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Children on the Move in China: Insights from the Census Data 2000-2020[1]

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Abstract

Using data from the 2000, 2010, and 2020 National Population Census of China, this study uncovers evolving trends in the experiences of children in family structures reshaped by China's massive internal migration. We develop a new framework to examine family structures from the census data, which facilitates a detailed exploration of family splits as a result of migration. Our results show a significant surge in the proportion of children in migrant families and the trend of children on the move. While the number of left-behind children far exceeded that of migrant children in 2000, the picture became the opposite in 2020, signifying an enhanced capacity and inclination for migrant parents to bring their children to migration destination. This shift has also engendered a more heterogeneous population of children in migrant families. Notably, a subgroup warranting particular attention is that of "left-behind child migrants," those moving to proximate towns or cities without both parents. This emergence blurs the traditional urban-rural dichotomies and underscores the intricacies of family split within the migrant population. Finally, we reflect on the significant role of educational aspirations and obstacles which influence these migratory patterns.

Keywords: migrant children, left-behind children, left-behind child migrant, census, China
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1. Introduction

Mass migration is an epic phenomenon that has dramatically shaped China's demographic landscape and socioeconomic development. Since the initiation of the economic reforms, China's migrant population has increased dramatically, from 6.57 million in 1982 to 376 million in 2020 (NBSC 2021). Similar to other developing countries, migration in China is mainly driven by regional disparities in economic opportunities and resources (Massey et al. 1993; Taylor 1999). Initially in the 1980s and early 1990s, men dominated the migration. Over time, this pattern has evolved, gradually encompassing a broader spectrum of family structures. This evolution includes millions of left-behind children cared for by spouses and relatives in rural hometowns (Duan and Zhou 2005) alongside a growing trend of children accompanying their parents to urban destinations (Fan et al. 2011; Duan et al. 2013). The phenomenon of "children in migrant families"—a term we adopt in this paper to encompass both migrant and left-behind children—becomes more prominent. The rise of migrant families has led to a growing number of children facing unique challenges. Particularly, they are confronted with difficulties in enrolling in state schools and later taking entrance exams for high schools or universities in destination due to China's *hukou* institution (Goodburn 2020).

The existing studies on migration in China have predominantly focused on adult migrants, especially those who were attracted to cities for economic reasons (Keung Wong et al. 2007), whilst research focusing on children's migration,

particularly considering the dynamic changes in the prevalence of migrant and left-behind children over time, remains limited. Although some studies have explored children migration in China (Wu and Zhang 2015; Chan and Ren 2018), most rely on data up to the 2010 census or the 2015 1% population sample survey. Given the significant changes in China's population mobility, especially the profound increase from 2010 to 2020, earlier data may not accurately reflect the escalated scale of migration and its complexities. This period notably saw the number of migrant children doubling, significantly altering the socio-demographic landscape of migration in China. The goal of our study is to bring migrants' children to the forefront of the migration discourse, by providing a dynamic picture of the children in migrant families over the last two decades, using data from the 2000, 2010 and 2020 National Population Census of China (hereafter referred to as "the census"). In particular, we adopt a comprehensive approach to investigate multifaceted child migration within China, by examining the magnitude, age, gender selectivity and family arrangements of children in migrant families.

Our paper contributes to existing studies in three ways. First, most census-based studies concentrate on general migration patterns (Cao et al. 2018; Liang et al. 2014; Liang and Ma 2004; Shen 2012). Chan and Ren (2018) is an exception which examines the patterns of migrants' children, based on data from the 2010 census. This paper is the first, to the best of our knowledge, to use three waves of the census data to address a notable gap in the literature by providing an overview of children migration nationwide. It adds to knowledge by uncovering both the most recent

patterns of migrant and left-behind children at the national level, but also their changes in the past two decades. By focusing on China—a crucial case in global migration patterns—our study enhances understanding of how migration influences family structures and dynamics, thereby offering deeper insights into the impacts of population redistribution on children. Second, our study frames the discourse about migrants' children from the household's perspective. We develop a new method of identifying family structures using the census data and explore family living arrangements, specifically whether migrant parents and their children reside together. This is important because existing research reveals that parental migration exerts multifaceted impacts on children's development (Cortes 2015; Murphy 2014). The examination of family living arrangements can enhance our understanding of the family circumstances of the children's experience of migration. Third, we identify a subgroup warranting particular attention, i.e., "left-behind child migrants", which refer to children moving to towns or cities near their hometown without both parents. Previous Studies tend to target either migrant or left-behind children separately (Murphy 2014; Wei and Gong 2019) However, both groups do not exist in isolation, as they might change to each other's group at different time periods due to family circumstances. By proposing the concept of the "left-behind child migrant", our study breaks through the urban-rural dichotomy and reveals the complexity of family separation within the migrant population.

The paper proceeds as follows. It first reviews existing studies about the theories on family migration and the Chinese context. Then the data and methods used

in the study are introduced. The following sections present the results about the dynamic characteristics of children in migrant families, including their age and gender selectivity, and living arrangements. The paper concludes with a summary of findings.

2. Literature Review

2.1 Migration as a household livelihood strategy

Labor migration for economic purposes as a household strategy enhances family income and employment prospects, contributing to improved living standards and financial stability (McKenzie et al. 2010). Furthermore, migration offers significant chances for personal development and cultural exchange (Hormiga and Bolívar-Cruz 2014; Diehl et al. 2016). Based on the new economic theory of migration (Stark and Bloom 1985), this strategy diversifies family risks, with some members working elsewhere and sending remittances home, thereby reducing poverty and enhancing family well-being.

Due to varying capacities for migration, family members might not be able to migrate together (Mulder and Malmberg 2014), leading to chain or staged migration processes (Moskal and Tyrrell 2016). This pattern, prevalent in both internal (Mulder and Malmberg 2014) and international contexts (Boyle et al. 2003), reflects the complex decision-making within families regarding who migrates and when. Such staggered migration patterns are often shaped by factors such as socio-economic resources, family household structure, and previous migrant experiences (Kofman 2004; Root and De Jong 1991). In developing countries, internal migration often

results in families being split between origin and destination, maintaining strong ties with their place of origins (Deshingkar 2006), as seen in cyclical labor migration in Indonesia (Hugo 1982). While migration as a household strategy is often driven by the goal of economic betterment, its implications for family members, especially children, are complex. Although the additional income from remittances may improve household consumption and children's schooling, it disrupts traditional family roles. The absence of a primary caregiver often increases responsibilities on the left behind members, notably the women and the elderly. Children left behind usually face educational interruptions and emotional challenges (Lauby and Stark 1988). Therefore, it is crucial to understand these dynamics to fully assess the broader implications of migration on both the economic and emotional well-being of individual family members, particularly children.

