Empirical Essays in the Economics of Education

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I would like to dedicate this thesis to my loving parents ...

Declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution

Zhen Long
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Abstract

This thesis contributes to understanding the education of disadvantaged children within the field of Economics, with a focus on rural China, where educational inequalities are prominent. Chapter 1 examines the relationship between parental migration and children's cognitive abilities and school engagement. The findings show that while parental migration does not significantly impact cognitive abilities, it negatively affects school satisfaction for both boys and girls, with a more pronounced effect on boys. Boys' school engagement also suffers due to parental absence. Chapter 2 presents a survey report. The survey focuses on ethnic minority children who were potentially exposed to the "One Village, One Preschool" (OVOP) program. The survey gathered data on family background, parental care, school engagement, personality, and peer relationships. The results indicate that participation in the OVOP program enhances social skills, self-control, and learning habits, which helps explain the academic performance gap between participants and non-participants. Chapter 3 evaluates the impact of the OVOP program on ethnic minority children's academic performance and socio-emotional skills using academic records and survey data. The findings suggest that the OVOP program significantly improves academic outcomes and enhances socio-emotional skills, including task performance, emotional regulation, social engagement, and open-mindedness.

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Chapter 0

Introduction

Early childhood is a crucial time for development and learning, and there is strong evidence in economics that highlights the importance of these early years. In developing countries, disadvantaged children often have lower levels of educational achievement and socio-emotional skills. My PhD thesis focuses on understanding the education of disadvantaged children in rural China, guided by two main questions: (i) Why do these children become disadvantaged, and how can we measure this inequality? (ii) Do interventions effectively help reduce these disadvantages?

This thesis looks at two groups of disadvantaged children: left-behind children (LBC), whose parents have migrated for work and are separated from them for long periods (discussed in Chapter 1), and ethnic minority children, whose families do not speak Mandarin, the official language of China (covered in Chapters 2 and 3). Both groups face challenges in their early development and tend to have poor educational outcomes.

LBC are mainly disadvantaged because their parents leave to find work elsewhere. Studies show that being separated from parents can negatively affect LBC's development and adjustment. In China, because of long work hours, low wages, poor living conditions, and the restrictions of the rural-urban Hukou system, many migrant workers have no choice but to leave their children in rural areas. Besides common issues faced by unattended children globally, China's LBC face additional difficulties. The dual rural-urban system makes it hard for children to move with their parents, so they are often cared for by grandparents or other relatives. Due to economic imbalances, rural LBC often have to deal with low socioeconomic status and limited access to education.

Ethnic minority children are mainly disadvantaged due to language barriers. This issue has not been well studied in economics, and the needs of these children are often overlooked. If these inequalities are not addressed, they could lead to ethnic tensions, poor economic outcomes, and instability. While ethnic inequality is not unique to China, it is more evident

in developing countries where rapid but uneven economic growth and changing institutions often leave disadvantaged groups behind.

Both groups of children—those left behind and those facing language barriers—often come from families with low socioeconomic status. Research shows that families with lower education levels are less likely to prioritize education for their children. Less educated parents might not value education highly, have lower academic abilities themselves, or struggle to help with schoolwork. In addition, poor community resources often lead to lower-quality schools, which can reduce the perceived benefits of education and discourage attendance. In remote areas, the low return on education might also discourage families from investing in schooling (Schady, 2011; **?**).

Given these challenges, early childhood interventions are crucial for these children. Improving school resources and boosting both cognitive and non-cognitive skills through anti-poverty programs can help reduce educational inequalities among disadvantaged children.

In the first chapter, the study examines how parental migration affects children's cognitive and non-cognitive abilities. It begins by outlining the basic characteristics of China's rural left-behind children (LBC) and then employs an instrumental variable approach to consistently assess the effects of parental migration on children's literacy and math test scores, school engagement, and school satisfaction. This chapter adds to the literature by providing evidence on the impact of parental migration on non-cognitive abilities. The findings suggest that while parental migration does not significantly impact children's literacy and math skills, it negatively affects school satisfaction for both boys and girls.

The second chapter conducted a survey which was designed to support the data analysis in Chapter 3. This survey targeted junior high school students who were part of the "One Preschool, One Village" (OVOP) early childhood intervention program. It gathered comprehensive data on various aspects of the student's lives, including family background, program attendance, language skills and family language environment, home study conditions, parental care, parenting style, school enjoyment, class behaviour, learning habits, time management on weekdays and weekends, experiences during Covid, personality traits, conduct problems, and peer relationships.

The survey's contribution lies in its tailored questionnaire, specifically developed for ethnic minority children based on an extensive review of existing literature. The data collected serves not only the evaluation objectives of Chapter 3 but also provides a foundation for exploring other topics related to ethnic minority contexts, such as mental health, parenting behaviour, and peer influence effects. The survey process, including the sampling strategy and pilot design, is also detailed. Statistical analysis of the survey data, mainly from the perspective of evaluating the OVOP program, reveals that children exposed to the OVOP

program show significantly higher levels of personality skills and school engagement. Further analysis shows that family background and parental care can positively influence socio-emotional skills and school engagement, but relatively wealthier students would have more mental issues.

The third chapter evaluates the effects of the OVOP program on children's academic performance and socio-emotional skills. It specifically examines the role of language barriers and their impact on minority children's academic success compared to their majority counterparts. It also investigates whether the program helps narrow the educational gap and supports the most disadvantaged children. This chapter contributes to the field by addressing the underexplored relationship between language, educational behaviour, and socio-emotional skills. Three key conclusions are drawn: First, removing language barriers significantly reduces ethnic inequality, particularly by improving academic performance by 14% of one standard deviation. Second, gaps between minority and majority children persist, with further analysis suggesting that addressing the unique needs of minority students should also involve family support. Third, as the OVOP program is implemented and refined over time, children exposed to the program at an earlier age, as well as younger cohorts, benefit more significantly.

Chapter 1

Cognitive Performance and School Engagement of Left-behind Children in Rural China

ABSTRACT

The swift pace of urbanization in China has led to a critical educational and social issue: the emergence of approximately 70 million so-called 'left-behind children'(LBC) in rural regions. These children remain in their homes while their parents migrate to urban for work. This paper explores the effects of parental migration on the educational engagement of LBC using a panel dataset of 12,734 rural children aged 10 to 15. The findings suggest that parental migration does not significantly impact the educational performance of teenage LBCs. However, the performance of LBCs declines when both parents migrate, with male LBCs experiencing more adverse effects than their female counterparts.

1.1 Introduction

Over the past four decades, China has experienced the largest rural-to-urban migration in its history, leaving millions of children behind in rural areas (Zhou et al., 2020). About 47 per cent of these "left-behind children" (LBC)—defined as children aged 0 to 16 who live in rural areas and have at least one parent who has migrated to the city for work for six months or more—have both parents away (All China Women's Federation Research Group (ACWF), 2013). This situation poses a significant social issue, as limited access to education in cities often forces parents to leave their children behind (Lai et al., 2014; Zhang et al., 2015a). Without parental care, these children are usually raised by grandparents or other relatives, leading to various psychological and educational challenges (Zhang et al., 2015a).

The number of rural LBC peaked at over 61 million in 2010, decreased to 41 million by 2015, and further dropped to 6.97 million by 2018, while the number of urban LBC rose from 7.7 million to 28.3 million between 2010 and 2015 (All China Women's Federation Research Group (ACWF), 2013; Ren and Chan, 2018; Zhou et al., 2020). However, this shift is largely due to the reclassification of districts from "rural" to "urban," rather than any real change in the children's situations (Ren and Chan, 2018). Studies have shown that rural LBC are more vulnerable to psychological and educational problems, such as depression, anxiety, low self-esteem, and higher dropout rates, compared to non-left-behind children (NLBC) (Chai et al., 2019; Chen et al., 2013; Hu et al., 2020).

The issue of left-behind children is not unique to China and is also observed in other developing countries like Mexico (Alcaraz et al., 2012; Antman, 2012), the Caribbean (Dillon and Walsh, 2012), Burkina Faso (Bargain and Boutin, 2015), the Philippines (Arlini et al., 2019), Peru (Robles and Oropesa, 2011), and Pakistan (Mansuri, 2006). A distinct feature of China's situation is that the migration is mostly internal, unlike the international migration seen in these other countries. This internal migration creates unique challenges for LBC in China, particularly in terms of their educational performance and emotional well-being, which can differ greatly from children in countries with more international migration.

Although much research has explored the effects of parental migration on children's development, there is still a lack of understanding about how it affects children's school behaviours. Most studies focus on children's health and academic performance (Fu et al., 2017; Hu, 2018; Liang and Yu, 2022). Recently, some research has looked into the effects of being left behind on non-cognitive abilities, such as honesty (Cadsby et al., 2019), but the impact on school engagement has not been fully explored.

This paper aims to examine how parental migration affects children's school engagement by addressing the following questions: What is the general state of school engagement among

children in rural China? How does parental migration affect this engagement? And what are the different effects on LBC's school engagement?

To answer these questions, this study uses nationwide survey data and employs the two-stage residual inclusion method with instrumental variables, specifically migration networks, to estimate the causal effects of parental migration on children's school engagement. The findings indicate that parental migration does not have a significant impact on children's cognitive outcomes or school engagement. However, further analysis reveals that LBC with both parents migrated tend to perform worse in literacy tests compared to their peers, and male LBC show lower levels of school engagement.

This study contributes to the literature in two ways. First, it provides new evidence on the impact of parental migration on children's school engagement. Second, it highlights the critical role of parental accompaniment by examining the differences among children with both parents migrated versus one parent migrated.

1.2 Studies on LBC's Educational Performance

The existing literature shows mixed findings on the educational performance of left-behind children (LBC) using various research methods and data. Generally, studies find that receiving remittances from a migrant household member positively contributes to a child's human capital accumulation because the remittances are often used for educational investments (Bouoiyour and Miftah, 2015; Calero et al., 2009; Xing and Wei, 2017). Paternal migration can also positively impact children's education by increasing the mother's decision-making power within the household (Antman, 2011b; Malone, 2007). For example, Yang (2008) found that when both parents migrate, it reduces children's work hours and increases their educational attainment in the Philippines. Similarly, Mansuri (2006) observed in Pakistan that migration leads to educational gains, particularly for girls.

On the other hand, some studies present different findings. Acosta (2011) reported that male migration in El Salvador encourages child labour and does not significantly affect education. In China, Hu (2013) used data from Gansu province and found that while parental migration does not significantly impact boys' educational performance, girls left behind face substantial challenges in school. Zhao et al. (2014), who surveyed Ningxia and Qinghai provinces in China in 2009, found that parental migration led to a 15.6% decline in math test rankings.

Lee (2011) was the first to consider parental migration as an endogenous decision and used an instrumental variable approach to study how parental absence affects youth schooling in rural China. The study found that children with no migrant parents were more likely to be

enrolled in school than those with migrant parents, who were also more likely to drop out after middle school. Hu (2012) and Zhou et al. (2014) also showed that the lack of parental guidance negatively impacts high school attendance in rural areas. However, Lee (2011) also found that while children's education was generally negatively affected in terms of school enrollment and years of schooling when both parents were absent, the schooling rate of LBC remained unaffected or even improved when only one parent migrated. Similarly, Duan and Yang (2009) found that preteens in families that send migrants are more likely to stay in school.

Although previous studies have either focused on the educational performance or well-being of LBC, few studies have investigated the school engagement of left-behind children and the underlying mechanisms. In the absence of parental support and care, LBC are usually cared for by grandparents who are commonly not well educated and not as attentive as parents (Song et al., 2021). As a result, neighbourhood social cohesion, such as care from teachers, becomes important for LBC's development (Chai et al., 2019). In this paper, I find that male LBC tend to be less engaged in class, while female LBC are more engaged in class and both male and female LBC are less satisfied with schools which potentially implies that school accompaniment cannot compensate for the absence of parental care.

1.3 Why are Children Left Behind

In many countries, migrant children often face educational barriers, such as being denied access to public schools or being required to pay fees that their families cannot afford (Bartlett, 2012). These challenges discourage migrants from relocating with their families. Additionally, the high costs of housing and restrictions on access to urban services often force parents to leave their children behind in rural areas (Center for Child Rights and Corporate Social Responsibility, 2013). In China, the household registration system (Hukou) plays a crucial role in this context. Originally designed to control population distribution and resources for social planning and industrialization (Zhang et al., 2019), the Hukou system has created significant barriers to labour mobility.

1.3.1 The Hukou System

Established in 1958, the Hukou system acts as an internal passport in China, determining where a person can live and what benefits they are entitled to based on their registration location (a specific residence) and type (rural or urban) (Liang and Chen, 2007; Zhang et al., 2019). This system places significant restrictions on individual migration, particularly from

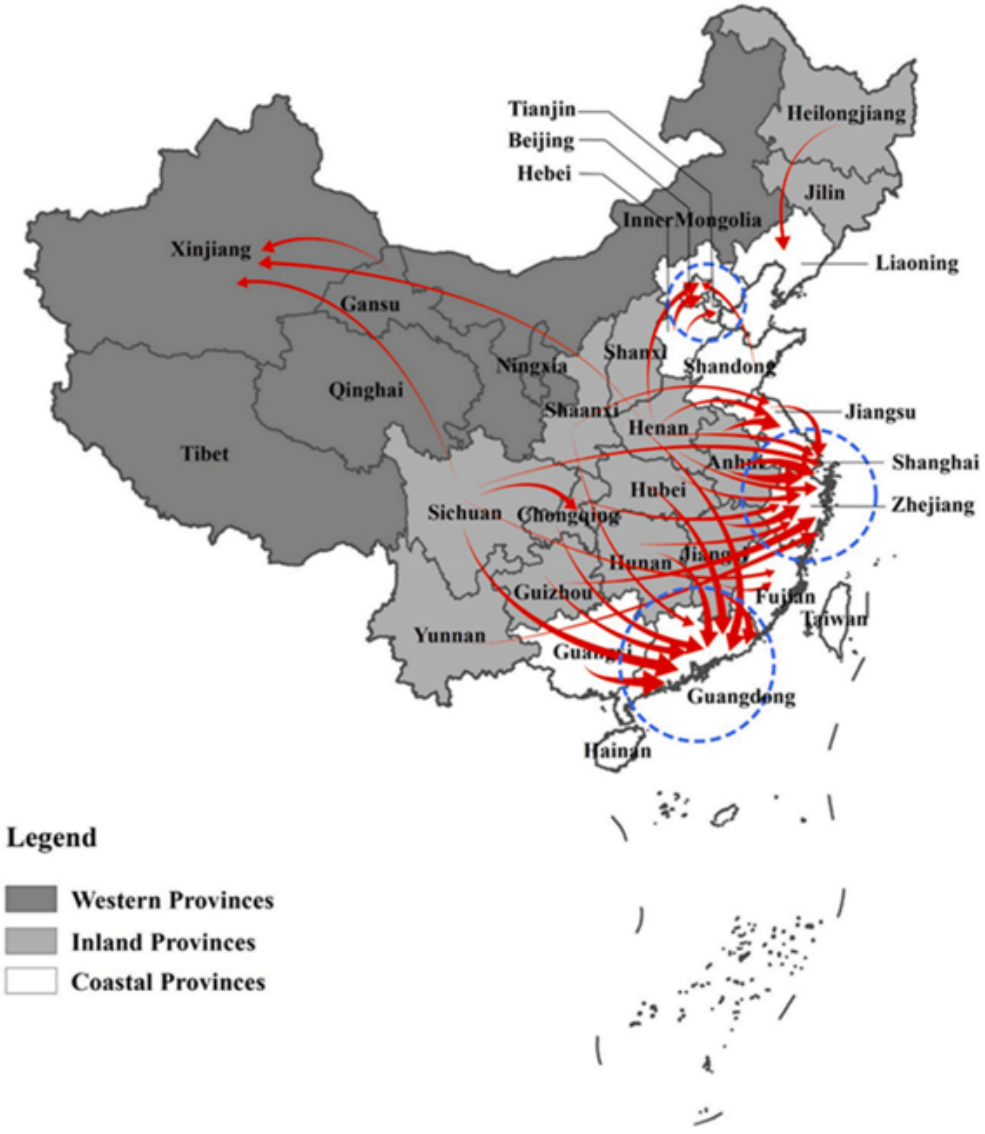
rural to urban areas (Vendryes, 2011). To migrate, one must obtain permission from both their original location and their intended destination, and approval for an urban Hukou is generally granted through one of five channels: investment, home purchase, talent programs, employment, or marriage (Zhang et al., 2019).

It is extremely difficult for a rural resident to become a permanent urban resident in a prosperous city without initial capital or a high level of education, and even more challenging if they wish to migrate with a child (Ren and Chan, 2018). This barrier to labour mobility is closely tied to a range of urban benefits, including government-provided housing, medical care, children's education, and social security (Zhang et al., 2015b). As a result, it is particularly hard to migrate to more developed cities like Beijing or Shanghai, which ironically are the very cities that require a large number of migrants to sustain their growth. As shown in Figure 1.1, the primary destinations for migrants are the three largest economic regions in China: Jingjinji, the Yangtze River Delta, and the Pearl River Delta (Long et al., 2022). Consequently, millions of people work in these cities without local Hukou registration and thus lack access to local benefits, such as public medical insurance and educational opportunities for their children. Yang (2013) argued that because of these institutional constraints, migrants from rural areas, especially younger migrants, are unable to fully benefit from the positive effects of migration.

Although the Hukou system's constraints have been gradually and partially relaxed since the 1990s, financial limitations, welfare systems, and educational policies still force many workers to leave their children, especially those of school age, in their rural hometowns (Jingzhong and Lu, 2011). The reform of the Hukou system began in small and medium-sized cities in 2000, with the intensity and scope of the reform expanding until 2013, and more transparent Hukou requirements being introduced in larger cities in 2014 (Zhang et al., 2019). However, since internal migration began in China in the 1980s, nearly two generations of non-Hukou migrants and their families have been deeply affected by these institutional restrictions.

According to Zhang et al. (2019), Hukou reforms since 1978 can be divided into four phases: 1978-1991, 1992-2000, 2000-2013, and 2014-2020. These major reforms have been combined with a process of decentralization (Raimondo, 2019; Wu, 2013; Zhang et al., 2019), where the central government promotes general regulations but transfers fiscal and administrative powers, including Hukou management, to regional governments. Local governments have played significant roles since the second phase (1992-2000) (Duan, 2008), often implementing policies that serve their own local interests. These policies primarily aim to attract wealthy individuals who can afford to buy property or those with high-demand skills (Fields and Song, 2020; Song and Smith, 2019; Song, 2014).

Fig. 1.1 Migration Flows across Provinces in China from 2005 to 2010.



Source: Houyin Long et al.(2022).

Note: The circles show that the main migrant flows from 2005 to 2010 concentrated on the three largest economic regions of China: Jing-Jin-Yi, Yangtze River Delta, and Pearl River Delta.

For migrant families, settling in cities became a priority after the first Hukou registration reform advanced in small and medium-sized cities around 2000. Despite a Ministry of Education mandate that public schools must enrol children with local temporary residence permits (Han, 2017), migrant children were often required to pay extra fees to attend school in their new cities. At the time, private education in urban areas was financially inaccessible to most migrant children (Zhou and Cheung, 2017). Many were barred from local schools, preventing them from living with their migrating parents, an issue that persists despite multiple central government directives emphasizing the importance of educating migrant children[1].

Local governments have implemented these legislative changes to varying degrees (Ming, 2014). Many have tacitly allowed public schools to engage in rent-seeking behaviour, charging extra fees called "school selection fees" or "miscellaneous fees" (Chi and Qian, 2016). This effectively excludes migrant families who cannot afford these fees from the public education system. Furthermore, even if a child completes nine years of mandatory education in a city, many urban public high schools do not accept students without a local Hukou, and some cities do not provide high schools for migrants (Chen and Feng, 2013). As a result, many migrant families either attempt to change their Hukou or are forced to send their children back to their rural hometowns for high school (Koo et al., 2014). These children, often returning after years in urban environments, face significant adjustment difficulties and frequently drop out of high school, becoming migrant workers like their parents (Chow et al., 2023).

The reform of the Hukou system has been symbolic but also complex. While it has allowed for selective internal migration, preventing overpopulation in major cities and supporting market economy growth, it has also involved conflicting interests among various social groups. The deeply entrenched social system has profoundly affected individual lives, leading to unintended consequences such as social segregation, discrimination, and parental absence. The delayed or hesitant reforms have failed to keep pace with emerging challenges, necessitating further government action.

[1] In 2001, the State Council's Ruling over Basic Education Reforms and Development established two primary principles (*liangge weizhu*) for migrant children's education: (1) Local governments have primary responsibility, rather than the origin government, for providing education to migrant children; (2) Public schools are prioritized over private schools (Ming, 2014). In 2006, the newly revised Compulsory Education Law reiterated the host government's responsibility for migrant children's education. In 2008, the National Development and Reform Commission officially confirmed that charging temporary schooling fees is illegal (Zhou and Cheung, 2017).

1.3.2 Determinants of Internal Migration in China

Attracted by the economic reforms and opening-up policies that began in the early 1980s, many migrants started moving from rural areas to cities in search of higher incomes and better prospects[2]. However, despite their strong desire to integrate into urban society, migrants are often excluded from city life (Wang, 2010; Wei, 2007; Yin and Yao, 2009). Many parents choose to leave their children in their rural hometowns because this allows them to focus on establishing themselves in the city. Additionally, exclusion from both institutional structures and local social networks may force parents to make this compromise.

To understand why parents continue to migrate despite facing institutional barriers and social exclusion, it is important to highlight the structural disparities between regions and between urban and rural areas. Cities, especially those with manufacturing industries, have a high demand for low-skilled labour, while rural areas suffer from a labour surplus and a significant economic gap compared to urban areas. This disparity, combined with the relaxation of Hukou controls, has motivated many rural residents to seek better economic opportunities in urban areas (Wang, 2010).

1.3.3 Education Policies and School Quality

The quality of education and educational policies are crucial for migrant children because parents face a trade-off when deciding whether to bring their children with them to the cities. They must consider if it is worthwhile to pay additional costs, such as extra tuition fees, as institutional restrictions often prevent migrant children from attending regular public schools unless their parents can afford these fees. Additionally, educational inequality between rural and urban areas has been a long-standing issue for children born in underdeveloped regions. Table 1.1 highlights these inequalities by comparing factors such as teacher-student ratios, teacher quality, and educational expenditure. The table shows that urban schools have a higher proportion of teachers with advanced professional ranks, and rural students receive less educational funding than their urban counterparts[3].

Many other countries also struggle to guarantee education for migrant or immigrant children. Klugman and Medalho Pereira (2009) noted that while most developed countries generally allow immediate access to schooling for all migrants, more than 40% do not provide

[2]Due to data limitations, studies of rural-urban migration in China mainly focus on the new-generation migrants born after 1980, whose parents have rural Hukou. Unlike their parents, these migrants rarely farm for a living, though they may return home to help during harvest season (Yang, 2013).

[3]The rural classroom size is bigger in primary school but smaller in junior high school. This is because there were fewer junior high schools available in rural areas than in urban areas and students have to do school boarding in town or urban areas(Hu, 2012).

access for children with irregular status. In some countries, such as the Netherlands and Sweden, migrant children are separated from other children (Klugman, 2009), similar to the "migrant schools" found in Chinese cities.

In China, local restrictions also create educational barriers. A child can only attend a local school if they are registered in that school's district, as school funding is allocated through the local district government (Liang and Chen, 2007). Allowing children without a local Hukou to attend could strain the local educational budget. However, exceptions exist: students can attend schools outside their registered district if they pay an additional "education endorsement fee," which ranges from 2,000 to 50,000 yuan, depending on the city and school level. This financial burden is often too heavy for low-income migrant workers from rural areas, forcing them to leave their children behind in their hometowns (Lai et al., 2014). Feng (2010) argued that this economic exclusion puts migrant children at a disadvantage compared to urban children because their parents, often migrant workers, have less ability to spend on education. Wang (2008) further highlighted that government policies and additional fees are key barriers preventing rural migrant children from achieving social mobility through education, as poor families cannot afford the costs of compulsory education in cities. As a result, migrant families face significant difficulties when moving with their children.

However, financial constraints are not the only issue. Whether children of rural migrant labourers move to the city or stay in rural areas, both groups face challenges related to education, guardianship, and mental health (Youlu, 2017). It is important to understand the educational dilemmas facing migrant children, including residential segregation into low-quality schools and lower high school completion rates. These barriers prevent education equity and often force parents to leave their children in rural areas.

Privately owned or tuition-funded, for-profit migrant schools began to appear in China in the 1990s. However, many of these schools have issues with legitimacy and teacher qualifications. These migrant schools frequently relocate and close down (Stepping Stones, 2010), failing to provide non-Hukou children with a stable learning environment. Official data indicates that even if students initially attend these schools, they often end up leaving and returning to rural schools (Zhang et al., 2015a). Chen and Feng (2013) found that children who are unable to enrol in public schools perform worse than local children on standardized tests. Xiong (2015) noted that a "ceiling effect" prevents these children from achieving upward social mobility through education, leading to a counter-school culture among rural migrants, which can be seen as an adaptation to economic inequality and institutional discrimination.

Table 1.1 The Indicators for Rural-Urban Schools Inequality in Compulsory Education Stage

	Urban (In 2013)	Rural (In 2013)
Primary School		
Teacher-pupil Ratio	0.05	0.06
Teachers with Higher Professional Rank (ratio)	0.58	0.51
Classroom Size	37.20	55.22
Per-pupil Fixed Asset (Yuan)	8187.06	7259.97
Per-pupil Computers	0.11	0.08
Number of Pupils (Thousands)	29432.48	30498.61
Junior High School		
Teacher-student Ratio	0.07	0.09
Teachers with Higher Professional Rank (ratio)	0.22	0.14
Classroom Size	30.83	20.53
Per-student Fixed Asset (Yuan)	14920.32	13519.57
Per-student Computers	0.15	0.15
Number of Students (Thousands)	14686.96	7484.59

Data source: China Educational Finance Statistical Yearbooks of 2013.
Note: Table 1.1 presents the inequalities between urban and rural schools in China in 2013.

1.4 Methodology

1.4.1 Data

The data used in this analysis comes from the China Family Panel Studies (CFPS), a nationwide, biannual, longitudinal survey of communities, families, and individuals that began in 2010. By 2023, survey data from five waves (2010, 2012, 2014, 2016, 2018) are available[4]. The samples were collected from 25 provinces[5], representing 95 percent of the Chinese population (Xie and Hu, 2014).

For this study, the sample is restricted to 11,549 rural children enumerated in the CFPS between 2010 and 2018[6]. Children aged 10-15 completed a self-report survey that included educational outcomes, standardized word and math tests, and well-being scales. Treated children were identified using two questions: "Was this family member living at home in

[4]Though the data of the 2020 wave is available as well, the statistics of LBC might not be precise because of migration restrictions during the Covid-19.

[5]Tibet, Qinghai, Xinjiang, Ningxia, Inner Mongolia, and Hainan provinces were excluded from the sample to reduce costs, but these regions together account for only 5 per cent of China's population.

[6]Samples were excluded if the child's parent(s) were not at home for reasons other than work, such as death, imprisonment, or divorce.

Table 1.2 Sample Statistics of Families and Children

Wave	Families with Children	% of Rural Families	Children (0-18 yo)	Rural Children (0-18 yo)	% of LBC (among rural children)
2010	5,843	77.89%	7,840	6,281	32.73%
2012	5,380	78.56%	7,715	6,224	25.18%
2014	5,048	78.89%	7,177	5,797	21.55%
2016	4,527	79.26%	5,558	4,503	23.61%
2018	3,870	78.99%	6,056	4,872	8.01%

Data Source: CFPS.
Note: Table 1.2 presents the sample distribution of families and children participating in the China Family Panel Studies from 2010 to 2018. The observed decrease in the proportion of LBC from 23.61% in 2016 to 8.01% in 2018 could be attributed to selective attrition, potentially and partly influenced by policy efforts to integrate migrant children into local schools (Central Government of the People's Republic of China, 2018).

the past 12 months?" and "Reasons for living outside." Children are classified as left-behind children (LBC) if either both parents or one parent has "gone out" for work.

1.4.2 Measures

Migration Status

The key independent variable in this study is whether a child has been left behind by parent(s). A child who is originally born in a rural area and one or two parents are working in other cities is defined as a left-behind child. If their parents have never migrated, this value is 0. If one or both parents migrated for work, the variable takes a value of 1.

This paper uses the information from CFPS regarding the working conditions of each family member. All the respondents were asked 'whether this family member living at home in the past 12 months' and 'Reasons for living outside', which included outside for work. In this case, children can be recognized as LBC if one of their parents is working outside and not living at home.

Table 1.2 shows the distribution of survey samples across five survey waves. Fluctuations in the number of families from one wave to another are largely due to household changes such as merges, and splits, as well as the natural demographic events of births and deaths. If one family is chosen, then each family member who is older than ten years old receives the survey questionnaire (Xie and Hu, 2014; Xie and Lu, 2015). Questionnaires designed for children under 9 years old are answered by parents or guardians. Once included in

the sample, the survey respondent becomes a permanent member of the database and will receive invitations to follow-up waves of the survey (Zhang et al., 2015a). Additionally, some literature found a post-2015 decline in rural-urban migration coincident with an uptick in urban-urban movements, which is attributed to the ongoing urbanization progress in China – whereby erstwhile rural areas urbanized – and the education of the surplus of rural labour, leading to a burgeoning cohort of urban LBC[7] (Ge et al., 2015; Lu et al., 2023; Wang et al., 2020a). However, due to the data constraints, the present study only concentrates on rural LBC [8].

Figure 1.2 and Appendix Table A.1.1 to A.1.3 continue to present the evolving landscape of LBC in CFPS. While there appears an obvious decline in the proportion of LBC from 2010 to 2020, this trend may not be showing improved circumstances for these rural children. In fact, Xia (2023) indicates that the experience of being left behind adversely affects enrollment in senior secondary education among LBC, which aligns with findings from the report by China National Bureau of Statistics et al. (2023), which highlights that old children dropping out of school to work in cities desiring to help with family's financial situation. Though many other rural children were able to migrate with their parents with the relaxation of the Hukou restrictions, barriers persist in the urban public schools, which may include prejudiced enrolment requirements and social integration (Deng and Law, 2020; Nieuwenhuis and Shen, 2023).

Last, I analyzed varying parental migration patterns: single parental migration and both parental migration; and paternal Migration and maternal Migration. Both curves in Figure 1.3 and Figure 1.4 present a discernible downward trend in the proportion of LBC across four distinct categories. Although there is a notable decline in all categories, the most significant decrease is the paternal migration in Figure 1.4, which potentially links to China's evolving economic landscape and urbanization processes. Appendix Figure A.3.1 compares the timing of parental migration–parent(s) migrate before and after ten years old.

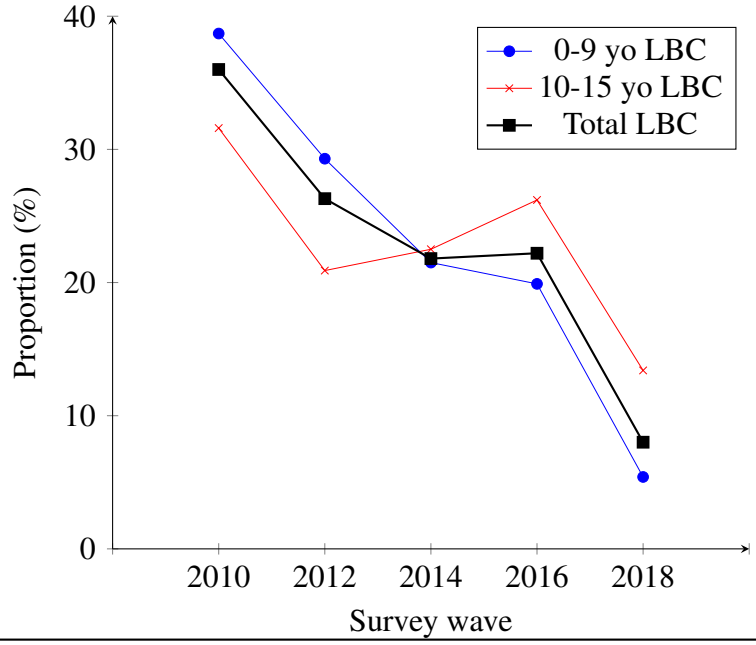
Dependent Variables

Cognitive outcomes The CFPS provide invaluable systematic cognitive tests conducted in the survey years of 2010, 2014, and 2018, for respondents aged ten and above. The cognitive tests include assessments in literacy and mathematics, with each test comprising different questions across the three waves. Specifically, literacy requires the recognition

[7]Urban Left-behind children refers to those children who are permanent urban residents under the age of 18 and their parents absent over half-year for professional reasons (Ge et al., 2015).

[8]The county-level data is not accessible in this paper. It is not able to classify the former categorization of districts with rural or urban for the new sample. Furthermore, Appendix Table A.1.3 reveals that administrative changes from rural to urban do not substantively alter the configuration of rural LBC within the CFPS dataset.

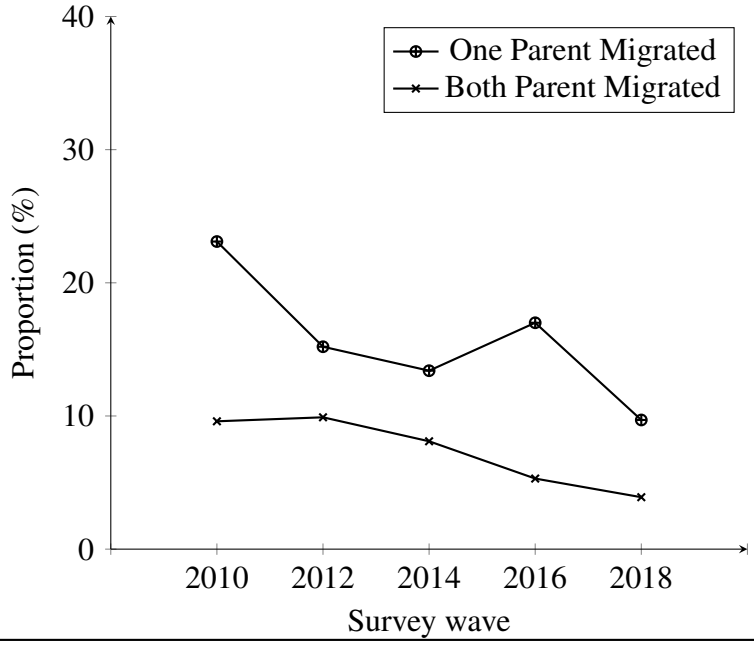
Fig. 1.2 Proportion of LBC among Rural Children in CFPS



Data Source: CFPS.

Note: Figure 1.2 presents the distribution of LBC across different age groups in the China Family Panel Studies. The data indicates a substantial decline in the proportion of LBC from 2010 to 2018. By 2018, the proportion had decreased to a third of what it was in 2010.

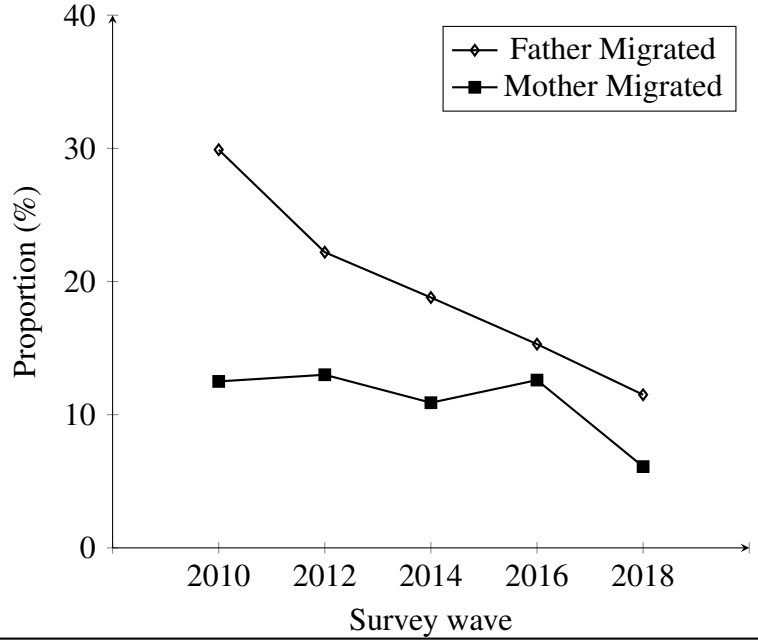
Fig. 1.3 Proportion of LBC with Single or Both Parent(s) Migrated



Data Source: CFPS.

Note: Figure 1.3 displays a clear decrease in the prevalence of LBC in rural China from 2010 to 2018 in the China Family Panel Studies. The cases of one parent migrating consistently decline more sharply than those with both parents migrating.

Fig. 1.4 Proportion of LBC with Maternal or Paternal Migration



Data Source: CFPS.

Note: Figure 1.4 displays a clear decrease in the prevalence of LBC in rural China from 2010 to 2018 in the China Family Panel Studies. The gap between father migration and mother migration reduced over time. This data suggests a shift in China's rural labour dynamics in the past decade.

and pronunciation of 34 Chinese characters, whereas the math test includes 24 questions of varying difficulty levels. The scoring is straightforward, based solely on the number of correct responses. The CFPS has instituted a standardization process for these scores to facilitate reliable and consistent comparisons both across and within subjects.

Figure 1.5 illustrates the performance gap between LBC and NLBC on the literacy tests and math tests, with the LBC group demonstrating lower achievement levels. Expanding upon these findings, Figure 1.6 and Appendix Figure A.4.1 and A.4.2 segment LBC performance further by parental migration status and gender. Intriguingly, Figure 1.6 shows that LBC with only one parent migrated performed better in literacy tests, whereas LBC with both parents absent performed better in math tests. Appendix Figure A.4.1 shows that LBC with paternal migration outperforms those with maternal migration in both tests. Furthermore, Appendix Figure A.4.2 underscores a gender disparity within LBC, where females outpace males in both literacy and math tests.

School Engagement Beside the tests, children aged 10 to 15 were asked to measure their school engagement by the self-answer portion in all survey waves of the CFPS questionnaire. Questions measure students' attitudes towards study, teachers and school using a 5-point Likert scale (1 = fully disagree, 2 = partly disagree, 3 = indifferent, 4 = partly agree, 5 = fully agree).

