.000	0.000
	(0.013)	(0.002)	(0.003)
Constant	-0.128***		
	(0.036)		
Observations	2383	2383	2383

Source of data: RUMiC data. MHS wave 2008 and UHS wave 2008. Notes: Expenditure is measured in RMB per year. Number of left-censored observations at ln(sponsorship) =0: 1992 . Number of uncensored observations: 391. Standard errors are reported in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Chapter 5

Conclusion

Summing up all three individual chapters, the results provide an overall framework for understanding the decision of internal migrant workers regarding their children.

One of the findings in Chapter 3 is that migrants' children being schooled in cities do not always perform better than their left-behind peers. On the other hand, Chapter 2 shows that Chinese internal migrant workers may be better off leaving children behind if the relocation cost to the destination city is beyond a certain threshold. This leads to the conclusion that, under the studied policy setting, leaving children behind in rural hometowns might be the rational choice for migrant workers, no matter how much they would like to take their children with them on subjective grounds.

Chapter 4 finds evidence that the hukou influences the patterns of household educational expenditure in cities. Chapter 2 also suggests that the decrease in relocation cost of migrant workers in cities, such as diminishing school fees of their children, can encourage them to take children with them.

Since the hukou policy is shown to increase relocation cost and migrant households' educational expenditure, it could seem tempting to suggest abolishing the hukou policy. However, the hukou system is justified by macrolevel concerns about resource allocation instead of individual households concerns studied in this dissertation. This is why we do not argue for the removal of the hukou policy based on the results presented here. We could however conclude that more projects should be launched both in rural villages and in destination cities in order to mitigate the burden of the migrant families. For instance, local authorities could invest in building boarding schools or care centers in villages, which provide physical and psychological support for the left behind children.

Considerable efforts are needed to strengthen enforcement of abolishing the tuition and miscellaneous fees for migrant children in compulsory education in China's cities. The subsidies or funding should be allocated to public schools in cities so as to encourage them to reduce the gap how local and migrant children are treated in school.

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