2.2 Coexistence of family split and family migration in China

Family split and the institutional background

In China, complex, fluid and split households have been highly prevalent, along with the maintenance of dual household arrangements as a result of migration (Zhu 2003; Wen and Lin 2012). Whilst some children are brought to destination as migrant children, many migrants leave their children at hometown due to financial constraints and institutional *hukou* obstacles (Liang et al. 2020), cared for by relatives.

According to the *hukou* system, every Chinese citizen was required at birth to be registered with certain type of *hukou* status at a particular place, and this status is linked to an individual's access to social benefits and services. Opportunities to change one's *hukou* location and type are limited (see Chan (2010) for a review of the

hukou system). The economic reforms in the late 1970s initiated an enormous scale of migration from the countryside to cities and from small cities to large ones. Most migrants lack a local *hukou* status in destination, thereby limiting their access to welfare benefits. Moreover, a non-local *hukou* status puts migrant children at a disadvantage in accessing educational opportunities, as places in local schools could be difficult to obtain (Goodburn 2020).

The enrollment policies for migrant children in compulsory education, including primary and junior secondary schools, vary. Some cities employ a "points-based system," factoring in parent qualifications and other criteria to determine school admission. Others use an "application-based system" requiring a slew of documents like tax receipts and work permits. These systems disproportionately disadvantage low-income migrant families. Consequently, many enroll children in sub-standard migrant schools facing closure (Dong and Goodburn 2020) leading to unstable education or family separation (Fan et al. 2011; Wei and Gong 2019).

Even after migrant children complete nine-year compulsory education in public schools in destination, they encounter new obstacles to further their education because most places in high schools and registration for college entrance exams require local *hukou* status (Koo et al. 2014; Li and Zhang 2023). Therefore, many migrant children return hometowns for high school, else attend vocational schools or enter labor markets (Lyu et al. 2018). Likewise, registration for the university entrance exam is only available to children with local *hukou* status plus very few migrant children from privileged background, thus disproportionately excluding the

vast majority of migrant children (Zhang 2017). In light of this, it is important to consider the amplified impact of institutional obstacle on older children aged 15-17 who might enter the labor market directly as a viable alternative, further complicating the reasons for their separation from parents as well as the subsequent living arrangements.

Moreover, migrants' decision regarding family arrangements are subject to policy intervention related to urban development strategies. The 2014 *hukou* reforms, relaxed small cities *hukou* restrictions, whereas tightened mega-city controls (State Council of the PRC 2014). As a consequence, many mega-cities adopted evacuation policies towards migrants, such as displaced migrants, raised education barriers (Liu et al. 2017; Zhang et al. 2021), prompting some migrants relocate children to hometown or neighboring small cities. The incidence of left-behind children among adult migrant populations in mega-cities increased significantly after 2014 (Chan and Ren 2018). This trend is particularly prominent among school-age children from low-income households.

The rise of family migration in China

Recent years have witnessed a new trend of family migration in China. The nuclear family arrangement, i.e., parent(s) with children, has become the most prevalent arrangement for migrant parents in destination (Fan and Li 2019). Once migrant parents are settled in destination, they are likely to bring their family members to destination. However, the specific patterns and motivations behind this trend in China have evolved in response to local socio-economic conditions.

One of the major drivers of the rise of family migration is related to a notable increase in intra-provincial migration in recent years. This is partly because of the rapid development of the major cities in the central and western China which generates more job opportunities. Therefore, many migrants do not need to seek opportunities across provincial boundaries to the east coast (Cheng and Duan 2021; Zhu et al. 2021). Furthermore, the existing *hukou* system creates administrative barriers for inter-provincial migrants, making movement within a province, where these barriers are less pronounced, a more appealing option. This rise of migration with shorter migration distances often facilitates family migration, allowing children to move together with their parents.

The continuous improvement of the education system for migrant children at destination is another significant driver for family migration. There are several policy initiatives to improve migrant children's educational opportunities in cities over the past decade, including the "Policy on Taking the Entrance Examination for Secondary Schools in the Place of Destination" in 2012, the "National New Urbanization Plan" in 2014 and further *hukou* reforms through the "Opinions on Further Promoting Household Registration System Reform". These policies emphasize that it is the destination government that is primarily responsible for the education of migrant children, and a more flexible and inclusive framework should be provided to guarantee children's compulsory education. These efforts have resulted in significant progress, as the acceptance of migrant children in state schools and vocational education improved.

Meanwhile, the concentration of educational resources towards urban areas over the past two decades has led to reduced educational opportunities for rural children, prompting their migration to cities for better prospects. Between 2010 and 2020, the numbers of junior high and high schools in rural areas decreased by 125,000 and 14,000, respectively (MEOC 2022). However, in urban areas, the proportion of primary schools increased from 18.1% to 45.5%; that of junior high schools increased from 47.7% to 73.0%, and the proportion of senior high schools increased from 89.8% to 94.5% (MEOC 2022). The rate at which schools are concentrated in urban areas far exceeds the rate of population concentration. Consequently, rural children face longer commuting distances to schools and diminished educational opportunities in the countryside, which ultimately prompted their migration to urban areas.

Given the trend of family migration, it is unknown about the extent and patterns of family migration and family separation among children in migrant families on a nationwide scale. To address this gap, our empirical analysis aims to quantify the magnitude, age and gender selectivity of these children, as well as the level of family split during 2010 and 2020. It is the data and methods that we will now turn to.

3. Data Sources and Methods

The data used in this study comes from the individual-level 1‰ sample of the 5th, 6th and 7th population censuses[2] conducted by the National Bureau of Statistics of

2 While the 2010 and 2020 Chinese Population Censuses were designed to capture residents' information through

China in 2000, 2010 and 2020, respectively. The census acts as a reliable source for examining the dynamics of children in migrants' families. As in the 2020 Census, measures such as cross-checking respondents' ID numbers with administrative records were implemented to ensure data accuracy (NBSC et al. 2023a).

3.1 *Measuring children in migrant families*

In China, the migrant population refers to persons whose current place of residence is different from the location (e.g., town/township or sub-district[3]) of their *hukou* registration and who have left the location of their *hukou* registration for more than six months. We use this definition, aligning with established literature (Liang and Ma 2004; Chan and Ren 2018; Liang et al. 2014; Wu and He 2015) to ensure consistency and facilitate comparison. This definition suggests that migration is not solely determined by a change in residence, but rather a change in the current residence compared to the location of the *hukou* registration. As the census is by nature cross-sectional and does not record individuals' migration history prior to the census date, we are not able to discuss how the timing of migration and any potential

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a combined approach of de jure and de facto, the data utilized in our study, provided by the National Bureau of Statistics of China, has been processed to reflect a de facto approach. This means our analysis is based on individuals' actual place of residence, rather than their *hukou* registered location, thereby capturing the population in their physical locations..