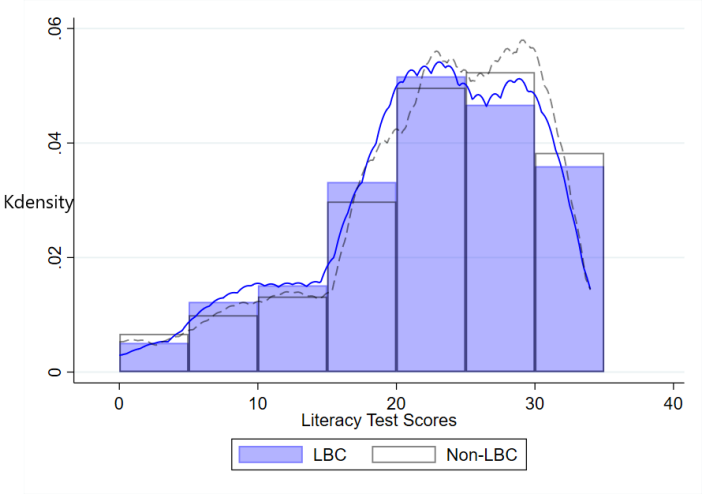
Table 1.3 offers a detailed look at the school engagement scale. The results show that LBC scored consistently lower levels of engagement across all questions, including their dedication to studying hard, class concentration, homework completion, school rules adherence, personal items organization and time allocation. Aside from the school behaviour, the survey asked about students' attitudes toward school and teachers and the results in Table 1.4 show that LBC are less satisfied with the class headteacher than NLBC.

Predetermined Variables

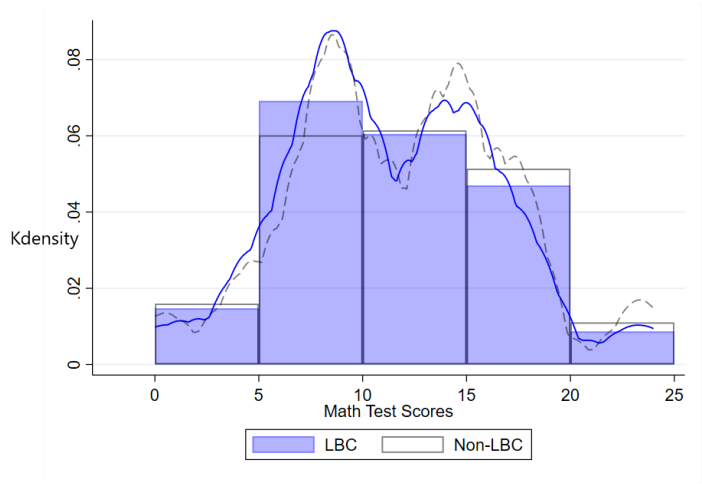
To mitigate estimation bias arising from confounding heterogeneity in the regression of cognitive abilities and school engagement, the regression estimation controlled for a number of child demographic variables such as LBC gender, age, family size, and an array of parental characteristics which include parental age, height, health status, educational attainment, Hukou status, current work occupation, and annual income.

Table 1.5 and Table 1.6 present an overview of statistics between LBC and NLBC along with their family characteristics. Results show that LBC and their parents are generally younger than NLBC and their parents, which reflects the fact that younger parents are more inclined towards migration when their children are young (Ren and Chan, 2018). Additionally, in 1.5, LBC household sizes are larger, which is consistent with previous research– surplus

Fig. 1.5 The Cognitive Test of Children



(a) Literacy test among LBC

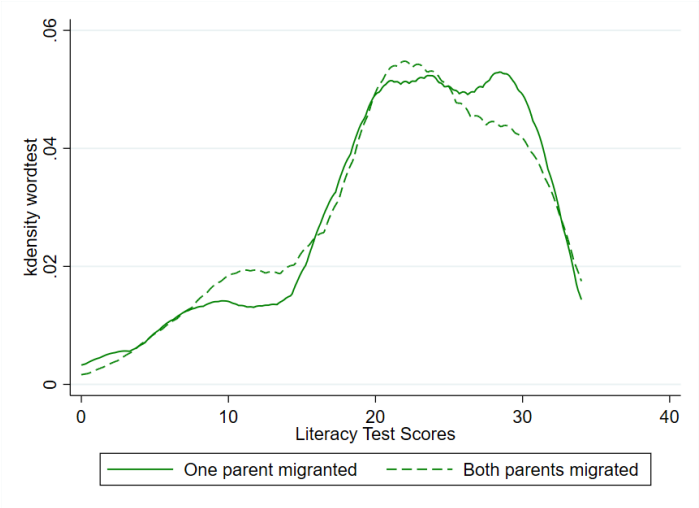


(b) Math test among LBC

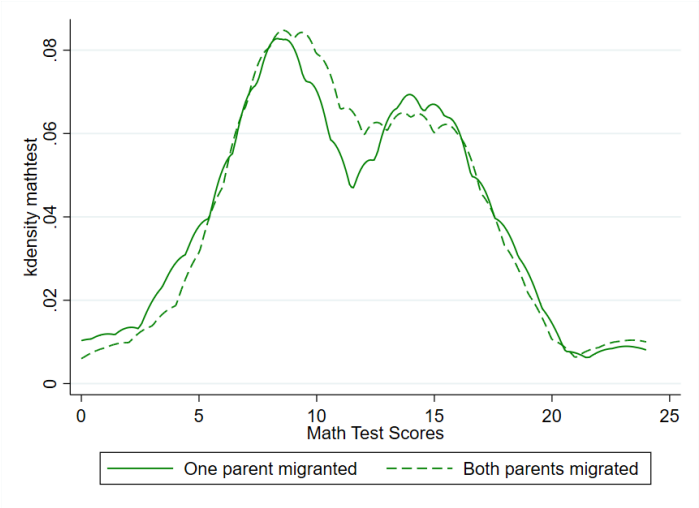
Data Source: CFPS.

Note: Figure 1.5 presents the distribution of cognitive tests for LBC versus NLBC in the CFPS. The results reveal a consistent performance gap, with LBC scoring lower in both word recognition (Panel (a)) and mathematics (Panel (b)).

Fig. 1.6 The Cognitive Test of LBC with Singular and Dual Parental Migration



(a) Literacy test among LBC



(b) Math test among LBC

Data Source: CFPS.

Note: Figure 1.6 presents the performance distinctions among LBC with varying parental migration scenarios. Panel (a) shows that LBC with only one parent migrated outperform those with both parents absent in word tests. Conversely, Panel (b) suggests that LBC with both parents migrated exhibit comparatively stronger performance in math tests.

Table 1.3 School Engagement of Rural Children

Items (5-Points Likert)	Non-LBC	LBC	Diff
I study hard	3.23 (0.96)	3.19↓ (0.99)	0.04*
I concentrate on study in class	3.24 (0.97)	3.18↓ (1.02)	0.06***
I check my homework to make sure correction	3.20 (0.97)	3.15↓ (1.00)	0.05**
I abide by school rules and regulations	3.09 (1.22)	2.96↓ (1.21)	0.14***
I like to put my things in order at school	3.05 (1.18)	2.91↓↓ (1.17)	0.13***
I only play after finishing homework	3.02 (1.08)	2.92↓ (1.08)	0.10***
Total: School Engagement Index	18.23 (5.34)	17.53↓ (5.33)	0.70***

***p <0.01, **p <0.05, *p <0.1

Data Source: CFPS.

Note: Table 1.3 presents a comparison of school engagement between NLBC and LBC using a 5-point Likert scale. NLBC exhibits statistically higher levels of engagement than LBC. Further analysis of the overall school engagement aggregation score highlights the magnitude of engagement discrepancy.

Table 1.4 School Satisfaction of Rural Children

Items (5-Points Likert)	Non-LBC	LBC	Diff
Satisfied with school	3.88 (1.01)	3.85 (1.03)	0.03
Satisfied with class headteacher	4.21 (1.00)	4.15↓ (1.02)	0.05**
Satisfied with Chinese teacher	4.18 (0.98)	4.17 (0.97)	0.00
Satisfied with math teacher	4.13 (1.01)	4.09 (1.02)	0.04
Satisfied with English teacher	4.01 (1.04)	4.01 (1.04)	0.00
Total: School Satisfaction Index	20.39 (3.68)	20.27 (3.67)	0.13

***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: Table 1.4 shows the evaluation of school satisfaction among rural children using a 5-point Likert scale. The results show that LBC reported significantly lower satisfaction levels with their class headteachers compared to NLBC, though both groups rated above 4 points, indicating general satisfaction. No other significant differences in satisfaction levels were observed. The overall school satisfaction aggregation indicates no statistical difference between the groups, despite the noted variance in headteacher satisfaction.

Table 1.5 Summary Statistics of Child and Family Characteristics

	Non-LBC	LBC	Diff
Child and Family characters			
Age (10 to 15 years old)	13.78 (2.55)	13.44↓ (2.40)	0.34***
Gender (male=1)	0.52 (0.50)	0.51 (0.50)	0.01
Household Size	5.04 (1.73)	5.43↑ (1.86)	0.02***
Number of Children	9,954	2,683	

***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: Table 1.5 shows the demographic information among LBC and NLBC in CFPS. The results show that the average age of LBC is statistically lower than that of NLBC. LBC households exhibit a statistically larger size on average.

Table 1.6 Summary Statistics of Parent Characteristics

	Non-LBC	LBC	Diff
Father characters			
Age (in years)	42.09 (5.88)	40.92↓ (5.17)	1.17***
Height (cm)	167.96 (6.45)	168.01 (6.36)	-0.06
Health Status (5 point Likert Scale)	3.36 (1.21)	3.38 (1.26)	-0.02
Education (in years)	6.65 (3.82)	6.77 (3.39)	-0.13
Have a job (yes=1)	0.86 (0.35)	0.87 (0.34)	-0.01
Non-agricultural Work (yes=1)	0.46 (0.50)	0.62↑ (0.49)	-0.17***
Annual Income (yuan) (Base: 2010)	14,026.04 (21,746.66)	19,823.68↑ (23,278.82)	-5,797.64***
Mother characters			
Age (in years)	39.69 (5.59)	39.13↓ (4.71)	0.56***
Height (cm)	158.02 (6.60)	158.30 (6.14)	-0.28
Health Status (5 point Likert Scale)	3.19 (1.31)	3.16 (1.36)	0.03
Education (in years)	4.71 (4.03)	4.55 (3.99)	0.16
Have a job (yes=1)	0.74 (0.44)	0.74 (0.44)	0.01
Non-agricultural Work (yes=1)	0.26 (0.44)	0.33↑ (0.47)	-0.07***
Annual Income (yuan) (Base: 2010)	4,493.57 (9,449.59)	7,911.70↑ (26,568.83)	-3,418.13***
Number of Children	9,954	2,683	

***p <0.01, **p <0.05, *p <0.1

Data Source: CFPS.

Note: Table 1.6 presents demographic and economic characters of parents in the CFPS data. The data shows that LBC parents are statistically younger than NLBC parents. A lower proportion of LBC parents hold an Urban Hukou compared to NLBC counterparts. LBC parents are more engaged in non-agricultural occupations. This trend is also reflected in the annual income data.

rural labour forces have high preferences on migration (Jingzhong and Lu, 2011). In 1.6, LBC parents are more likely to work in non-agricultural jobs and earn significantly more annually than NLBC parents, which is consistent with the fact that parents migrate out to seek better work opportunities. Overall, the summary statistics present disparities between rural and urban work conditions, which reveal the fact that surplus labour forces in rural areas and higher incomes in urban areas motivated parents to migrate and leave children behind in rural areas.

1.4.3 Regression Method and Instrumental Variable

General Model

To explore the impact of parental migration on children's cognitive abilities, school engagement and school satisfaction, the analysis commenced with the estimation of baseline regressions using Ordinary Least Squares (OLS)[9]. The foundational empirical framework is represented by the following reduced-form estimation equation:

$$Y_{iht} = \alpha + \beta_0 LBC_{iht} + \gamma X'_{iht} + \varepsilon_{iht} \tag{1.1}$$

where the dependent variable, Y_{iht}, denotes to the educational outcomes or engagement of child i in household h at time t. The term LBC_{iht} refers to variables reflecting the parental migration pattern, while X'_{iht} denotes a vector of control variables that bear an association with cognitive performance and school engagement. ε_{iht} represents the regression's unobserved error term. To account for potential regional dependencies, standard errors were clustered at the county level. β, which is of interest in this study, presents the causal influence of being left behind on cognitive abilities and school engagement.

Fixed-Effect Instrument Variable Model

An important concern of parental migration decisions is endogeneity. In this context, the concern is that OLS estimation will yield biased estimates because parental migration decisions may be non-random. The existing literature applies a child fixed-effects estimator[10]

[9] Given the ordinal nature of certain dependent variables within this study, specifically, self-reported school engagement and school satisfaction, a more appropriate approach would be the ordered choice models. Nonetheless, Ferrer-i Carbonell and Frijters (2004) and Zheng et al. (2022) posit that the signs and significance levels from OLS are close to those obtained from the ordered choice model, despite disparities in the magnitude of coefficients. In this study, to give a more straightforward interpretation of results, the OLS method is employed.

[10] An intuitive explanation to this estimator can be a child's endowment. For example, genetics and experience do not change over time but these kinds of fixed parameters may influence a child's outcomes directly or indirectly.

to control for all time-invariant, both observed and unobserved, variables to tackle the endogenous problem with panel data (Nguyen, 2016; Wang et al., 2019b)[11].

However, Antman (2011a) pointed out that in the wake of time-invariant factors, time-varying elements are still some source of endogeneity. First, high-ability parents may gain more opportunities in big cities. Second, because of the genetic advantage, children may excel in their studies. Therefore, OLS estimates may be underestimated as parents whose children have better educational performance may worry less and would be more likely to migrate (positive selection); Thirdly, if children have bad educational performance in school, their parents may be pushed to migrate for better income to increase educational spending such as home tutors for their children (negative selection). For example, parental poverty might influence being left behind and simultaneously influence children's test scores through avenues that have nothing to do with parental migration.

For this reason, OLS regression analysis that compares the scores of left-behind children and not-left-behind children can lead to bias, with the impact of parental migration on children's educational performance being either underestimated or overestimated (Zhou et al., 2014). The panel data allows a solution to this type of endogeneity by using individual fixed effects in the regression. Thus, under these circumstances, this paper adopts individual fixed effects according to Antman (2011a) and the econometric framework can be expressed as:

$$Y_{iht} = \alpha + \alpha_{ih} + \beta_1 LBC_{iht} + \gamma X'_{iht} + \nu_{iht} \tag{1.2}$$

where α_{ih} captures the child's fixed effect. However, the decision of parental migration, a potential source of endogeneity, may still render the primary OLS results problematic. There could still be some source of endogeneity that varies over time. For example, family income and parental health conditions may change because of shocks, which will impact migration decisions.

To address this, this paper proposes three distinct instrument variables: the proportion of migrated labour force in each village, which was employed by (De Brauw and Giles, 2018; Mu and De Brauw, 2015); the percentage of households with the most common surname in the village, as per (Liang and Yu, 2022); and the average proportion of parental migration of other respondents in the same county, as advocated by (Zhao et al., 2014; Zheng et al., 2022).

As stated in Table 1.7, these IVs are selected based on the assumption that they influence the parental migration decision without directly affecting a child's school performance and engagement. The rationale behind these IVs is twofold: Firstly regarding the migration

[11] Mu and De Brauw (2015) controlled for individual-level fixed effects. However, they may lose important unobservable determinants of child outcomes as well as household migration decisions which vary over time by doing so and cannot fix the problem.

Table 1.7 Instrumental Variables

IV	Details	Explanation	Concern
The proportion of migrated labour force in each village of birth (De Brauw and Giles, 2018; Mu and De Brauw, 2015)	Share of the migrated labour force in the county answered by the head of the village.	The migration network individually affects migration decisions and migration is more likely among individuals with a larger proportion of local migration networks and their children are more likely to be left behind.	Areas with large migration networks may receive more remittances and households with large migrant networks might have better access to education information affecting children's outcomes independently of migration.
The percentage of households with the most common surname in the village of birth (Liang and Yu, 2022)	Share of households with the most common surname in the county answered by the head of the village.	With more family members working outside, the job information is shared through social networks. The costs of migrating to a city should fall and the risks caused by differences in language and habits shall be reduced, thus increasing the migration probability.	
The average proportion of parental migration of other respondents in the same county of birth (Zhao et al., 2014; Zheng et al., 2022)	The actual share of households with migrated parents in the county	High parental migration rates indicate stronger social network, which can increase job opportunities and reduce migration costs.	

Data Source: CFPS.

Note: The first-stage results and validation tests of the instrument variables are shown in the next subsection.

network and parental migration proportion: both the estimated proportion of the migrated labour force (from the baseline 2010 CFPS survey) and the parental migration rate reflect the migration network in an area. A more extensive network may reduce migration costs and facilitate others' migration in the same household or community (Hu, 2013). This variable is expected to influence the likelihood of parental migration without directly impacting children's educational outcomes and behaviour. Secondly, concerning clan culture and social networks. The percentage of households sharing the most common surname is thought to reflect clan culture and social networks. These social structures could influence migration decisions by affecting the perceived costs and benefits of migration, thus facilitating job opportunities and the exchange of information amongst migrants in urban settings.

However, there are still some concerns about the instruments. For example, the negative effect of parental absence may be underestimated when areas with high migration ratios might use remittances to improve local economies, potentially affecting local educational infrastructure and, consequently, children's behaviour. Additionally, the migration of adults in previous years might have a lingering direct impact on children's education. Thirdly, children from larger families may receive more attention from family members, which could confound the results.

The main empirical strategy of this analysis involves IV estimation of Eq.(2), predicated on a first-stage regression specified as follows:

$$LBC_{iht} = \mu + \eta Z_{iht} + \theta X^{'}_{iht} + \varepsilon_{iht} \tag{1.3}$$

where Z_{iht} represents instrumental variables that are exogenous to Eq.(2) and η captures the correlation between the IV and parental migration status. If IV is a valid instrument, the parameter β in the second-stage equation can be reliably estimated by the IV approach with a large sample size.

Two-stage Residual Inclusion Model

Due to the nature of the dependent variable in the first stage, the standard two-stage least squares (2SLS) estimation is not suitable for the analysis. The use of continuous IVs (proportion of migrants) to instrument a binary treatment (the status of parental migration) results in the first-stage regression non-linear. When treatment is binary, the conditional mean of the treatment indicator in the first stage shall be modelled by a nonlinear model, often embodied by probit or logit regression models. Basu et al. (2018); Cai et al. (2011); Terza et al. (2008a) argued that the two-stage least squares (2SLS) approach produces biased

estimates of the ATE in a nonlinear setting [12]. Conversely, the nonlinear two-stage residual inclusion (2SRI) method is recommended for cases where the first or second stage involves a binary variable or nonlinear regression.

Following Basu et al. (2018); Terza (2017); Terza et al. (2008b); Windmeijer and Santos Silva (1997), this study adopt 2SRI method as the main empirical strategy. In the first stage of 2SRI, the treatment variable, parental migration, is regressed as a function of an instrument variable and control variables and then the residual is predicted. At the second stage of the 2SRI estimation, the dependent variables are estimated as a function of the same control variables and the residual term[13].

The first stage of the 2SRI approach presents a similar expression of Eq.(3) but is estimated by the probit model:

$$Pr(LBC_{iht} = 1|X,Z) = Pr(\mu + \eta Z_{iht} + \theta X'_{iht} + \varepsilon_{iht} > 0) \tag{1.4}$$

The second stage of the 2SRI approach estimates the cognitive performance and school engagement equation while controlling for the residual term predicted from the first stage estimation as an additional regressor. Specifically, Eq.(2) can be rewritten as follows:

$$Y_{iht} = \pi + \alpha_{ih} + \rho LBC_{iht} + \sigma X'_{iht} + \omega Residual_{ih} + \phi_{iht} \tag{1.5}$$

where $Residual_{ih}$ is a residual term predicted after estimating Eq.(4), and it is used to account for unobserved heterogeneity. If the coefficient of $Residual_{ih}$, ω is statistically significant, this would suggest the presence of unobserved factors that may bias the impact of parental migration on cognitive performance and school engagement.

The first-stage results of marginal average effects predicted from the probit model for IV 1 (Proportion of migration of the village), IV 2 (Proportion of popular surname in the village) and IV 3 (Parental migration rate of the county) are plotted in Figure 1.7 and the first-stage regression results are presented in Appendix Table A.5.1.

Figure 1.7 shows that the marginal coefficient of IVs elucidates a significant positive correlation between the village's migrated labourer percentage and the likelihood of children

[12]The methodology of two-stage least squares (2SLS) uses ordinary least squares regression to parameterize both the first and second stages and optimize the model by minimizing the sum of squared residuals from linear models. Whereas the two-stage residual inclusion (2SRI) method derives residuals from the first-stage regression and incorporates them as an added covariate into the second-stage regression alongside the original endogenous variable and observed confounders. When both stages are linear, the two methods are the same.

[13]There are two IV-based approaches to alleviate endogeneity bias in nonlinear models – Two-stage Residual Inclusion (2SRI) and Two-stage Predictor Substitution (2SPS). The 2SPS estimator has the same first-stage regression as 2SRI. However, in the second stage, the residual is not included as an additional control. Instead, the endogenous variable is substituted by the predicted values derived from the first-stage regression. Terza (2017) found that the 2SRI results are consistent, while 2SPS is not.

being left behind in rural areas. The average marginal effects indicate that the probability of being left behind would increase by 4.7% with a 10% increment of migrant proportion in the village. The magnitude is one-third of the likelihood in (De Brauw and Giles, 2018). To assess the robustness of these instrumental variables, a Wald test for their joint significance was performed, yielding a chi-squared statistic of 14.3 and a P-value of 0.0002, thereby strongly refuting the null hypothesis that the coefficients are jointly zero at any conventional level of significance.

IV 3 predicts a higher probability of children being left behind, which is plausible given that the parental migration rate offers a more precise prediction of migration status by specifically focusing on parents, in contrast to the broader demographic encompassing all village households (IV 1 and IV 2), which may not all include children. The chi-squared statistic for IV 3 stands at 381.82, with a P-value of 0.00, rejecting the null hypothesis of jointly zero coefficients.

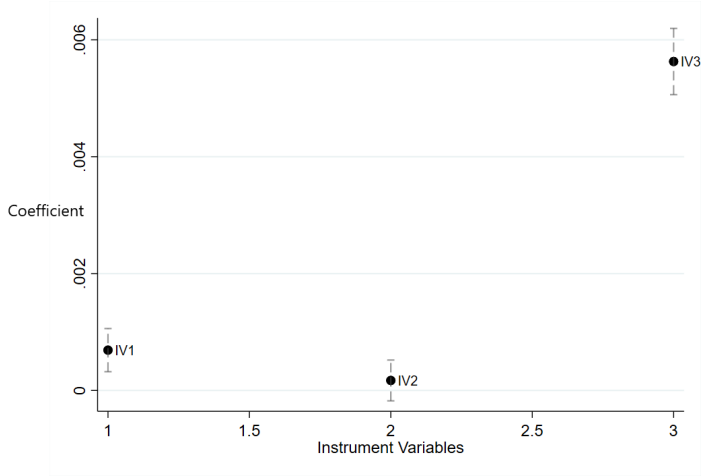
However, the chi-squared statistic of 1.32, and P-value of 0.34 associated with IV 2 suggests its weakness as an instrumental variable within this model, possibly due to a weaker correlation with the endogenous variable. In this case, I first used the migration network of the village as the instrument of parental migration decisions, further, as a robustness check, I employed the parental migration rate of the county as another instrumental variable.

1.5 Baseline Results

The primary results are shown in Table 1.8 and Table 1.9 with more details shown in Appendix Table A.6.1 to A.6.4, which presents the effects of being left behind on cognitive test results and school engagement. Appendix Table A.6.1 Column (1) finds significant evidence that LBC performs worse than NLBC in literacy tests. Specifically, LBC averagely scored lower than NLBC with 6.3 units in the word test. The other result in Table A.6.2 and Table A.6.3 Column (1) also supports the findings that LBC performed significantly worse than NLBC, in other words, there is significant evidence showing that LBC is more disadvantaged in cognitive abilities and school engagement than NLBC. These findings are consistent with Li et al. (2017) who think that though overall parental migration may have a positive effect on children's test scores, LBC's test scores are lower than NLBC with parents migrated after 2012. However, after controlled confounders, individual fixed effects and county-level fixed effects, Table 1.8 and Table 1.9 show that parental migration has no significant impacts on children's cognitive performance and school engagement.

However, as discussed above, the OLS regression may have biased results. The 2SRI results are reported in Table 1.10, with the first-stage probit estimator listed in column (1)

Fig. 1.7 First-stage Marginal Average Effects of IVs on the Probability of Being Left-behind Children



Data Source: CFPS.

Note: Figure 1.7 presents first-stage results of predicted marginal average effects with 95% CIs which are derived from the probit models for each IV. IV 1 refers to the proportion of migration in the village. IV 2 refers to the proportion of popular surnames in the village. IV 3 refers to the parental migration rate of the county. The chi-squared statistic of 1.32 of IV 2 and the insignificant ATE estimator indicates that IV2 is not a valid IV.

Table 1.8 OLS Results of Cognitive Tests

	Literacy Test		Math Test	
	(1)	(2)	(3)	(4)
LBC	-0.68	-0.66	-0.05	-0.06
	(0.53)	(1.64)	(0.31)	(1.19)
Child Fixed Effects	No	Yes	No	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.71	0.79	0.72	0.80
Observations	2,583	1,348	2,583	1,348

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: All columns control for county and individual fixed effects. Standard errors (in parentheses) are clustered at the county level.

Table 1.9 OLS Results of School Engagement and School Satisfaction

	School Engagement		School Satisfaction	
	(1)	(2)	(3)	(4)
LBC	-2.86	-1.39	-0.53	0.14
	(0.39)	(0.50)	(0.32)	(0.49)
Child Fixed Effects	No	Yes	No	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.30	0.73	0.13	0.58
Observations	2,171	1,313	2,013	1,300

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: All estimations controlled county fixed effects and individual fixed effects. Standard errors (in parentheses) are clustered at the county level. School Engagement and School Satisfaction are indexes, which are shown in Table 3 and Table 4 respectively.

Table 1.10 2SRI Results for the Effects of Being Left Behind on Cognitive Test and School Engagement

	First-Stage Estimation	Literacy Test	Math Test	School Engagement	School Satisfaction
	(1)	(2)	(3)	(4)	(5)
Being Left-Behind	0.001***	-0.21	-0.24	-0.08	-0.00
	(0.00)	(0.17)	(0.22)	(0.05)	(0.04)
Residual		0.22	0.30	0.08	-0.01
		(0.17)	(0.22)	(0.05)	(0.05)
Observations	1,322	1,216	1,216	1,299	1,287
Log Likelihood	-1914.05	-9662.22	-3464.16	-7185.94	-5236.98
Chi-squared Statistic	14.3	1372.78	1447.81	44.06	99.25

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: All estimations controlled county fixed effects and individual fixed effects. The first-stage probit estimator is listed in column (1) and the second-stage estimates are listed in columns (2)-(5). Standard errors were bootstrapped with 3000 times. The coefficients of residual terms are not significant which implies that unobserved factors do not result in biased results in the regression.

and the second-stage estimates listed in columns (2)-(5). The positive first-stage results confirm the argument that migration networks tend to encourage migration and leave more children behind with the coefficient significant at 1% level, hence that the IV is relevant. As mentioned above, the value of the chi-squared test statistic is 14.3, which implies a low risk of a weak instrument.

The most important finding from the 2SRI regression model is that, regarding the cognitive tests and school engagement results, it is found that after being instrumented for parental migration decisions, there is no significant negative effect of parental migration on cognitive tests and school engagement. Results in Zheng et al. (2022) and this paper have similar levels of magnitude of coefficients of cognitive tests (0.13 and -0.30 respectively). Zheng et al. (2022) used the same data, CFPS, and also used the historical migration rate in the birth county as the instrument variable for parental migration. Their results show that the experience of being left behind has no significant results on adults' cognitive performance.

Most studies documented the negative effects of parental migration on educational achievement, which mainly focus on academic tests (Chang et al., 2019; Fu et al., 2017), school enrollment (Lee, 2011). This paper extends the educational performance to school behaviour and provides evidence showing that LBC performs as well as NLBC.

1.6 Robustness checks

By including the endogenous variable and IV in the main regression equation, Table 1.11 shows that the coefficient of the instrumental variable is not significant. Therefore, the concern can be eliminated which is related to a direct effect of the proportion of migration networks on children's cognitive behaviour and school engagement. Table 1.12 presents the results with IV 2. Similar to the results in Table 1.10, parental migration has no significant impact on LBC's cognitive performance and school behaviours.

Table 1.11 Exogeneity of the IV

	Literacy Test (1)	Math Test (2)	School Engagement (3)	School Satisfaction (4)
Being Left-Behind	1.22	1.31	-0.33	-0.46
	(0.84)	(0.92)	(0.30)	(0.36)
IV: proportion of migration network	-0.02	0.02	0.30	0.22
	(0.07)	(0.04)	(0.49)	(0.56)
Observations	1,186	1,186	1,272	1,253
R-squared	0.01	0.02	0.16	0.01
Control Variables	Yes	Yes	Yes	Yes
Individual-Fixed Effect	Yes	Yes	Yes	Yes
County Fixed Effect	Yes	Yes	Yes	Yes

* ***p <0.01, **p <0.05, *p <0.1

Data Source: CFPS.

Note: All estimations controlled county fixed effects and individual fixed effects. Standard errors (in parentheses) are clustered at the county level.

Table 1.12 2SRI Results of IV 2

	First-Stage Estimation (1)	Literacy Test (2)	Math Test (3)	School Engagement (4)	School Satisfaction (5)
Being Left-Behind	0.005***	-0.08	-0.10	-0.05	0.01
	(0.00)	(0.15)	(0.18)	(0.04)	(0.04)
Residual		0.09	0.16	0.04	-0.02
		(0.15)	(0.19)	(0.04)	(0.04)
Observations	1,322	1,216	1,216	1,299	1,287
Log Likelihood	-150.43	-9662.89	-8664.91	-5408.64	-5236.92
Chi-squared Statistic	77.58	1365.53	1434.62	42.62	99.56

* ***p <0.01, **p <0.05, *p <0.1

Data Source: CFPS.

Note: All estimations controlled county fixed effects and individual fixed effects. The first-stage probit estimator is listed in column (1) and the second-stage estimates are listed in columns (2)-(5). Standard errors were bootstrapped with 3000 times. The coefficients of residual terms are not significant which implies that unobserved factors do not result in biased results in the regression.

Table 1.13 2SRI Results for LBC with Father and Mother Migrated Out for Work

	Literacy Test (1)	Math Test (2)	School Engagement (3)	School Satisfaction (4)
Panel A: Father migrated out for work				
Being Left-Behind	0.01	-0.14	-0.03	-0.20
	(0.06)	(0.08)	(0.04)	(0.11)
Observations	1,186	1,186	1,072	1,013
Log Likelihood	-4874.81	-3467.49	-7186.00	-6805.17
Panel B: Mother migrated out for work				
Being Left-Behind	0.37	0.43	-0.01	-0.51
	(0.29)	(0.28)	(0.05)	(0.32)
Observations	1,186	1,186	1,272	1,253
Log Likelihood	-4873.17	-3473.82	-7185.30	-6776.44

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: All estimations controlled county fixed effects and individual fixed effects. Standard errors were bootstrapped with 3000 times.

1.7 Heterogeneity Results

Hu et al. (2020) examined parental migration effects on four groups of children: village NLBC, partially LBC (who lived with one parent in a rural village), Completely-LBC (whose parents both work outside in cities) and Migrant children (who migrated with their work-seeking parents). To compare with Hu's research, Table 1.13 and Table 1.14 present the cognitive results of LBC who were exposed to different types of parental migration.

In Table 1.13, neither fathers' nor mothers' absence impacts significant effects on children's cognitive tests and school engagement. This result is different from Chen et al. (2014a), though there is no significant effect of migration on school performance in the paper, which found that the father out-migrates improves LBC's education performance.

Table 1.14 continues to show results differences between LBC with one parent migrated and NLBC, LBC with both parents migrated and NLBC. The significant negative effect in Panel B (1) indicates that LBC with parents who both migrated out for work scored less than other rural children in the literacy test. The magnitude of coefficient -0.388 is much bigger than the result in Table 1.10 Column (2). Many other studies find conflicting results when examining partial LBC and complete LBC. Yao and Mao (2008) found that LBC with both parents working out have better relationships with teachers than those living with one of the parents. while Li et al. (2017) showed evidence that with one parent taking care of LBC, children perform better in academic tests than LBC with both parents migrated out.

Table 1.14 2SRI Results for LBC with One Parent and Both Parents Migrated Out for Work

	Literacy Test (1)	Math Test (2)	School Engagement (3)	School Satisfaction (4)
Panel A: One parent migrated out for work				
Being Left-Behind	0.07	0.02	-0.02	-0.02
	(0.06)	(0.10)	(0.04)	(0.03)
Observations	1,186	1,186	1,272	1,253
Log Likelihood	-4874.77	-3467.38	-7186.37	-6846.96
Panel B: Both parents migrated out for work				
Being Left-Behind	-0.39*	0.42	0.02	-0.79
	(0.23)	(0.30)	(0.05)	(0.34)
Observations	1,186	1,186	1,272	1,253
Log Likelihood	-4879.13	-3473.51	-7185.77	-6693.71

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: All estimations controlled county fixed effects and individual fixed effects. Standard errors were bootstrapped with 3000 times.

Table 1.15 2SRI Results of LBC's Cognitive Test and School Engagement by Gender

	Literacy Test (1)	Math Test (2)	School Engagement (3)	School Satisfaction (4)
Panel A: Boys				
Being Left-Behind	0.07	0.04	-0.12**	-0.33**
	(0.08)	(0.10)	(0.05)	(0.16)
Observations	539	539	549	563
Log Likelihood	-2496.11	-1683.26	-3806.51	-3685.45
Panel B: Girls				
Being Left-Behind	-0.01	-0.32	0.08*	-0.09***
	(0.21)	(0.24)	(0.04)	(0.03)
Observations	516	516	515	519
Log Likelihood	-2360.11	-1722.82	-3276.99	-3025.41

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: All estimations controlled county fixed effects and individual fixed effects. Standard errors were bootstrapped with 3000 times.

Table 1.15 presents the parental migration effects on LBC's outcomes by gender. overall, the insignificant differences in cognitive tests between LBC and NLBC persist for both sons and daughters. However, it is interesting to see that boys and girls LBC presented significant adverse reactions to school engagement in column (3). Boys tend to be less engaged in their studies if they are left behind than accompanied by both parents, while girls are more engaged. A teacher's gender might influence student's feelings in school. Dee (2007) find that same-gender teachers positively improve the achievement of both girls and boys as well as teacher perceptions of student performance and student engagement. While in rural areas teachers are more likely to be female. Column (4) shows that both boys and girls LBC are less satisfied with school and teachers than NLBCs and the larger magnitude of coefficient in Panel A (4) than in Panel B (4) implies that male LBC suffers more from parental absence than female LBC in the sense of school belongings.

1.8 Discussion and Conclusion

Although a variety of studies have studied the contemporaneous effects of parental migration on children's academic performance, health and well-being, empirical evidence on the impacts on children's non-cognitive behaviours remains scarce. This study examined the effects of parental migration on the cognitive test and school engagement of children in the context of China's largest rural-urban migration spurred by economic reforms. The Hukou system, which limits the social welfare to migrants, including education, and healthcare, has inadvertently contributed to a significant population of left-behind children.

There are many other studies intensively focused on mitigating the adverse effects faced by LBC. Wang and Mao (2018) suggested that improving boarding school facilities and management can develop the sense of LBC's school belonging and may compensate for parental absence. But they also suggested that male and primary school LBC should not attend boarding schools. Wang et al. (2016) suggest that providing social-emotional learning programs can help with the learning anxiety of students in junior high schools.

In this context, employing a 2SRI analysis on the panel dataset from the China Family Panel Studies (CFPS) from 2010 to 2018, this study finds that parental migration does not universally affect the educational performance of LBC. Notably, further analysis reveals that LBC with both parents absent tend to exhibit poorer educational outcomes, particularly in literacy tests, compared to their peers. This trend is pronounced among male LBC, who demonstrate lower engagement levels, and an aversion towards school and teachers, contrasted by the relatively positive performance and engagement observed among female LBC.

These findings indicate that the dual migration of parents brings negative consequences for LBC including educational attainment and human capital development. The negative impacts may be related to the reduced care from parents, especially for boys, while the impact can be alleviated with only one parent migrating out.

This study has several limitations. First, due to data constraints, the outcomes only present the situation of children above 10 years old. While Jingzhong and Lu (2011) found that young LBC are more vulnerable than teenage LBC. Second, due to the limited information on genetic factors and the quality of child care, the mechanisms of parental migration may not have been fully examined. Third, the redesign of urban and rural areas might bring potential chaos to the statistics of LBC.

Gao et al. (2018); London (2013) critique the efficacy of China's economic policies in ameliorating rural-urban disparities, highlighting investing in physical infrastructure as well as higher education at the expense of primary education and healthcare, which disproportionately affects rural and migrant populations.

In light of these insights, this study advocates for policies aimed at improving access to urban public schools for all children as the negative performance of school engagement of LBC, which implies that parental accompany is important to LBC's well-being and it cannot be compensated in school. To facilitate this, a system of financial transfers from the government to urban public schools should be established. This funding would help urban schools accommodate the influx of rural students without compromising the quality of education. Additionally, to support the families of these children, migrant parents should receive targeted subsidies to cover the costs associated with their child's education, such as transportation, accommodation, and other expenses. Such a policy shift could enhance the educational environment for millions of LBC, whose human capital accumulation is essential for the future labour market.

Appendix A

A.1 Children Distribution in all Waves in CFPS

Table A.1.1 Children Distributions in Rural Areas

Wave	LBC age 0-9		LBC age 10-15		Total 0-15	
	N	%	N	%	N	%
2010	1,304	38.7%	659	31.6%	1,963	36.0%
2012	990	29.3%	381	20.9%	1,371	26.3%
2014	672	21.5%	412	22.5%	1,084	21.8%
2016	571	19.9%	428	26.2%	999	22.2%
2018	306	13.4%	247	13.4%	553	13.4%

Data Source: CFPS.
Note: Table A.1.1 shows the LBC distribution from wave 2010 to 2018. Data source: The China Family Panel Studies.

Table A.1.2 LBC in Rural Areas: One Parent vs Both Parents Migrated

Wave	One parent migrated		Both parents migrated	
	N	%	N	%
2010	1,451	23.1%	605	9.6%
2012	948	15.2%	619	9.9%
2014	779	13.4%	470	8.1%
2016	767	17.0%	232	5.3%
2018	466	9.7%	189	3.9%

Data Source: CFPS.
Note: Table A.1.2 shows the LBC distribution from wave 2010 to 2018.

Table A.1.3 LBC in Rural Areas: Father vs Mother Migrated

Wave	Father migrated		Mother migrated	
	N	%	N	%
2010	1,878	29.9%	783	12.5%
2012	1,379	22.2%	807	13.0%
2014	1,087	18.8%	632	10.9%
2016	690	15.3%	541	12.6%
2018	552	11.5%	292	6.1%

Data Source: CFPS.
Note: Table A.1.3 shows the LBC distribution from wave 2010 to 2018.

A.2 LBC Configuration

Table A.2.1 LBC Configuration

Wave	Num. of Rural Children (0-18 yo)	% of LBC	% of LBC 0-9 yo	% of LBC 10-15 yo
2010	6,281	32.7%	38.7%	31.6%
2012	4,193	27.5%	26.5%	19.9%
2014	4,167	23.2%	24.5%	22.7%
2016	2,554	25.3%	24.0%	26.3%
2018	2,876	14.5%	17.5%	13.7%

Data Source: CFPS.
Note: Table A.2.1 shows the patterns of LBC within the parameters of the 2010 administrative urban categorization. The LBC configuration was recalculated under the assumption of a constant urbanization rate as of 2010. When contrasted with Table 14 and Table 15, this table demonstrates that though recognizing the rapid urbanization in China from 2010 to 2020, changes in urban categorization have had a minimal impact on the rural LBC configuration in the CFPS data.

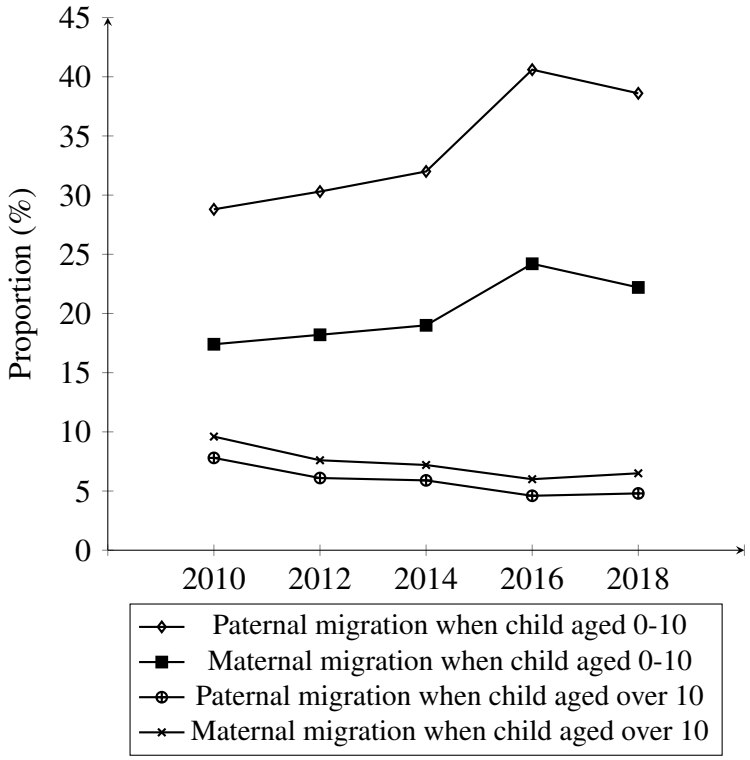
A.3 The Timing of Parental Migration

Left-behind children (LBC) are divided into two age-based cohorts to assess the impact of parental migration: those whose parents migrated before their birth and those whose parents migrated before and after they reached adolescence (age 10). There are several challenges related to attrition within the panel survey data. First, since the data was collected every two years, some instances of migration occurring between survey periods may not be recorded. For example, if a parent migrates for work after one survey and returns before the next, this movement would not be captured, especially if the household missed some survey waves. Second, it is not possible to determine the household's migration status retrospectively if the child was already older than 10 when the family first participated in the survey, making it difficult to categorize the child's cohort. In such cases, these samples were excluded from the analysis. Third, the survey design limits the analysis to children over 10 years old, who were the only ones asked about cognitive abilities and school engagement. Consequently, the effects of parental absence on younger cohorts cannot be examined, and a panel regression analysis cannot be conducted. Finally, the assumption that exposure to being left behind before age 10 has a uniform effect on all children is a simplification that overlooks variations in the length of parental absence. Meng and Yamauchi (2017) found that LBC with longer exposure to parental absence generally have less favourable outcomes.

Figure A.3.1 shows the proportion of LBC segmented by the timing of parental migration. The two highest curves indicate that younger rural parents, particularly fathers, are more likely to migrate for work. The migration patterns for parents with children older than 10 are relatively stable. Notably, there is a gender difference in migration patterns across the cohorts; mothers tend to migrate at a higher rate when children are older than 10 compared to fathers.

Li et al. (2023) used a different approach to measure the timing of parental migration. They segmented cohorts based on whether one or both parents migrated at any time during the five survey waves from 2010 to 2018. Their findings suggest that most simultaneous parental migrations last less than two years, and fathers are often absent for longer periods than mothers.

Fig. A.3.1 Timing of Parental Migration

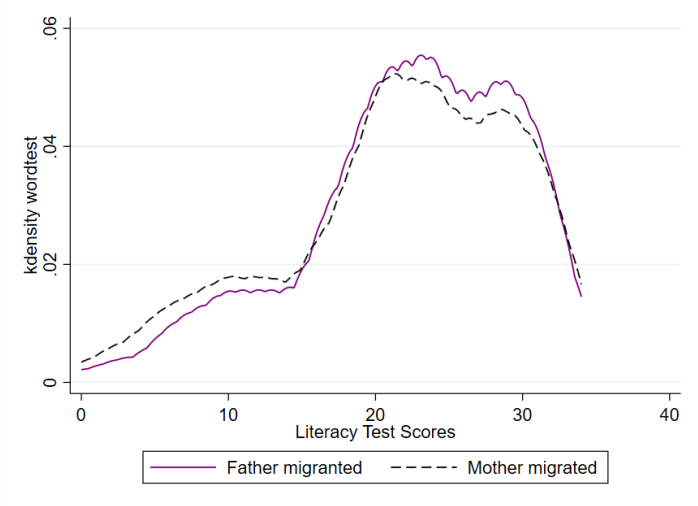


Data Source: CFPS.

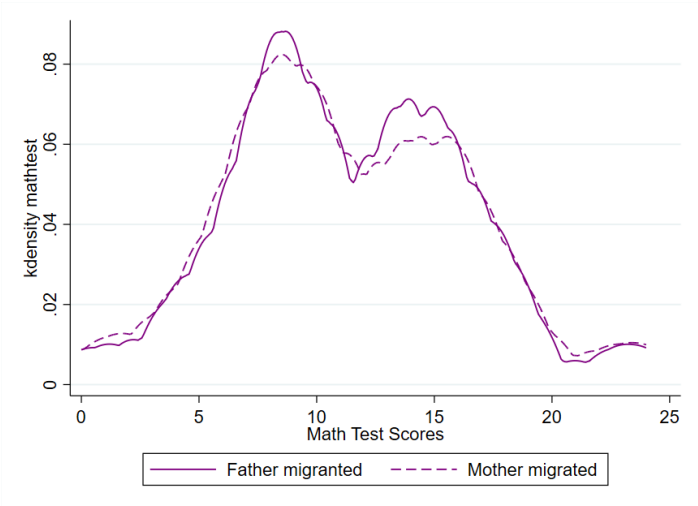
Note: Figure A.3.1 categorizes LBC based on the timing of their parents' migration. The data indicates that the majority of LBC parents were inclined to migrate when children were young (0-10 years old), particularly during the 2016 and 2018 survey waves. Notably, young fathers are more likely to migrate compared to young mothers. In contrast, the likelihood of maternal migration increases when children are older than 10 years.

A.4 The Cognitive Test for LBC

Fig. A.4.1 The Cognitive Test Distribution for LBC with Paternal and Maternal Migration



(a) Literacy test among LBC



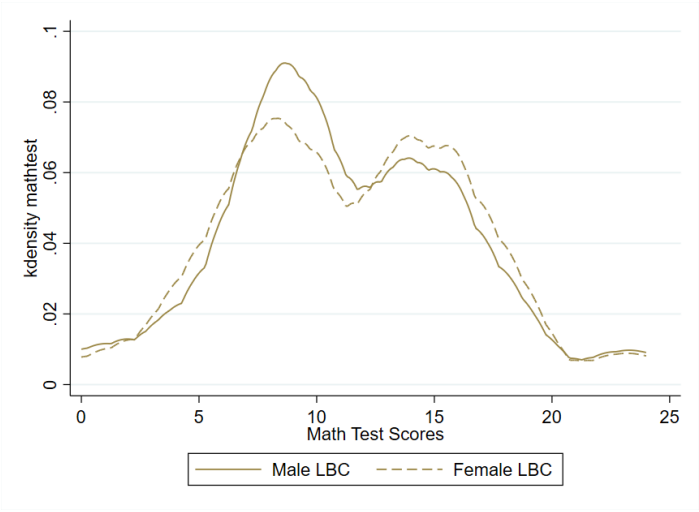
(b) Math test among LBC

Data Source: CFPS.

Notes: Figure A.4.1 presents the cognitive test distribution for LBC within the CFPS, segmented by parental migration status. Across both cognitive domains, LBC with paternal migration appears to achieve higher test scores than those with mother migration.

Fig. A.4.2 The Gender-Based Cognitive Test of LBC

(a) Literacy test among LBC



(b) Math test among LBC

Data Source: CFPS.

Notes: Figure A.4.2 presents the cognitive test distribution for male LBC and female LBC. It is observable that female LBC outperformed their male counterparts in both word tests and math tests.

A.5 The First Stage Results

Table A.5.1 The First Stage Results

Variables	IV 1 Migration Network	IV 2 Parental Migration	IV 3 Main Surname
Migration Status (yes=1)	0.001***	0.005***	0.000
	(0.000)	(0.00)	(0.001)
Father's Education	0.03***	-0.03***	0.02**
	(0.01)	(0.01)	(0.01)
Father's Hukou	-0.10*	-0.12**	-0.11*
	(0.05)	(0.06)	(0.06)
Father's Workstatus	-0.05	0.02	-0.22
	(0.15)	(0.16)	(0.16)
Father's Worktype	0.13**	0.18**	0.16**
	(0.07)	(0.07)	(0.07)
Father's Income	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)
Mother's Education	-0.04***	-0.04***	-0.05***
	(0.01)	(0.01)	(0.01)
Mother's Hukou	-0.00	0.04	0.04
	(0.06)	(0.06)	(0.06)
Mother's Workstatus	0.50***	0.26*	0.65***
	(0.13)	(0.14)	(0.16)
Mother's Worktype	-0.25***	-0.14*	-0.23***
	(0.08)	(0.09)	(0.09)
Mother's Income	0.00**	0.00***	0.00**
	(0.00)	(0.00)	(0.00)
Chi-squared Statistic	14.30	381.82	1.32
Observation	1,322	1,322	844

* ***p <0.01, **p <0.05, *p <0.1

Data Source: CFPS.

Note: Table A.5.1 shows the first stage results.

A.6 The Detailed OLS results

Table A.6.1 Literacy Test OLS results

Variables	(1)	(2)	(3)	(4)
LBC	-6.26***	-0.52	-0.68	-0.66
	(0.34)	(0.51)	(0.53)	(1.64)
Control Variables		Yes	Yes	Yes
Individual-Fixed Effect			Yes	Yes
County Fixed Effect				Yes
Observations	10,431	2,586	2,583	1,348

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: Table A.6.1 shows Literacy tests OLS results.

Table A.6.2 Math Test OLS results

Variables	(1)	(2)	(3)	(4)
LBC	-4.13***	-0.22	-0.05	-0.06
	(0.22)	(0.32)	(0.31)	(1.19)
Control Variables		Yes	Yes	Yes
Individual-Fixed Effect			Yes	Yes
County Fixed Effect				Yes
Observations	10,431	2,586	2,583	1,348

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: Table A.6.2 shows the Math tests OLS results.

Table A.6.3 School Engagement OLS results

Variables	(1)	(2)	(3)	(4)
LBC	-0.70***	-3.18***	-2.86***	-1.39***
	(0.14)	(0.36)	(0.39)	(0.50)
Control Variables		Yes	Yes	Yes
Individual-Fixed Effect			Yes	Yes
County Fixed Effect				Yes
Observations	8,654	2,174	2,171	1,113

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: Table A.6.3 shows the School Engagement OLS results.

Table A.6.4 School Satisfaction OLS results

Variables	(1)	(2)	(3)	(4)
LBC	-0.08	-0.28	-0.53	0.14
	(0.09)	(0.29)	(0.32)	(0.49)
Control Variables		Yes	Yes	Yes
County Fixed Effect			Yes	Yes
Individual-Fixed Effect				Yes
Observations	9,456	2,017	2,013	1,000

* ***p <0.01, **p <0.05, *p <0.1
Data Source: CFPS.
Note: Table A.6.4 shows the School Satisfaction OLS results.

Chapter 2

Socio-Emotional skill of Disadvantaged Ethnic Minority Children in Rural China

ABSTRACT

This report presents the descriptive results of the "One Village, One Preschool" (OVOP) program on the socio-emotional skills (SES) and school engagement of Yi ethnic minority children in Mabian, a remote rural county in China. A survey was administered to junior high school students, and data collected indicate that exposure to the OVOP program significantly enhances social skills and self-control, with prolonged participation further strengthening these abilities. Additionally, the program positively influences overall school behaviour and the development of good learning habits, partly explaining the academic performance gap between students exposed to OVOP and those who were not. The study also finds that family background and parental care can positively influence SES and school engagement, but relatively wealthier students would have more mental issues. The survey data can be further utilised for empirical studies on socio-emotional skills, internalizing and externalizing behaviours, parental care, parenting style, school engagement, language and peer effects.

2.1 Introduction

Socio-emotional skills, a key aspect of human capital, have gained increasing attention in recent years (Attanasio et al., 2020a; Moroni et al., 2019). Research shows that gaps in socio-emotional skills can appear at very young ages and, without intervention, are likely to persist throughout life (Attanasio et al., 2020b; Heckman et al., 2006). Almlund et al. (2011) found that these skills have significant long-term effects, and many studies suggest that socio-emotional traits are important predictors of educational and employment outcomes (Heckman et al., 2013). These outcomes, in turn, influence human capital development and economic growth.

However, there is limited research on socio-emotional skills in children from developing countries, particularly in remote areas. In this study, the Yi ethnic minority in Mabian, a remote rural county in China, faces significant disadvantages in education, employment, and healthcare. Due to language barriers, most Yi children do not speak Mandarin at home, which is the official language of the Chinese education system. Additionally, low socio-economic status and lack of educational resources limit access to early childhood education, making it difficult for these children to adapt to a Mandarin-speaking environment in primary school (Wang et al., 2020b). This situation can lead to several issues in school, including poor academic performance, behavioural problems, and mental health challenges.

To address these challenges, the "One Village, One Preschool" (OVOP) initiative was launched in Mabian, in the Liangshan Yi Autonomous District of China. The main goal of OVOP is to teach basic Mandarin communication skills to children who speak Yi at home, helping them transition more easily into the Mandarin-speaking environment of primary schools. By establishing preschools that focus on early Mandarin education, the OVOP program also aims to enhance both cognitive and non-cognitive skills through daily activities. These objectives are designed to help children integrate more smoothly into the primary education system, laying a strong foundation for their cognitive, social, and emotional development, and promoting their overall academic and personal growth.

The OVOP Mabian Survey on Socio-Emotional Skills aims to further explore the impact of the OVOP universal preschool program in Mabian on students' human capital development, specifically focusing on the development of socio-emotional skills. This survey examines how factors within schools, families, and the language environment, along with demographic data, contribute to or hinder educational attainment and the growth of socio-emotional skills among Yi students.

This fieldwork was important to the OVOP evaluation due to the limitations of the original OVOP data, which lacked detailed information on child characteristics across control and treatment groups, such as family backgrounds, language environments, and preschool

attendance. To address these gaps and the lack of digital records on preschool attendance, the fieldwork collected firsthand information on these variables based on students' memories from around the age of six [1].

The survey was conducted in a cohort-based manner, collecting data from primary students in Grades 2 to 5 and junior high school students in Grades 7 to 9 in Mabian[2]. Although the survey included both primary and junior high school students, its focus differed between these two groups. The survey aimed to investigate boarding issues among primary school pupils and evaluate the impact of the OVOP program on junior high school students. To align with the main theme of this PhD research, this analysis centers exclusively on the OVOP program, focusing primarily on the results related to junior high school students.

After a thorough literature review and evaluation by professionals, a preliminary trial of the survey was conducted in March 2023 in a primary school class. The formal survey began in May 2023 using a paper-pencil assessment method, with data collection completed by October 2023. The OVOP Mabian Survey was jointly managed by the China Household Finance Survey Centre (CHFS) and the schools in Mabian. CHFS oversaw the survey's management, including securing ethics approval, refining the questionnaire, and ensuring high-quality data collection. The schools in Mabian cooperated closely with the survey, adhering to established standards and procedures.

The work primarily focused on the overall survey design, data analysis, and reporting. The survey design included a literature review, questionnaire development, timeline and progress management, and data quality control.

The survey was centred on students' socio-emotional skills, guided by the Big Five model (Abrahams et al., 2019; Rammstedt et al., 2013), which encompasses task performance, emotional regulation, collaboration, open-mindedness, and engagement with others. The questions were adapted based on the student's comprehension levels and were spread across different sections of the questionnaire. Additionally, considering the unique context of second language learning, two additional indices were developed to assess students' learning efficiency and social behaviours. Information on socio-emotional skills, family background, parent-child relationships, parenting styles, preschool attendance, family language environment, study environment, time allocation, school engagement, and mental health was gathered through student self-reports. This data is vital for assessing the medium and long-term impacts of the OVOP program on Yi students, providing insights into its effectiveness

[1] Johnson (1984) suggested that children may have difficulty with some, not all, remembering but Wright et al. (2010) finds that the memory reliability increase with age.

[2] China implemented the compulsory education law in 1986, stipulating that school-age children must receive compulsory education for a specified nine years (primary for 6 years plus lower-secondary for 3 years) (Tsang, 1996).

in fostering social and emotional development and supporting human capital accumulation by improving academic performance, extending schooling years, and reducing dropout rates.

This report is organized into three parts. The first part details the development of the survey questionnaire, methodology, and initial findings. It highlights the design of assessment tools tailored for second language learners, the sampling process for schools and classes, and operational procedures, including test administration, data collection, and processing. It also describes the methods used for data analysis and preparations for future research.

The second part of the report describes the survey design, covering the reasons for selecting Mabian as the study site, the preparatory work involved in designing the survey, the pilot survey and lessons learned, the formal survey implementation, and methods used to detect careless responses.

The third part explores the factors affecting the socio-emotional skills (SES) of children living in Mabian's remote areas and compares the findings with previous studies. Using primarily quantitative methods, this section analyzes the impact of OVOP participation and the duration of involvement on socio-emotional skills and school engagement. It also examines other factors influencing SES development, such as gender, family background, and parental care.

The first key finding is that exposure to the OVOP program positively influences the development of SES, especially in social skills and self-control. Self-control skills are further enhanced in children who spend more years in preschool. However, there is no significant difference in the development of peer problem-solving skills between the treatment and control groups.

The second finding is that participation in the OVOP program improves overall school behaviour and the development of good learning habits. Specifically, students with longer exposure to the OVOP program perform better in class than those with shorter exposure. This result may explain the academic performance gap between the treatment and control groups, suggesting that school engagement plays a crucial role in the educational outcomes in Mabian.

The third finding highlights the positive impact of family factors and parental care on the development of SES. Although the family's socio-economic status negatively affects students' mental health, the impact is not significant. Additionally, active parental involvement in daily activities significantly improves students' class behaviour and learning methods. These findings suggest that while the family environment is fundamental to SES development, targeted policy interventions can help mitigate negative influences.

This report contributes to two strands of literature. First, it adds to the research on early childhood interventions in disadvantaged areas, particularly focusing on the impact of early

childhood programs on long-term development (Bailey et al., 2021; Conti et al., 2016). The study provides evidence that universal preschool programs can foster good learning habits, social skills, and self-control, which in turn enhance academic performance. While most existing research is based in the US and Europe, this study's focus on a remote area in China offers insights more relevant to other developing countries and helps address ethnic inequalities.

Second, the report contributes to the emerging literature on the importance of language proficiency for educational and economic outcomes. Most studies in language economics have focused on how language proficiency affects immigrant adults. This study, however, explores the impact of a universal policy aimed at changing children's language habits from an early age.

The rest of the report is structured into three main parts: Section 2 covers the questionnaire design, Sections 3 to 5 discuss the fieldwork design, and Sections 6 and 7 present the quantitative data analysis.

2.2 Survey Design

2.2.1 Development of Questionnaire

The design of the principal questionnaire items aims to integrate scales carefully selected by our research team and well-recognized from existing literature, creating valid, reliable, and comparable assessment scales for Yi students from Mabian. The item wording, syntax, and semantics were modified as simply as possible to minimize cognitive burden among the respondent groups, especially for Yi students, for whom Mandarin is not the first language.

Tourangeau et al. (2000) proposed that respondents go through five steps when answering a questionnaire: (1) reading the item and response options, (2) understanding its content or meaning, (3) retrieving relevant information from memory, (4) making a judgment based on the retrieved information, and (5) fitting this judgment onto the given response options. Each step can be complex, requiring considerable cognitive effort from students, especially when respondents are encouraged to report on self-expression, emotional behaviour, or sensitive topics that may feel uncomfortable (Warwick and Lininger, 1975).

Krosnick (2018) summarized that common wisdom for children's questionnaire designs includes: (1) using simple and familiar words, avoiding technical terms or slang; (2) employing simple syntax; (3) choosing words without ambiguous meanings; (4) providing specific and concrete wording; (5) ensuring response options are exhaustive and mutually exclusive; (6) avoiding leading respondents to a specific answer; (7) asking one question at a

time (avoiding double-barreled questions); and (8) avoiding questions with single or double negations.

Following the guidelines from Tourangeau et al. (2000) and Krosnick (2018), a large number of scales and questions were selected from existing surveys and scales, such as the European Social Survey (ESS), the National Longitudinal Survey of Youth 1979 cohort (NLSY79), the 1970 British Cohort Study (BCS70), the German Socio-Economic Panel (SOEP), World Values Survey, China Family Panel Studies (CFPS), China Education Panel Survey (CEPS), and scales like the International Personality Item Pool (IPIP) (Lewis and Gerard, 2022), Center for Epidemiologic Studies Depression Scale (CESD) (Radloff, 1977), Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997), the Big Five Inventor-2 (BFI-2) (Zhang et al., 2022), Alabama Parenting Questionnaire (APQ) (Frick, 1991), the Parental Authority Questionnaire (Buri, 1991), and Student Engagement in School Four-Dimensional Scale (SES-4DS) (Veiga, 2016), among others (see Appendix Table B.2.1). Relevant scales were listed and ranked based on their relevance for assessing language skills, school engagement, parenting style, behaviour and personality, theoretical importance, and relevance for future research. Items were then amended to better align with Yi students' situations or, when necessary, new items were created using the format of existing scales. Measures less relevant for students in Mabian than in other areas were modified or excluded, and new items of particular relevance to Mabian were created. For example, the item "parent(s) praise me" from the CFPS parenting style measure was changed to "when I finish work or get good grades, parent(s) praise me" to cater to children with low cognitive abilities. Additionally, 5-point Likert-type agree/disagree response scales were merged into 4 or 3-point scales, as numerous studies have shown that a 3-point scale is more effective for respondents with cognitive disadvantages (Fang et al., 2011; Taherdoost, 2019) and the exchange between 4 and 3-point scales might not make students feel distracted.

The questionnaire underwent four rounds of revision, encompassing professional reviews and trial tests to ensure its suitability for young children in terms of reading level, as well as its reliability and validity in content [3].

The survey team meticulously reviewed the item bank. Following discussions and feedback from professionals, the questionnaire was condensed from 40 to 10 pages, considering the importance of response time and minimizing the testing burden. After receiving ethical approval from the CHFS Research Ethics Committee, a trial test was conducted to verify the

[3]I extend my gratitude to my supervisors, Tanya Wilson, Michele Battisti, Anwen Zhang from the University of Glasgow, researchers from the China Household Survey Center, Qing He, Junhui Wang, and Professor Yingquan Song from Peking University, as well as my Ph.D. peers at the University of Glasgow, for their invaluable suggestions and comments on the questionnaire.

questionnaire's validity. Based on the outcomes of this test and additional feedback from the survey team, certain items were rephrased or omitted to lessen the respondents' burden.

2.2.2 Socio-Emotional skill

Why Socio-Emotional skill is important?

The term 'socio-emotional skills' is frequently used interchangeably with 'noncognitive skills,' '21st-century skills,' 'personality traits,' and 'life skills' (Duckworth and Yeager, 2015; Heckman and Kautz, 2013; Puerta et al., 2016). However, socio-emotional skills are distinct from many of these concepts in several critical ways. Notably, socio-emotional skills specifically exclude beliefs, preferences, values, and attitudes, such as optimism, which are often considered inherent to an individual. Furthermore, they do not encompass technical knowledge related to media, technology, health, finance, and social issues.

Socio-emotional skills are characterized by a well-defined set of competencies, recognized for their malleability and applicability across various contexts. The Collaborative for Academic, Social, and Emotional Learning (CASEL) defines socio-emotional skills as the abilities required to 'manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions.' This definition underscores the skills' emphasis on emotional intelligence and interpersonal interactions, distinguishing them from broader 'soft skills,' which may also include socio-emotional competencies and personality traits (Heckman et al., 2006). The Socio-emotional skills, developed through early family interactions and education, significantly affect life outcomes including income, happiness, health, and longevity (Heckman et al., 2006; Lacey, 2023)). The importance of these skills is multifaceted: Heckman and colleagues highlight the early emergence of skill disparities and the high returns on early human capital investments (Carneiro and Heckman, 2003; Coneus et al., 2012). Moreover, early childhood interventions have been shown to yield sustained improvements in personality skills (Heckman et al., 2013) and play a critical role in adult outcomes, as evidenced by associations with higher earnings and reduced engagement in risky behaviours (Ajayi et al., 2023; Mitchell et al., 2023).

While the original focus of the OVOP program evaluation was primarily on students' academic performance, Kautz et al. (2014) have underscored that achievement tests may not fully capture essential non-cognitive skills. Such skills, including perseverance ("grit"), conscientiousness, self-control, and empathy, among others, hold substantial value in the labour market, educational settings, and society at large. Contrary to the notion that skills are immutable traits determined at birth, Kautz et al. (2014) argue that both cognitive and non-cognitive skills evolve with age and instruction, with non-cognitive skills showing greater

malleability at later stages of development. This is supported by (Moffitt et al., 2011), who found variability in the mastery of self-control by age 10, with significant implications for future health, financial stability, and criminal behaviour.

The mental health and psychosocial challenges faced by children in rural China have been extensively documented, with studies attributing these issues to various factors, including parental migration (Tang et al., 2018; Wu et al., 2015; Zhao et al., 2017), the pressures of only one child (Chi et al., 2020), academic stress (Lv et al., 2016), and parenting styles (Li et al., 2018). Conversely, social-emotional competencies have been shown to positively influence students' academic achievements, emotional and attitudinal dispositions, and interpersonal relationships (Wang et al., 2019c).

Access to early childhood education seems to be a key mechanism for developing socio-emotional competence, with a strong body of evidence supporting the long-term efficacy of early educational interventions over those implemented at later stages (Attanasio et al., 2022; Conti et al., 2016; Elango et al., 2015). Kautz et al. (2014) emphasize the broader evidence base for the effectiveness of early interventions in improving long-term outcomes, highlighting the limited impact of such programs on IQ but their substantial contributions to later-life success. Additionally, Attanasio et al. (2020a) have shown that socio-emotional skills assessed early in life can predict health outcomes and behaviours, extending the scope of socio-emotional skills' predictive power beyond the domains traditionally considered in the literature.

Research further indicates that socio-emotional skills, crucial for academic achievement, vary according to socio-economic status (Attanasio et al., 2020a; Gruijters and Behrman, 2020; Gruijters et al., 2021; MacCann et al., 2020), with disparities being particularly pronounced among disadvantaged children (Domitrovich et al., 2017).

In summary, early development of socio-emotional skills has significant long-term benefits, including higher income, better health, and reduced risky behaviours. These skills are also crucial in academic, social, and economic contexts and are particularly important for disadvantaged children, as disparities in these skills can emerge early and have lasting impacts throughout life. Access to early education could be a key factor in fostering these skills and improving life outcomes.

The Big Five personality

The survey is crafted to capture the SES of Yi students. It employs a widely recognized assessment framework, the "Big Five Inventory"(BFI) personality traits model (McCrae and Costa, 1987), which categorizes the personality into five dimensions: task performance, emotional regulation, open-mindedness, collaboration, and engagement with others (Abra-

hams et al., 2019; Rammstedt et al., 2013). These broad domains encompass measurable subdomains with clusters of related behaviours or thoughts.

However, existing research has highlighted potential limitations of the original BFI in accurately reflecting or predicting students' SES, especially in developing countries (Laajaj et al., 2019). Studies indicate a tendency for acquiescent responses[4] existed among respondents with low educational levels, which could skew the assessment outcomes and compromise the reliability of the BFI in evaluating students' SES. Rammstedt et al. (2013) find that cognitive abilities, especially verbal abilities, are related to these tendencies. Besides the Acquiescence tendency, Huang and Santos (2022) proved two other factors that may also cause the results of BFI untrusted: socially desirable response[5] and scenarios that enumerators influence respondents' answers in some ways, for instance, explained the items differently.

Furthermore, cultural differences substantially influence the effectiveness of the BFI, with certain traits like agreeableness and extroversion eliciting varying responses across cultures, underscoring the profound impact of cultural contexts on personality assessment (Liu et al., 2005). For instance, they found that Chinese culture tends to encourage collectivism, in contrast to the individualistic orientation of American culture.

In response to these challenges, including the need to reduce the reading burden for students and address cultural and cognitive (verbal) variability, the survey does not employ the original BFI or its abbreviated 20-item versions (Donnellan et al., 2006) and 10-item versions (Rammstedt, 2007). Instead, it integrates items from the BFI-2 Chinese version (Zhang et al., 2022) with comparable items from other scales, aiming to offer a more accessible measure. Liao et al. (2022) found that the BFI-2 Chinese version is suitable for Chinese context.

Table 2.1 illustrates how the selected questionnaire items correspond to the domains of the BFI, ensuring a comprehensive and contextually relevant evaluation of the SES among Yi students. These items were chosen based on their comprehensibility to children from 10 to 15 years old. Furthermore, many studies support the predictive value of these items that can be associated with academic performance (Balart et al., 2018; Burks et al., 2015; Holmlund and Silva, 2014; Mendez, 2015), health and well-being (Savelyev and Tan, 2019) and career development (Gensowski, 2018). Last but not least, these items have been identified not only as predictors but also as malleable traits that can be shaped through future policy interventions, as suggested by Heckman et al. (2006).

[4]Acquiescence or "Yeah-saying" refers to the tendency of an individual to consistently agree to questionnaire items regardless of the item content (Jackson and Messick, 1958).

[5]socially desirable response refers to the tendency for respondents to over-report positive behaviours or under-report negative ones (Edwards, 1953)

Table 2.1 Big Five domains reflection in the Questionnaire

Big Five Domain	Skill	Example Items	Section in Questionnaire
Task Performance	Self-Control	I cannot sit for a long time, always want to play outside I think before I do things I am easily distracted, I find it difficult to concentrate	Personality
		My desk is always in a mess I stay focused on class	School Behaviour
	Responsibility	I finish the things I'm doing. My attention is good	Personality
	Persistence	I keep working on a question until it is solved	School Behaviour
Emotional Regulation	Stress Resistance	I get a lot of headaches, stomach-aches or sickness I am often unhappy, downhearted or tearful	Personality
	Emotional Control	I get very angry and often lose my temper	Personality
	Optimism	I always worry about bad things to happen I have many fears, I am easily scared	Personality
Engaging with Others	Energy	I am excited to go school every morning I am engaged in answering questions in class	School Behaviour
	Assertiveness	Are you taking any leadership role in class?	School Behaviour
	Sociability	I usually tend to be alone I have at least one good friend Most classmates like me How many good friends are there in your school?	Personality
Collaboration	Empathy	I try to be nice to people. I care about their feelings I am helpful if someone is hurt, upset or feeling ill I am always kind to kids	Personality
	Trust	I feel nervous in strange environments I usually do as I am told I am often accused of cheating or lying	Personality
	Co-operation	I usually share with others (food, games, pens etc.) I often volunteer to help others (parents, teachers, children)	Personality
Open-mindedness	Tolerance	Do you feel difficult to be friends with other ethnic students?	Language
		I fight a lot. I can make other people do what I want How is your patience now after finishing this questionnaire?	Personality
	Curiosity	I love learning new things in class	School Behaviour
	Creativity	I think how to link what I learned in class into reality	School Behaviour

Note: The survey measures students' self-reported social-emotional skills in 15 domains as shown in Table. The language of the Mandarin version is modified to the child's understanding level.

The Strengths and Difficulties

We designed items that can construct measures of SES by the Strengths and Difficulties Questionnaire (SDQ). The SDQ is extensively utilized for research across the United States and in high-, middle-, and low-income countries worldwide. As a concise screening tool, the SDQ evaluates emotional and behavioural aspects of children (i.e. Attention Deficit Hyperactivity Disorder (ADHD)) and young people's mental health (Diagnosis of Autism Spectrum Disorder (ASD)) through five problem scales: emotional symptoms, conduct problems, hyperactivity, peer relationship issues, and prosocial behaviour. Each of these problem scales comprises five items, offering three response options ranging from 0 ('not true') to 2 ('certainly true'). Utilizing established cut-offs, the SDQ allows for the categorization of participants into groups—noticeable/abnormal, borderline, and normal—based on their cumulative scores. By summing up four sub-scales, excluding pro-social behaviour, the total difficulty score (0 to 40) can be used as the non-cognitive outcome (Goodman, 1997). Moroni et al. (2019) further separate specific scales and combine them into two different traits, internalizing and externalizing behaviour. The internalizing trait combines emotional symptoms and peer problems and the externalizing trait combines conduct problems and hyperactivity problems.

White et al. (2013) emphasized the SDQ's reliability in providing straightforward insights into children's social and emotional development. Furthermore, Ravens-Sieberer et al. (2022) employed SDQ data to demonstrate an increase in mental health problems and anxiety levels among children in the aftermath of the COVID-19 pandemic. In alignment with these applications, certain items within the personality section of our questionnaire (as detailed in Table 2.2) were inspired by the SDQ.

Many economic surveys use SDQ as the measure of non-cognitive outcomes, behaviour, and mental health, such as the Millennium Cohort Study (MCS), the 1970 British Cohort Study (BCS70), and the British Understanding Society Data. And many studies have found that SDQ is an important predictor. Bono et al. (2016) find that children's non-cognitive abilities are higher when mothers spend more time with children. Del Bono et al. (2020) find that children's non-cognitive skills are directly affected by parents' skills. Attanasio et al. (2020a) also find the intergenerational links of internalizing and externalizing skills between grandmothers and grandchildren. Del Bono et al. (2024) find that aggression and impulsivity problems can predict labour market outcomes, such as wages, labour supply and productivity. Lu et al. (2019) find negative relations between psychological problems and parental migration.

Table 2.2 The Strengths and Difficulties Questionnaire (SDQ) in the Questionnaire

	Items
Pro-social Scale	I try to be nice to people. I care about their feelings
	I usually share with others (food, games, pens etc.)
	I am helpful if someone is hurt, upset or feeling ill
	I am kind to younger children
	I often volunteer to help others (parents, teachers, children)
Hyperactivity Scale	I cannot sit for a long time, always want to play outside
	I am constantly fidgeting or squirming
	I am easily distracted, I find it difficult to concentrate
	I think before I do things
	I finish the things I'm doing. My attention is good
Emotional Symptoms Scale	I get a lot of headaches, stomach-aches or sickness
	I worry a lot
	I am often unhappy, downhearted or tearful
	I am nervous in new situations. I easily lose confidence
	I have many fears, I am easily scared
Conduct Problems Scale	I get very angry and often lose my temper
	I usually do as I am told
	I fight a lot. I can make other people do what I want
	I am often accused of cheating or lying
	I take things that are not mine from home, school or elsewhere
Peer Problems Scale	I am usually on my own. I generally play alone or keep to myself
	I have one good friend or more
	Other people my age generally like me
	Other children or young people pick on or bully me
	I get on better with adults than with people my own age

Note: Some items were modified based on the Mabian context. The language of the Mandarin version is modified to the child's understanding level.

2.2.3 School Engagement

The concept of student engagement in school has been established as a potent predictor of educational outcomes (Appleton et al., 2008; Dogan, 2015; Fredricks et al., 2019; Shernoff and Schmidt, 2008). However, evidence supporting the impact of educational interventions on school engagement is scarce, especially in fields beyond psychology. The behaviour related to students' engagement in school could serve as a mechanism to explain variations in academic performance and SES, such as levels of self-esteem.

To measure student engagement, it is essential first to define it clearly and understand its components. The consensus among most researchers is that student engagement encompasses multiple dimensions of involvement in school and commitment to learning. These dimensions include interest in learning, class participation, and task completion (Appleton et al., 2008; Fredricks et al., 2019). Lam et al. (2014) introduced a third dimension, cognitive engagement, into the framework, encompassing the utilization of learning strategies, adherence to a particular work style, and self-regulated learning. Lam et al. (2014) posits, 'To be truly engaged in school, it is crucial for students to cognitively involve themselves in the learning process.' This aspect of engagement is particularly relevant for evaluating the OVOP program, as it captures the learning processes and strategies employed by students. Thus, following Lam et al. (2014) conceptualization, student engagement can be viewed through three primary dimensions: cognitive, affective, and behavioural[6]. While additional indicators related to school engagement exist, such as the amount of time spent on homework, it is also important to balance the need for comprehensive measurement with the necessity of minimizing respondent burden. Overloading the questionnaire with too many indicators could obscure the clarity of the engagement construct and confuse its dimensions.

In conclusion, this study assessed students' school engagement using a scale developed from Lam et al. (2014), to measure three subscales of School Engagement: affective/emotional, behavioural, and cognitive. The original affective/emotional subscale encompasses nine items that capture students' feelings towards learning, such as 'I am very interested in learning.' The behavioural subscale consists of 12 items reflecting students' effort and persistence in schoolwork, for example, 'When I'm in class, I participate in class activities.' The cognitive subscale, also comprising 12 items, assesses the learning strategies

[6]Even with identical conceptualizations, item contents and dimensions still showed some variability due to various research contexts. It is worthwhile to mention that Veiga (2016) proposed a fourth dimension, agency, which includes items 'During classes I put questions to the teachers', 'I talk to my teachers about my likes and dislikes', 'I comment with my teachers, when something interests me', 'During lessons, I intervene to express my opinions', 'I make suggestions to teachers about how to improve classes'. However, after discussion and deliberation with the survey team, we think that the agency dimension is suitable for higher-level education students (high school above). Primary students and junior high school students may commonly not be able to make comments on teachers' classes.