3 It refers to a level of government that comes under urban districts or townships, managing several neighborhoods. It is the lowest level of urban administrative divisions and is typically found within larger cities.

multiple migration influence children's migration patterns.

The definition of migrants used in the 2000, 2010 and 2020 censuses maintains consistency, despite minor changes in certain questions (Duan and Sun 2006; Liang et al. 2014). The process of identifying migrants based on the 2020 census questionnaire is illustrated in Figure 1. We first use the information of the current residence (C7 in the short form of the census questionnaire), to identify the resident population living within Mainland China[4]. Question C8 presents respondents with several choices that detail the relationship between their current residency and their *hukou* registration. Specifically, the designation of "residence-*hukou* inconsistency" emerges when options 3 or 4 are selected. These selections indicate that the respondent's current living location diverges from their registered *hukou* location, marking either a residence within the same county but in a disparate township or a residence in a different county.

<Place Figure 1 about here>

The census options for *hukou* registration locations are closely aligned with China's administrative jurisdictions[5] This alignment is crucial because the benefits

4 Individuals residing in the Hong Kong SAR, Macao SAR, Taiwan Province of China, and other countries are subsequently excluded from the analysis.

5 China's administrative hierarchy is organized into several levels, starting from the top with provinces, autonomous regions, and municipalities directly under the central government, followed by municipality-level cities (or municipality), which oversee districts, counties, and county-level cities, and further down to townships,

tied to the *hukou* system are region-specific, establishing a direct link between administrative jurisdictions and the *hukou* system. The migration across different administrative levels, particularly where individuals physically relocate but are impeded from obtaining corresponding changes in their *hukou* registration, is a key focus of our study. This scenario, commonly identified in the literature as the "floating population" (Liang and Ma 2004; Liang et al. 2014) captures individuals residing away from their registered *hukou* location for an extended time. Within a municipality-level city (or simply municipality), there are districts, sub-districts and counties. It excludes the population whose current place of residence is different from that of their *hukou* registration but within the same or different district(s) of the same municipality. We exclude this form of migration, termed "Residence-*hukou* separation within the municipality", as such movements often have negligible impacts on individuals' access to public services and opportunities compared to other migration.

Children are defined as individuals between 0-17 years old, in accordance with the United Nations Convention on the Rights of the Children. Left-behind children refer to children aged 0-17 years old who live in the location of their *hukou* registration, but do not live together with both parents, as either one parent or both parents have migrated outside of their hometown for more than six months[6]. Migrant

towns, and sub-districts. At the foundational level, it comprises villages in rural locales and street committee within urban settings.

6 Children in single-parent families who can only live with one parent are excluded from the group of left-behind

children refer to members of the migrant population who are aged 0-17 years. Existing studies reveal two distinct groups of migrant children; one group tends to migrate and live with their families, who are usually below 14 years old (Song and Xie 2017); the other group is more inclined to migrate independently for education or employment, with the majority aged between 15 and 17 years old (Duan and Huang 2012). We therefore take this into account when discussing the dynamic patterns of children in migrant families.

3.2 *Identifying family structure*

Due to the lack of explicit identifiers for children's parents in the census data, we develop a new matching method to determine the relationships among various family members. The approach is more context-specific compared to existing studies in other countries which rely on locator variables or "pointers" to identify family members (Sobek and Kennedy 2009). Specifically, we focus on children and assess the roles of fathers, mothers, grandfathers, and grandmothers for each adult within the same household, based on marital and generational ties. If a child's parents in a two-parent family cannot be identified within the household, it means that they have not been registered as permanent residents in the household, suggesting migration. Our primary criterion for matching is the relationship with the head of the household (C2): when a child is the household head, a sibling, a child, or a grandchild of the head, the

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children. Additionally, children who cannot be determined whether they live with their parents or not are also excluded.

presence of their parents and grandparents can be ascertained by considering the relationship with the head, along with the information on gender and marital status. When a child's relationship with the head of the household is classified as "other" (C2=9), available data cannot determine which household members are the parents and grandparents. Then the child is identified as living with unrelated individuals or residing independently.

After identifying parents and grandparents, we categorize children's living situations based on their parents' presence: (1) both parents at home, (2) one parent at home (either father or mother), or (3) no parents at home. Children living with one parent can be further divided into single-parent children residing solely with one parent due to parental divorce or widowhood, and children with married parents but living with only one due to the other's registration absence from the household. When neither parent is present, children's living arrangements include residing with grandparents, living with unrelated individuals, or living independently.

4. Results

4.1 Dynamics of the Children Population by Migration Status

Figure 2 provides an overview of children in migrant and non-migrant families, with the former including both migrant children and those left behind. Over the period from 2000 to 2020, there has been a pronounced increase in the population of children in migrant families, rising from 14.5% to 46.4%. This shift indicates that nearly one in every two children is in family structures affected by migration. Figure

2 also makes it clear that more children are on the move. In 2000, a greater share of children in migrant families were left behind, while by 2020, migrant children outnumbered them. This trend was particularly evident between 2010 and 2020, a period that saw a 21.9% increase in left-behind children and a 98.5% growth in migrant children. Consequently, migrant children constituted 51.5% of all children in migrant families by 2020. The number of migrant children reached 71.09 million, accounting for 23.9% of China's total children population.

<Place Figure 2 about here>

The observed trends during this period are the results of combined factors: evolving family migration trajectory and reforms in China's *hukou* and education systems. First, the growth of migrant children correlates with a dramatic increase in labor migration. which saw a nearly 90 million increases in the number of migrant workers over the past decade, marking a 46.3% growth. This surge has led to more migrant workers relocating with their children. Second, constantly improved public service capabilities in urban destinations, including increased access to state schools for migrant children, have incentivized family relocations. Third, the shrinkage of educational resources and closure of schools in rural areas have necessitated children's migration to nearby towns and cities to continue their education.

The last two decades have also witnessed nuanced shifts in the profile of left-behind children in China. Between 2010 and 2020, there was a rise of 2.07 million

rural left-behind children, representing a 5.2% increase. Although this growth appears moderate compared to the substantial rise in migrant children, the implications are alarming when viewed against the backdrop of a 28.6% in the rural child population from 154.44 million to 110.31 million. Concurrently, the proportion of rural left-behind children of all rural children increased from 25.7% in 2010 to 37.9% in 2020. This contrasting trend—of declining rural child numbers alongside an increasing proportion of left-behind children—suggests a deepening impact of rural-to-urban migration and underscores the growing visibility of left-behind children in rural settings.