Table 2.3 School Engagement Scale with three dimensions in the Questionnaire

	Items	Source
Affective Engagement	I like go to school.	CHFS
	I enjoy learning new things in class.	Lam et al. (2014)
	I think learning is boring.	Lam et al. (2014)
	Most mornings, I look forward to going to school.	Lam et al. (2014)
Behavioral Engagement	In class, I actively answer questions.	Survey team
	In class, I often gossip with classmates.	Survey team
	I pay attention in class.	Lam et al. (2014)
	When I'm in class, I just act like I'm working.	Lam et al. (2014)
	When I'm in class, my mind wanders.	Lam et al. (2014)
	When I run into a difficult homework problem, I keep working at it until I think I've solved it.	Lam et al. (2014)
	When I run into a difficult homework problem, I seek help from others, e.g. teachers, classmates	Survey team
	I actively participate in school activities such as sports day.	Lam et al. (2014)
Cognitive Engagement	When learning things for school, I often try to associate them with what I learnt in other classes about the same or similar things.	Lam et al. (2014)
	When I study, I figure out how the information might be useful in the real world.	Lam et al. (2014)
	I make up my own examples to help me understand the important concepts I learn from school.	Lam et al. (2014)
	When reading aloud in the morning, I think about what I am reading.	Survey team

Note: Some items were created or modified based on the Mabian context. The language of the Mandarin version is modified to the child's understanding level.

students adopt, such as 'I try to understand how the things I learn in school fit together.' To better suit our respondents, we modified the response scale from the original 5-point to 4-point and 3-point format. To reduce the reading burden, we reduced some items that have repeated meanings. Additionally, certain items were adjusted to reflect the context of Yi students more accurately. For instance, the item 'I am an active participant in school activities such as sports day and school picnic' was revised to 'I actively participate in school activities such as sports day'. Table 2.3 shows the school engagement scale for the survey.

2.2.4 Parental Interaction and Parenting Style

Extensive research underscores the importance of parental involvement and parenting style in children's school performance (Barger et al., 2019; Deslandes et al., 1997; Dornbusch et al., 2016; Fan and Chen, 2001; Hill and Tyson, 2009; Karsidi et al., 2013; Sapungan and Sapungan, 2014; Sørensen et al., 2024), behaviour (Ansong et al., 2017; Saltalı and İmir, 2018), and emotional well-being (Hosokawa and Katsura, 2019).

Parental support provides overall psychological protection, enhancing children's school engagement (Goodall and Montgomery, 2014). Higher levels of parental involvement correlate with increased student engagement—affective engagement (Yang et al., 2022), behavioural engagement (Ansong et al., 2017; Gil et al., 2021), and cognitive engagement (Dotterer and Wehrspann, 2016)—which, in turn, contributes to academic competence. However, not all forms of parental involvement positively correlate with academic achievement. Academic socialization[7] shows the strongest positive association, whereas home-based involvement, such as homework help, shows a weaker link, possibly due to parents' limited tutoring abilities as children progress in education (Barger et al., 2019; Fan and Chen, 2001; Hill et al., 2015; Hill and Tyson, 2009).

Parental involvement in this survey encompasses the parent's role in communication interaction with children, expectations for child achievement, positive affective relationships between parent and child, parental attributions regarding child development, and discipline and control strategies exerted by parents (Hess and Holloway, 1984). This definition spans three subcategories: school-based involvement (e.g., participating in teacher-parent meetings, involvement in school governance, or volunteering at school), home-based involvement (e.g., assisting with homework, museum visits, or reading to the child), and academic involvement (e.g., setting educational goals and communicating expectations) (Lavenda, 2011; Yang et al., 2023). Notably, home-based involvement contributes to the construction of the parent-child relationship and parental discipline and controls.

Meanwhile, parenting style also plays a crucial role. Howard et al. (2019) observed significant relationships between overparenting, parental acceptance, involvement, and children's grit, which academic success. Bonneville-Roussy et al. (2017) noted an association between parenting style and students' self-evaluation biases of academic competence. Sørensen et al. (2024) found that children of authoritative or permissive parents exhibited better educational outcomes compared to those of authoritarian parents, especially in mathematics. Kostereli-oglu (2018) discovered significant effects of democratic and overprotective parenting styles on learning orientations. Mihret et al. (2019) found that neglectful parenting negatively impacts students' motivation for academic achievement.

Parents were categorized into three types: Authoritarian, Authoritative, and Permissive, following Doepke and Zilibotti (2017). Authoritarian parents limit children's choices, emphasizing obedience. Authoritative parents encourage children towards choices they view as successful, valuing hard work. Permissive parents, conversely, are lenient, allowing children to make independent choices.

[7]Academic socialization in education is how parents use their own educational beliefs and expectations to provide messages to their children to help navigate or influence their academic success and development (Hill and Tyson, 2009).

In developing the parental interaction items for this survey, we generated initial items under major themes and conducted thorough reviews by the survey team to refine the item pool. Initially comprising 30 items, the pool was narrowed down after eliminating those that were redundant, complex, ambiguous, or unnecessary. The final set of 17 items (as shown in Table 2.4) was established after meticulous review for precision, transparency, repetition, and understandability, incorporating expert opinions.

Table 2.4 Parental Interaction Scale in the Questionnaire

	Items	Source
Parent-Child relationship	In the past month, how many times did you quarrel with your parents?	CHFS
	In the past month, how many times did you talk about mood with your parents?	CHFS
	What are your parents' expectations on your educational attainment?	Survey Team
Parental Involvement	Parent talk about my study	CHFS, Frick (1991)
	Parent check my homework	CHFS
	Parent ask about things in school	CHFS, Frick (1991)
	Parent read me stories	CHFS
	Parent play with me	CHFS
Parenting Style	Parent ask me reasons and discuss with me when I did something wrong	Buri (1991)
	Parent admit mistakes to me if they were wrong	Buri (1991)
	Parent talk to me nicely	CHFS, Buri (1991)
	Parent praises you for behaving well.	CHFS, Buri (1991)
	Parent criticise me for behaving not well.	CHFS, Buri (1991)
	Parent talks to me when I feel unhappy.	Buri (1991)
	Parent would beat me to force me to obey.	Buri (1991)
	Parents do not punish you, you can do whatever you want	Frick (1991)

Note: Some items were created or modified based on the Mabian context. The language of the Mandarin version is modified to the child's understanding level.

2.2.5 Preschool Attendance and Language Proficiency

One of the primary goals of this survey is to gather detailed information regarding students' attendance at OVOP preschools. Recognizing that children may not recall the specific type of preschool they attended, but are more likely to remember their preschool attendance in general, we formulated two key questions to facilitate identification. The first question asks the duration of their preschool experience, while the second asks whether the preschool was situated within a local primary school. This approach accounts for the fact that many OVOP preschools in Mabian operate in vacant classrooms within existing primary schools in Mabian, rather than constructing separate preschool campuses.

Chiswick and Miller (2015) proposed three 'Es' dimensions for language proficiency measurement: Exposure to the dominant language usage, Efficiency of converting exposure

to language learning, and Economic incentives for acquiring the dominant language. The exposure of dominant language can be measured by the origins of immigrants to see whether the origin was a former colony or dependency of the UK, the US, or Spain (Chiswick and Miller, 2002), or survey questions regarding the family language environment (Bevelander, 2011; Budría et al., 2017; Hayfron, 2001; Lang, 2022). Additionally, duration of exposure, intensity of exposure, and immigrants' expectation of returning origin places can all mediate between language proficiency and economic outcomes, such as health care access, employment (Chiswick and Miller, 2015; Dustmann, 1999; Lebrun, 2012; Lu and Myerson, 2020; Pippins et al., 2007). The efficiency measurement of this survey mainly focuses on the critical age, beyond which second language learning becomes difficult. Though there is no specific age threshold from literature (Chiswick and Miller, 2015), many studies have proved that language proficiency, especially for young people, has positive relation with education (Yao et al., 2016), health (Pottie et al., 2008; Tam and Page, 2016), and economic returns(Lindley, 2002; Park, 1999). Furthermore, studies find cognitive and non-cognitive skills, gender, family support, language similarities and social discrimination on ethnic minorities can also be mediators for language learning efficiency (Adida et al., 2014; Budría et al., 2017; Chiswick and Miller, 2015; Schachter et al., 2012; Ubalde et al., 2017; Yao and Van Ours, 2015). The measurement of Economic incentives is an individual's expectation of earnings (Chiswick and Miller, 2015) and education in this survey context. The incentive measurement can include questions regarding the engagement of certain events, such as language training (Dustmann, 1994).

Furthermore, the family language environment is a significant contextual factor affecting the impact of the OVOP program on students' Mandarin academic test results. A child from a family where Mandarin is spoken proficiently, including Yi students, is likely to have been exposed to Mandarin from an early age, potentially mitigating language barriers upon entering primary school. Conversely, if Yi students predominantly use the Yi language at home and with peers, the OVOP program's effect might be minimal, suggesting the program's limited success in altering students' linguistic habits. Dovì (2019) find Mandarin proficiency is not related to family social status and they think that the horizontal variation across regions is larger than vertical variation across social groups, which matches the situation in Mabian that Mandarin proficiency varies a lot across villages. Caminal et al. (2021) find positive spillover causal effect of parental linguistic training on family language environment. Pottie et al. (2008) find that low-level parental language proficiency can negatively affect children's health and health care.

Accordingly, it is essential to incorporate questions concerning parental language proficiency and the students' daily language practices into the survey. These questions aim to

capture the language environment of the students, providing valuable context for assessing the OVOP program's effectiveness.

There are many datasets that measure the language proficiency level of respondents. For example, the China Labor Force Dynamics Survey (CLDS), China Family Panel Studies(CFPS), the Fourth National Survey of Ethnic Minorities(FNSEM), the Family and Working Lives Survey(FWLS), the Estonian Labor Force Survey(LFS) asked the survey interviewer to measure respondents' proficiency level, and reading and writing skills in English on a 5-Likert or 7-Likert scale. It is concerned that the self-reported language level could result in measurement errors (Dovì, 2019). While in this survey, it is not feasible for interviewers to observe the language level of each student. However, the student's academic records could alleviate this problem.

In this case, the language items are designed by three dimensions mentioned above, which include language exposure age and duration (the age exposed to the OVOP program), family language environment, self-reported language level, and education expectations which could measure the incentives of language learning. Table 2.5 shows details of the items.

2.2.6 Demographic Information

In addition to assessing students' socioeconomic status skills, school engagement, and parenting styles, the survey examines contextual factors integral to the OVOP program evaluation. This includes demographic backgrounds and family information, with a particular emphasis on attributes that are more related to policy interventions like OVOP and to the development of SES. This information enables us to have a deeper insight into the facilitators and barriers influencing the OVOP program's outcomes, encompassing the policies and practices that underpin them.

The initial phase of developing the contextual questionnaires for the survey was conducting an in-depth literature review. This review aimed to identify and map out the various factors within students' family, school, peer, and community environments that could potentially influence the development of their Socio-Emotional skill. A substantial body of research has demonstrated the variability of preschool program impacts across different demographics such as gender (Alexander et al., 2004; Wikle and Wilson, 2023), ethnicities (Pages et al., 2023), cohorts (Bailey et al., 2021; García et al., 2023), and family (Duncan et al., 2023; Executive Office of the President Council of Economic Advisers, 2016; Waterman and Lefkowitz, 2017), as well as school and community environments (Araujo et al., 2016; DeMalach and Schlosser, 2024; Duncan and Magnuson, 2013; Engle et al., 2011; Heckman, 2011; Magnuson et al., 2004; Miller et al., 2023; Walker et al., 2011). Additionally, other aspects that could enhance the evaluation of the OVOP program, such as academic aspiration,

leadership roles in class, and closeness to family, were also considered for inclusion in the questionnaire.

In the third phase, the survey team reviewed existing items, eliminating and revising questions that could potentially introduce bias into the results. For example, it is usually hard for a child to accurately remember his or her actual height and weight (Seghers and Claessens, 2010), even for adolescents (Elgar et al., 2005). Furthermore, in an effort to alleviate reading burdens and shorten the questionnaire, items irrelevant to the Mabian context were removed. A notable example includes questions about family ownership of telephones, as this is a commonality among nearly all families in the area, offering no valuable variance in responses. In addition, many items were designed based on the local features[8]. For example, Yi houses are different from Han. In the questionnaire, we asked about the material of the house[9]. Table 2.5 shows the contextual items included and excluded decisions in the questionnaire design.

2.2.7 Serial Number and Follow-up Strategy for future study

Each participant in the survey was issued a unique serial number at the start of the study. Our follow-up strategy is designed by tracking students with their own or parents' phone numbers, WeChat IDs and family addresses.

2.2.8 Drawback of Questionnaire Design

The survey's limitations primarily stem from three factors: the cognitive ability of respondents, the inability to involve parents, and the length of the questionnaire.

Most of our respondents are 12 to 14 years old, and they lack the cognitive ability and temporal understanding to provide detailed information on aspects such as family income or the specific type of preschool attended in their early years. Additionally, the generally low education level of parents makes it challenging for children to bring questionnaires home, which may lead to significant sample attrition. This situation precludes the collection of

[8]When I paid my first visit in October 2017, I saw that most of the Yi family had no heating system indoors, and no toilet indoors. Some of them would cover a sheepskin cloth to keep warm, which is a unique local custom called "Cha-er-wa", and according to (Ting and Sundararajan, 2017), the value of a sheepskin cloak exceeded 1000 RMB. The options for public transportation are also limited. There is no bus available to take people from town to the villages nearby. Local van rental usually costs at least 300-500 RMB. people can only travel by foot, motor car or car. People always ask for information about rides, if they need to travel from the village to the centre area. The difficulty in accessing remote villages might further explain why the cost of living is so high in Mabian.

[9]Rural Han houses are built of mud with thatch or tile roofs, as are the stalls for animals, which are attached to the main house. Yi traditional houses are built of rough-hewn wooden planks placed vertically in the ground and caulked with mud, topped by a thatch roof with low, overhanging eaves. Some Yi have switched to mud housing, but the stalls and stables are inevitably built separately of widely spaced logs.

Table 2.5 Background Information Included and Excluded in the Questionnaire Design

	Items Included	Items Excluded
Preschool Attendance	How many years did you spend in preschool? Were you preschool inside a primary school? (OVOP Program Identification) What did you learn in preschool? How was the teacher?	Did you attend the OVOP program, and when did you go to preschool? (type of preschool)* Did your family change their family address for schooling purposes and how?*† Family-Preschool Distance*; Transportation*
Mandarin Level	4-Likert subjective Mandarin Level; Language use in 6 years old; Language use in family; Language use with Yi classmates; Prental and grandparental Mandarin Level	How many Chinese characters can you recognize? (or a word test)†
Basic Demographic information	Gender; Birth Date; Ethnic; Family Address; Siblings; Family-School Distance; Transportation to School; Travel Time; Whether live in School	Hukou*; Height*; Weight*; Severe Disease*; What is the biological relationship with your father/mother?*
Parental Information	Parental Education Level; Maritus Status; Whether live at home; Disability; Parental relationship;	Parental Age*; Job*
Family Economic Level	Necessaries, washing machine etc.; Main material of the house; Num. of rooms; Have a toilet; Main material of the floor; Have a flat in county centre	Necessaries: TV, Phone‡
Family Environment	Who is tutoring your study at home? Who taking care of you at home?	How long do they tutor your study usually?*

Note: Items were excluded based on the consideration of the child's cognitive ability(*), reading burden(†) and Mabian local situation(‡). The language of the Mandarin version is modified to the child's understanding level.

parental data on employment, income, attitudes towards children, and parenting styles. To address these obstacles, the study employs thorough literature reviews and expert discussions to ensure the assessment's validity, reliability, and comparability.

Due to the need to control the length of the questionnaire, many measurements were excluded from the original version, such as bullying behaviours, ethnic self-identification, Yi language usage, superstitious behaviour, and cultural practices. For example, during the survey, many girls in junior high schools mentioned that they expected to marry after junior high school because Nuosu people (a subgroup of Yi people) practice bride price but not dowry.

Additionally, nutritional habits were not observed in this survey. Local Yi people typically consume meat as their main food category and drink beer. The consumption of alcohol has been a significant issue. According to Ting and Sundararajan (2017), there is also abuse of drugs, alcohol, and other substances in nearby towns, where AIDS/HIV prevalence is a concern.

2.3 Study Area

The study area selected for this research is Mabian, a county in the southwestern part of China, Sichuan Province, near Tibet. Mabian is part of the XiaoLiangshan region[10]. Table 2.6 presents disparities in educational level and income level between Main and other areas in Sichuan Province. The population of Mabian primarily consists of two ethnic groups: Yi people (an ethnic minority in China) and Han people (the ethnic majority in China)[11].

[10]XiaoLiangshan, adjacent to Liangshan Prefecture, Sichuan Province, is one of the 14 contiguous poverty-stricken areas in China, a typical area of deep poverty, and the largest Yi-populated area in China (Ministry of Education of the People's Republic of China, 2019; Zhou and Lv, 2021).

[11]China has 56 ethnic groups, with the Han comprising more than 91% of the population. The remaining 55 ethnic groups constitute various minority groups with complex religious contexts and historical lineages (Ting and Sundararajan, 2017). Yi people differ significantly from Han people in language, religion, and other cultural traits.

Table 2.6 Demographic Statistics of Mabian and Sichuan Province

	Mabian	Rural Areas	Urban Areas
Population (Million)	0.22	36.21	30.43
Proportion of Han people	47.66%	89.49%	97.74%
Proportion of Yi people	51.25%	1.22%	0.27%
Years of schooling per capita (year)	7.12	8.77	10.41
Illiteracy of the population (Proportion)	10.96%	7.94%	1.59%
Disposable income Per capita (Yuan) (2017)	9,320	12,227	30,727

Data Source: Bulletin of the Seventh Census of China (2020); China Statistical Yearbook (2017)

Note: The Disposable income data was derived from the China Statistical Yearbook of 2017. The other data were from the Data of China Seventh Census.

Yi children living in remote villages with a high proportion of Yi people primarily speak the Yi language in their families (Harrell, 1990), which places them at a disadvantage regarding Mandarin proficiency. To address this language barrier, the "One Village, One Preschool" (OVOP) preschool program was formally implemented in 2015 in Sichuan Province, China (Central Government of the People's Republic of China, 2017).

Mabian was chosen for this study due to its significance as the site of the first county-level pilot of the OVOP[12] program in Sichuan province, initiated in 2014[13]. According to data from China's Sixth Census (2010), the Yi ethnic group constitutes approximately 50.11% of Mabian's population, emphasizing the importance of Mandarin language acquisition in the region's OVOP program.

Furthermore, Mabian exhibits distinct geographic features that promote the OVOP program as a quasi-natural experiment. Firstly, many children's language environments were not influenced before the OVOP program due to Mabian's mountainous terrain and low

[12]To avoid repetition, Chapter 3 provides details of the OVOP program.

[13]The OVOP program in Mabian (Education Department of Sichuan Province, 2016, 2019) differs from another preschool program in western China, also called the "One Village, One Preschool" (OVOP) program, initiated by the China Development Research Foundation (Chen et al., 2019; China Development Research Foundations, 2017). Both programs aim to provide accessible early childhood development services in remote and impoverished rural areas, such as offering nearby preschools to reduce school travel difficulties for children in remote mountainous areas. However, the Sichuan OVOP has an additional vital duty of providing a Mandarin environment to non-Mandarin-speaking children, facilitating their transition to Mandarin-based education.

population density[14]. This naturally restricted migration[15], low accessibility of preschools[16], and poor educational levels of the population[17]. This provided insufficient exposure to the Mandarin language for Yi children, especially those in remote villages. Secondly, the diversity of ethnic groups in Mabian allows for an interesting and informative comparison between the control and treatment groups of the OVOP program. Some villages are composed of mixed ethnicities, including Han, Yi, and other ethnic minorities, while other villages are comprised solely of Yi people, often deeply deprived and poverty-stricken (Huang, 2016).

2.4 Sampling Strategy

The survey's sampling strategy was designed to account for the complex demographics of Mabian schools and ensure the representation of diverse schools and classes. This strategy combined judgmental sampling at the town and school levels with systematic random sampling at the class level.

As shown in Table 2.7, the sampling strategy was conducted in three stages: the Primary Sampling Unit (PSU) consisted of administrative towns, the Second-stage Sampling Unit (SSU) consisted of schools, and the Third-stage (Ultimate) Sampling Unit (TSU) consisted of classes. In the first and second stages, towns and schools were selected based on demographic information from Huang (2016), academic records, and distance from Mabian central town. The third sampling stage involved a systematic selection of class units[18] from the school list using a random non-repetitive selection and equal probability method.

To ensure a high response rate, the formal survey used the estimated response rates from the pilot survey as a reference and proportionately enlarged the sample size. The original target sample size was 1,200 individuals. A total of 1,520 students[19] were selected according to systematic sampling principles, ensuring the expected sample size for the survey.

[14]There were 95 people per square kilometre in Mabian in 2015 (Leshan Bureau of Statistics, 2015), a figure much lower than neighbouring counties, which averaged 268 people per square kilometre in Leshan.

[15]According to China's Sixth Census data (2010), the proportion of migrated people whose families resided in the mountainous areas (west part) of Mabian was 8.46%, lower than the overall Mabian migration rate of 18.07%, and lower than its neighbouring county, Ebian Yi Autonomous County, which had a migration rate of 12.02%.

[16]The report from Education Department of Sichuan Province (2019) shows that there were only 9 preschools in Yi Autonomous areas in Leshan (Mabian and Ebian) in 2013, mainly located in central areas.

[17]According to China's Seventh Census data (2015), 43.24% of the population in Mabian had an education level of primary school or below, with an average of 7.12 years of schooling (Leshan Bureau of Statistics, 2021)

[18]The sample was class-clustered to properly manage the work of questionnaire collection. The survey was conducted in a course session, and students needed to finish the questionnaire within the session.

[19]Students who could not finish the questionnaire independently were not included in the survey. For example, those with disabilities that influenced their ability to complete the questionnaire.

Table 2.7 Sampling Demographics and Sample Size

PSU: Student Source (Town)	SSU: School	Ethnic: Yi Proportion	TSU: Class	Target/Actual Sample Size	Oversampling Rate
Minjian (Central)	A (Central School)	64%	1st, 10th Class	240/540	225%
Sanhekou (NW)	B	100%	1st, 3rd Class	240/274	142%
Gaozhuoying (SW)	C	100%	1st, 3rd, 5th Class	240/224	93%
Suba (SW)	D	97%	1st, 2nd Class	240/266	111%
Minzhu (SE)	E	49%	1st, 4th Class	240/216	90%
Xiaxi (NE)	F	77%	-	-	-
Rongding (NE)	G	39%	-	-	-
Qiaoba (NE)	H	5%	-	-	-

Note: The sampling strategy was conducted in three stages: the Primary Sampling Unit (PSU) consisted of administrative towns, the Second-stage Sampling Unit (SSU) consisted of schools, and the Third-stage (Ultimate) Sampling Unit (TSU) consisted of classes.
Note: The table shows that we used a mixed sampling method. The selection of schools was done by judgmental sampling and the selection of classes applied systematic sampling. All students in the selected class participated in the survey. Schools F, G and H were not selected for the consideration of the validation of the treatment group of OVOP and the similarity of the Ethnic component with other schools.

It is important to note some features of the Mabian sample, which are related to the OVOP program evaluation. Firstly, the first cohort exposed to the OVOP program (as noted in Table 2.8, Cohort I) was in the second grade of junior high school during the survey[20]. Secondly, each cohort includes an over-representation of children from minority ethnic groups to ensure sufficient numbers for making comparisons between different groups. Thirdly, each cohort includes an over-representation of children from deprived areas to better understand the effects of disadvantage.

In this context, the target population for this study consists of disadvantaged Yi ethnic minority children residing in the rural areas of Mabian County, China. Specifically, the study focuses on junior high school students who were beneficiaries of the early cohort OVOP program[21] (as noted in Table 2.8, Cohort I and Cohort H[22]). These students received early preschool education and language development support through the OVOP program, and their experiences during their preschool years may have implications for their academic performance and social-emotional skills.

[20]The OVOP program covers all subsequent cohorts after its implementation was completed in 2016 (Cohort A to Cohort E). Conversely, the OVOP program does not cover older cohorts born before 2008 (Cohort J and earlier).

[21]To enable a comprehensive comparison of the OVOP program's impact, the study includes a control group. The control group comprises children who were not exposed to the OVOP program during their preschool years. Specifically, it includes children born in villages without OVOP preschool services or those who were not eligible to attend the OVOP preschool during the preliminary construction period. The control group provides a baseline for evaluating the program's effectiveness by allowing researchers to compare the outcomes of children exposed to OVOP with those who were not.

[22]Cohort G is not included in this survey due to considerations regarding their cognitive ability to complete the questionnaire.

Table 2.8 Cohort Map of Mabian students

Cohort	Age in 2014	Age in 2015	Age in 2016	Age in 2017	Age in 2022 (Survey year)	Expected School Grade Level
A				0	5	
B			0	1	6	Primary school Grade 1
C		0	1	2	7	Primary school Grade 2
D	0	1	2	3	8	Primary school Grade 3
E	1	2	3	4	9	Primary school Grade 4
F	2	3	4	5	10	Primary school Grade 5
G	3	4	5	6	11	Primary school Grade 6
H	4	5	6	7	12	Junior High school Grade 7
I	5	6	7	8	13	Junior High school Grade 8
J	6	7	8	9	14	Junior High school Grade 9
K	7	8	9	10	15	High school Grade 10
L	8	9	10	11	16	High school Grade 11
M	9	10	11	12	17	High school Grade 12

* Table 8 shows the cohort map and the **expected** school level of each student cohort. Cohorts were marked with faded colours if they were too young or too old for the survey purpose. The circled cohorts show that children were age-eligible (3 to 5 years old) during the three-year OVOP program implementation, which means they were potentially in the controlled group for this study. However, only Cohort H and Cohort I participated in this survey due to cognitive ability considerations.

2.5 Field Work Plan

2.5.1 Ethical Approval

Ethical approval for both the pilot surveys and the main survey was obtained from the China Household Finance Survey Center (CHFS). Approval was granted by the CHFS Research Ethics Committee. Further details can be found in Table 2.9.

Table 2.9 Ethical Approval Content

Who from	Elements	Consent
Teachers	Interview	Approved
Students	Family information	Approved
	Ethnic Opinions	Approved
	School Engagement	Approved
	Parental Involvement	Approved
	Personality	Approved
	Health	Approved
	Behaviour during Pandemic	Approved

Note: Ethical approval was obtained by the China Household Finance Survey Center (CHFS).

2.5.2 Pilot and Improvements

Due to the OVOP program evaluation focusing on ethnic minority groups, we believe that random sampling techniques based on the Mabian students would result in insufficient observations and high standard deviations (Whitehead et al., 2016). To obtain a precise sample size, control the reading burden for respondents, and identify any potential flaws in the measurement instruments, a pilot survey was conducted in a class at School B at the beginning of March 2023. Afterwards, the pilot experience was summarized, and improvements were made to the survey implementation and questionnaire design. However, the pilot was not designed to, and cannot, provide a valid and reliable assessment for specific modules of questions. Thus, the statistics of the pilot data are not included in this paper.

Following the pilot experience, we decided to adopt a paper-pencil assessment mode aided by trained interviewers reading aloud the questionnaires for the main survey (see photo in Appendix I, Figure B.7.9). In the paper-pencil assessment mode, the respondent processes the cognitive progress. The differences in reading abilities between higher and lower cognitive level participants can lead to scenarios where students cannot finish the questionnaire by themselves simultaneously, and the tendency for acquiescent responses (as mentioned in Chapter 2 Section 2.3) cannot be controlled. Following Rammstedt et al. (2010), we used an interview assessment mode in which all items and response categories were read to the respondents. This method alleviates the reading burden on respondents, ensuring that differences in reading abilities have no influence on their responses. Table 2.10 shows the improvements made to the main survey after the pilot.

Table 2.10 Experiences from Pilot and Improvements from the Main survey

Experiences	Improvements
Students show different levels of reading ability, which is regarding to their speed, accuracy and paitience The questionnaire was shortened to 10 pages.	Training exercises: Interviewers guide and read the questionnaire in each interview session. Training exercises: Interviewers audit the questionnaire after the first collection and return it to students if important parts are missed.
Students feel hard or confused on some questions	Reassess the appropriateness of measurements. Questions were shortened and language was modified. Identify any difficulties that might be encountered by interviewers

Note: The training session for interviewers took place in April 2023. Interviewers were trained in reading questionnaires, delivering, collecting and auditing questionnaires.

2.5.3 Formal Survey

Fieldwork Progress

The fieldwork was initially scheduled to run from October 2022 to December 2022. However, due to the pandemic, we had to wait until school restrictions were lifted[23]. While waiting, we took the opportunity to review the questionnaire several times, making it more tailored to Yi cultural features than our previous survey.

As a result, the fieldwork was delayed until February 2023. We immediately recruited and trained interviewers once we confirmed the survey with Mabian schools. Almost three-quarters of our interviewers had participated in previous CHFS surveys and were familiar with safety protocols, data collection, and data protection. Inexperienced interviewers were supervised by an experienced interviewer within each interview team during the survey. The data collection was completed in May 2023, and data cleaning was finished in December 2023.

Interviewer Training

Interviewing in Mabian was carried out in May 2023. A total of 10 interviewers participated in the study. Interviewers were given guidance on how to work effectively and efficiently with school teachers and children. They were instructed to handle physical contact and privacy protection with care, including explaining to children before any physical contact, informing children that their information would be collected but not released to others (such as their parents and friends), and ensuring that teachers could observe the entire process. To maintain confidentiality, interviewers were instructed to avoid mentioning the title of the study to anyone. Additionally, interviewers were not permitted to interview anyone they knew personally, such as friends, neighbours, or colleagues. Such instances were reassigned to other interviewers.

Interviewers were instructed to complete multiple tasks during the survey, including contacting the headteacher and class teachers, distributing, collecting, and auditing consent forms and questionnaires, and taking pictures during the survey. Table 2.11 outlines the materials provided to the interviewers.

[23]The survey could not be conducted online because the facilities in Mabian schools do not support students' access to computers. Additionally, even if they could access computers, it would place a greater reading burden on students to read questionnaires online.

Table 2.11 Materials for Interviewers

Materials for interviewers	Explanation
Explain Letter about the survey	The purpose of the survey and the material lists.
Teachers contact	Contact teachers in advance. Confirm pick-up time and survey time.
'What would we like to do the survey' leaflet	Interviewers convey the leaflet to class teachers and explain the survey progress.
School information and Class details	Though sample size and sampling methods are confirmed, interviewers should check the class size and report for emergencies.
Refusal Form	Record information of respondents who cannot or refuse to answer the survey.
Attendance Form	Record questionnaire collection information, including interview date, and amount of sheets.
Auditing Form	Record sheets that need a second-time review.
Thank you Gift	Interviewers thank teachers for their support and cooperation.

Note: The training session for interviewers took place in April 2023. Interviewers were trained in reading questionnaires, delivering, collecting and auditing questionnaires.

Seeking Support from Local

Help and support from headteachers in the Mabian school promised the success of the survey. An introduction letter was sent out to headteachers in February 2023. The letter depicted the survey and detailed sampling strategy. The potential sampling class lists were confirmed in late February. In addition, we informed the local police station about this survey to make sure that the police were aware that our interviewers were working in the area. They documented this survey, including what the survey was about, how long it would be, and which schools would participate.

Data Collection Consents

Before answering the questionnaire, teachers and participants were informed to sign a consent form for the participation[24]. The consent form was printed in triplicate. One copy was kept by the respondent, and the other two copies were returned by interviewers to the CHFS. More details and copies of the consent form can be found in the Appendix.

[24]All participants are above 10 years old, in which age can be seen have enough intelligence and understanding to fully appreciate what's involved in the questionnaire. Thus they are able to sign the consent form by themselves(Xie and Hu, 2014).

The consent form was used to gain consent to analyse respondent's economic records and social-emotional skills. Respondents are informed in the form about the purpose of the survey and data protection.

Audit and Quality Control

Interviewers were instructed to ensure that all consent forms and questionnaires were returned and correctly completed. Firstly, the personal information on the first page of the questionnaire was checked to ensure that the questionnaire was answered by the correct student[25]. Secondly, interviewers checked refusals from respondents, asked for the reason, and tried to encourage participation[26]. Thirdly, interviewers quickly reviewed the questionnaires after collection and returned them if any parts were missing or if characters were hard to recognize[27]. This enabled interviewers to clarify and resolve data discrepancies directly with the respondent during the interview.

Last but not least, the issue of careless responses was considered in this survey. Meade and Craig (2012) estimated that around 10% of undergraduates respond carelessly. Goldammer et al. (2020) found that careless answers result in higher variances, biased item means, and reduced within-group constructs. Some careless response patterns can be easily recognized, such as giving many consecutive items a response of '4' or repeating a pattern of '1,2,3,4...' (Meade and Craig, 2012). To quickly identify this problem, I designed special items to detect it. More details can be found in Appendix B.6. Interviewers should return the questionnaire to respondents for further review and then record the issue in the auditing form.

According to the auditing form records, most of the returned sheets were due to missing responses, and only 16 respondents displayed impatience during the survey. Interviewers gently asked the reasons for carelessness and encouraged respondents to answer the questions based on their true feelings. Thus, the easily recognizable careless response issues were resolved during the data collection stage.

[25]If any typos were discovered during the early data processing stage, the name information allowed us to contact their teacher and rectify the issue. For example, a student wrote his/her date of birth as the date of the interview. I contacted the class teacher and corrected it.

[26]There were no refusals during this survey. On the contrary, although the consent form stated that participation is voluntary, students viewed this survey as obligatory and were willing to fill in the questionnaires because they thought it meant they did not need to attend class.

[27]To analyze the peer effects of the OVOP program, I designed a question: "Please tell me five of your friends' names in this school." Thus, it was important to ensure that students wrote the correct friends' names.

Thank-you Gift

All headteachers and class teachers who participated in the study were sent a thank-you card and a small gift. The thank-you card features the logos of CHFS and the University of Glasgow. Copies of the thank-you cards can be found in the Appendix Figure B.5.1.

2.5.4 Coding, Editing and Data Checking

The data-checking work comprises 'soft' and 'hard' checks. The hard checks, and auditing, were completed by the interviewers at the time of the interview. The soft checks happen during the coding and processing stage. Experienced data technicians from the CHFS ensured that the final data could be used for the OVOP evaluation.

2.6 OVOP Exposure and Preschool Participation

Five out of eight junior high schools in Mabian were included in the survey, with 1,520 students participating and 1,350 valid questionnaires collected[28]. Of the participants, 80.81% were of Yi ethnicity, and 16.67% were Han[29]. The intent-to-treat (ITT) identification indicates that 19.63% of all students were exposed to the OVOP program when they were between 3 and 5 years old, with 20.89% of Yi students exposed.

As shown in Table 2.12, the proportion of students exposed to the OVOP program increases over time with its implementation. For instance, the proportion of Yi children exposed to the program rose from 17.89% in grade 8 to 42.4% in grade 7, while the proportion of Han students increased from 12.35% to 29.51%. This suggests that a higher percentage of Yi students were exposed to the OVOP program compared to Han students[30]. Conversely, Table 2.13 shows that in remote schools, the exposure rate of Han students was higher than that of Yi students, indicating that Yi children have less access to educational resources compared to Han children in remote areas.

[28]Interviewers conducted thorough checks during the survey to ensure questionnaires were completed carefully, but additional checks are needed to identify more subtle issues. An array of special items was included in the questionnaire for detection purposes; more details are provided in Appendix B.6.

[29]As noted in Chapter 2, Section 4, Sampling Strategy, ethnic minority groups are over-represented in this survey to ensure sufficient treatment observations for the OVOP program. According to administrative data, Yi students make up 77% of the student population in Mabian, which is not significantly different from their proportion in this survey.

[30]As described in Section 4 of the Sampling Strategy, the target population for the OVOP program was students aged 3 to 5 years. According to Table 2.8, the oldest cohorts are expected to be in grade 8 with one year of potential exposure to the OVOP program, and the second oldest cohort is in grade 7 with two years of exposure. Some students might have entered school early, so a few grade 9 students were also exposed to the OVOP program.

Table 2.12 The Proportion of the Exposure of the OVOP

	Grade 7		Grade 8		Grade 9	
	N	%	N	%	N	%
Yi Students						
Treat	159	42.4%	66	17.89%	3	0.86%
Control	216	57.60%	303	82.11%	344	99.14%
Sum	375		369		347	
Han Students						
Treat	18	29.51%	10	12.35%	0	0.00%
Control	43	70.49%	71	87.65%	83	100%
Sum	61		81		83	

* Proportion is the ratio of the treated group of the grade. For example, the treated Yi students in grade 7 versus the overall Yi students in grade 7.
Note: Table 2.12 presents the sample distribution regarding ethnicity, grade and exposure to the OVOP program.

Table 2.13 Continue of Table 2.12 (In Remote School)

	Grade 7		Grade 8		Grade 9	
	N	%	N	%	N	%
Yi Students						
Treat	118	47.20%	53	20.00%	1	0.38%
Control	132	52.80%	212	80.00%	262	99.62%
Sum	250		265		263	
Han Students						
Treat	9	47.37%	8	30.77%	0	0.38%
Control	10	52.63%	18	69.23%	25	100%
Sum	19		26		25	

* Proportion is the ratio of the treated group of the grade. For example, the treated Yi students in grade 7 versus the overall Yi students in grade 7.
Note: Table 2.13 presents the sample distribution without samples from the central junior high school regarding ethnicity, grade and exposure to the OVOP program.

Table 2.14 Preschool Attendance according to Student's Memory

	Grade 7		Grade 8		Grade 9	
	N	%	N	%	N	%
Yi Students						
Affiliated Preschool	87	37.50%	81	31.40%	13	0.05%
Other Preschool	50	22.32%	31	12.02%	22	0.08%
Never Attend	87	38.84%	146	56.59%	226	86.59%
Sum	224		258		261	
Han Students						
Affiliated Preschool	5	29.41%	9	37.50%	3	13.04%
Other Preschool	10	58.82%	4	16.67%	7	30.43%
Never Attend	2	11.76%	11	45.83%	13	56.52%
Sum	17		24		23	

* Proportion is the ratio of the treated group of its cohort.
Note: Table 2.14 presents the sample distribution without samples from the central junior high school regarding ethnicity, grade and the reported OVOP participation.

In addition to the ITT strategy, questions about preschool participation were designed based on students' recollections. Two sets of questions were used to help identify whether a student attended an OVOP preschool[31]: "How many years did you attend preschool?" and "Was the preschool built within a primary school?" The second question helps distinguish between regular preschools and OVOP preschools, as OVOP preschools often (though not always) use vacant rooms in primary schools as classrooms. Another question asked, "How old were you when you started kindergarten?" This question was designed to detect potential carelessness in student responses. However, it is important to recognize that student recollections are not a reliable method for identifying OVOP participation. The survey data revealed that 4.22% of students could not remember their preschool participation, and 21.64% reported starting preschool after the age of seven, which is unlikely.

The proportions of primary-school-based preschools shown in Table 2.14 indicate that OVOP participation rates are higher than the ITT exposure rates, except for those reported by grade 7 students. Several factors may explain this discrepancy. First, OVOP preschool recruitment did not strictly limit students based on their family addresses. Students from nearby villages or those who had relocated were allowed to attend OVOP preschools if their guardians committed to daily pick-ups (see the photo in Appendix I, Figure B.7.1). Second, the number of OVOP preschools located outside of primary schools increased over time as

[31]There were three or more regular preschools in central Mabian before the OVOP preschool program. However, no preschools existed in remote areas before OVOP.

the OVOP program expanded[32] (see the photo in Appendix I, Figure B.7.2), leading to a rise in the proportion of "other preschools" over time. Third, some students may have travelled to Mabian Central to attend private preschools, although this is likely rare.

Assuming that 10% of students attending "other preschools" were in Mabian Central and the rest attended individual OVOP preschools, the overall OVOP participation rate would be 39.07%, with rates of 36.84% for Yi students and 56.09% for Han students. This suggests that, in remote areas of Mabian, Han students are more likely to attend preschools than Yi students.

2.7 Socio-Emotional Skill

This section provides an overview of the socio-demographic distribution of socio-emotional skills and school engagement among the students in Mabian who participated in the survey. The analysis primarily explores the differences in socio-emotional skills and school engagement based on factors such as age, ethnicity, socio-economic status, and parenting style.

The focus is on samples from remote areas of Mabian, excluding those from Mabian Central School. The language gap between Yi and Han students is smaller in central areas because many Yi students speak Mandarin at home. As previously noted, the OVOP program mainly targets disadvantaged children. Including students from the central school could lead to underestimating the program's impact if the differences between the treatment and control groups are small. Conversely, it could overestimate the impact if Yi students perform better due to better school resources in central schools compared to remote schools.

Socio-emotional skills are measured using two scales in the survey: the Big Five domains and the Strengths and Difficulties Questionnaire (SDQ). Each domain of the Big Five personality traits—task performance, emotional regulation, engagement with others, collaboration, and open-mindedness—generates scores ranging from 0 to 10. The SDQ includes five subscales that assess difficulties in areas such as pro-social behaviour, hyperactivity, emotional symptoms, conduct problems, and peer problems. To ensure comparability between the scales, each sub-scale score was standardized to a 0 to 10 scale.

[32]These OVOP preschools might still use vacant classrooms from primary schools that were closed due to other policies (Guo et al., 2023).

2.7.1 OVOP Exposure

A key aim of the study is to assess the impact of the OVOP program on students' development of non-cognitive abilities. Table 2.15 illustrates the relationship between OVOP exposure and children's socio-emotional skills (SES) in remote areas of Mabian.

For the Big Five personality traits, children who attended the OVOP program showed the most improvement in task performance and open-mindedness, focusing on aspects such as self-control, responsibility, persistence, tolerance, and creativity.

According to the SDQ measurements, children exposed to the OVOP program experienced significant reductions in hyperactivity problems, demonstrated greater kindness towards others, and had fewer mental health issues compared to those in the control group. The marked differences in school engagement scores indicate that students who participated in the program performed much better than those who did not, which could positively affect their academic performance.

Overall, the results in Table 2.15 suggest that attending an OVOP preschool in early childhood is beneficial across various SES dimensions, consistent with findings from other studies on early childhood investment (Heckman et al., 2006; Moroni et al., 2019).

The positive outcomes of the OVOP program can be partly attributed to the preschool's teaching activities, which significantly enhance students' social skills, learning methods, hygiene habits, and mental health. For instance, during daily nap time, children are not allowed to walk around or play. Teachers gently explain to awake children that making noise would disturb their friends, encouraging them to lie quietly and try to sleep (see photo in Appendix I, Figure B.7.3). This practice helps develop self-control. Additionally, children are taught how to make friends and are encouraged to share toys in the classroom, fostering social skills in an environment with limited resources.

2.7.2 Exposure Duration

Socio-emotional skills are adaptable and can be shaped by biological and psychological development, environmental factors, individual efforts, and early childhood interventions (Heckman et al., 2006; Specht et al., 2014). This subsection compares the socio-emotional skills between two cohorts with different lengths of exposure to the program.

According to the survey data in Table 2.8, Cohort I, expected to be exposed to the OVOP program for one year, is in grade 8 of junior high school and aged 13 during the survey year. In contrast, Cohort H, exposed for two years, is in grade 7 and aged 12. Since the comparison is based on birth year rather than the year of schooling, there may be concerns about differences in cognitive abilities due to varying levels of schooling that could impact

Table 2.15 Exposure Differences in Socio-Emotional Skills

	Treatment Group	Control Group	Differences
Big Five Personality			
Task Performance	7.54 (1.08)	7.05 (1.07)	0.48***
Emotional Regulation	8.54 (1.25)	8.23 (1.37)	0.31*
Engaging with Others	7.33 (1.06)	6.97 (1.13)	0.36**
Collaboration	7.55 (1.06)	7.17 (0.99)	0.39***
Open-mindedness	7.37 (1.07)	6.97 (0.98)	0.41***
The Strengths and Difficulties Questionnaire (SDQ)			
Pro-social	5.78 (1.87)	5.27 (1.89)	0.52**
Hyperactivity	3.54 (2.08)	4.33 (1.90)	-0.79***
Emotional Symptoms	2.58 (1.90)	3.06 (2.09)	-0.47*
Conduct Problems	1.57 (1.14)	1.95 (1.19)	-0.38**
Peer Problems	2.76 (1.18)	2.69 (1.37)	0.07
School Engagement			
Affective Engagement	5.09 (1.63)	3.95 (1.83)	1.14***
Behavioral Engagement	6.81 (2.74)	5.02 (3.43)	1.79***
Cognitive Engagement	5.03 (3.26)	3.22 (3.24)	1.81***
Observations	67	403	

* ***p <0.01, **p <0.05, *p <0.1

Note: Table 2.15 presents the exposure differences in Socio-Emotional skill. The numbers of treatment and control groups are calculated in section 2.7.1. In the SDQ scale, the pro-social scores are counted positively and the rest subscales are counted negatively. The subscale total scores of Big Five personalities and SDQ are 10. The subscale total scores of School Engagement are 12, 20 and 24 respectively.

Table 2.16 Duration Differences in Socio-Emotional Skills

	One year Exposure	Two years Exposure	Difference
Big Five Personality			
Task Performance	6.71 (0.99)	7.56 (1.29)	0.85**
Emotional Regulation	8.71 (0.99)	8.75 (0.89)	0.04
Engaging with Others	6.57 (0.94)	7.58 (1.26)	1.01**
Collaboration	7.36 (0.74)	7.54 (1.22)	0.19
Open-mindedness	6.71 (0.73)	7.28 (1.54)	0.57
The Strengths and Difficulties Questionnaire (SDQ)			
Pro-social (+)	5.36 (1.55)	5.71 (2.24)	0.35
Hyperactivity (-)	4.71 (1.98)	3.32 (1.73)	-1.39**
Emotional Symptoms (-)	2.14 (1.46)	2.33 (1.63)	0.19
Conduct Problems (-)	1.86 (1.10)	1.24 (0.93)	-0.62*
Peer Problems (-)	3.14 (1.41)	2.54 (1.32)	-0.60
School Engagement			
Affective Engagement	3.64 (1.74)	4.72 (2.13)	1.08
Behavioral Engagement	4.64 (3.39)	7.36 (3.93)	2.72**
Cognitive Engagement	3.43 (1.99)	5.04 (4.64)	1.61
Observations	14	25	

* ***p <0.01, **p <0.05, *p <0.1

Note: Table 2.16 presents the exposure duration differences in Socio-Emotional skill. The exposure length of preschool can be estimated by the student's schooling age. In the SDQ scale, the pro-social scores are counted positively and the rest of the subscales are counted negatively. The subscale total scores of Big Five personalities and SDQ are 10. The subscale total scores of School Engagement are 12, 20 and 24 respectively.

socio-emotional skills. To mitigate this, samples of students who started school earlier or later than the expected ages were excluded.

Table 2.16 shows that students with two years of exposure to the OVOP program had higher socio-emotional skills than those with just one year of exposure. The differences in the Big Five traits reveal that the younger cohort achieved significantly higher scores in task performance and engagement with others compared to Cohort H. Thirteen-year-old students reported more concerns on the SDQ scale, except for emotional symptoms, which were not significant. Students with one year of OVOP exposure reported notably higher scores in hyperactivity and conduct problems than those with two years of exposure. The gap in school engagement scores indicates that younger students were more engaged in their studies compared to older students.

Overall, the results in Table 2.16 suggest that students perform better in task performance, engagement with others, hyperactivity, conduct problems, and class behaviour if they spend more time in the OVOP preschools.

2.7.3 Gender

Many studies have identified gender gaps in socio-emotional skills in developing countries. For example, Cunningham et al. (2016) and Balliet et al. (2011) found that females tend to be more collaborative than males in the labor market. DiPrete and Jennings (2012) found that girls are less likely than boys to have conduct problems in the classroom. This subsection examines the gender gap in socio-emotional skills among children in China's remote rural areas.

In Mabian's remote areas, 209 boys (44.47%) and 261 girls reported their socio-emotional skills[33]. The results in Table 2.17 reveal significant gender differences among students in these areas. Boys typically reported higher scores in emotional regulation but showed lower levels of social skills, including engagement with others, cooperation, and open-mindedness, compared to girls. Similarly, girls reported higher levels of pro-social behaviour but also more difficulties with emotional problems. While there is no significant difference in school engagement between boys and girls, girls' average school engagement scores were higher than those of boys.

[33]More boys were found to exhibit careless responses during data checks than girls, resulting in the deletion of 101 boy samples and 69 girl samples.

Table 2.17 Gender Differences in Socio-Emotional Skills

	Boys	Girls	Difference
Big Five Personality			
Task Performance	7.03	7.19	-0.16
	(1.14)	(1.04)	
Emotional Regulation	8.68	7.94	0.74***
	(1.19)	(1.40)	
Engaging with Others	6.89	7.12	-0.22**
	(1.18)	(1.06)	
Collaboration	7.13	7.29	-0.17*
	(1.02)	(0.99)	
Open-mindedness	6.89	7.14	-0.25***
	(1.06)	(0.95)	
The Strengths and Difficulties Questionnaire (SDQ)			
Pro-social	5.03	5.58	-0.55***
	(1.76)	(1.97)	
Hyperactivity	4.28	4.16	0.12
	(1.91)	(1.98)	
Emotional Symptoms	2.29	3.54	-1.24***
	(1.83)	(2.08)	
Conduct Problems	1.90	1.86	0.02
	(1.25)	(1.14)	
Peer Problems	2.76	2.66	0.10
	(1.37)	(1.32)	
School Engagement			
Affective Engagement	4.07	4.16	-0.08
	(1.83)	(1.87)	
Behavioral Engagement	5.06	5.46	-0.40
	(3.72)	(3.11)	
Cognitive Engagement	3.37	3.57	-0.20
	(3.49)	(3.14)	
Observations	209	261	

* ***p <0.01, **p <0.05, *p <0.1

Note: Table 2.17 presents the gender differences in Socio-Emotional skill. In the SDQ scale, the pro-social scores are counted positively and the rest of the subscales are counted negatively. The subscale total scores of Big Five personalities and SDQ are 10. The subscale total scores of School Engagement are 12, 20 and 24 respectively.

2.7.4 Family Background

Family background is often viewed as a confounding or heterogeneous factor when predicting cognitive and noncognitive abilities in social and emotional contexts (Haider and von Stumm, 2022). Shi et al. (2023) used OECD survey data and found that socioeconomic status positively influences socio-emotional skills, and that school resources can help mitigate negative effects for students from economically disadvantaged families.

Distinguishing socioeconomic status using a simple dichotomy can be challenging in economically disadvantaged areas. To address this, an index of socioeconomic status was created based on three factors: parental education level, financial situation, and family language level, weighted at 40%, 40%, and 20%, respectively.

Table 2.18 provides descriptive statistics on key variables related to family background. Overall, the parental education level in remote areas of Mabian is relatively low compared to other rural areas in China (Zhang et al., 2020; Zhao et al., 2017). Nearly half of the fathers and over 60% of the mothers in these remote areas have only a primary education or less, and the percentage of parents with a college degree or higher is below 6%. There are also significant disparities in education level, Mandarin proficiency, and Socio-Economic Status between Yi and Han parents. Yi adults are less likely than Han adults to have completed junior high school or higher education. While most Yi parents can communicate in basic Mandarin, 13% of fathers and 32% of mothers have poor Mandarin proficiency. The SES gap also shows that Yi students are in a more disadvantaged position compared to Han students in these remote areas.

Figure 2.1 illustrates the linear relationship between socioeconomic status and the socio-emotional skills (SES) of Yi students in remote areas of Mabian. Panel (a) shows that most of the Big Five personality traits are positively associated with family factors; however, relatively wealthier students are more likely to face well-being issues compared to those from less affluent families, and which results are contradictory to Bøe et al. (2012) and Grüning Parache et al. (2024). A literature review from Vukojević et al. (2017) found that children coming from lower SES families are more likely to manifest some psychosomatic symptoms. However, as Mabian is a relatively impoverished area where both income and education levels are below the poverty line, the results of this study which emphasise the disadvantaged ethnic minority groups are distinct from studies focusing on the general population. A plausible explanation for this result is that students from wealthier families are more likely to have parent(s) migrate outside and experience LBC problems, in other words, high-education-level parents have more opportunities to migrate outside and offer more financial support to their children but the absence of parental care result in a negative relationship with children's mental health.

Table 2.18 Sample Descriptive Statistics of Family Background

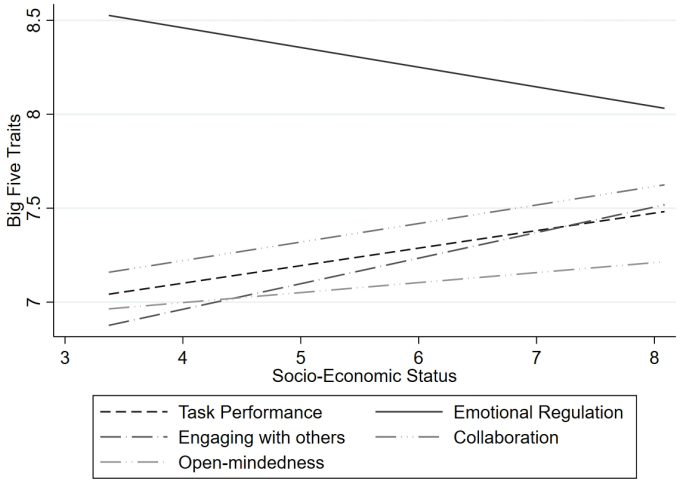
	Full Sample	Ethnic: Yi	Ethnic: Han	Differences
Father Education: Primary school or less	0.48	0.56	0.32	0.23***
	(0.50)	(0.50)	(0.47)	
Father Education: Junior high school	0.36	0.27	0.52	-0.24***
	(0.48)	(0.45)	(0.50)	
Father Education: High school	0.10	0.09	0.12	-0.03
	(0.30)	(0.29)	(0.33)	
Father Education: College and higher	0.06	0.04	0.06	0.03
	(0.23)	(0.24)	(0.19)	
Mother Education: Primary school or less	0.64	0.77	0.37	0.40***
	(0.48)	(0.42)	(0.49)	
Mother Education: Junior high school	0.27	0.16	0.48	-0.33***
	(0.44)	(0.36)	(0.50)	
Mother Education: High school	0.06	0.04	0.10	-0.06**
	(0.24)	(0.20)	(0.30)	
Mother Education: College and higher	0.03	0.03	0.05	-0.02
	(0.18)	(0.17)	(0.21)	
Father Mandarin Level: Native	0.42	0.23	0.80	-0.57***
	(0.49)	(0.42)	(0.40)	
Father Mandarin Level: Basic	0.49	0.64	0.20	0.44***
	(0.50)	(0.48)	(0.40)	
Father Mandarin Level: Bad	0.08	0.13	0	0.13***
	(0.28)	(0.33)	(0.00)	
Mother Mandarin Level: Native	0.37	0.16	0.80	-0.65***
	(0.48)	(0.36)	(0.40)	
Mother Mandarin Level: Basic	0.42	0.52	0.20	0.33***
	(0.49)	(0.50)	(0.40)	
Mother Mandarin Level: Bad	0.21	0.32	0	0.32***
	(0.41)	(0.47)	(0.00)	
Socio-Economic Status Index (Score 10)	5.18	4.84	5.79	-0.96***
	(0.92)	(0.87)	(0.63)	
Observations		315	155	

* ***p <0.01, **p <0.05, *p <0.1

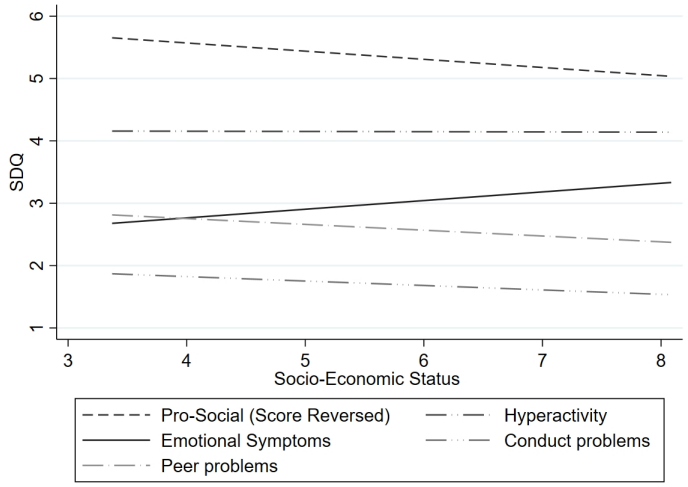
Note: Table 2.18 presents statistics of Mabian remote families. The statistics reported in the table are the sample means with standard deviations in parenthesis.

The differences in students' Strengths and Difficulties Questionnaire (SDQ) scores based on socioeconomic status, shown in Panel (b), are similar to those in Panel (a). Higher socioeconomic status is linked to fewer difficulties with pro-social behaviour, conduct issues, and peer problems but is associated with higher scores in emotional problems. Additionally, Panel (c) demonstrates that the differences in class behaviour and study methods according to socioeconomic status are more significant than those related to personality traits.

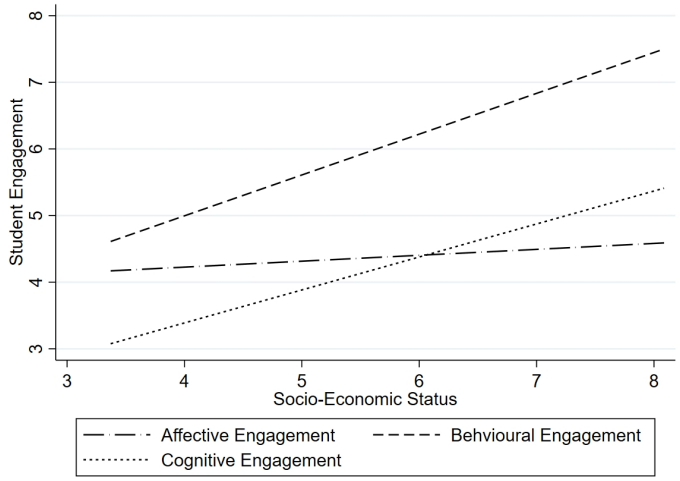
Fig. 2.1 The Family Socio-Economic Status and Socio-Emotional Skills



(a) Big Five Traits



(b) SDQ



(c) School Engagement

Notes: Figure 2.1 presents the relationships between socio-economic status and students' SES.

2.7.5 Parental Care and Parenting Style

Parents play a crucial role in developing children's socio-emotional skills, with daily parenting care and parenting style being the most studied factors in understanding their impact on child development.

Table 2.19 shows that parents in remote areas of Mabian are predominantly permissive, with only 10% following an authoritarian style. According to Zhang et al. (2020), authoritative parenting is the most common style in Chinese families, making up over 39%. In Ethiopia, a study found that the proportions of authoritarian, authoritative, and permissive parents were 35.2%, 41.6%, and 23.2%, respectively (Zena and Heeralal, 2021). These differences from earlier studies could be due to variations in both the cognitive and non-cognitive abilities of parents. When combining the education levels shown in Table 2.18 with the results in Figure 2.2, it becomes clear that while 63.32% of parents discuss their child's studies more than three times a week, only 20.93% check their child's homework as frequently. Interestingly, a slightly higher percentage of parents (25.69%) play with their children more than three times a week, suggesting that while they are engaged with their children, they may lack the necessary skills to provide academic support.

Table 2.19 Parenting Style in Mabian Remote Areas

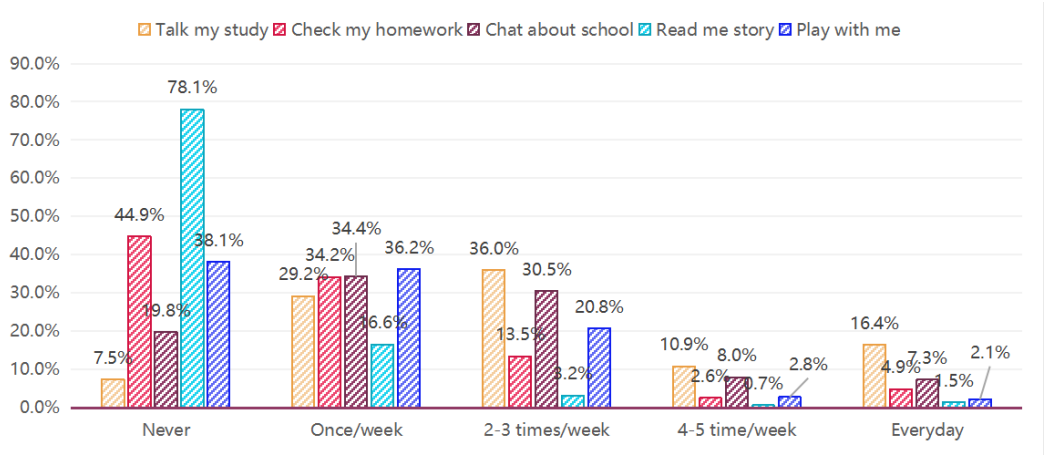
Parenting Style	Freq.	Percent
Authoritarian	49	10.56%
Authoritative	161	34.70%
Permissive	254	54.74%
Total	464	

Note: Table 2.19 presents the parenting style differences in Socio-Emotional skill.

Figure 2.3 shows the relationship between parental care and socio-emotional skills (SES). Generally, parents' involvement in their children's daily lives positively influences their development. The figure indicates that greater parental interaction is associated with better personality development; children who engage more with their parents tend to be more prosocial and have fewer behavioural and mental health issues. Panel (c) specifically highlights that cognitive school engagement is most strongly linked to parental involvement compared to other engagement measures. This is likely because effective learning habits and methods are often developed through parental guidance.

The findings in Table 2.20 further show that parenting style also affects children's SES. Overall, a permissive parenting style contributes to healthier SES development compared to

Fig. 2.2 Parental Care in Mabian Remote Areas



Notes: Figure 2.2 presents the frequency of parental care for children in Mabian remote areas.

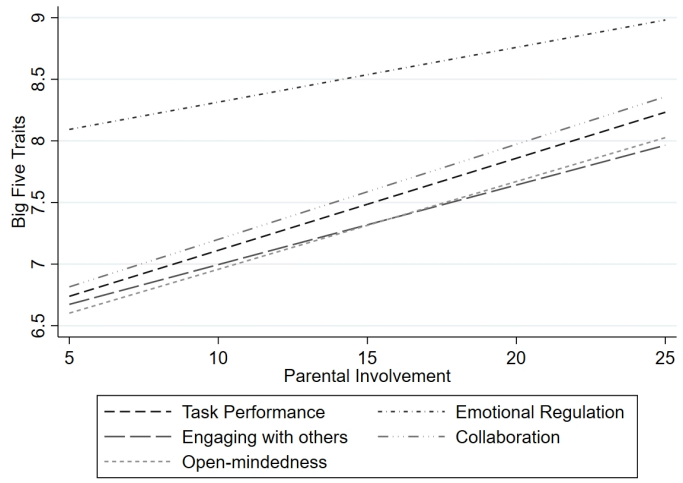
the other styles. In contrast, authoritarian parenting, characterized by strictness, negatively impacts children's well-being and school engagement, particularly in cognitive engagement. Students with authoritarian parents scored, on average, 30% lower in cognitive engagement than those with permissive parents.

2.8 Implications and Conclusion

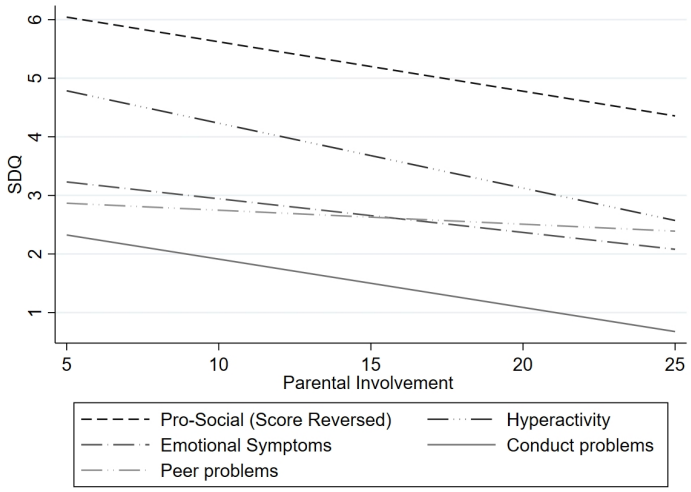
Education inequalities among ethnic minorities are a significant issue globally. This study aimed to measure how early childhood interventions can influence socio-emotional skills among ethnic minority children. Each scale used in the questionnaire was theoretically grounded and supported by empirical evidence. The quantitative results indicate that socio-emotional skills are adaptable, and the effects of interventions are lasting. The main contribution of this survey is demonstrating that early childhood interventions can help reduce inequalities in socio-emotional skills and learning habits, thereby narrowing the educational gap between different ethnic groups.

The findings show that the OVOP program has a positive effect on socio-emotional skills and school engagement. Extended participation in OVOP preschools enhances students' self-regulation skills, emphasizing the importance of early preschool enrollment. Introducing Mandarin language support in early childhood can help non-Mandarin-speaking children transition more smoothly into the formal education system.

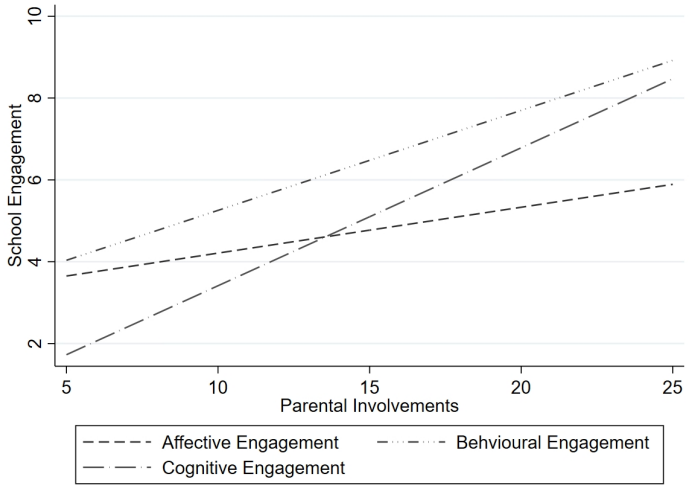
Fig. 2.3 The Frequency of Parental Involvement and Socio-Emotional Skills



(a) Big Five Traits



(b) SDQ



(c) School Engagement

Notes: Figure 2.3 presents the relationships between the frequency of parental involvement and students' SES.

Table 2.20 Parenting Style Differences in Socio-Emotional Skills

	Permissive	Authoritative	Authoritarian
Big Five Personality			
Task Performance	7.37	6.93	6.47
	(1.07)	(1.05)	(0.92)
Emotional Regulation	8.49	8.13	7.53
	(1.12)	(1.35)	(1.65)
Engaging with Others	7.19	6.85	6.72
	(1.11)	(1.08)	(1.20)
Collaboration	7.31	7.14	7.02
	(0.95)	(1.06)	(1.07)
Open-mindedness	7.15	6.92	6.78
	(1.02)	(0.95)	(1.07)
The Strengths and Difficulties Questionnaire (SDQ)			
Pro-social	5.37	5.25	5.45
	(1.71)	(2.10)	(2.17)
Hyperactivity	3.74	4.56	5.61
	(1.78)	(2.08)	(1.40)
Emotional Symptoms	2.69	3.23	3.94
	(1.98)	(2.03)	(2.31)
Conduct Problems	1.68	2.03	2.61
	(1.04)	(1.30)	(1.27)
Peer Problems	2.59	2.82	2.96
	(1.32)	(1.34)	(1.46)
School Engagement			
Affective Engagement	4.54	3.70	3.27
	(1.75)	(1.79)	(2.04)
Behavioral Engagement	6.06	4.61	3.46
	(3.47)	(3.16)	(2.66)
Cognitive Engagement	4.35	2.78	1.31
	(3.23)	(2.99)	(3.19)
Observations	254	161	49

Note: Table 2.20 presents the parenting style differences in Socio-Emotional skill. In the SDQ scale, the pro-social scores are counted positively and the rest of the subscales are counted negatively. The subscale total scores of Big Five personalities and SDQ are 10. The subscale total scores of School Engagement are 12, 20 and 24 respectively.

These findings also relate to immigration studies, underscoring that early exposure to schools in the destination area can help children build social connections with local peers by familiarizing them with local customs and culture.

Another key contribution of this survey addresses ethnic inequalities in remote areas. Parental involvement has a significant impact on children's socio-emotional skills. However, Yi children in Mabian receive significantly less parental support than Han children. Many Yi parents are not aware of how different parenting styles can influence their children's development. Policymakers should encourage and support parents to become more involved in their children's education.

In conclusion, early childhood programs like OVOP can play a crucial role in reducing educational inequalities, promoting better socio-emotional development, and enhancing school engagement, particularly among ethnic minority children in remote areas. The insights from this study can help inform policies and programs designed to create more equitable and effective education systems.

Appendix B

B.1 Questionnaire for the Survey (Translated in English)

Part A: Basic information

Table B.1.1 Questionnaire Part A: Basic information

Questions	Options
1. What is your gender?	A. Male B. Female
2. What is your date of birth?	( ) year ( ) month ( ) day [In number]
3. What is your ethnicity?	A. Han B. Yi C. Other ( )
4. What is your family address?	( )town ( )village
5. Provide long-term contact information (It can be WeChat id, phone number of you or your parents)	
6. Exclude yourself, how many siblings do you have? (cousins not include)	
7. How many are your elder brothers? younger brother? elder sisters? younger sisters?	
8. How many siblings are in the school?	
9. How far is your home from school?	
9a. What is the main transportation method?	A. walk B. bike C. bus D. car E. other
9b. How long?	
10. Do you live in school?	

Part B: Family information

Table B.1.2 Questionnaire Part B: Family information

Questions	Options
1. What is your mother's highest education level?	A. Primary school or below B. Junior high school C. High school D. College E. Undergraduate F. Postgraduate
2. What is your father's highest education level?	A. Primary school or below B. Junior high school C. High school D. College E. Undergraduate F. Postgraduate
3. What is your parents' marriage status?	A. Married B. Divorced C. Father remarried D. Mother remarried E. Father or Mother passed away F. Mother run away from home G. Other
4. Are your parents living at home?	A. Both live at home B. Father migrates outside for work, mother at home C. Mother migrates outside for work, father at home D. Both migrate outside for work E. Do not know/ Not sure
5. How is your parents' relationship?	A. Very good B. Good C. Well D. Bad E. Very bad
6. Do your parents quarrel a lot?	A. Never B. Seldom C. Sometimes D. Often E. Always
7. In the past month, how many times did you quarrel with your parents?	
8. In the past month, how many times did you talk with your parents?	

Questions	Options
1. Please choose three topics that you think you communicate with your parents the most.	A. Academic performance B. Future study C. School performance D. Teacher-classmate relationship E. Friendship social F. Romantic issue G. Social issues H. Your interests I. Your future job J. Other
2. Do your family have these situations? [Multiple]	A. Father or mother is severely disabled or seriously ill and is unable to work B. Father or mother has been out of touch for many years C. Mother or father has passed away D. None of the above exists (if choose D, you cannot choose the previous option)
3. Do your family have these things? [Multiple]	A. Washing machine B. Refrigerator C. Air conditioner D. Computer E. Water heater F. Charva G. Motorcycle/tricycle/battery car H. Car/truck I. None (if I is selected, the previous option cannot be selected)
3a. What do you think is the economic status of your family in your village/community?	A. Relatively good B. Average C. Relatively poor

Please answer the following questions according to your family situation before and now in primary school:

Question	Before Primary school	Now
1. Who takes care of you at home?	A. Grandparents / grandparents B. Father C. Mother D. Brothers and sisters E. Other relatives F. Other G. Can't remember	A. Grandparents / grandparents B. Father C. Mother D. Brothers and sisters E. Other relatives F. Other
2. What is the main building material of the house you live in?	A. Brick and cement B. Wood C. Stone D. Bamboo grass adobe E. Don't remember/don't know	A. Brick and cement B. Wood C. Stone D. Bamboo grass adobe E. Don't know
3. How many rooms do you have?	A. One room B. two rooms C. three rooms D. four rooms E. five rooms and above F. Don't remember	A. One room B. two rooms C. three rooms D. four rooms E. five rooms and above
4. Is there a separate room in your house for the toilet? (Outside the house does not count)	A. Yes B. No C. Don't know	A. Yes B. No C. Don't know
5. What's your floor made?	A. Soil B. Stone C. cement D. Tile E. Wood floor F. Don't remember/don't know	A. Soil B. Stone C. cement D. Tile E. Wood floor F. Don't remember/don't know
6. Does your family own a house in the Mabian Center, excluding rent?	A. Yes B. No	A. Yes B. No

Part C: Preschool Participation

Table B.1.3 Questionnaire Part C: Preschool Participation

Questions	Options
1. How many years have you been in kindergarten?	
Students who have attended kindergarten please answer questions 2 to 7 (students who have not attended kindergarten will not answer)	
2. How old were you when you started kindergarten?	
3. Remember when you were in kindergarten, was your kindergarten in a primary school?	A. Yes B. No C. Can't remember
4. Please recall when you were in kindergarten, what knowledge did you mainly learn? [Multiple]	A. Say hello in Mandarin B. Read and understand C. Tang poems and children's songs D. Painting E. Handmade F. Hygiene and safety habits G. Other H. Don't remember (if you choose H, you can't choose the previous option)
5. Remember when you were in kindergarten, how did your teachers teach?	A. The teacher was very conscientious B. The teacher didn't control us much C. Don't remember
6. Please recall when you were in kindergarten, did the teacher ask you to speak Chinese?	A. The teacher asked us to speak Chinese all the time B. The teacher could communicate with us in Yi language C. The teacher had no requirement on us D. Don't remember
7. Remember when you were in kindergarten, how much time did your teacher take you to play games?	A. Most of the time was playing with teacher B. Most of the time was played by myself C. I don't remember

Part D: Language

Table B.1.4 Questionnaire Part D: Language

1. Do you agree or disagree with the following description of your Mandarin proficiency?

I can state my home address clearly in Chinese	1. No problem at all 2. Need to think before telling 3. Need to think for a while 4. Not able to
I can ask the teacher questions about studying in Mandarin very clearly	1. No problem at all 2. Need to think before telling 3. Need to think for a while 4. Not able to
I can clearly understand the requests made by others in Mandarin	1. No problem at all 2. Need to think before telling 3. Need to think for a while 4. Not able to
I can express my ideas clearly in Mandarin	1. No problem at all 2. Need to think before telling 3. Need to think for a while 4. Not able to

Question	Options
2. When you were 6 years old, what was the main language you spoke with your family?	A. Mainly Yi B. Mainly Chinese C. mixed, half of each D. don't remember
3. What language do you usually speak at home with your family?	A. Mainly Yi B. Mainly Chinese C. mixed, half of each
4. Now at school, what language do you mainly speak when you play with your Yi classmates?	A. Mainly Yi B. Mainly Chinese C. mixed, half of each
5. How good is your father's Mandarin level?	A. Very fluent, no barrier in communication B. fluent, able to carry out basic communication C. average, able to use some commonly used phrases D. not fluent, speaking is difficult E. very awkward F. do not understand/do not know
6. How good is your mother's Mandarin level?	A. Very fluent, no barrier in communication B. fluent, able to carry out basic communication C. average, able to use some commonly used phrases D. not fluent, speaking is difficult E. very awkward F. do not understand/do not know
7. If your grandparents also live in your home, do you think they speak Mandarin fluently?	A. Very fluent, no barrier in communication B. fluent, able to carry out basic communication C. average, able to use some commonly used phrases D. not fluent, speaking is difficult E. very awkward F. do not understand/do not know
8. Which of these things do you do regularly (at least once a week)? [Multiple]	A. Take after-school classes to improve Chinese proficiency, Such as host, writing, etc. B. Use Chinese when talking to family and friends C. self-learning (reading extracurricular books, newspapers, magazines, comics, etc.) D. Learning Chinese through media/mobile phones/video recordings E. Have not done the above things (if you choose E, you cannot choose the previous option)
9. Do you have any trouble hanging out with friends of other ethnicities?	A. Sometimes there is a barrier in language B. Sometimes there is a barrier in life habits C. Sometimes there is a barrier in custom D. None (if you choose D, you can't choose the previous option)

Part E: Home Environment and Parental Care

Table B.1.5 Questionnaire Part E: Home Environment and Parental Care

Question	Options
1. What is your education expectation?	A. I don't want to continue now B. primary school graduation C. junior high school graduation D. High school, secondary school, technical school graduation E. University graduation F. I don't know/have no plan
2. How are your parents' education expectations of you?	A. I don't want to continue now B. primary school graduation C. junior high school graduation D. High school, secondary school, technical school graduation E. University graduation F. I don't know/have no plan
3. Who is the main person as your study tutor at home?	A. Parents B. Older brothers and sisters C. Other relatives D. People from the same village
4. How many extracurricular books do you have at home (excluding textbooks and problem books from school)?	
5. Currently, do you have any of the following study equipment in your home?	A. Desk and chair for study B. Desk lamp for study C. Dictionary D. Bookshelf E. None (if you choose E, you can't choose the previous option)
6. What's your plan after junior high school?	A. High school and want to go to college in the future B. vocational high school C. No longer want to go to school, want to work D. I haven't decided yet

Question	Agree	Disagree
Parent ask me reasons and discuss with me when I did something wrong		
Parent admit mistakes to me if they were wrong		
Parent talk to me nicely		
Parent praises me for behaving well		
Parent criticise me for behaving not well		
Parent talks to me when I feel unhappy		

Please answer the following questions based on the number of times you have communicated with your parents about school life since the beginning of the school year.

Question	Frenquency
Talk about my study	A. Never B. Once a week C. 2 to 3 times a week D.4 to 5 times a week E. Almost every day
Check my homework	A. Never B. Once a week C. 2 to 3 times a week D.4 to 5 times a week E. Almost every day
Chat about school	A. Never B. Once a week C. 2 to 3 times a week D.4 to 5 times a week E. Almost every day
Read me story	A. Never B. Once a week C. 2 to 3 times a week D.4 to 5 times a week E. Almost every day
Play with me	A. Never B. Once a week C. 2 to 3 times a week D.4 to 5 times a week E. Almost everyday

Question	Disagree	Agree	Fully Agree
My dad or any other adult male in the family respects my mom			
Everything in my house is neatly arranged and it is easy to find what I need			
I have a quiet place in my house where I can read and study			
I have enough books and study equipments			
Parent would beat me to force me to obey			
Parents do not punish me, I can do whatever you want			

Question	Disagree	Agree	Fully Agree
My family argued and fought a lot			
My family are alcoholic			
My family gambles (eg cards, mah-jongg and bets a lot of money)			
My parents just sit around doing nothing			

Part F: School Engagement

Table B.1.6 Questionnaire Part F: School Engagement

Question	Disagree	Agree	Fully Agree
I like to go to school			
I enjoy learning new things in class			
I think learning is boring			
Most mornings, I look forward to going to school			
I like to participate in extracurricular activities on campus, such as sports			
I always forget to bring things (such as pens, books, homework, etc.)			
My desk is always messy and I often can't find things or it takes a long time to find them			
I always forget what my teacher tells me to do after school			

Question	Fully Disagree	Disagree	Agree	Fully Agree
In class, I actively answer questions				
In class, I often gossip with classmates				
I pay attention in class				
When I'm in class, I just act like I'm working.				
When I'm in class, my mind wanders.				