In urban areas, the narrative differs markedly. The number of urban left-behind children surged by 9.95 million, a staggering 65.4% increase, resulting in 25.16 million in 2020, which account for 37.6% of all children left behind. This increase is explained by the reclassification of rural areas to urban ones and the proliferation of urban-to-urban migrants that leads families to leave children behind in urban settings (Ge et al. 2015; Wang et al. 2020).

In contrast, a significant shift is observed in the steady decline of children in non-migrant families, who once formed the majority of the child population. This decline, from 85.5% in 2000 to 53.6% in 2020, is not only a direct consequence of the enhancing influence migration on Chinese family dynamics but also serves as a critical baseline for understanding the broader demographic shifts in China.

4.2 Age selectivity of children's migration

The decision on whether to involve children in migration is essentially a

family one that involves balancing the diverse needs of children at different ages, as well as the urban and rural residential/educational opportunities and family socioeconomic circumstances. As a result, the chances and reasons for children to migrate vary significantly according to age. This underscores the importance of a family-centered approach to understanding children's migration decision-making process. In general, children's chances of involvement in migration increase with age. Data from all three censuses indicate a consistent pattern in the age distribution of migrant children in China, characterized by a higher proportion of older children in the 15-17 age group and a lower proportion of younger children, as shown in Figure 3.

<Place Figure 3 about here>

This pattern reveals a number of interesting findings. First, although the proportion of children aged 0-2 among all migrant children increased from 10.8% in 2010 to 11.4% in 2020, the number of migrant children below one-year-old remains the lowest among all migrant children. This is confirmed by the pattern of left-behind children, where the proportion of rural left-behind children aged 0-2 accounts for 36.1% of the children in migrant families in the same age group, higher than that of other age groups. The high cost of childbirth and limited caring support available for migrant mothers in host cities serve as the main contributing factors. In China, a considerable number of migrant pregnant women still return to their hometowns to give birth, and some of them migrate again when their children are a little older.

Second, the age group of 6-14, consistent with the compulsory education stage, has the highest increase (141.5%) in the number of migrant children, with a growth of 19.71 million between 2010 and 2020. Correspondingly, the number for left-behind children between 6 and14 years old is 22.62 million, accounting for 54.2% of the total rural left behind children. Despite the significant increase in the number of children in compulsory school age over the past decade, the share of migration involvement for this age group remains considerably lower than that of their older counterparts aged 15 to 17. This suggests that the educational opportunities for migrant children of compulsory school age in destination cities remain largely constrained. Meanwhile, upon reaching the age of 15, the proportion of migrant children shows an upward trajectory, showing the highest migration involvement level among all age groups. The majority of adolescent migrant children may enter the labor market after completing compulsory education. In conclusion, the likelihood of becoming rural left-behind children is highest in the early stages and declines over time, while the probability of becoming migrant children increases progressively with age.

4.3 Gender selectivity of children's migration

Figure 4 presents children's migration participation by gender for the years 2010 and 2020, using the Gender Equality Index (GEI). In 2020, the GEI for migration participation narrowed compared to 2010. For ages 0-14, the index in 2010 and 2020 census all exceeded 1, suggesting boys had higher migrating opportunities than girls, especially among the 6-14 age group. Conversely, for the 15-17 age group,

the index was below 1, indicating higher migrating opportunities for girls than boys.

<Place Figure 4 about here>

Census data shows that in 2020, the national children's sex ratio in China was 113.8, with a negligible difference between urban and rural areas, which registered 113.5 and 114.3, respectively. The sex ratios for migrant children and rural left-behind children were 115.3 and 111.9, respectively, indicating a higher sex ratio among migrant children and a lower sex ratio among rural left-behind children. It appears that boys are more likely to be involved in migration relative to girls before the age of 15. Over time there seems to be a narrowing trend in the gender equality indices concerning migration involvement across all children's age groups in 2020 when compared to the 2010 data.

Figure 5 displays the sex ratios of migrant and left-behind children across different age groups, while we also include children's sex ratio nationwide for comparison. The sex differences among migrant children exhibit fluctuations across different age groups; the sex ratio of migrant children aged 0 and 1 closely aligns with the national average and is substantially higher than that of left-behind children. This implies that migration opportunities for male and female infants are relatively equal, although female infants demonstrate a higher likelihood to be left behind. For migrant children aged 6-14, the sex ratio surpasses the national average, suggesting a greater likelihood for boys in this age group to migrate compared to girls. Conversely, the sex ratio for left-behind children aged 6-14 is predominantly lower than the national

average, indicating a higher probability for girls within this age range to remain behind. This suggests that migrant parents are more likely to bring their boys to receive compulsory education in their destinations compared with girls. The sex ratio of migrant children aged 15-17 is significantly lower than the national average, signifying that girls within this age range are more inclined to migrate. However, the sex ratio for left-behind children aged 15-17 exhibits considerable variability, rendering it challenging to derive definitive conclusions.

<Place Figure 5 about here>

4.4 Progress Towards Familialization of Migration

This section focuses on the familial structures, especially a nuanced breakdown of living arrangements that reflects a more complex picture of familialization in migration. In Table 1, we use a Familialization Index (FI) to assess the prevalence of migrant children in different family setups. FI-1 represents the percentage of migrant children residing with both parents at destination among children in migrant families. FI-2 measures the percentage of migrant children living with at least one parent among all children in migrant families.

<Place Table 1 about here>

From 2000 to 2010, the familial mobility pattern remained relatively stable. However, a marked increase transpired between 2010 and 2020. FI-1 experienced growth from 25.0% in 2010 to 31.8% in 2020, while FI-2 witnessed a rise from 28.1%

in 2010 to 38.6% in 2020. These changes highlight not only an intensified family-centric migration but also diversified, particularly among one-parent households and non-traditional family arrangements. This trend is further evidenced by the increase, from 2.0% in 2000 to 7.5% in 2020, of migrant children in two-parent families living with one or no parents. The familial migration pattern is more dynamic than previously understood, demonstrating significant variations influenced by parental marital status and migratory status.

Age-specific living arrangements are shown in Table 2, Among migrant children aged 0-14 in 2020, 79.5% lived with both parents, which implies that 10.89 million migrant children who could not live with both parents. In contrast, 8.3% lived with a single parent (typically the mother), 4.5% with grandparents, and a smaller yet significant proportion (6.6%) with other adults, or with fellow minors or alone (1.1%). For older minor (aged 15-17), a mere 24% lived with both parents, while 68.8% lived with unrelated individuals or independently. As migrant children grow older, their living arrangements tend to involve less direct parental support and more independence or network connections with non-parental adults and peers.