Question	Fully Disagree	Disagree	Agree	Fully Agree
When I run into a difficult homework problem, I keep working at it until it is solved				
When I run into a difficult homework problem, I seek help from others. e.g. teachers, classmates				
When learning things for school, I often try to associate them with what I learnt in other classes about the same or similar things				
When I study, I figure out how the information might be useful in the real world				
I make up my own examples to help me understand the important concepts I learnt from school				
When reading aloud in the morning, I think about what I am reading				
I review what I have learned that day every day				
I have a set time every day to read aloud, such as morning reading				

Question	Options
1. Last week, how many times did you take the initiative to ask your teacher questions about study?	A. Never B. Once C. Twice D. 3 times or more
2. What do you think is the main difficulty in your study? [Multi]	A. I don't feel interesting or interested in studying B. I don't understand the teacher's Mandarin C. I don't understand the content of class D. I don't like the current teacher E. There is no one to answer questions F. There is not enough study time G. There is a lack of dictionaries, tutorial books and other learning materials H. There is no quiet study environment at home I. Other J. No difficulty(if you choose J, you cannot choose the previous option)
3. Are you currently serving as one of the following class leaders? [Multi]	A. Not serving as class leader B. Monitor C. Commissary in charge of studies D. Course representative E. Other
4. Which of the following class leaders did you serve when you were in primary school? [Multi]	A. Not serving as class leader B. Monitor C. Commissary in charge of studies D. Course representative E. Other
5. In what aspects do you find it difficult to learn Chinese?	A. The Mandarin language itself is a language barrier to me B. New words C. Reciting texts and poems D. Reading comprehension of poems and classical Chinese E. Reading comprehension of modern Chinese F. Writing G. All right to me
6. In what aspects do you find it difficult to learn English?	A. New words B. Reciting texts and sentences C. Listening D. Reading E. Writing F. All right to me

Part G: Pandemic

Table B.1.7 Questionnaire Part G: Pandemic

Question	Options
During the Internet class of the pandemic, how is the internet signal at your home?	A. The network signal is very good B. The signal occasionally has a problem and does not affect C. The signal is often very poor, very affects the class D. do not remember
What is the equipment for online classes at home during the pandemic?	A. Computer/tablet B. Phone C. Borrowed someone else's device D. Can't remember
In the pandemic Internet class, Do parents supervise your class?	A. Parents supervise me all the time B. Parents check on me occasionally C. Parents don't really care D. Don't remember

Part H: Social and Personality

Table B.1.8 Questionnaire Part H: Social and Personality

Question	Disagree	Agree	Fully Agree
I try to be nice to people. I care about their feelings			
I usually share with others (food, games, pens etc.)			
I am helpful if someone is hurt, upset or feeling ill			
I am kind to younger children			
I often volunteer to help others (parents, teachers, children)			
I cannot sit for a long time, always want to play outside			
I am constantly fidgeting or squirming			
I am easily distracted, and I find it difficult to concentrate			
I think before I do things			
I finish the things I'm doing. My attention is good			
I get a lot of headaches, stomach-aches or sickness			
I worry a lot			
I am often unhappy, downhearted or tearful			
I am nervous in new situations. I easily lose confidence			
I have many fears, I am easily scared			
I get very angry and often lose my temper			
I usually do as I am told			
I fight a lot. I can make other people do what I want			
I am often accused of cheating or lying			
I take things that are not mine from home, school or elsewhere			
I am usually on my own. I generally play alone or keep to myself			
I have one good friend or more			
Other people my age generally like me			
Other children or young people pick on or bully me			
I get on better with adults than with people my own age			

Question	Options
How many good friends do you have at school now?	
Please list the names of your five best friends in the same class as you (please fill in the names according to the rank of friendship with you).	
How is your patience in answering the questionnaire now?	A. Very patient, I filled in all the questions carefully and checked all the questions B. Patient, I filled in all the questions carefully but I do not want to check C. Average, I did not want to fill in the questions but I still insisted on the end D. Impatient, more than a quarter of the questions were filled in randomly E. completely impatient. More than half of the questions were filled in randomly

B.2 Item pool of questionnaire

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Table B.2.1 Examples items from the item pool

Survey/Scale pool	Example Items	Relevant Section
The European Social Survey (ESS)	How often do you use the internet on these or any other devices, whether for work or personal use? ;On a typical day, about how much time do you spend using the internet on a computer, tablet, smartphone or other device, whether for work or personal use?	Time allocation
The European Social Survey (ESS)	Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?; Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?; Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves?; All things considered, how satisfied are you with your life as a whole nowadays?; Taking all things together, how happy would you say you are?how often do you meet socially with friends, relatives or work colleagues?	Personality
The European Social Survey (ESS)	How about people of a different race or ethnic group from most [country] people?; Would you say it is generally bad or good for [country]'s economy that people come to live here from other countries?Would you say that [country]'s cultural life is generally undermined or enriched by people coming to live here from other countries?Is [country] made a worse or a better place to live by people coming to live here from other countries?; Do you feel you are part of the same race or ethnic group as most people in [country]?	Ethnicity

Table B.2.1 –

Table B.2.1 Examples items from the item pool

Survey/Scale pool	Example Items	Relevant Section
The European Social Survey (ESS)	How many people, if any, are there with whom you can discuss intimate and personal matters?	Making Firends
The European Social Survey (ESS)	How is your health in general?; Are you hampered in your daily activities in any way by any longstanding illness, or disability, infirmity or mental health problem?	Health
The European Social Survey (ESS)	What language or languages do you speak most often at home?	Language
The European Social Survey (ESS)	To what extent would you say that online and mobile communication.....makes people feel closer to one another?; To what extent would you say that online and mobile communication.....makes work and personal life interrupt each other?	Other
the National Longitudinal Survey of Youth 1979 cohort (NLSY79)	when you were a child, was any language, other than English ,spoken in your home?	Language

Table B.2.1 –

Table B.2.1 Examples items from the item pool

Survey/Scale pool	Example Items	Relevant Section
the National Longitudinal Survey of Youth 1979 cohort (NLSY79)	How close does child feel toward you?; How close does child feel toward his/her biological father/ stepfather?; Mother response to tantrum- Grounding; Spanking; Talke with child; Give child a household chore; Ignore it; Send child to room; Take away allowance; Take way Tv, phone or other privileges; Shor time-our; Other; If child brough home a report card with grades lower than expected, how likely would you be to contact his or her teacher or principal? to lecture the child? to keep a closer eye on child's activities? to punish child? to talk with child? to see child improves on his/her own? to tell child to study more? to help child with his/her homework more? to limit non-school activities? others?	Parenting Syle (Transfer to child angles)
the National Longitudinal Survey of Youth 1979 cohort (NLSY79)	Child expected to —-make his/her bed; clean room; clean up after spills; bathe him/herself; keep shard living areas clean and straight; do routine chores such as lawn, her with dinner, dishes; help manage his/her own time	Independence (Tansfer to child angles)
The National Longitudinal Survey of Youth 1979 cohort (NLSY79)	Home is not dark; Home is reasonably clean; Home is minimally cluttered	Home Environment

Table B.2.1 –

Table B.2.1 Examples items from the item pool

Survey/Scale pool	Example Items	Relevant Section
World Values Survey (WVS)	list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Good manners; Independence; Hard work; Feeling of responsibility; Imagination; Tolerance and respect for other people; Thrift, saving money and things; Determination, perseverance; Religious faith; Not being selfish (unselfishness); Obedience	Parenting Style
China Family studies Panel (CFPS)	I feel I'm valuable, at least not worse than others. ; I feel that I have many valuable qualities. ; After all, I consider myself a loser. ; I can do things well like most people. ; I feel I have few things to be proud of. ; I am positive about myself. ; Generally speaking, I am satisfied with myself. ; I hope to gain more respect for myself. ; I indeed often feel I am useless. ; I don't think I can solve the difficulties I am now facing by myself. ; I often think I am good for nothing. ; Sometimes I think I am forced to do things due to my hard life. ; I can control things that happen to me.; I often feel helpless in life.	Personality

Table B.2.1 –

Table B.2.1 Examples items from the item pool

Survey/Scale pool		Example Items	Relevant Section
China Panel (CFPS)	Family studies	One of my main goals in life is to make my parents be proud of me. ; I pursue my own goals rather than following others. ; I will try my best to make friends like me. ; I decide my own life goals. ; If I decide to do something, I will complete it no matter what.; Some children are born to be lucky.; Don't spend too much time striving since it will never prove effective.; It is nearly impossible to correct a mistake once you make one.; The best way to deal with a problem is not to think about it.; If something bad is about to happen, then it will happen no matter what you do.; I believe that planning in advance helps me to do things better.	Personality
China Panel (CFPS)	Family studies	The parents/guardians encouraged you to do things with great effort. ; The parents/guardians were gentle when talking to you. ; The parents/guardians encouraged you to think independently. ; The parents/guardians would tell you reasons when they asked you to do something. ; The parents/guardians liked to talk with you. ; The parents/guardians asked about what happened to you at school. ; The parents/guardians checked your homework. ; The parents/guardians helped you with your schoolwork. ; The parents/guardians told stories to you. ; The parents/guardians played with you [for example, playing chess or playing outside]. ; The parents/guardians praised you. ; The parents/guardians criticized you. ; The [father/mother] attended parent-teacher meetings at school.	Parenting Style

Table B.2.1 –

Table B.2.1 Examples items from the item pool

Survey/Scale pool	Example Items	Relevant Section
China Family Panel studies (CFPS)	Last month, how many times did you quarrel with your parents? ; Last month, how many times did your parents quarrel with each other?	Home Environment
China Family Panel studies (CFPS)	Feel depressed and cannot cheer up no matter what you are doing ; Feel nervous ; Feel upset and cannot remain calm ; Feel hopeless about the future ; Feel that everything is difficult ; Think life is meaningless	Mental-health
China Education Panel Survey (CEPS)	I would try my best to go to school even if I was not feeling very well or I had other reasons to stay at home. ; I would try my best to finish even the homework I dislike. ; I would try my best to finish my homework, even if it would take me quite a long time.; I was able to express myself clearly. ; I was able to give quick responses. ; I was a fast learner. ; I was curious about new stuff.	School Engagement Language Level
China Family Panel studies (CFPS)	In the past seven days, did you— feel blue? depressed? unhappy? not enjoying life? sad?	Mental-health
China Family Panel studies (CFPS)	My father often gets drunk.; My parents quarrel a lot. My parents get along very well.	Home Environment

Table B.2.1 –

Table B.2.1 Examples items from the item pool

Survey/Scale pool		Example Items	Relevant Section
China Panel (CFPS)	Family studies	Do you have a writing desk of your own at home?; How many books do your family own? (not including textbookds or magazines)	Home Environment
China Panel (CFPS)	Family studies	Do your parents care and are they strict with you about—- your homework and examination? your behaviour at school? attendances at school everyday? time when you get home everyday? whom you make friends with? your dress style? time you spend on the internet? time you spend on watching tv?	Parent-Child Relationship
China Panel (CFPS)	Family studies	How often do your parents discuss— the thing happened at school? the relationship between you and your firends? the relationship between your and your teachers? your feelings? your worries and troubles?	Parent-Child Relationship
China Panel (CFPS)	Family studies	What is the highest level of education your parents expect you to receive?	School Expectation

B.3 Survey Design: School Selection

Due to the Mabian unique geographical features and varying ethnic compositions across different regions, selecting schools for the survey posed some challenges. The use of pure probability random sampling at the school level could have led to a situation where selected schools predominantly contained students from mixed-ethnicity villages. This is because these schools had higher probabilities of being chosen, given their prevalence in Mabian Counties[1]. Such a situation would have created an identification problem for determining OVOP participation and could have introduced bias in estimating the impact of OVOP. Respondents from mixed-ethnicity schools were more likely to come from mixed-ethnicity villages and were thus more likely to have been exposed to a Mandarin language environment than children from Yi villages.

To address this issue, schools were selected using a judgmental sampling method, as recommended by Etikan and Bala (2017). Schools were carefully chosen based on specific criteria related to ethnic composition, school size, similarity to other schools, and geographical proximity. Table 6 displays the five schools that were selected for the survey.

Specifically, for School A: This central school was chosen because it enrols over 40% of the junior middle school students in Mabian. Despite the identification challenges associated with School A, studying it along with other less resource-centralized schools (such as Schools B, C, and D) may help in estimating the disparities between mixed-ethnicity areas Yi children and typical disadvantaged Yi children who both attended the OVOP program. For school B, C and D: These schools were chosen because the Yi students were dominant, with some schools having 100% Yi students, further enhancing the representation of the Yi ethnic group in the survey. For school E: This school was selected as it represents mixed-ethnicity schools in remote areas of Mabian and received fewer resources compared to School A. For school F, G and H: These schools were not chosen for the survey because they had a higher proportion of Han students, which could have identification concerns for the OVOP evaluation. Additionally, they shared similar characteristics regarding resource allocation and endowments with School A and E.

[1]There were 5 junior high schools out of 8 were mixed-ethnicity schools in Mabian. See in Table 2.7

B.4 Consent Form Content

Thank you for participating in the Survey on Social and Emotional Skills.

The purpose of this study is to assess the social and emotional skills of students in Mabian and to identify the factors within their family, school, and community environments that promote or hinder the development of these skills.

All information collected in this study will be kept strictly confidential. To ensure your privacy is protected, only aggregated results from the entire study will be analyzed and reported. No personal information will be disclosed to any individual or organization unless you provide written consent and authorization. Participation in this study is entirely voluntary. You may withdraw from the study or choose not to participate at any time. If you agree to participate, please proceed with the survey.

There are no "right" or "wrong" answers. Please try to answer each question to the best of your ability.

Consent to Participate:

By proceeding with the survey, you confirm that you have read and understood the above information, and you voluntarily agree to participate in this study.

B.5 Thank-you Card

Fig. B.5.1 The Thank-you Card

All teachers will receive a postcard and a small gift for the survey participation.

B.6 Special Items For Careless Problem Detection

The quality of survey data can be influenced by various factors, including respondents' tendencies to skip particular items or to provide inaccurate or incomplete answers. Respondents might skip questions due to a variety of reasons, such as saving an item for later and forgetting it, becoming bored during the survey, or finding certain questions embarrassing (Klaas et al., 2003).

In addition to strict quality control measures during questionnaire collection, such as reviewing responses to identify missed or forgotten answers, the questionnaire for this study included specific strategies to assess the cognitive ability of respondents to understand and answer the questions accurately. This approach aimed to ensure the reliability and validity of the collected data.

To achieve this, the questionnaire incorporated several sets of questions that had similar meanings but were phrased differently:

Set 1: Sibling Count

1. Excluding yourself, how many siblings do you have (common parents, not including cousins)? 2. Please write down the number of brothers, sisters, and siblings. 3. How many siblings do you currently have in school?

In this set, questions 1 and 2 were identical and aimed to test whether respondents answered the questionnaire attentively by comparing the numbers provided in question 2. Out of the total 1520 samples, 9 (0.59%) did not answer either question 1 or question 2 accurately. Question 3 served both as a useful statistical variable for further data analysis and as an indicator of respondents' cognitive ability in comprehending and responding to the questionnaire. Notably, 94 samples (6.18%) indicated that they did not know the answer to question 3, suggesting potential challenges in understanding subsequent questions that require a higher level of comprehension.

Set 2: Marital Status and Family Difficulties

1. what is the current marital status of your parents? A. In marriage B. Divorced C. Father remarries D. Mother remarries E. Father or mother dies F. Mother left home G. Other

2. Is there any of the following difficulties in your home? A. The father or mother is severely disabled or seriously ill and cannot work B. Mom or dad can't be contacted for years C. Father or mother has passed away D. None of the above conditions exist

In this set, option E in question 1 ("Father or mother dies") was similar to option C in question 2 ("Father or mother has passed away"). If respondents answered these two questions inconsistently, their responses could be indicative of careless filling. There were 30 instances where respondents' answers did not match between the two questions.

Set 3: School Engagement

I like school. I feel bored at school.

Set 4: Social Interaction

I usually play alone, not with other people. I have at least one good friend. How many good friends do you have at school now?

By incorporating such strategies, the questionnaire aimed to ensure that respondents engaged thoughtfully with the survey, minimizing errors, and enhancing the overall quality and reliability of the collected data. These measures contribute to the validity of the research findings and the meaningfulness of the conclusions drawn from the study.

B.7 Survey Photos

Fig. B.7.1 Preschool After School

Children walk home by themselves if live near the preschool. Guardians were required to pick up children daily if lived far from the preschool.

Fig. B.7.2 OVOP Preschool: Fengchan Village Yonghong Primary School Affiliated Preschool

Not all of the OVOP preschools were built inside of a local primary school. However, they were still affiliated to a local primary school which can be recognized from the names, though there could also be cases in which the preschool name does not show its superior primary school.

Fig. B.7.3 Noon Sleep

Kids are not allowed to walk and play around during sleep time. Teachers would nicely remind awake students that others are sleeping.

Fig. B.7.4 Daily Course: Painting

The OVOP preschool would provide stationery for kids to fill in colours on pictures. Teachers say this is children's favourite course.

Fig. B.7.5 Daily Course: Social and Emotional Skills

Teachers would teach basic social manners to kids. Not all OVOP preschools have screens and computers in the classroom. The screen shows how to be nice to friends.

Fig. B.7.6 Storybooks

All OVOP classrooms are equipped with storybooks. Children take reading courses twice a week.

Fig. B.7.7 Storybooks

All OVOP classrooms are equipped with storybooks. Children take reading courses twice a week.

Fig. B.7.8 Hygiene Area

Teachers teach hygiene habits which include washing hands before and after the toilet, and washing face in the morning.

Fig. B.7.9 Interviewers Read Questionnaire

Interviewers are required to read the questionnaire to participants. Because some students may be lost when answering the questionnaire by themselves.

Chapter 3

Impacts of Preschool on Education and Socio-Emotional Skills for Ethnic Minorities: Evidence from 'One Village One Preschool' Program in China

ABSTRACT

This paper evaluates the impact of a bilingual preschool program, the OVOP program, in a rural county in China on ethnic minority pupils' standardized test scores and junior students' socio-emotional skills, using both academic records and survey data collected by the research team. The findings show that preschool enrollment has significant and persistent effects on academic performance during the primary school years. While ethnic minority children benefit from the OVOP program, their gains are slightly less than those of ethnic majority children. The program's effects are stronger for children who are exposed to it at an earlier age, and there is no evidence of gender gaps in academic performance following the preschool intervention. Participation in the OVOP program also enhances socio-emotional skills and school engagement. Further analysis of ethnic minority subgroups indicates that family language environments are positive predictors of academic success. Additionally, the effects of the preschool program on different cohorts of students have increased over time, likely due to the growing experience, effectiveness, and resources of the OVOP program.

3.1 Introduction

It is estimated that more than half of the world's population is bilingual due to ethnic reasons (Grosjean, 2022), which implies that bilingual education deserves significant attention because proficiency in the official language is positively related to many important outcomes, including educational attainment, medical care access, mental health, and career development (Chiswick and Miller, 2015; Dollmann et al., 2024; Dustmann and Fabbri, 2003; Lindley, 2002; Lu and Myerson, 2020; Wang et al., 2019a). Moreover, the integration of ethnic minorities across countries can promote social mobility and healthy economic growth (Damm et al., 2022).

Educational attainment is vital for integrating ethnic minorities, and many multi-ethnic countries, including the United States (Batalova and McHugh, 2010; Escamilla et al., 2014; Steele et al., 2017), Canada (Baker, 2011), and some European nations (Palacios-Hidalgo et al., 2021), recognize the challenges faced by minority children with limited proficiency in the official language. These countries have created programs, such as the Bilingual Education Act of 1968, to support these children in school. Similarly, China, with its diverse ethnic groups and languages, has promoted bilingual education for decades (Cai and Li, 2015; Chen et al., 2019; Geary and Pan, 2003; Li et al., 2022), teaching Mandarin as a second language from primary school. However, ethnic minority students who are not exposed to Mandarin before primary school acquire language skills more slowly than Han students, who learn Mandarin from birth, leading to ongoing educational inequalities (Campos et al., 2016; Chen et al., 2019; Postiglione, 2009). It is expected that additional education can help bridge these gaps (Campos et al., 2016; Wan and Jun, 2008).

This paper evaluates the "One Village One Preschool" (OVOP) program, an experimental preschool launched in Mabian in 2014, a remote and impoverished county in Sichuan province, China. The program aims to help thousands of ethnic minority children, specifically those from the Yi ethnic group, master Mandarin and develop positive life habits before entering primary school. In addition to contributing to children's human capital and school success, the implementation of OVOP in Mabian provides insights into the effects of early childhood second language acquisition[1]. By combining academic records data with designed survey data, this paper examines the short- and medium-term effects of the OVOP program on students' academic performance and socio-emotional skills, considering the language barriers faced by ethnic minority children.

Many researchers have examined the effects of bilingual educational policies on specific language groups (Baker, 2011; Han, 2012; Lindholm-Leary and Block, 2010), yet there is

[1]Research suggests that the optimal period for mastering a second language is before age 7 (Flege et al., 1999; Johnson and Newport, 1989; Zhang, 2009), making preschool a crucial time for language learning.

limited research reflecting on students' academic performance and socio-emotional skills, particularly in preschool program evaluations. The underlying rationale for the OVOP program is to teach ethnic minority students Mandarin at an early age so that they do not fall behind in their learning when entering primary school.

Although numerous studies have examined the performance of students or adults in preschool programs (Anderberg and Olympiou, 2023; Bailey et al., 2021; Barnett and Frede, 2017; DeMalach and Schlosser, 2024; Gray-Lobe et al., 2023), most have been short-term or long-term studies that, due to data constraints, could not fully explain the trajectory of students' human capital development and its underlying mechanisms. Additionally, Gándara et al. (2017) found that many studies showing no difference or less positive effects for bilingual instruction were based on very short-term analyses. Our study addresses this limitation by utilizing the roll-out of the OVOP program, which provides Mandarin exposure to age-eligible students in registered-born villages in a rural county in China, Mabian. The OVOP Mabian program[2] is the earliest dual-language immersion program in rural China. Our study represents the largest ethnic minority program in rural China that we are aware of; the longitudinal primary school academic records allow us to track students across various preschools (town central preschools versus remote preschools) for up to six years. We also conducted a survey on junior high school students who were the main beneficiaries of the initial phase of the OVOP program (from 2014 to 2016) and examined their socio-emotional skills in the context of different family socio-economic statuses and language environments.

This article addresses these gaps by asking: How do Yi students benefit from the OVOP program? How do Han students perform within the practices and policies of a racially diverse preschool dual-language learning program? What challenges do policymakers face in striving to offer educational equity to Yi students?

We then explain the theoretical framework of the study, describing its methodology and site. We first estimated the intention-to-treat (ITT) effect of the OVOP program by developing a difference-in-difference model using administrative data, which included the Chinese and Math scores of all pupils in Mabian County. The empirical identification strategy for measuring OVOP exposure was constructed by combining the geographic timing of OVOP introduction data with the age-eligible students' family addresses from the administrative data. Variation in program exposure primarily resulted from some children being too old for OVOP and never being treated when the program was introduced in their village, or from some children not being treated because there was no OVOP preschool in their village even though they were age-eligible. Conversely, other children were exposed to the OVOP

[2]There are other OVOP programs in China, such as in Qinghai province (Chen et al., 2019), but Mandarin immersion is not the primary goal of OVOP Qinghai.

program, who were sufficiently young when the preschool was introduced. We validated the identifying strategy by controlling for town-by-birth-year fixed effects and presenting other policies related to students' education in Mabian.

The main findings of this study show that the "One Village One Preschool" (OVOP) program significantly boosted students' academic performance, learning habits, and socio-emotional skills. Students in the OVOP program scored about 15% of a standard deviation higher in reading and math than their peers in each grade. However, the improvement was slightly less for Yi students compared to Han students, possibly due to the Yi language-speaking family environment, which can create educational challenges because of linguistic and cultural differences. The study also found that children who joined the OVOP program at a younger age benefited more, highlighting the importance of early exposure to a Mandarin-speaking environment.

The analysis also shows that the benefits of the OVOP program go beyond immediate academic improvements. The program helps develop students' personality skills and academic engagement over time. These socio-emotional skills are important as they play a key role in children's long-term development and success.

The study also points out the uneven distribution of educational resources between central and remote areas in Mabian. While the program was beneficial for all students, those in remote areas with fewer resources showed less significant improvement, indicating that the most disadvantaged groups need further attention. This finding emphasizes the importance of providing equal access to quality early childhood education to reduce educational inequalities.

Last, the findings suggest that the program's impact has increased over time. Younger cohorts benefit more from access to the OVOP program in terms of their academic performance. This is likely due to more resources, better teaching materials, and greater teacher experience in bilingual education.

The first contribution of this paper is to expand the understanding of how dual-language preschool programs impact reading and math test scores among ethnic minorities. Examining how language proficiency influences education is as crucial as exploring how it addresses educational inequality. The second contribution lies in analyzing ethnic assimilation and integration in the context of language proficiency's effects on personality and school engagement. This research is rare in the literature on language acquisition and personality. Therefore, by considering the effects of language acquisition on integration vis-à-vis segregation, this paper also explains how language barriers influence ethnic segregation. Third, China offers a particularly intriguing case for analysis. While most previous research has focused on developed countries, similar effects are likely to be observed in developing nations. There

is still a lack of empirical evidence from multi-ethnic developing countries such as India (Kulkarni-Joshi, 2019), Peru (Cueto et al., 2009), and various African nations (Good, 2017).

3.2 Literature Review

3.2.1 Bilingual Immersion Education

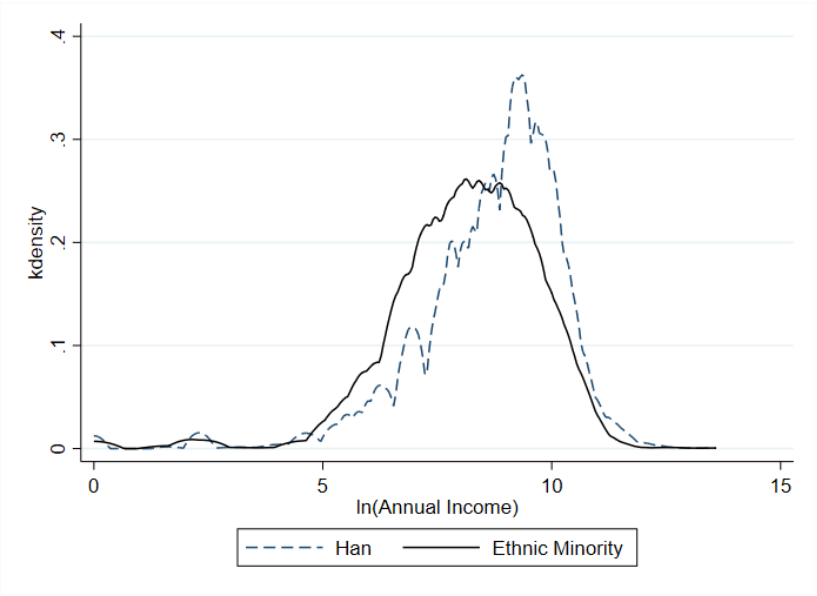
Most bilinguals are not just immigrants whose children are born in a new country, but also local ethnic minorities whose first language is different from the official language of their country. In the United States, about one in five students speak a language other than English at home (Batalova and McHugh, 2010). Although there are no exact figures for the bilingual population in China, there were 780,000 ethnic minority bilinguals with college degrees or higher, compared to 113 million Mandarin speakers with the same education level (Ma, 2017).

Language barriers related to family language and ethnicity put these individuals at a disadvantage in accessing equal opportunities for education, healthcare, and jobs (Chiswick and Miller, 2015). For example, Gil and Ceja (2015) found that Latinx students have lower educational outcomes than their white peers. Figure 3.1 shows the income distribution of Han (the majority ethnic group) and other minority groups in China. According to the China Family Panel Survey 2010, ethnic minorities earned less than Han people.

Among the various intervention models, dual-language programs are widely regarded by practitioners and scholars as effective in reducing some of the inequalities faced by ethnic minorities (Steele et al., 2017). The success of these programs has been shown in different contexts, such as English-Spanish (Barnett et al., 2007), English-Italian (Montanari, 2014), English-Mandarin (Padilla et al., 2013), and Hebrew-Russian (Schwartz, 2014). A long-term study following students from kindergarten to high school found that those in dual-language programs outperformed their peers in English proficiency and language arts compared to students in English-only programs (Umansky and Reardon, 2014). Other studies have also found that bilingualism leads to higher literacy and math performance (Fielding and Harbon, 2022; Genesee et al., 2006; Lindholm-Leary, 2017; Lindholm-Leary and Block, 2010), lower high school dropout rates, better career positions (Rumbaut, 2014; Xu and Liu, 2023), higher college attendance (Santibañez and Zárate, 2014), and greater government cost efficiency (Steele et al., 2018).

Grosjean (2022) argued that exposure to a language and culture can influence students' personalities, as using a second language may activate behaviour patterns that align with the cultural norms of that language (Chen and Bond, 2010).

Fig. 3.1 Income Distribution of Ethnics Minorities in China in 2010



Data Source: China Family Panel Studies 2010, CFPS.

Note: Figure 3.1 presents the annual income distribution of Han and other ethnic minorities in China.

However, not all bilinguals benefit equally from bilingual programs. For example, Macdonald (2022) found that Spanish bilingualism is associated with lower earnings compared to English monolinguals. Concerns about the quality of bilingual programs often focus on two main issues: the shortage of fully trained teachers (Gándara et al., 2017) and the persistence of family attitudes and language use at home (Boutin-Martinez et al., 2019). In the context of Mabian, interviews from the survey also revealed a shortage of qualified teachers, but due to data limitations, this issue is not explored further in the analysis. However, the mechanism analysis shows that the family language environment negatively affects students' academic performance.

Persistent ethnic inequalities highlight the urgent need for researchers and practitioners to understand the challenges dual language learning faces in providing equitable education to ethnic minorities. Addressing these challenges is crucial for considering racial dynamics when designing educational programs and policies, thereby increasing the potential of dual language learning to promote equitable education for ethnic minorities.

Although empirical studies have provided valuable insights and there is growing interest in this area (Escamilla et al., 2014), few have specifically focused on dual-language learning at the preschool level. Language skills are most effectively developed through extensive communicative exchanges (Chater and Christiansen, 2018), and according to language skill

formation theory (Chater and Christiansen, 2018), dual-language preschools likely offer the most effective approach for dual language learning education.

3.2.2 Preschool Programs

Research on the effects of preschool programs is extensive, with much evidence from public programs indicating that initial test score improvements often fade over time (Bailey et al., 2017, 2021; Deming, 2009; Miller et al., 2023).

Gray-Lobe et al. (2023) estimated the causal effects of public preschool on college participation, test scores, and behavioural outcomes using an instrumental variable (IV) approach based on each student's likelihood of receiving a preschool offer, considering their preferences and priorities. Their findings suggest that preschool enrollment improved college enrollment and graduation rates but had no impact on academic achievement or behavioural outcomes during primary, middle, and high school. Additionally, they did not identify race as a source of heterogeneous effects.

Some studies have sought to explain the fade-out pattern by decomposing preschool effects using various methods. Heckman et al. (2013) used longitudinal data to examine the impact of the Perry Preschool program on adult outcomes. They initially observed a fade-out effect on IQ test scores but found that personality skills developed through the program persistently reduced externalizing behaviours. This highlights the importance of cognitive ability in achieving long-term success. Andersen et al. (2022) offered three explanations for the fade-out phenomenon through theoretical and empirical analysis. First, they showed how statistical measurement can create an artefact fade-out effect when comparing different cohorts with non-comparable standardized test scores. They also demonstrated that skill formation is influenced by factors like family background, which affects self-productivity. Finally, they noted that the skill growth curves differ between treated and control groups, suggesting that while initial effects may fade, treated students still maintain a consistent advantage over time.

Han (2012) investigated the relationship between bilingual education and students' academic progress from kindergarten to fifth grade using a large U.S. national dataset of over 16,000 Hispanic, Asian, and White children. However, the study did not specifically control for the effects of particular education programs. The findings revealed that non-English-speaking students initially scored lower in both English and math compared to native English speakers at the start of primary school, even if they had attended kindergarten. Despite this, the achievement gaps narrowed by the fifth grade.

Many studies have reported high returns on investment in preschool programs for disadvantaged children from low-income families, showing both short-term and long-term benefits

in academic performance, educational attainment (Cascio, 2023), problem behaviour, juvenile arrests (Reynolds et al., 2010), socioeconomic status, and human capital (Bailey et al., 2021). However, several questions remain unanswered, especially in developing countries: Which populations benefit most from early childhood education? How should investments be made, and what intensity of intervention is needed? Can successful programs be scaled up from small-scale pilots to broader implementations? These questions are explored in this paper.

3.3 Institutional Background

3.3.1 Background of Language Barriers for Ethnic Minority Children

China has made significant efforts to expand access to early childhood education (ECE) in rural areas, particularly in disadvantaged, poverty-stricken villages where early education resources were previously lacking (Chen et al., 2019). Studies have demonstrated the educational and social benefits of these preschools and kindergartens (Li et al., 2015; Lu et al., 2020; Zhang, 2017). However, early interventions have largely overlooked children with special needs and those from ethnic minority groups.

This research focuses on a large group of disadvantaged ethnic minority children whose natural language is not Mandarin, the official language of China. Before starting primary school, these children primarily use their native languages for daily communication. Their academic success is often hindered by language barriers, as they struggle to learn Mandarin, the language of instruction and textbooks, with limited social and economic resources when entering primary school.

3.3.2 Background of Mabian

Mabian Yi Autonomous County, commonly known as Mabian, is located in Leshan City, Sichuan Province, in southwest China (see Figure 3.2). It is part of Liangshan Yi Autonomous Prefecture, the largest Yi community and one of the most impoverished regions in China (Ting and Sundararajan, 2017). According to the 2010 census, the Yi ethnic minority made up 0.65% (8,714,393) of China's population, with 25.55% (2,226,755) residing in Liangshan Yi Autonomous Prefecture in Sichuan Province[3]. Mabian spans about 2,293 square kilometres and has a population of approximately 228,000, of which 53.3% are Yi ethnic people. The county's mountainous areas make up 87.6%.

[3]Many Yi people primarily live in the provinces of Sichuan, Yunnan, and Guizhou, with smaller populations in Guangxi (Harrell, 1990).

Yi and Han are the two main ethnic groups in Mabian. The Yi, a minority ethnic group in China, comprised 47.51% (about 94,000 people) of Mabian's approximately 200,000 population[4]. Meanwhile, the Han, the majority ethnic group in China[5], accounted for 51.45% (around 113,000 people) of the population in 2011[6] (Huang, 2016).

Instead of speaking Mandarin, Yi people primarily speak their own language, the Yi language[7], which they use at home, during festivals, and in religious activities. Since the Chinese Democratic Reforms of 1956, the Yi language has not been used in schools in Mabian (Harrell, 2001), making formal education more aligned with Han culture than Yi culture[8]. However, since most modern infrastructures, such as education, skilled jobs, and social media, rely on Mandarin, this has contributed significantly to the socioeconomic disadvantages experienced by the Yi people (Wang et al., 2020b).

The challenging geographic features of Mabian, its surrounding hills and underdeveloped transportation facilities, are widely believed to have restricted local economic growth. Mabian was designated a national-level poverty-stricken county in China in 1984 (Yang et al., 2019)[9]. In 2014, 25.91% of households were living below the poverty line (Zhang and He, 2020)[10].

In 2015, 98 out of 115 villages in Mabian were classified as poverty-stricken by Sichuan province[11]. Only five villages had developed into urban areas (one in Rongding, one in Xiaxi, and three in Minjian), and the weighted average urbanization rate among the 20 towns was just 13.3%. Appendix Table C.1.1 provides details on Mabian's administrative divisions[12].

[4]According to (Harrell, 1990), Han farmers migrated to Yi Autonomous areas on a large scale in the early nineteenth century.

[5]Han is the largest ethnic group in China. In 2020, all other 55 national minorities made up only 8.89% of the total Chinese population (China National Bureau of Statistics, http://www.stats.gov.cn/tjsj/tjgb/rkpcgb/qgrkpcgb/202106/t20210628_1818821.html).

[6]More than 30 minority ethnic groups live in Mabian. Besides the Yi, the Miao are the second-largest minority group in Mabian, making up 1.8% (around 1,700 people) of the population in 2011 (Huang, 2016).

[7]Bradley (1979) classifies the Yi languages as Nuosu and Lipou. Mabian Yi people speak Nuosu, the Northern Yi language, rather than Lipou, the central Yi language.

[8]Yi students can learn the Yi language in primary school and junior school but not compulsory.

[9]Mabian experienced rapid economic growth starting in 2014 and was no longer classified as a poverty-stricken county in 2020 (Sichuan Government, https://www.sc.gov.cn/10462/c103045/2020/2/18/17b5754ca0e2431f8d34a3d7e5363788.shtml).

[10]In 2011, the Central Conference on Poverty Alleviation and Development in China set the national poverty line for rural areas at 2,300 yuan per capita per year (about 350 USD), which is higher than the World Bank's poverty threshold of 1.9 USD a day (2011 PPP) (World Bank, https://data.worldbank.org/topic/poverty).

[11]Leshan Government, https://sxczx.leshan.gov.cn/sfpkfj/gzxx/201910/4b1fd5b47a8e49b496fa8568d4adfd5c.shtml

[12]Villages in Mabian have undergone several changes in administrative divisions, with the most recent in 2020 (Sichuan Government, https://mzt.sc.gov.cn/scmzt/gsgg/2020/5/19/0d335569ad8947788aa9861bb22d4102.shtml). Since the data presented in this study is from 2016, the study follows the administrative divisions of Mabian as recorded in 2016 (Huang, 2016).