<Place Table 2 about here>

There has been a notable shift towards more complex living arrangements. The percentage of children in one-parent households, particularly with mothers, has increased. This trend, along with the prominence that migrant children living with non-parental guardians or on their own, underscores the evolving landscape of family

structures amidst migration. This finding highlights the challenges faced by migrant children in maintaining familial bonds and cohesive family structures, which is particularly concerning given the critical role that a family plays in shaping a child's development and well-being.

4.5 Inter-provincial and intra-provincial migration

Recent *hukou* reforms have made it easier for migrants to obtain local *hukou* status in relatively smaller cities, especially within their own province. Coupled with recent economic development in hinterland regions, people might move to cities within their own provinces rather than more distant ones, facilitating family migration. The census data confirms such a trend. From 2000 to 2010, the proportion of inter-provincial migrant children increased from 23.8% to 30.1%, while the proportions of intra-provincial migration, including both inter-township within counties and inter-county within cities, decreased. However, from 2010 to 2020 shows the opposite trend. The proportion of inter-provincial migration decreased to 21.2%, while the proportion of inter-township migration within counties increased from 38.2% to 46.3%, and the proportion of inter-county migration within cities rose from 12.8% to 14.3%. The proportion of inter-city migration within provinces remained stable.

Figure 6 further shows how children's inter-provincial migration varies by age, suggesting that the migration decision is influenced by children's age and education. In 2020, the proportion of children aged 0-2 and 3-5 who migrated inter-provincially

was relatively high, at 23.5% and 24.5% respectively, while 22.4% of children in compulsory education migrated inter-provincially, and only 13.3% of children aged 15-17 migrated inter-provincially. Cross-provincial migrant children face greater challenges in pursuing secondary and higher education than those encountered during preschool and compulsory education. Conversely, although rural children tend to discontinue their education and search for employment opportunities inter-provincially after completing compulsory education, a noteworthy proportion of migrant children begin to receive high school education within their provinces. As a result, the proportion of migrant children aged 15-17 migrating inter-provincially is lower than that of other age groups. Figure 6 also confirms the recent rise of intra-provincial migration. Between 2000 and 2010, the proportion of children aged 0-14 migrating inter-provincially increased notably, while it decreased significantly from 27.2% to 18.2% for those aged 15-17. From 2010 to 2020, the proportion of children migrating inter-provincially decreased significantly, by 14.6 percentage points for children aged 0-2 and by 9.6 percentage points for children aged 3-5 respectively. The proportion of children aged 15-17 decreased even further in 2020.

<Place Figure 6 about here>

4.6 Emergence of left-behind child migrants

We identify a special group of children, known as “left-behind child migrants” or liuliu ertong in Chinese, who migrated across townships within a county but do not live with both parents. These left-behind child migrants, facing similar issues of

parental separation as other left-behind children, often find themselves in more independent or unaccompanied situations, although some live with other relatives or in unrelated households.

The number of left-behind child migrants has consistently grown since the turn of the century. In 2020, 46.3% of migrant children, or about 32.92 million, migrated within counties (See Table 3). Among them, after excluding the 2.2% who were from single-parent families, the remaining 41%, corresponding to 14.2 million were classified as left-behind child migrants. From 2000 to 2010, its number expanded by 1.02 times, corresponding to an increase of 3.51 million children. Between 2010 and 2020, the growth rate slightly accelerated, rising by 1.05 times and adding 7.28 million children.

<Place Table 3 about here>

The left-behind child migration uncovers a trend driven by educational priorities in China. A notable observation is the high school enrollment rate among rural children migrating across townships, indicating education as the primary migration motivator. For rural children aged 15[7], the enrollment rates were 98.63%, 96.04%, and 88.38% for cross-township, cross-county, and cross-provincial migrations, respectively. Many rural children migrated to nearby urban areas for

7 The age of 15 is a pivotal educational stage in China, marking the transition from junior high to high school. This period is critical for future educational paths, hence the focus on this age group.

better education, often accompanied by a parent or grandparents. This move, prompted by the pursuit of superior educational facilities also leads to challenging family dynamics, such as separations, as parents continue to work in elsewhere to finance such education(X. Wang et al. 2017). Moreover, the presence of left-behind child migrants is partially a consequence of the significant closure of primary and secondary schools in rural areas, which force parents to send their rural left-behind children to proximate towns. Some children opt for full boarding in schools, reflecting a form of education-driven "urbanization" for rural left-behind children (Cui and Wu 2023). Besides, there are children moving from large cities to attend schools in towns close to their *hukou* registration place due to educational barriers in large cities. These children are often confronted with the living dilemma, and face integration challenges away from their usual support networks.

In terms of gender, a notable feature is that left-behind child migrants aged 15-17 have a lower sex ratio compared to both the overall population of children and migrant children. The sex ratio among left-behind child migrants aged 15-17 in 2000 was only 92.3, indicating girls in this age group were more likely to be left-behind child migrants than boys. Although the ratio has increased to a more balanced one in recent years[8], it still lags behind that of migrant children, suggesting the female-biased nature of the group. This could be partly explained by the facts that a large number of

8 From 2000 to 2015, left-behind child migrants have seen an increase in sex ratio from 92.3 to 108.0, reflecting a significant move towards gender balance. Migrant children's sex ratio has similarly improved from 94.1 to 116.1.

left-behind child migrants were driven by educational reasons and girls aged 15-17 have a higher proportion of being in secondary schools than boys. Nationally, girls' enrollment and completion of education at all levels have not only seen a significant increase but also surpassed those of boys, particularly after 2010 (NBSC et al. 2023b).

Approximately one-third of left-behind child migrants lived with one parent in 2020, predominantly the mother (23.4%), and 10.2% lived with their grandparents. The remaining 29.2% lived with other minors, while 25.1% lived with other adults. In 2000, only 22.8% of left-behind child migrants lived with relatives, a figure that rose to 42.9% by 2020. Specifically, the percentages of left-behind child migrants living with one parent, and grandparents when both parents are absent, have markedly increased from 2010 to 2020. Meanwhile, the percentage of children living with unrelated individuals or alone decreased from 77.2% in 2010 to 57.1% in 2020. The decline reflects a move away from non-familial arrangements, suggesting a reevaluation of family priorities in the context of migration possibly influenced by policy reforms and changing societal attitudes towards the care of migrant children.

Within the dynamics of child migration, the shift away from traditional dual-parent households towards reliance on extended family networks or alternative caregiving arrangements is notable, highlighting and the need for support systems. Moreover, the trend towards consolidating smaller schools into larger ones, may not always yield the expected educational benefits. Some studies (Lu and Du 2010; Wu and Yang 2021) indicate that such consolidation can adversely affect students' academic performance. In addition, left-behind child migrants in boarding schools

might be vulnerable to neglect and abuse without adequate family support. This aspect directly connects to the broader theme of left-behind child migration, emphasizing the importance of considering the welfare and safety of these children in migration-related policy discussions.

5. Conclusion

Using the census data of 2000, 2010 and 2020, this paper has provided an overview of children in migrant families in China in the past two decades including both migrant children and left-behind children. We find a remarkable increase in the number of children in migrant families and the trend of children on the move. The share of migrant and left-behind children among all children rose from 14.5% in 2000 to 46.4% in 2020. It means that almost one in every two children in China has been in family structure shaped by migration. While the number of left-behind children far exceeded that of migrant children in 2000, the picture became the opposite in 2020, with the shift occurring between 2010 and 2020. This indicates a rising preference among migrant families to bring their children to cities rather than leaving them behind. As migrant families gradually establish themselves in destinations, they have more resources and capacities for family reunification.

Although out-migration might present valuable educational and long-term developmental opportunities for children, migrant children continue to be confronted with institutional obstacles in their destination without local *hukou* status, such as difficulties in securing places in state schools. Our data reveal that the likelihood of being migrant children increases with age, as younger children need intensive care

which might be difficult to provide at destination cities where migrant parents usually work long hours. Compared with girls, boys are more likely to migrate to cities during their years of compulsory education, reflecting traditional preference for boys in migrant families. About 79.5% of migrant children aged 0-14 lived with both parents, whilst 68.8% of migrant children aged 15-17 lived with individuals other than their parents or grandparents.

The rise of family migration is associated with an increase of intra-provincial migration, as *hukou* restrictions within a province is more relaxed and shorter distances facilitate family migration. An emerging group that holds significant potential for further scholarly exploration, i.e., "left-behind child migrants" who moved to towns or cities near their hometown for educational purposes without both parents. This phenomenon goes beyond the traditional binary narratives between "rural" and "urban" areas and between "destination" and "origin". It underscores the ongoing issue of family fragmentation and necessitates a more comprehensive understanding of migrant children's experiences. By recognizing the intricate relationship between migration and staying behind, future research and policy interventions are needed to effectively address the needs of vulnerable children and promote their holistic development and wellbeing.

Our analysis based on census data offers a wealth of information, however, there are limitations. First, according to the annual population sample survey results before the 2020 census, China's migrant population reached a peak of 253 million in 2014 and exhibited a continuous decline to 236 million in 2019 (NBSC 2020).

However, the 2020 census data revealed that the size of the migrant population did not decrease, but experienced a surprisingly substantial increase. Some scholars attribute this discrepancy to significant improvements in the census implementation and conclude that the 2020 census identified migrant population more accurately. This suggests the actual size of the migrant population in 2000 and 2010 might have been larger than those reported in the corresponding census. Under these circumstances, the increase in the number of migrant children might be slightly overestimated. Nevertheless, this will not alter our conclusion regarding the patterns of children in migrant families. Second, our analysis about the patterns of children in migrant families is limited to the number of questions available on the census questionnaire. Due to data constraints, we are unable to conduct in-depth analysis of the underlying factors influencing parents' decision-making of migration with or without children. Our aim is to provide a dynamic overview of the characteristics of these children in family structures affected by migration. This provides solid foundation and context for further research on these children.

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TABLE 1 Living arrangement of children in China in 2000, 2010, and 2020

	2000 (percentage)	2010 (percentage)	2020 (percentage)
Living with both parents			
Non-migrant children with both parents	79.2	64.9	50.5
Migrant children with both parents	3.6	7.2	13.1
Not living with both parents			
Left-behind children (excluding those living with one parent in a single-parent family)	11.3	19.7	22.5
Migrant children with one or no parents (in a two-parent family)	2.0	3.9	7.5
Migrant children with one parent (in a single-parent family)	0.1	0.1	0.5
Non-migrant children with one parent (in a single-parent family)	2.5	2.5	2.6
Others	1.3	1.5	3.1
Total	100.0	100.0	100.0
FI 1: Migrant Children with Both Parents/Children in migrant families	25.3	25.0	31.8
FI 2: Migrant Children with One or Both Parents/Children in migrant families	28.1	28.1	38.6
Percentage of Migrant Children Living with Both Parents among all children nationwide	3.7	8.1	14.8

TABLE 2 Living arrangements of migrant children aged 0-14 and 15-17 in China in 2000, 2010, and 2020

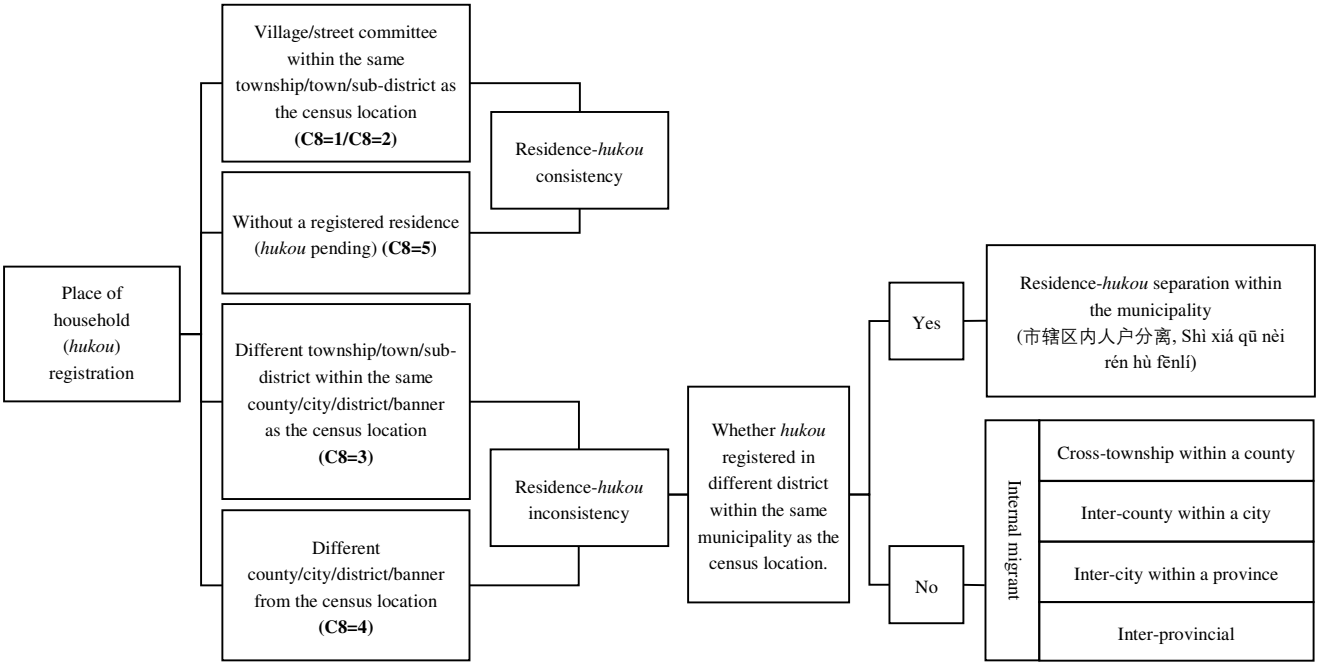
	0-14 (percentage)			15-17 (percentage)		
	2000	**2010**	**2020**	**2000**	**2010**	**2020**
With both parents	81.6	80.7	79.5	24.8	27.1	24.0
With mother only	5.3	5.9	5.4	1.5	2.6	3.6
With father only	1.6	2.1	1.5	1.1	0.9	1.2
With a single parent	1.6	1.3	1.4	1.1	1.1	1.3
With grandparents	4.6	4.1	4.5	0.7	0.9	1.1
With other adults	5.0	4.7	6.6	55.0	42.6	32.3
With other minors or living alone	0.4	1.3	1.1	15.9	24.9	36.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 3 Living arrangements of migrant children cross-township within the county in China in 2000, 2010, and 2020