Fig. 3.2 The Location of Mabian Yi Autonomous County

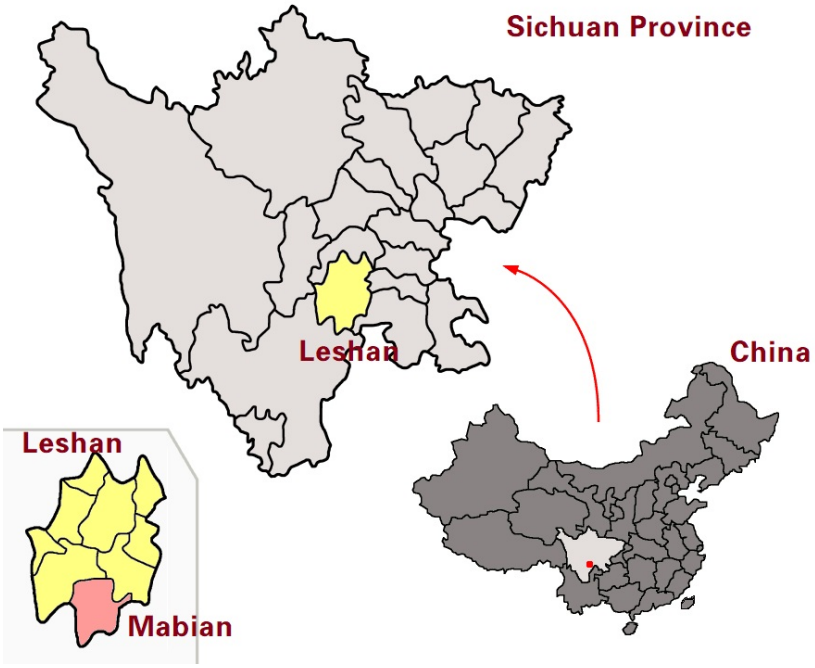


Figure Source: Google Wikipedia.

Note: Figure 3.2 illustrates the location of Mabian county in China.

As shown in Appendix Figure C.1.1, a smaller proportion of Han people live in the western parts of Mabian compared to the eastern parts, likely because the western side has more hills, which are associated with transportation and resource limitations. Public transportation is also limited, with no bus service available; residents must travel by foot, motorcycle, or car. To reach the central area from a village, people often have to ask for information about available rides. These regional characteristics significantly restrict communication and mobility. The village road construction was completed only six months before May 2023 (when the survey of the paper began). Despite this, driving from each school still takes a significant amount of time.

In these villages, some have been exposed to Han culture in addition to their indigenous traditions, while others remain largely untouched, depending on geographical and historical factors (Ting and Sundararajan, 2017)[13][14].

Zhang et al. (2010) found that cultural, customary, and linguistic differences between the Yi and Han contributed to the financial struggles of most Yi families. Yi people tend to spend significant amounts on family events such as weddings, funerals, and religious activities, but invest little in children's education. In 2009, the average education level of Yi people was 3.9 years. There were 28% of Yi people who never got an education and 70% only completed junior middle school or below (Zhang et al., 2010). Most Yi people in Mabian could not recognize Chinese Mandarin characters and were unable to communicate in Mandarin with Han people, which further widened the socioeconomic gap between the two ethnicities.

The scarcity of educational resources and lack of efforts for improvement have fundamentally impacted the education level of the population in Mabian. Most people in Mabian are unable to attend college and even those who do rarely return to contribute to the development of Mabian (Yang et al., 2019). Consequently, developing Mabian into an economically and culturally prosperous area has been nearly impossible due to insufficient investment, skilled professionals, and teachers.

[13]For instance, interviews from Ting and Sundararajan (2017) reveal that Yi males are traditionally only allowed to marry women of the same caste to maintain their family lineage within the social hierarchy.

[14]According to Harrell (1990), there are three main types of Yi-Han communities in China. The first type consists of Yi communities that are isolated from Han society and are culturally distinct, with differences in language and customs. In the second type, Yi and Han people live completely intermixed and share the same culture, although their distinct ethnic identities are recognized and accepted by everyone involved. The third type includes communities where people classified as Yi are culturally identical to the Han but live separately. Although they are officially classified as Yi, these individuals do not identify as Yi; instead, they refer to themselves as the *shuitian zu* or "rice-field people."

3.3.3 Children's Education in Mabian

Mandarin, the official language of China, is the primary language used in schools, both in classroom instruction and textbooks. However, it is not widely spoken among the Yi people, most of whom cannot read or even speak Mandarin and instead only speak the Yi language (Wang et al., 2020b; Zhang et al., 2010). Experts suggest that the optimal age for mastering a second language is before 6 or 7 years old, with the ability to learn diminishing with age (De Houwer, 1999; Flege et al., 1999; Hu, 2016; Johnson and Newport, 1989). However, Yi children typically do not begin learning Mandarin until they start school at age 7 or older, especially if their parents do not speak Mandarin, putting them at a significant disadvantage in terms of language skills and educational background.

Many Yi students suspend or drop out of school due to poor academic performance. While the reasons for this are complex and may include financial difficulties, language barriers, cultural conflicts with Han peers and teachers, and parental beliefs that education is not valuable (Qubie and Li, 2020), there is a consensus that language barriers are the most significant obstacle preventing minority groups from achieving educational equality. These language challenges are seen as a critical cause of persistent poverty among these groups (Qubie and Li, 2020; Tan, 2018; Yang, 2020; Zhang and Bian, 2018).

In this context, learning Mandarin before primary school could be the most effective way to reduce educational inequality for children from non-Mandarin-speaking families. However, prior to the implementation of the OVOP program, only children living in urbanized areas[15] in Mabian had access to preschool[16]. In more remote rural areas, young children, mostly Yi, were half as likely to attend centre-based kindergartens and would only speak the Yi language before starting primary school. There were only 417 kids who received preschool education in 2013 with only 9 kindergartens available in Mabian[17]. Having missed the optimal period for learning a second language—before age 7—there were concerns about their ability to succeed in school.

Yi students are as smart as Han students. One fieldwork reported that most Yi pupils can only recite but don't understand the meaning of poems in textbooks and rarely would a Yi child acquire high scores in school (Qubie and Li, 2020). But they also found that Yi kids

[15]Rural areas in China, such as Mabian, often have urbanized towns within a county. Townships are the basic units of political division in rural China and typically govern both the town itself and several neighbouring villages. Towns are generally more populous, wealthier, and less remote than villages, while villages tend to be more impoverished (Chen et al., 2019).

[16]Urbanized areas are usually mixed communities of Han and Yi, where Yi children do not face language barriers because their parents can also speak Mandarin with locals. Han people, on the other hand, typically do not learn or speak the Yi language unless there are special circumstances.

[17](Sichuan Government, http://www.moe.gov.cn/jyb_xwfb/xw_zt/moe_357/jyzt_2019n/2019_zt27/jyjs/sichuan/201911/t20191101_406504.html)

would actually understand knowledge well from class if it was explained in Yi language, which implies that Yi children are intelligently as same as Han children.

3.3.4 "One village, One preschool" Program (OVOP)

"One village, One preschool" literally means one village should provide at least one preschool with free early education and nutritional supplements to 3-5-year-old children living in rural mountainous regions. OVOP itself is not a specific program but a model, which now is one of the most popular models in rural early childhood education development in China. It is notable that OVOP in this study is a different but similar program to OVOP in Chen et al. (2019) [18].

OVOP aims to help children learn Mandarin and develop good life habits before the primary stage, which has now been promoted in 51 rural poverty-stricken and high-ratio minority-ethnic counties/cities in Sichuan province. Distinguished from similar early childhood programs, it primarily targeted originally non-Mandarin-speaking children, but Han students who lived in mixed ethnic communities were also encouraged to attend OVOP. Local governments would usually flexibly build more than one preschool in each village based on the local population (Tan, 2018).

Launch of OVOP in Mabian

To help high-ratio ethnic minority areas effectively accumulate human capital resources and mitigate the risk factors that many non-Han children face in poverty-stricken places, Mabian was the first county to trail OVOP in 2014. OVOP preschools were sponsored by the Sichuan Government with 700 yuan per capita per year (around 110 USD) which included textbooks and tuition fees, an extra 3 yuan per capita per day (around 0.45 USD) as lunch expenses for children and 2000 yuan per capita per month (around 310 USD) as salary for teachers. Before the OVOP program, there were only 8 kindergartens in Mabian, which were mainly distributed in villages with less proportion of Yi people. As shown in Appendix Table A.1 column 6, over 90% of villages in Mabian could not provide proper access to preschool education before OVOP [19]. Similar to the program in Chen et al. (2019), children can get free education and nutrition from preschool. Most preschools were of small scale and were simply refurbished from previously existing vacant office rooms or activity rooms which

[18]The program in Chen et al. (2019) was conducted in another poverty-stricken county, Ledu, in Qinghai province and was founded by a different institution, and language barrier problem was not obvious in Ledu.

[19]According to Lu et al. (2020), preschool education was unavailable in 67% of administrative villages (400 thousand out of 590 thousand villages) amongst China countrywide in 2017.

were belonged to primary schools or governments, only 19 were newly built preschools [20]. The quality of infrastructures and teacher training in remote villages do not match those of kindergartens in the county centre, Mabian. Students learn Mandarin and basic social manners in preschool. Other curricula are flexibly designed based on the teacher's skills such as math, art and dance. Teachers are mainly recruited from local high school degree people. In addition, the OVOP is not a bilingual program and students are encouraged to speak Mandarin but teachers may occasionally explain in Yi language in private.

Mabian established respectively 73, 34 and 33 new open kindergartens from 2014 to 2016. It is reported that all Yi kids can get access to the free preschool resources in 2016[21]. Detailed data on the ages of OVOP participants from 2014 to 2016 are reported in Table 3.1, using data from OVOP records provided by the Mabian government. The table shows that in full-year OVOP programs from 2014 to 2021, three-year-old children increased from below 10 per cent to 20 per cent and four-year-old children increased from 20 per cent to 38 per cent, while approximately 40 per cent of participants were aged five, and the proportion of children aged six or older dramatically decreased from over 20 per cent to 0.46 per cent[22]. Overall, participants doubled during the implementation years from 2014 to 2016 and climbed slowly after 2016, when the implementation was basically finished.

Though the program mainly targets Yi children, Han students are encouraged to attend as well. In this diverse context, this language combination results in preschool classrooms with more than half Yi students and half Han students, while in some pure Yi villages, the Han student proportion can be zero.

[20] http://mb.leshan.cn/Item/47391.aspx

[21] http://www.leshan.cn/html/view/view_D502AFE23643C9D0.html

[22] Normally, preschools would admit 3-to-5-year-olds and the length is three years. However, many primary-age children would still stay in preschool until 7, because of the poor transportation conditions in Mabian. Children who are living far away from school have to wait until they are old enough to go to school by themselves. Parents are less likely to send children to primary school every day as many parents were working outside of Mabian. In this case, some kids may stay in the program longer than the regulation years.

Table 3.1 Age Distributions of OVOP Participants

	2014	2015	2016	2017	2019	2020	2021
Younger than 3	0.00%	0.00%	0.33%	0.27%	0.12%	0.92%	0.00%
3 Years Old	23.0%	8.08%	10.62%	14.66%	13.84%	22.10%	20.50%
4 Years Old		23.37%	27.11%	27.85%	28.87%	37.05%	38.69%
5 Years Old	76.96%	45.20%	42.54%	38.34%	42.46%	37.38%	40.33%
6 Years Old and Above		23.35%	19.41%	18.89%	14.72%	2.55%	0.46%
Total	2,773	3,491	4,615	4,823	4,290	5,131	5,425

Data Source: Mabian OVOP Data.

Note: Table 3.1 presents the number of students in different age groups in each year. The data for 2018 is lost.

3.4 Data and Design

3.4.1 The OVOP Implementation Data

This study collected the address of each OVOP preschool that was launched in Mabian between 2014 to 2016, which would allow us to identify the exposure of OVOP in this study. The address list shows that Mabian launched 73, 34 and 33 OVOP preschools from 2014 to 2016. Almost all children were exposed to the program in 2016 when the program implementation was finished. Unfortunately, the name lists of OVOP participants from 2014 to 2019 are not available, thus this paper cannot estimate the average treatment effects (ATE) of OVOP, instead, we estimate the intent-to-treat effects (ITT) by combining preschool address data with student information, which will be discussed in the next subsection.

3.4.2 Administrative Academic Records

The administrative data recording Mabian pupils' academic performance are available after 2016 because local schools began taking united exams for primary students with identical standardized scoring rules and started to record in 2016. The data from 2016 to 2021 is available for analysis. The register records which contain family address information allow us to identify the exposure strategy of the OVOP by matching the location village of each street with the village of each OVOP preschool. We use this matched information to identify the intent-to-treat exposure as the OVOP preschool was not mandatory and the attendance lists are not available.

This restricted data includes all students, 41,194 participants, from 28 schools in Mabian regarding their gender, ethnicity, birth date, home address, grade and most importantly, their

reading and math test scores in semesters from the 2016 autumn to 2022 spring. This sample size reflects the exclusion of 4992 children from migrated children, missing academic values, missing home addresses and other outliers. [23]

Overall, Mabian data is distinguished and superior in three ways when analysing the exposure of preschool education to minority ethnic children when compared with other preschool policy literature. Firstly, as shown in Figure 3.3, Mabian is a typical mixed ethnic community, which stays in a transitional area between Yi and Han people, which provides a unique advantage for comparing effects on two ethnic children under one framework. Secondly, united exams and marking among all schools alleviate the concerns of incompatible exam paper situations and scoring problems such as the case in Perry Project (Barnett, 1992). Last but not least, Mabian was the first county in the Sichuan province to experiment OVOP program, which implies that the impacts of quasi-experiments are less likely to be influenced by neighbour counties or cities. The drawback of the data is that children's family backgrounds are not available. Similar to the situation in Bailey et al. (2021), this lack of information constraints the study to model treatment effect heterogeneity by childhood characteristics. However, by combining family address data and Google Maps, this study is still able to shed light on mechanisms of OVOP effects from the perspective of the community.

3.4.3 OVOP Survey Data

The longitudinal academic records have the benefit of providing a large dataset and allow us to analyse nuanced subgroups, such as Yi students living in remote areas. However, the academic data cannot provide students' background information, such as family socio-economic status. In addition, the survey data have the benefit of allowing us to analyse more closely the OVOP participation rates for children and gauge the treatment-effects-on-the-treated (ATET) of the OVOP program.

We surveyed the initial exposed cohorts, who were in the middle school stage, in May of 2023. For example, if a child was 5 years old in 2014 and the OVOP preschool was implemented in his/her village, the child is potentially exposed to the OVOP program for one year and is expected to be in grade 8 in the 2023 survey year. Due to budget reasons, the survey's sampling strategy was designed to account for the complex demographics of Mabian schools and ensure the representation of diverse schools and classes. This strategy combined judgmental sampling at the town and school levels with systematic random sampling at the class level.

[23]There is no tradition for a child in Mabian to be sent to a neighbouring county/city preschool with better resources and attend a primary school in Mabian. Because transportation and financial conditions do not allow people to do so. Detailed reasons are presented in Section 2.

Fig. 3.3 Mabian Yi Autonomous County Locates in a Yi-Han Transitional Area

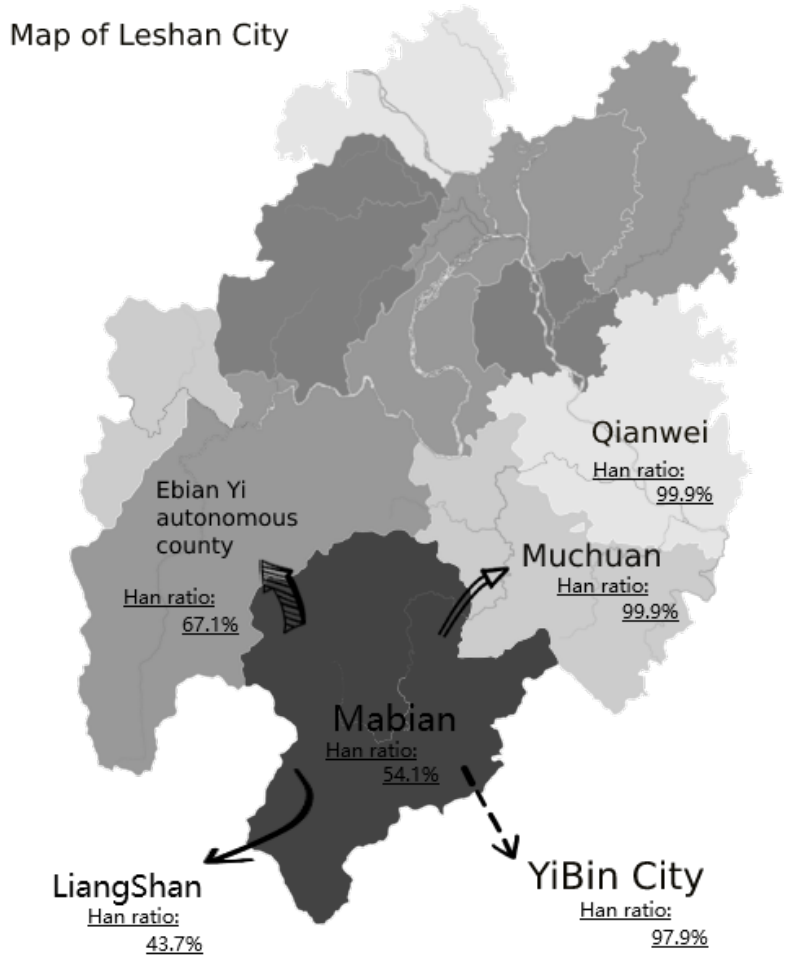


Figure Source: Google Wikipedia.

Note: Figure 3.3 presents the location and ethnicity proportion of Mabian and neighbouring counties/cities. The proportions of Han people are cited from Huang (2016). Mabian is a typical mixed ethnic community, which stays in a transitional area between Yi and Han people, which provides a unique advantage for comparing effects on two ethnic children under one framework.

A total of 1,520 students[24] were included in the survey. The survey collected students' information on demographic data, preschool participation, family language environment, family socio-economic status, parental daily care, parenting style, school engagement and behaviour, personality, and best friends' names.

3.4.4 Identification Strategy: Measuring Exposure to OVOP

Due to the lack of participant lists for the OVOP program, estimating the Average Treatment Effects (ATE) of OVOP is not possible. Instead, this paper evaluates the program by estimating the Intent-to-Treat (ITT) effects. OVOP exposure for individuals was measured by combining data on the program's launch, the addresses of preschools, and students' family addresses from administrative records. Age-eligible children were identified based on whether they would have been exposed to the OVOP program when an OVOP kindergarten opened in their registered village[25]. The exposure indicator is set to 1 if an age-eligible child's registered family address, which includes the village name, matches the location of the OVOP preschool. Specifically, a child is considered potentially exposed if they are between 3 to 5 (or 6) years old[26] before September 1st of the year when an OVOP preschool was launched in their village.

Table 3.2 displays the exposure distribution for each cohort. The dotted lines help interpret the distribution results. For instance, if a child starts primary school at age six and is in grade 2 in 2016, the child would be 7 years old in that year and therefore 5 years old in 2014. As noted earlier, children aged 3 to 5 are considered age-eligible for OVOP preschools. This means that a child who was 5 years old in 2014 would be in the first cohort potentially exposed to the OVOP program, and if a preschool was available in their village, the child would be exposed to the OVOP program for one year[27]. Accordingly, Table 3.2 shows that about 29% of the first cohort was exposed to the OVOP program.

For the second cohort, exposure could include children who were 4 years old in 2014 and those who were 5 years old in 2015, meaning this cohort could potentially be exposed to the OVOP program for one or two years. Table 3.2 indicates that around 54% of the second cohort was exposed to the OVOP program. Since the implementation of the OVOP was completed in 2016, it would be expected that the third cohort would have 100% exposure to the program. However, as noted in the previous section, not all children start primary school

[24]Students who could not finish the questionnaire independently were not included in the survey. For example, those with disabilities that influenced their ability to complete the questionnaire.

[25]Age eligibility is determined by birth date and the entry cutoff date—September 1st of each year.

[26]Table 3.1 shows that 20% of students over 6 years old were enrolled in OVOP preschools.

[27]Note that even though the child was 4 years old in 2013, there were no preschools available that year.

Table 3.2 Distribution of the OVOP Exposure in Each Year

	Wave					
	2016	2017	2018	2019	2020	2021
Grade 1	54.63%	77.70%	89.23%	87.43%	94.33%	-
Grade 2	29.08%	54.21%	77.86%	84.69%	90.17%	-
Grade 3	0.06%	29.12%	54.07%	73.73%	84.87%	90.86%
Grade 4	0.05%	0.05%	29.12%	53.09%	74.29%	84.59%
Grade 5	0.02%	0.04%	0.06%	29.57%	52.84%	74.07%
Grade 6	0.00%	0.02%	0.06%	0.08%	29.60%	51.71%
Observations (Semester 1)	18102	19081	19572	7670	21617	19205
Observations (Semester 2)	18013	18962	19585	20831	21251	-

Data Source: Mabian Academic Records. Records of grade 4 to grade 6 in wave 2020 semester 1 are missing. Records of grade 1 and grade 2 in wave 2022 semester 1 are missing.
Note: Table 3.2 presents the proportion of students exposed to the OVOP in each cohort. The proportions are the average rates of exposure in the two academic semesters of each wave. The three dotted lines present the three cohorts that experienced the roll-out of the OVOP program. If a child starts primary school at age six and is in grade 2 in 2016, the child would be 7 years old in that year and therefore 5 years old in 2014. As noted earlier, children aged 3 to 5 are considered age-eligible for OVOP preschools. This means that a child who was 5 years old in 2014 would be in the first cohort potentially exposed to the OVOP program, and if a preschool was available in their village, the child would be exposed to the OVOP program for one year. In addition, the child was expected to be in grade 8 in our survey in the year 2023.

at age six. The proportion of exposure is reduced because some children start school at age 7 or even 8 (Appendix Table C.2.1 shows the distribution of school entry ages).

3.4.5 Outcomes of Interest

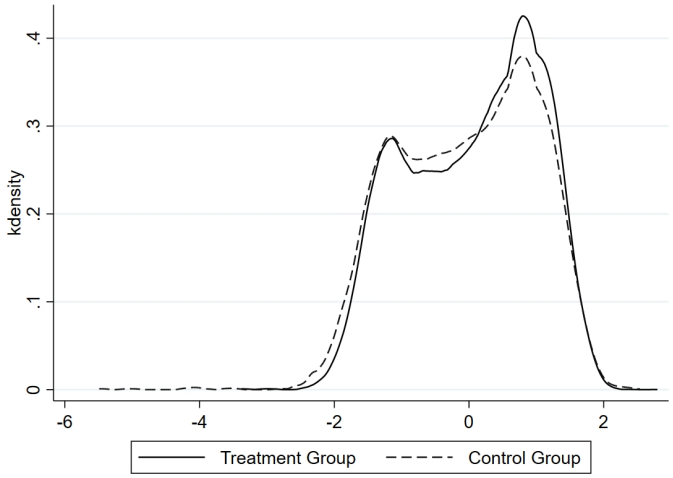
The focus of interest is on the effects of exposure on students' academic performance and socio-emotional skills. Academic performance data were obtained from school administrative records, while socio-emotional skills were measured using survey data.

Academic Performance

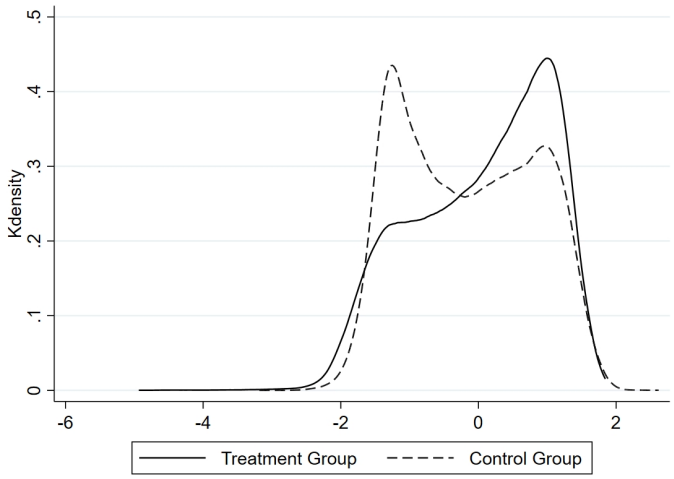
The outcomes of interest are children's standardized academic performance in primary school from Grade 1 to Grade 6, specifically their scores in Chinese and math. In the primary stage, Mandarin learning requires students to be able to recognize, read, and write 600 commonly used Chinese characters, as well as to listen and communicate in Mandarin. For mathematics, students need to master basic arithmetic and understand fundamental measurements, such as kilograms, kilometres, and hours (Ministry of Education of China, 2011a,b). There is no doubt that the primary school curriculum is important, serving as the foundation for future learning.

Figure 3.4 provides graphical evidence of the impact of OVOP programs on Chinese and math scores. There are clear differences between the treatment and control groups in all graphs, indicating that exposure to OVOP provides overall benefits to local children. Additionally, a comparison of Chinese scores between Yi and Han students in Figure 3.5 and Figure 3.6 reveals a bi-modal distribution among Yi students. The peak score for Yi students, representing excellence (around 0.5 standard deviations), is slightly lower than that of Han students (around 1.2 standard deviations). In the same comparison, a higher proportion of Han students achieved high exam scores, while there was only a slight difference between the two groups among those who did not perform well. Finally, math exam performance showed similar differences between the groups. Overall, though both Han and Yi students who were exposed to the OVOP program performed better than the control group students, the magnitude of the 'advantage' of Yi students is smaller than that of Han students.

Fig. 3.4 Distribution of Scores



(a) Chinese

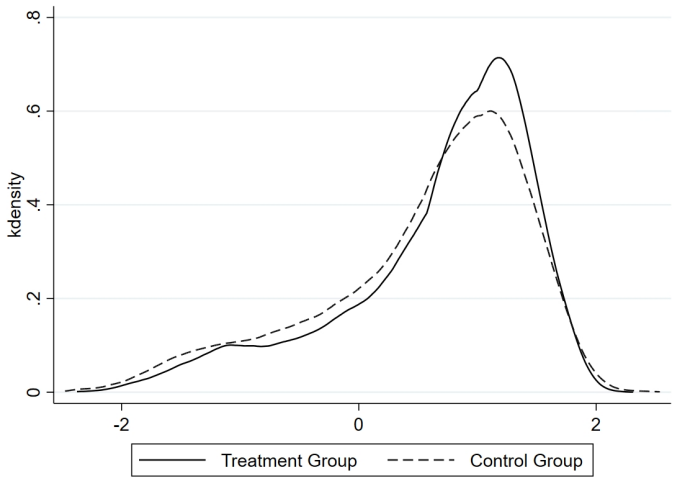


(b) Math

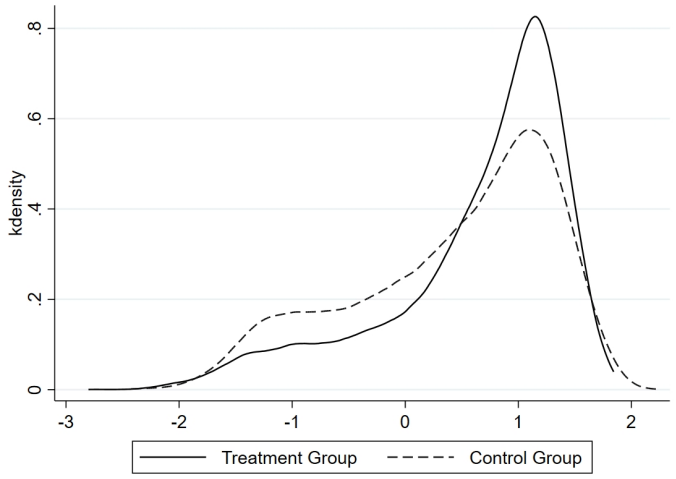
Data Source: Mabian Academic Records.

Note: Figure 3.4 presents the distribution of standardized Chinese and Math scores.

Fig. 3.5 Distribution of Scores of Han students



(a) Chinese

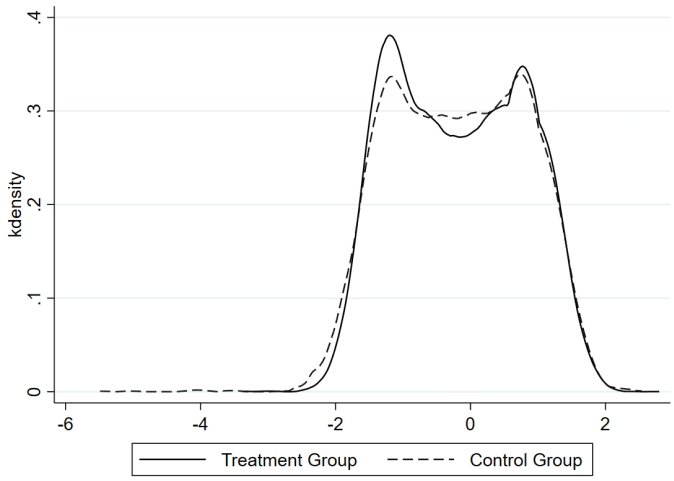


(b) Math

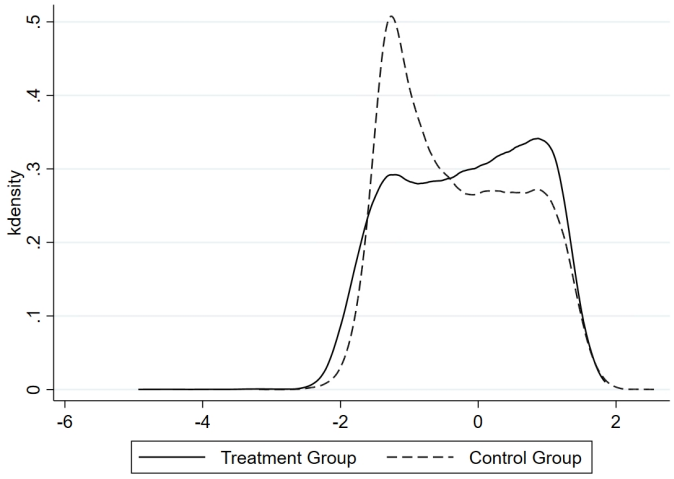
Data Source: Mabian Academic Records.

Note: Figure 3.5 presents the distribution of Han students' standardized Chinese and Math scores.

Fig. 3.6 Distribution of Scores of Yi students



(a) Chinese



(b) Math

Data Source: Mabian Academic Records.

Note: Figure 3.6 presents the distribution of Yi students' standardized Chinese and Math scores.

Socio-Emotional Skills

To assess the mid-term effects of the OVOP program, a survey was conducted on the two initial cohorts that benefited, who were expected to be in grades 7 and 8 in junior school (as shown in Table 3.2). The survey evaluated students' socio-emotional skills across three areas: the Big Five personality traits (BFI), the Strengths and Difficulties Questionnaire (SDQ),

and School Engagement. Table 3.3 presents the status of the students' socio-emotional level. The means and standard deviations of the Big Five domains, SDQ subscales and school engagement for the two treatment and control groups are shown in the table.

The "Big Five Inventory" (BFI) measures personality traits across five dimensions: task performance, emotional regulation, open-mindedness, collaboration, and engagement with others. Each dimension is scored out of 10, based on a series of questions.

As can be seen from Table 3.3, students exposed to the OVOP program outperformed in all domains of BF-I than the control group. The magnitude of the mean personality profile of the junior students was very similar to that of the Chinese teenager and U.S. college student sample in Zhang et al. (2022).

The SDQ is a concise screening tool that assesses emotional and behavioural aspects of children, such as Attention Deficit Hyperactivity Disorder (ADHD) and young people's mental health, including Autism Spectrum Disorder (ASD). It uses five problem scales: emotional symptoms, conduct problems, hyperactivity, peer relationship issues, and prosocial behaviour. Each scale includes five items with three response options, ranging from 0 ('not true') to 2 ('certainly true').

The second panel of Table 3.3 presents the descriptive statistics for the five difficulty scales of junior students in both the treatment and control groups. The results show that, except for peer problems, students exposed to the OVOP program are less likely to exhibit hyperactivity problems, emotional problems and conduct problems. Students who attended the OVOP were more prosocial than those who did not. In addition, the average scores for peer problems (around 3) and hyperactivity (around 4) are much lower than those of 11-year-olds in the UK, who have average scores of about 8.8 and 7, respectively, as reported in (Moroni et al., 2019), which means Mabian students are less likely to have the above problems than the UK students.

School engagement skills are measured through three subscales: affective/emotional engagement, which reflects students' feelings about learning; behavioural engagement, which refers to their effort and persistence in schoolwork; and cognitive engagement, which assesses the cognitive strategies students use during learning.

The bottom panel of Table 3.3 provides the descriptive statistics for different measures of children's school engagement in both the treatment and control groups. The results indicate that children who participated in the OVOP program have statistically significantly higher levels of affective, behavioural and cognitive engagement compared to those who were not exposed.

Table 3.3 Statistics of Socio-Emotional Skills Level

	Treatment Group	Control Group	Differences
Big Five Personality			
Task Performance	7.54	7.05	0.48***
	(1.08)	(1.07)	
Emotional Regulation	8.54	8.23	0.31*
	(1.25)	(1.37)	
Engaging with Others	7.33	6.97	0.36**
	(1.06)	(1.13)	
Collaboration	7.55	7.17	0.39***
	(1.06)	(0.99)	
Open-mindedness	7.37	6.97	0.41***
	(1.07)	(0.98)	
The Strengths and Difficulties Questionnaire (SDQ)			
Pro-social	5.78	5.27	0.52**
	(1.87)	(1.89)	
Hyperactivity	3.54	4.33	-0.79***
	(2.08)	(1.90)	
Emotional Symptoms	2.58	3.06	-0.47*
	(1.90)	(2.09)	
Conduct Problems	1.57	1.95	-0.38**
	(1.14)	(1.19)	
Peer Problems	2.76	2.69	0.07
	(1.18)	(1.37)	
School Engagement			
Affective Engagement	5.09	3.95	1.14***
	(1.63)	(1.83)	
Behavioral Engagement	6.81	5.02	1.79***
	(2.74)	(3.43)	
Cognitive Engagement	5.03	3.22	1.81***
	(3.26)	(3.24)	
Observations	67	403	

* ***p <0.01, **p <0.05, *p <0.1

Data Source: Mabian Survey Data.

Note: Table 3.3 presents the exposure differences in Social and emotional skills. In the SDQ scale, the pro-social scores are counted positively and the rest subscales are counted negatively. The subscale total scores of Big Five personalities and SDQ are 10. The subscale total scores of School Engagement are 12, 20 and 24 respectively.

3.4.6 Empirical model

The analysis of the exposure effects of the OVOP preschool program uses a difference-in-differences (DID) approach. The variation in the availability of the OVOP program within villages over time allows for a comparison of changes in outcomes between cohorts of children who lived in treatment and comparison villages and were age-eligible before and after the preschool was implemented. These variations were created by the program's roll-out from 2014 to 2016. The described data is used to estimate the following difference-in-difference regression model:

$$y_{ivt} = \alpha + \beta Village_t * Eligibility_t + \theta_v + \theta_t + \beta_1 \Phi_{town} birth + \varepsilon_{ivt} \tag{3.1}$$

where y_{ivt} represents the standardized Chinese and math scores, standardized Big-five inventories, SDQ and school engagement for an individual i at semester t, who was born in village v. *Village* is a dummy variable set to one if there is an OVOP preschool in the village at time t; *Eligibility* is a dummy variable set to one if the child is between 3 and 5 years old at time t. θ_v and θ_t are variables controlling for village and semester fixed effects, respectively.

The village fixed effects control for differences in the timing of each OVOP's establishment in different villages and any other unobserved factors influencing the roll-out decision. The semester fixed effects account for the child's surrounding environment, including classmates, teachers, school facilities, family background, etc. Although Figure 3.3 shows no dramatic geographic patterns and village fixed effects are controlled for with θ_v, different underlying trends in child outcomes could violate the "common trends" assumption, posing an endogenous problem, especially since there is no proof of random selection in the timing of each OVOP preschool's opening.

Following the literature from Bailey et al. (2021); Hoynes et al. (2011); Thompson (2018), town-specific linear birth cohort trends were added by interacting the birth year *birth* with the vector of town-level demographic controls Φ_{town}[28]. The town-level control variables include the proportion of non-Han people in 2011, the natural population growth rate in 2011, the proportion of labourers working in agriculture in 2011, GDP in 2011, mobile phone access rate in 2011, the urbanization rate in 2011, and the amount of labour in 2011. The coefficient of interest, β, reflects the intent-to-treat effects of the OVOP program on children's academic performance when eligible children aged three to six were exposed to the program.

Controlling for town-level characteristics helps to account for economic and policy changes[29] during the implementation of the OVOP program. This is because the town

[28]The vector Φ_{town} consists of town variables collected from yearbooks that do not vary over time. Town-level characteristics are collapsed to the village level since village-specific information is unavailable.

[29]Policies that do not directly influence a child's decision to attend OVOP or a child's academic performance.

government, which serves as the baseline government, directly manages the allocation of resources, such as educational investment, and remote schools within the same town typically have similar teachers and infrastructure.

The control variables were gathered from a 2011 yearbook (Huang, 2016), which provided geographical, political, cultural, and economic information on China at the province, city, county, and town levels. Table 3.4 lists the control variables used in this study. Comparing observations from the eastern and western parts of Mabian, it is clear that the western part is less developed than the eastern part. First, looking at the population distribution in Mabian, with slightly more observations in the west than in the east, a higher ratio of non-Han population suggests that more Yi people reside in the west. Secondly, indicators such as GDP, the proportion of agriculture, urbanization rate, and the number of labourers show that the economy of western towns relies more heavily on agriculture, while the eastern part has more economic activity. This suggests that resources, including educational resources, are more concentrated in the eastern areas.

The primary analysis of exposure effects uses the intent-to-treat (ITT) approach, assuming that students' birth locations are exogenous and that exposure to the OVOP program was randomly assigned. Since there are no participant lists for the OVOP program, the typical ATE and treatment-on-the-treated (TOT) effects cannot be estimated in this analysis. However, the participation rate of the OVOP program was estimated by asking about preschool attendance in the survey, with an overall rate of 39.07%, including 36.84% for Yi students and 56.09% for Han students. Using this participation rate, the ATET effect on the entire population can be calculated following the methodology of Bailey et al. (2021).

Table 3.4 Control variables: basic information of towns in 2011, by geography

	Mean	S.D.
Non-Han Population (ratio)	0.58	0.36
Natural Population Growth (ratio)	0.01	0.00
GDP	7623.21	5324.21
of Agriculture (ratio)	0.72	0.20
People in Urbanised Areas (ratio)	0.21	0.27
No. of Labor-forces (18 to 60 yo)	3947.62	4212.04
Access to Mobile Phone (ratio)	0.87	0.14
Observations	20	

Data Source: Mabian Survey Data.
Note: Table 3.4 presents the statistics of control variables.

3.4.7 Threats to Exogeneity

The validity of the research design rests on a crucial assumption, the parallel trends assumption, which is that treated cohorts who were sufficiently young for the program at the time of its introduction have evolved similarly to individuals who had low OVOP exposure because they were beyond the program's target age. This assumption requires that by the timing of OVOP's introduction, there are no confounding shocks or policy changes that would deferentially affect birth cohorts. Even if there is, the effects of the shocks on students' education shall be small. As far as we are aware, Hsu (2018) offered students monetary incentives based on students' test scores in Mabian, but the cohorts are fourth and fifth-grade students in 2015 which we would argue has no impact on our analysis.