	2000	2010	2020
Number of migrant children cross-township within the county (million persons)	8.1	13.7	32.9
Living arrangement of migrant children cross-township within the county (%)			
With both parents	57.5	49.2	56.8
With one parent in a single-parent family	1.7	1.2	2.2
With at most one parent in a two-parent family (known as "left-behind child migrants")	40.8	49.6	41.0
Total	100.0	100.0	100.0
Number of left-behind child migrants (million persons)	3.4	7.0	14.2
Living arrangement of *left-behind child migrants* (%)			
With relatives	22.8	20.2	42.9
With mother only	10.8	10.6	24.7
With father only	3.0	2.7	7.4
With grandparents only	9.0	6.9	10.8
With unrelated individuals or alone	77.2	79.2	57.1
With other adults	59.5	57.7	26.5
With other children	14.7	20.5	29.6
Alone	3.0	1.6	1.0
Total	100.0	100.0	100.0

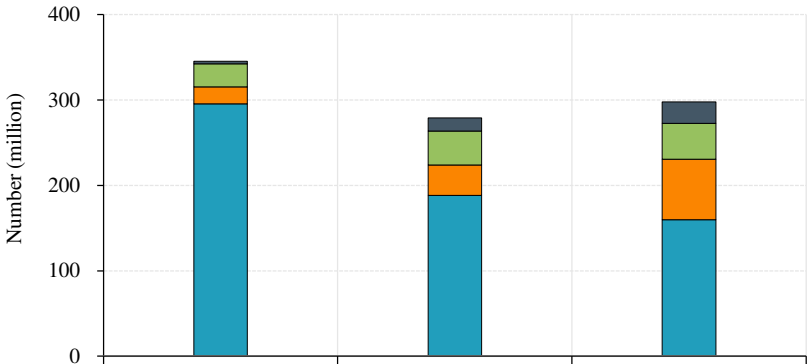
Note: The "living with unrelated individuals or alone" category may not capture the full complexity of every living arrangement. Particularly, it might include scenarios where a child is staying with distant relatives. However, in the interest of streamlining the text, which may not specify the exact relationship of every adult in the household to the child, such nuances could not be precisely delineated.

FIGURE 1 Process of identifying migrants in China's 2020 census



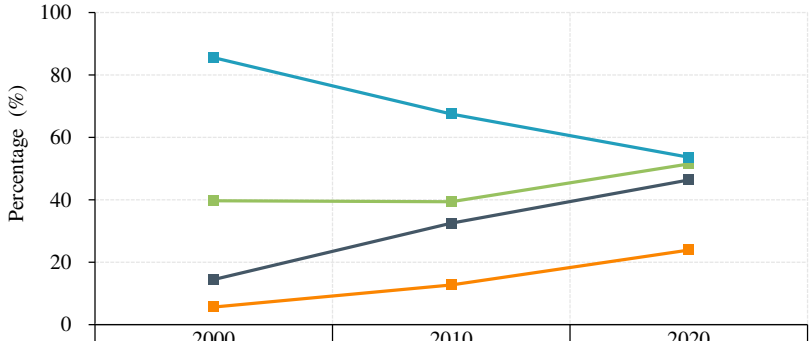
NOTE: The "Hukou pending" status, also known as the "population without household registration (definitions adapted from NBSC, UNICEF China, UNFPA China, 2023b)", primarily refers to individuals, often new-borns or adults in the process of transferring their hukou, whose household registration is not yet completed due to administrative procedures or personal circumstances, but their hukou is essentially local.

FIGURE 2 (a) Number of children in different family migration status in China in 2000, 2010, and 2020. (b) Percentage of children in different family migration status in China in 2000, 2010, and 2020



	2000	2010	2020
Number of urban left-behind children	3.1	15.2	25.2
Number of rural left-behind children	27.0	39.7	41.8
Number of migrant children	19.8	35.8	71.1
Number of children in non-migrant families	295.4	188.2	159.6

(a)



	2000	2010	2020
Percentage of migrant children in children in migrant families	39.7	39.5	51.5
Percentage of children in migrant families in all children	14.5	32.5	46.4
Percentage of migrant children in all children	5.7	12.8	23.9
Percentage of children in non-migrant families in all children	85.5	67.5	53.6

(b)

FIGURE 3 Age distribution of children in different family migration status in 2020

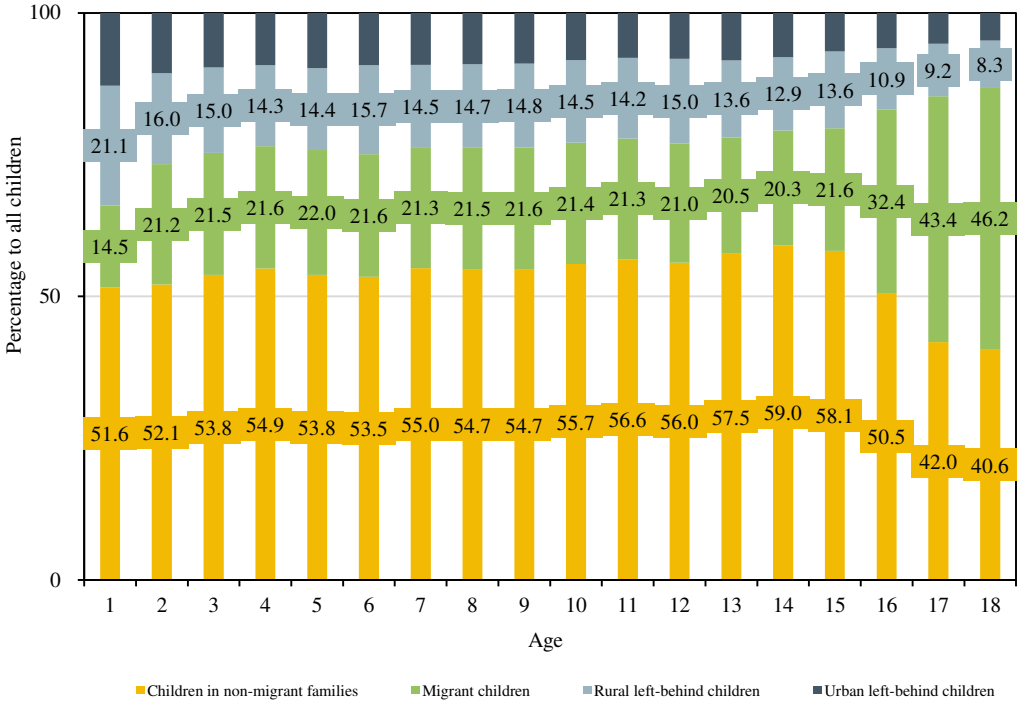
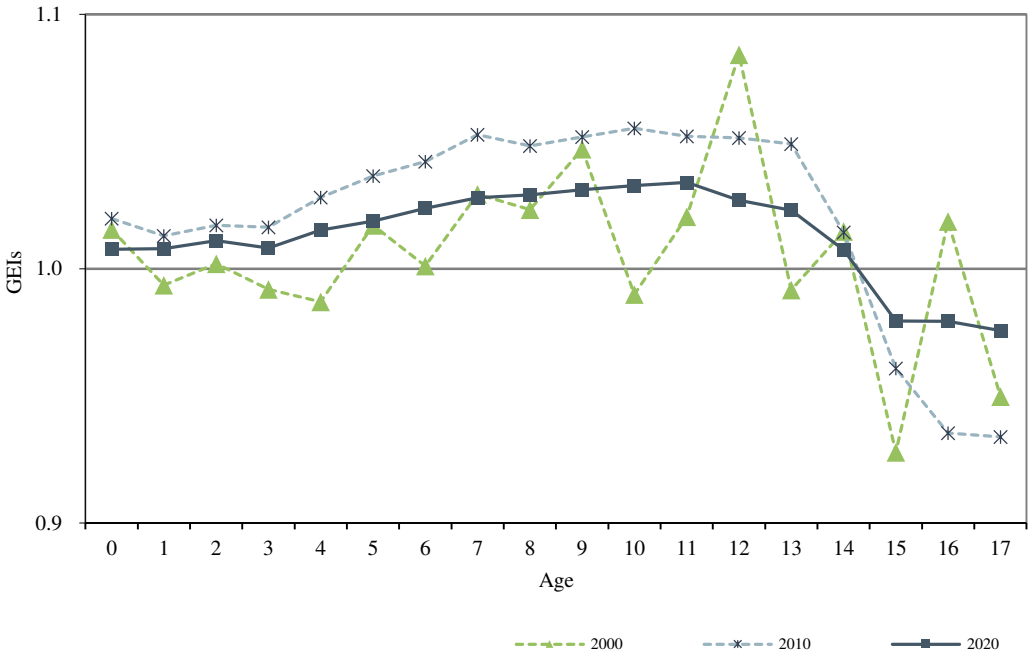


FIGURE 4 Age-specific gender equality indices (GEIs) for child migration in China in 2000, 2010 and 2020



NOTES: The gender equality index (GEI) of migrant children is measured as the ratio of the sex ratio among migrant children to the sex ratio of all children in the country. When the index equals 1, it indicates that the gender composition of migrant children within a specific age group is aligned with the national demographic pattern. An index value greater than 1 suggests that the sex ratio of migrant children exceeds the national-level sex ratio for children, implying a higher prevalence of migration participation for boys compared to girls. Conversely, an index value below 1 denotes that boys have fewer migration experiences compared to girls.

FIGURE 5 Age-specific sex ratios for all children, migrant children, and left-behind children in 2020

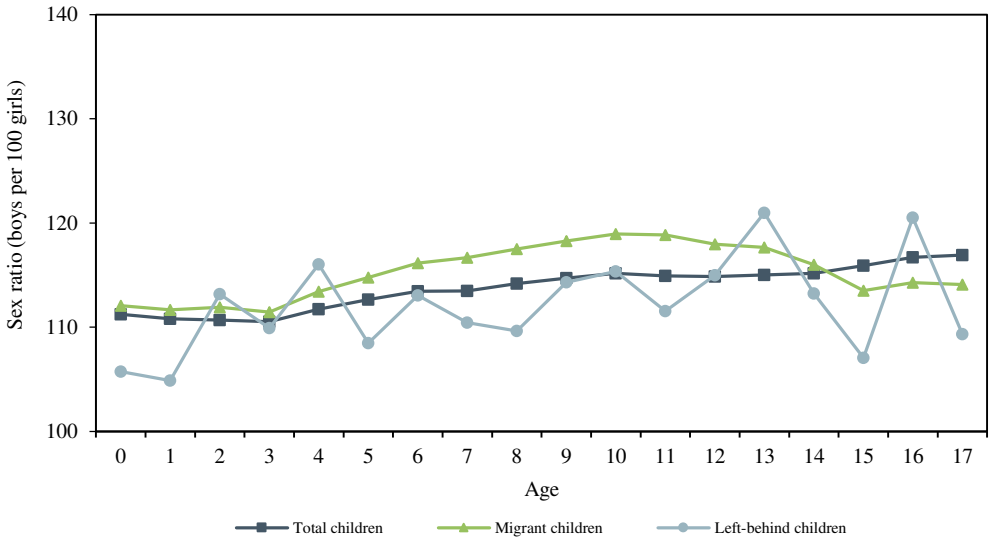


FIGURE 6 Age-specific percentages of inter-provincial migrant children in 2000, 2010 and 2020