3.5 Results

3.5.1 Results on Academic performance

Baseline Results

The DID estimates from equation (3.1) for the overall standardized Chinese and Math scores of students are first presented. In Table 3.5, Columns (1) and (3) provide estimates without controlling for town-level characteristics, as detailed in Table 3.4, while Columns (2) and (4) show results with these variables controlled.

Table 3.5 Preschool Exposure Effect on Students' Chinese and Math Scores

	Chinese		Math	
	(1)	(2)	(3)	(4)
Exposure	0.06*	0.05	0.07**	0.07*
	(0.03)	(0.04)	(0.03)	(0.03)
Town Character $\times Birth$		Yes		Yes
Village Fixed Effect	Yes	Yes	Yes	Yes
Semester Fixed Effect	Yes	Yes	Yes	Yes
R-sqaure	0.18	0.13	0.17	0.13
Observation	143,221	106,377	130,699	129,472

* ***p <0.01, **p <0.05, *p <0.1
Data Source: Mabian Academic Records.
Note: Standard errors are clustered at the town level.

The results in Columns (1) and (3) of Table 3.5 indicate that the universal preschool program increased Chinese and Math test scores for exposed students by 6% and 7% of a

standard deviation, respectively, compared to the control group, with a 10% significance level. The results in Columns (2) and (4) show that the OVOP program had an insignificant impact on Chinese scores but a significant impact on Math scores for treated students. The magnitude of the coefficients remains consistent after controlling for predetermined variables.

This paper believes that participation in the OVOP preschool program improves student performance for two main reasons: first, the language effects of learning Mandarin early. Early exposure to Mandarin helps students adapt more quickly to primary school teaching, learn vocabulary, and develop reading skills in a supportive environment, thus providing foundational support that prevents students from losing interest due to language difficulties in the primary stage. Second, preschool itself serves as an additional form of education that can enhance academic performance, as supported by various economic studies (Bailey et al., 2021; Heckman et al., 2013). During preschool, students not only learn language but also engage with related stories, rhymes, and poems, which can be connected to primary school learning and thus improve academic outcomes.

Therefore, both the language effect and the preschool effect positively influence student academic performance. Comparing improvements in Chinese and Math scores reveals that the increase in Math scores is slightly higher than in Chinese scores. This suggests that the overall effect of preschool attendance is greater than the language effect. In primary school, learning mathematics is less dependent on language skills. The language of mathematics is used both for studying within the discipline itself and as a conceptual tool for other subjects (Middleton et al., 2013). Indeed, Yi children in primary school face the challenge of learning a new language and new modes of representation when working with mathematical concepts. However, the results show that receiving additional preschool education itself is more beneficial for children's early-stage human capital development.

Academic Performance in Each Grade

While insignificant results of the OVOP program exposure effects on Chinese scores are shown in Columns (2), we find some potential explanations for this. There are many existing research showed no impacts or fade-out short-term impacts of early interventions on academic performance as discussed in the literature review section. It is considered in Heckman et al. (2013) that unobserved skills are affected by the intervention but the test score is not merely determined by the skill, which can be influenced by other unobservable factors such as teachers' prejudice and weather. Secondly, there would be statistical measurement error when looking at the overall effect with standardized test scores derived from each cohort. The standard deviation of various cohorts may bias the results if all of them are in one estimation.

Table 3.6 Preschool Exposure Effect on Students' Chinese and Math Scores in each grade

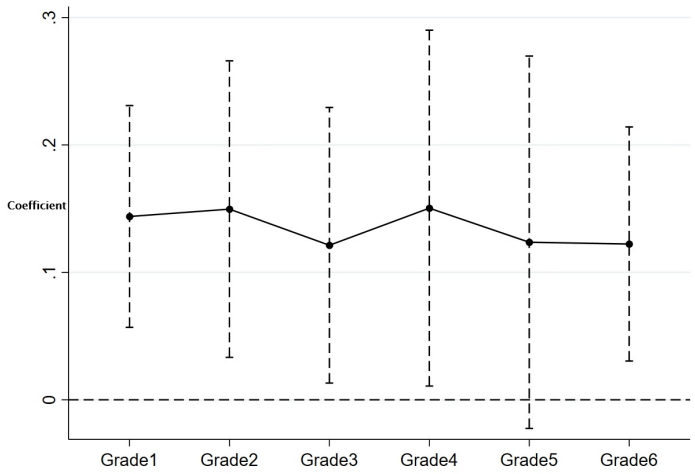
	(1) Grade 1	(2) Grade 2	(3) Grade 3	(4) Grade 4	(5) Grade 5	(6) Grade 6
ITT: Chinese	0.14**	0.15**	0.12*	0.15*	0.12	0.12**
	(0.05)	(0.07)	(0.06)	(0.08)	(0.08)	(0.05)
ATET : Chinese	0.37	0.36	0.31	0.38	0.32	0.31
[95% CI]	[0.15,0.59]	[0.09,0.68]	[0.03,0.59]	[0.03,0.74]	[-0.06,0.69]	[0.08,0.55]
R-sqaure	0.22	0.18	0.14	0.12	0.11	0.11
Observation	32,423	42,343	52,038	52,984	48,732	48,958
ITT:Math	0.14**	0.18***	0.13*	0.11	0.14*	0.09**
	(0.06)	(0.06)	(0.07)	(0.08)	(0.07)	(0.04)
ATET : Math	0.34	0.45	0.34	0.24	0.30	0.22
[95% CI]	[0.09,0.60]	[0.18,0.71]	[0.04,0.63]	[0.06,0.43]	[0.13,0.46]	[0.06,0.39]
R-sqaure	0.16	0.14	0.12	0.11	0.12	0.11
Observation	32,328	42,256	52,053	52,983	48,758	48,958

* ***p <0.01, **p <0.05, *p <0.1
Data Source: Mabian Academic Records.
Note: Standard errors are clustered at the town level. Town characters, time and village fixed effects are controlled.

A more reliable solution is to examine the exposure effects on each grade, which would alleviate the problems mentioned above. Table 3.6 presents the effects of the OVOP program on students' each grade academic performance. Figure 3.7 and Figure 3.8 plot the event-study estimates for standardised Chinese and math test scores in each grade respectively.

The results in Table 3.6 show that exposed students achieved higher scores of 0.14 standard deviations on Chinese tests and math tests in Grade 1 than the control group at a 5% significant level. The significant results in Figure 3.7 and Figure 3.8 are persistent during the primary stage, except for the insignificant result in Chinese tests in grade 5 and the insignificant result in math tests in grade 4. The magnitude is similar to other developing country studies. DeMalach and Schlosser (2024) find test scores in Arabic increased significantly by 0.12 standard deviations in fifth grade and 0.20 standard deviations for the Math scores. Consistent with the results in Table 3.5 and the assumption for language effect and preschool attendance effect, the human capital accumulation benefited from the OVOP program is mainly attributed to preschool attendance. We further translate the ITT effects into ATETs by the information of OVOP participation rate, 39.07%, derived from our survey. The amount of 38% and 34% of a standard deviation increment of Chinese and Math scores in grade 1 for treated children show a striking change in the attendance of OVOP, which suggests a remarkable human capital accumulation.

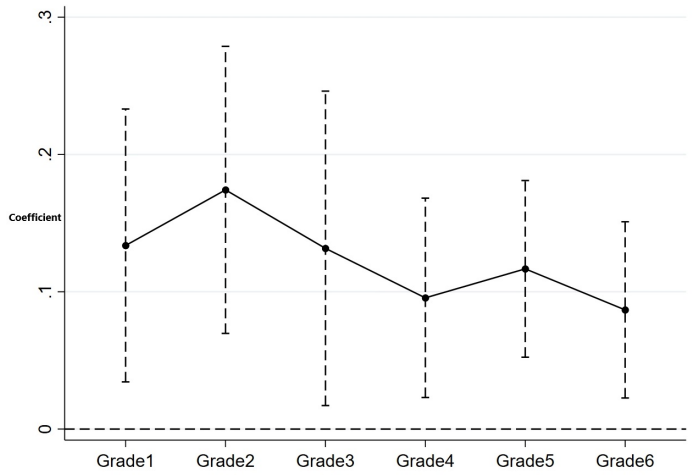
Fig. 3.7 Preschool Exposure Effect on Students' Chinese Scores in each grade



Data Source: Mabian Academic Records.

Note: Figure 3.7 presents the dynamic exposure effects of the OVOP program on students' standardized Chinese test scores. Confidence intervals are presented at 90% level.

Fig. 3.8 Preschool Exposure Effect on Students' Math Scores in each grade



Data Source: Mabian Academic Records.

Note: Figure 3.8 presents the dynamic exposure effects of the OVOP program on students' standardized Math test scores. Confidence intervals are presented at 90% level.

Large and persistent effects on academic performance might seem surprising, especially since many other studies on preschool programs have reported fade-out effects in primary education. However, few studies have specifically examined the effects of bilingual programs on primary test scores. This lack of evidence could be partly due to the small size of longitudinal samples or the limited scale of model preschool programs. Differences in the characteristics of participating children may also play a role.

Andersen et al. (2022) explained the fade-out phenomenon in three ways. First, variations in standardized test scores differ across various tests and cohorts. The dispersion of skills among students may change with age, and this variation in standard deviation can lead to a misleading fade-out conclusion. Second, test scores reflect both skills and other factors. The skill growth slope (the impact of skills from one period to the next) varies among individuals, allowing control groups to catch up with treated students, which can appear as a fade-out effect. Lastly, the skill growth curve is concave, meaning the initial skill gap between treatment and control groups is more apparent. Even if the fade-out suggests the program's impacts are diminishing, the skill gap may still exist later on when the growth curves of skills level off.

To address this issue, several robustness checks were performed. First, the identification strategy was adjusted to consider the effects on children aged 3 to 6, instead of 3 to 5, in the baseline estimation. This change includes more children in the treatment group, capturing factors like the family background that might influence the skill growth slope, as mentioned earlier. The results in Appendix Table C.3.1 align with the baseline findings. Second, following Callaway and Sant'Anna (2021), different cohorts experience different treatment effects in different years. The 'always treated' groups were excluded from the estimation in the second robustness check to avoid overestimating the results, as these groups might achieve higher test scores than earlier cohorts. The findings in Appendix Table C.3.2 are consistent with the baseline results. Additional robustness checks were conducted by comparing students' family backgrounds (derived from survey data) and by randomly assigning villages as treated. The results of these checks are presented in Appendix Table C.3.3 and Appendix Figure C.3.1, respectively.

Heterogeneity Results on Ethnicity

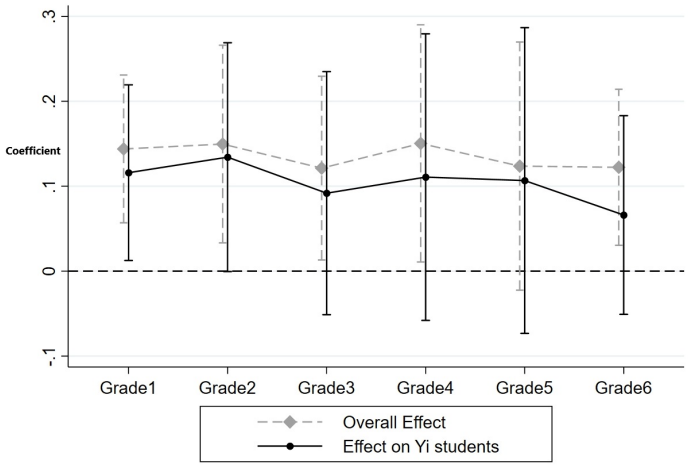
How does Yi ethnicity influence students' academic performance? If language is a key mechanism for the effects of the OVOP program, the exposure effects are expected to be greater for Yi students than for Han students, as the OVOP program was specifically designed to support the Yi ethnic minority. This is crucial for assessing the effectiveness of the OVOP policy. Figure 3.9 explores this by comparing the estimates for Yi students with

those for all students. The figures clearly show that Yi students experience smaller exposure effects than the average, with the fade-out effect beginning in grade 2. This may be due to the disadvantaged background of non-Mandarin-speaking students, which can limit the development of second language skills.

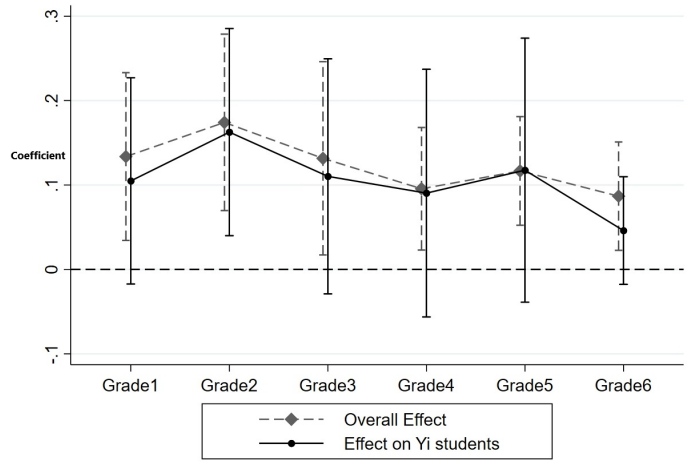
If ethnicity is simply equated with the family language environment, it suggests that although Yi children practice Mandarin for 5 hours daily in preschool (from 9 am to 3 pm, with a one-hour nap), they may still speak Yi at home. As shown in Figure 3.10, a home language environment dominated by Yi language negatively impacts students' test scores. In Figure 3.11, the analysis reveals that having a family tutor who speaks the Yi language does not significantly improve academic performance.

The findings in Figures 3.9 and 3.10 are important for several reasons. First, while it was anticipated that removing language barriers would reduce inequality among ethnic groups and narrow the educational gap by enhancing the benefits that minorities gain from education, the results indicate that Yi students, particularly those from Yi-speaking households, require additional investment or intervention to close these gaps. Second, the negative effects of language for minority households suggest that even in homes where parents can assist their children in their native language, a lack of fluency in Mandarin presents a substantial disadvantage. Finally, these results provide quantitative evidence of how language barriers affect academic performance. Language is not typically accounted for in econometric models analyzing ethnic inequality in China, possibly due to the small sample size of household data that includes language variables in national datasets. Chen et al. (2014b) found that fluency in Mandarin significantly affects income in the service sector, particularly in sales roles. Despite this, research on language barriers is limited, likely because such barriers primarily affect minority groups and are often excluded from broader analyses. In contrast, in other developing countries, it is not the case, language barriers are seen as a significant factor limiting minorities' ability to benefit from government policies and programs (Basaran et al., 2021; DeMalach and Schlosser, 2024; World Bank, 2009).

Fig. 3.9 Preschool Exposure Effect on Yi Students' Chinese Scores in each grade



(a) Chinese

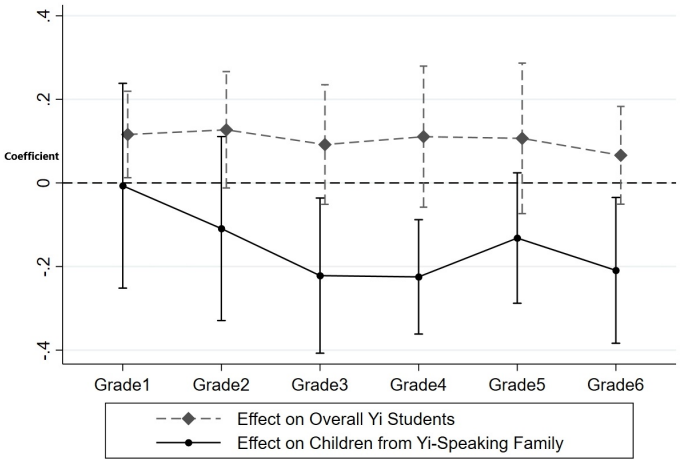


(b) Math

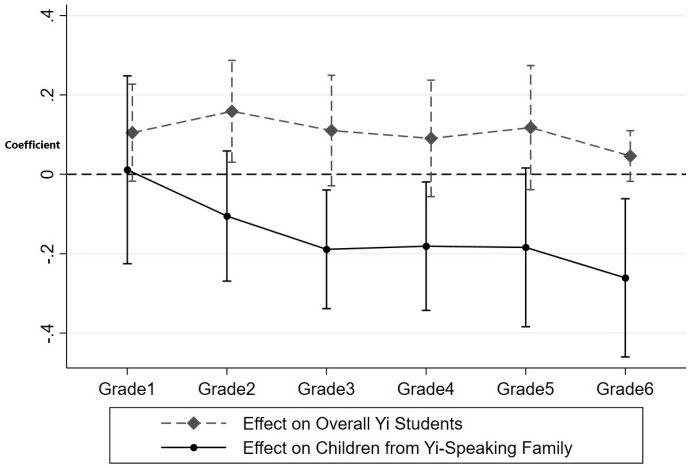
Data Source: Mabian Academic Records.

Note: Figure 3.9 presents the exposure effects of the OVOP program on Yi students' standardized Chinese and math test scores compared with the overall sample. Confidence intervals are presented in 90% levels.

Fig. 3.10 Exposure Effect on Students' Academic Scores for Children from Yi-Speaking Family



(a) Chinese

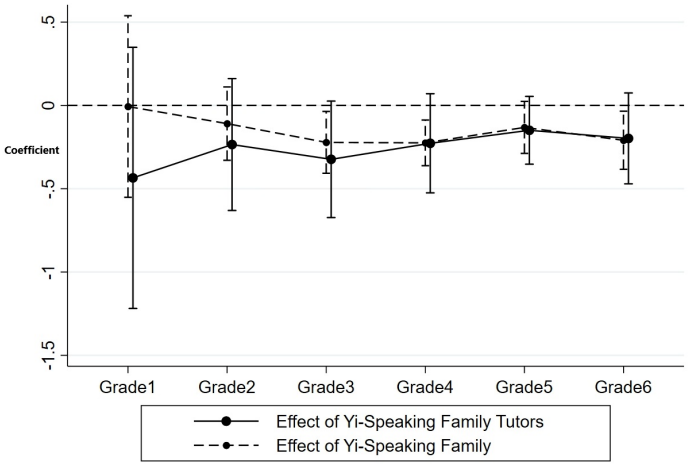


(b) Math

Data Source: Mabian Academic Records and Survey Data.

Note: Figure 3.10 presents the exposure effects of the OVOP program on Yi-speaking students' standardized Math test scores compared with the overall sample. Confidence intervals are presented at 90% levels.

Fig. 3.11 Exposure Effect on Students' Academic Scores for Children from Yi-Speaking Family with Yi-Speaking Home Tutors



Data Source: Mabian Academic Records.

Note: Figure 3.11 presents the dynamic exposure effects of the OVOP program on students' standardized Chinese test scores. Confidence intervals are presented at 90% level.

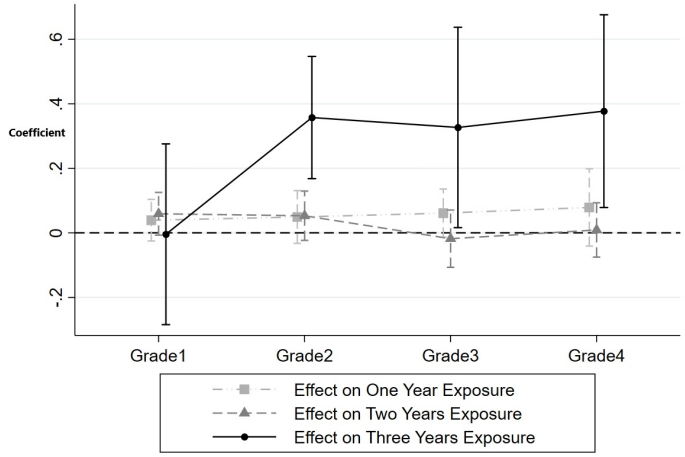
Heterogeneity Results on Exposure Duration

It is reasonable to expect that children who spent more time in an OVOP preschool would receive more intensive exposure to the Mandarin language environment, enhancing their academic performance in school. Based on the identification strategy, if a child was 5 years old when an OVOP preschool was introduced in their village, they would be exposed to the preschool for one year. If they were 4 years old, the exposure would be for two years, and if they were 3 years old or younger, the exposure would last three years.

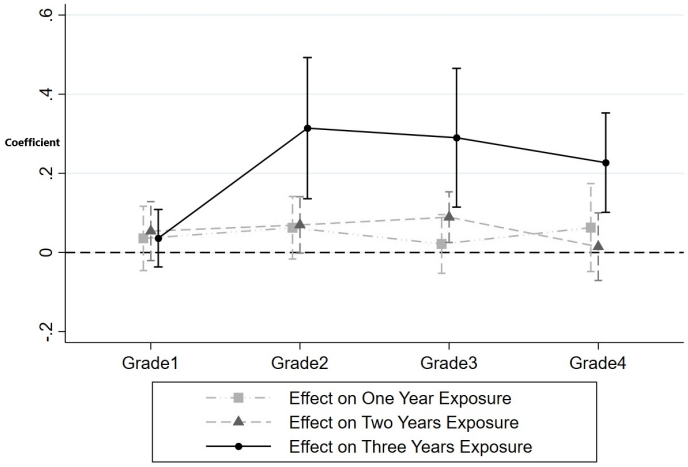
Figure 3.12 compares the effects of these three levels of exposure. Due to data limitations, the academic performance of higher-grade students who were exposed to the OVOP program for three years cannot be fully observed. Similarly, there are limited observations of grade 1 students who were exposed to the program for just one year.

The results demonstrate that students who attended the OVOP program for three years performed significantly better than those in the other two groups from grades 2 to 4. Apart from grade 1, the impact of the OVOP program on Chinese scores is both significant and larger than the impact on math scores for students with three years of exposure. The consistency in Chinese score improvement contrasts with the decrease in math score impact as the math content becomes more challenging.

Fig. 3.12 Exposure Length Effect on Students' Academic Scores in each grade



(a) Chinese



(b) Math

Data Source: Mabian Academic Records.

Note: Confidence intervals are presented at 90% level. Results after Grade 5 are omitted because of insufficient variation.

These findings have several important implications. First, they suggest that early exposure to the official language has a lasting positive effect on academic performance. Learning Mandarin at a young age provides a strong foundation that prevents children from losing interest in their studies due to language barriers. This sustained benefit is evident from the stable effects on Chinese scores, which remain at 35% of a standard deviation over the three years of primary school. When considering the ATET effects, the improvement is as high as 90% of a standard deviation, which is a substantial increase compared to other studies.

Moreover, the results highlight the dual benefits of attending OVOP preschools: the language effect and the early education effect. While Table 3.7 offers a different conclusion for the overall student population, the findings in Figure 3.12 indicate that for children exposed to the OVOP program for three years, the benefits of learning Mandarin outweigh the general preschool education effects. This is reflected in the greater impact on Chinese scores than on math scores, which aligns with the program's goal of helping children learn the official language.

Finally, the findings imply that the effects of the OVOP program are not uniform across all cohorts; younger cohorts appear to benefit more from improved access to the program. This suggests that the program's effectiveness is greater for children who start at a younger age, underscoring the importance of early language exposure for maximizing educational outcomes.

Heterogeneity Results on Preschool Quality

Additionally, the heterogeneity effect of preschool quality was compared by classifying the preschools into town-central OVOP preschools and countryside OVOP preschools. Town-central OVOP preschools are typically located near or within town-central primary schools and are often affiliated with them. Preschools receive subsidies based on the number of enrolled students, meaning that remote OVOP preschools, which usually have fewer students, receive less funding than town-central preschools. As a result, students in remote OVOP preschools have access to significantly fewer educational resources than those in town-central preschools. Appendix Table C.4.1 and Table C.4.2 highlight the differences between town-central and countryside OVOP preschools, which could potentially affect the trajectory of language development. The data show that remote countryside preschools have significantly fewer students, smaller facilities, fewer computers, fewer tutors, fewer tutors with college degrees, and a lower proportion of tutors with Mandarin certification.

Figure 3.13 illustrates the effects on children's academic performance based on exposure to different preschool qualities. The findings indicate that the exposure effects from remote OVOP preschools are smaller than those from town-central OVOP preschools, although

most of these effects are not statistically significant. This makes it difficult to conclude that preschool quality significantly impacts students' academic performance, suggesting that participation in the OVOP program can benefit students' studies regardless of preschool quality.

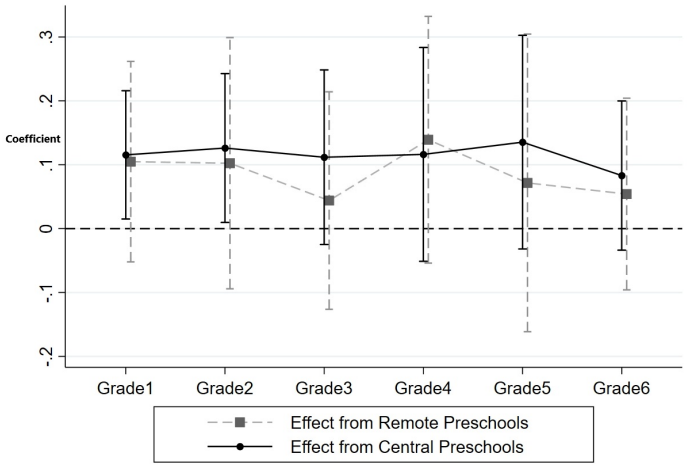
There could be other heterogeneity factors that influence language skill formation as well. Chetty et al. (2016) found that childhood environment can shape gender gaps in adulthood. However, we do not find gender inequality in the OVOP exposure effect in the primary stage, as shown in Figure C.5.1.

3.5.2 Results on Socio-Emotional skills

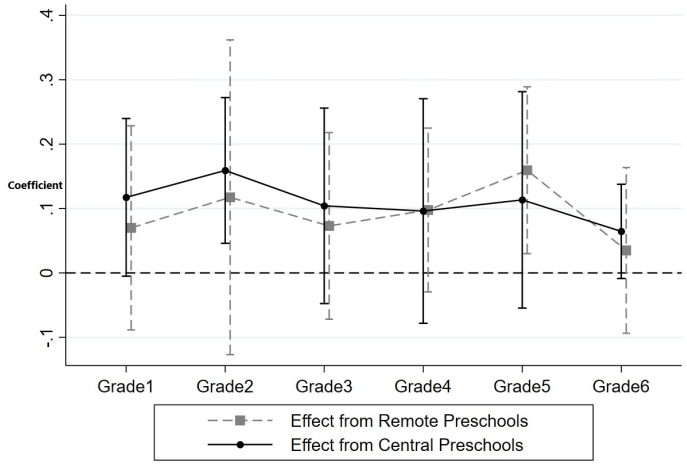
In this paper, students exposed to the OVOP preschools during the initial stage were surveyed to assess their personality traits and school engagement. The surveyed students included those who were just one year too old to participate in the OVOP program and are mostly in grade 9, as well as those who were expected to have been exposed to the OVOP program for one or two years, currently in grades 8 and 7, respectively. Heckman et al. (2013) found that early education investment consistently enhances personality skills and academic motivation, which, in turn, contributes to long-term success throughout the life cycle. Due to data limitations, an analysis of the mediation effect of socio-emotional skills on students' academic performance is not possible. However, the effects of the OVOP program on children's socio-emotional skills are presented here.

Figure 3.14 presents the exposure effects on middle school students' personality traits based on the Big-Five framework. The results show that treated students exhibited higher skills in task performance, emotional regulation, engagement with others and open-mindedness than the control group. The results are convincing because the OVOP preschools teach children not only Mandarin but also teach children to behave, share and hygiene. It also makes sense to see an insignificant effect on students' collaboration skills. The collaboration dimension closely measures students' skills in pro-social behaviour which reflects the children's connection with society instead of merely school, which students may lack the experience.

Fig. 3.13 Exposure Effect of OVOP Preschool Quality on Students' Academic Scores



(a) Chinese

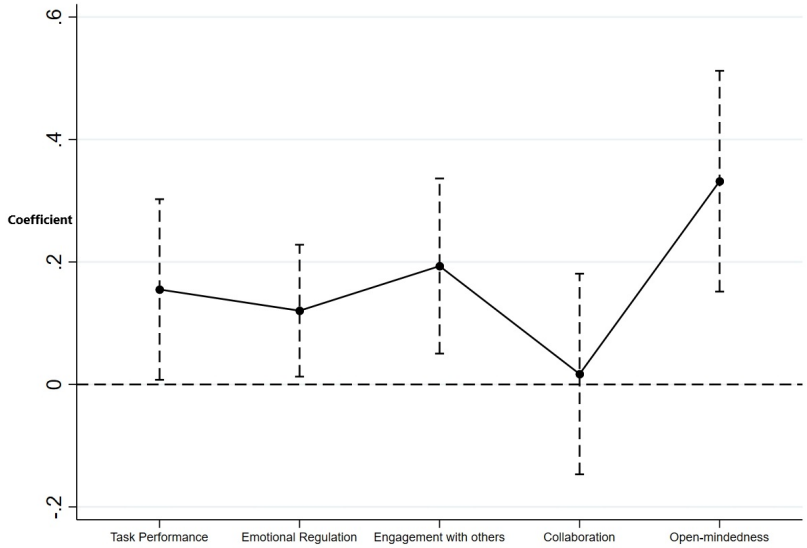


(b) Math

Data Source: Mabian Academic Records.

Note: Figure 3.13 presents the heterogeneity effect of town-centre OVOP preschools and remote OVOP preschools. Confidence intervals are presented at 90% level.

Fig. 3.14 Preschool Exposure Effect on Junior Students' Personality



Data Source: Mabian Survey Data.

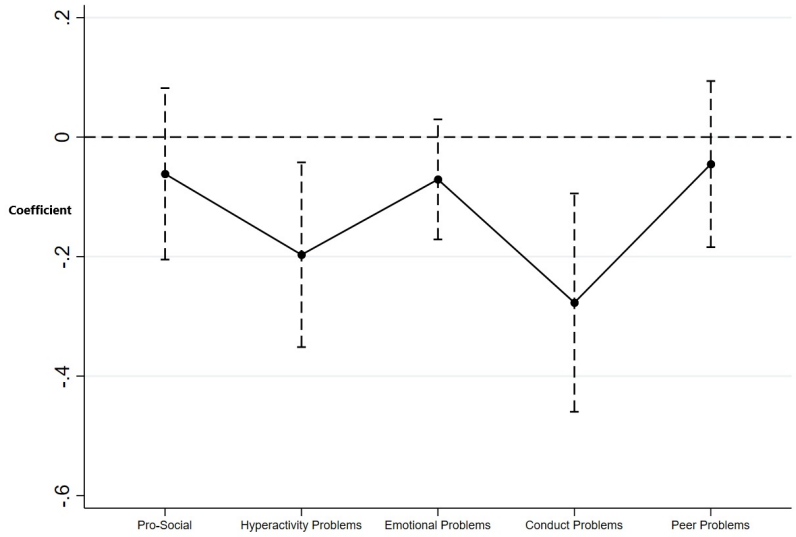
Note: Figure 3.14 presents the exposure effects of the OVOP program on junior high school(Grade 7 to Grade 9) students' Big-Five personalities. Confidence intervals are presented at 90% level.

Figure 3.15 shows the exposure effects of the OVOP program on students' SDQ (Strengths and Difficulties Questionnaire) problems. The findings indicate that children who participated in the OVOP program have significantly fewer issues with hyperactivity and conduct behaviour. These results align with the daily activities in the OVOP program, such as requiring children to sit quietly at their tables during nap time, even if they are awake, to avoid disturbing others. Hyperactivity and conduct problems can negatively affect academic performance (Arnold et al., 2020). The results suggest that students exposed to the OVOP program are better able to maintain good behaviour in school, which may also enhance their academic performance.

Figure 3.16 illustrates the exposure effects of the OVOP program on students' school engagement. If Mandarin acquisition is compared to a car engine, then academic engagement can be seen as the throttle that directly influences the speed of human capital accumulation. School enjoyment (affective engagement) reflects a child's motivation to study, class behaviour (behavioural engagement) directly measures a student's attention in class, and cognitive engagement assesses a student's study methods and habits, which have a direct impact on academic performance (Kusurkar et al., 2013). The results in Figure 3.16 show

that students who participated in the OVOP program have significantly improved academic motivation, class behaviour, and learning habits compared to the control group.

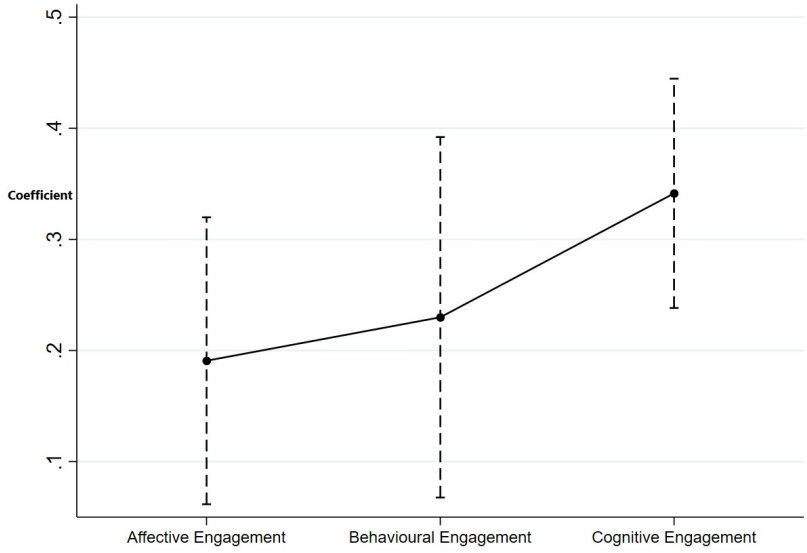
Fig. 3.15 Preschool Exposure Effect on Junior Students' SDQ Problems



Data Source: Mabian Survey Data.

Note: Figure 3.15 presents the exposure effects of the OVOP program on junior high school (Grade 7 to Grade 9) students' SDQ results. Confidence intervals are presented at 90% level.

Fig. 3.16 Preschool Exposure Effect on Junior Students' Study Engagement



Data Source: Mabian Survey Data.

Note: Figure 3.16 presents the exposure effects of the OVOP program on junior high school (Grade 7 to Grade 9) students' study behaviour. Confidence intervals are presented at 90% level.

3.5.3 The Most Needed Group: Children from Remote Villages

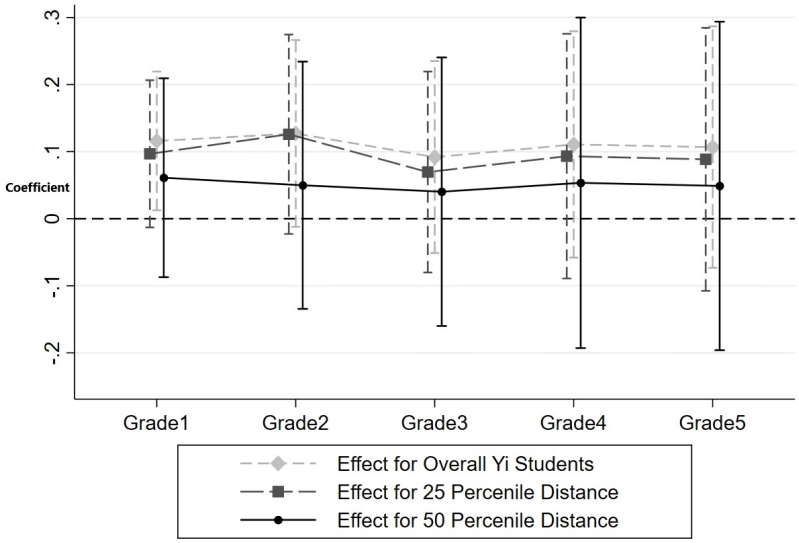
The results so far indicate that attending an OVOP program is associated with better academic performance in primary school, and it is clear that both ethnicity and exposure duration are important factors affecting the impact of OVOP. However, the geographical characteristics of Mabian suggest that educational resources are significantly unevenly distributed between central and remote areas. In rural China, local governments are typically located in more centralized and well-developed areas, where resources are more readily accessible. In contrast, a larger proportion of Yi people live on the west side of Mabian, where transportation infrastructure is underdeveloped, making it harder for children there to access advanced educational resources.

It is reasonable to assume that students living in remote villages would benefit the most from the OVOP program, as many Yi people reside in these areas, and their children have limited exposure to a Mandarin-speaking environment due to poor transportation. These language barriers have contributed to an average education level of just 3.9 years in rural Mabian in 2011. Research indicates that families with lower levels of education are less likely to prioritize their children's education. Less educated parents may not place a high

value on education, possess lower academic skills themselves, or find it challenging to assist with schoolwork. Moreover, inadequate community resources often result in lower-quality schools, which can diminish the perceived benefits of education and reduce school attendance. In remote areas, the low returns on education might further discourage families from investing in schooling (Ganzach, 2000; Keels, 2009; Schady, 2011). This raises the question of whether children from remote villages receive the same level of benefit from the OVOP program as those from more central areas.

To explore this, two types of distance variables were constructed to measure the distance from a student's home to the Mabian government and the town government. The results, shown in Figure 3.17 and Figure 3.18, indicate that greater distance to the Mabian government has a slightly negative effect on the academic performance of treated students, while the impact of the distance to the town government is minimal, with the differences being statistically insignificant. These results indicate that the OVOP educational resource distribution is not balanced in Mabian, especially in remote areas.

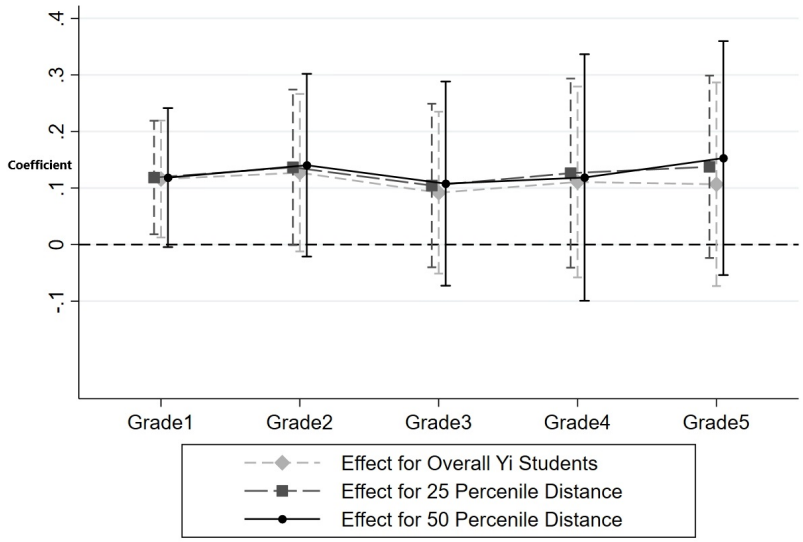
Fig. 3.17 Exposure Effect on Chinese Scores Based on Home Distances to the Mabian Government



Data Source: Mabian Academic Records.

Note: Figure 3.17 presents the exposure effects of the OVOP program on junior high school (Grade 7 to Grade 9) students' study behaviour based on students' home distance to the Mabin government. Confidence intervals are presented at 90% level.

Fig. 3.18 Exposure Effect on Chinese Scores based on Home Distances to the Town Government



Data Source: Mabian Academic Records.

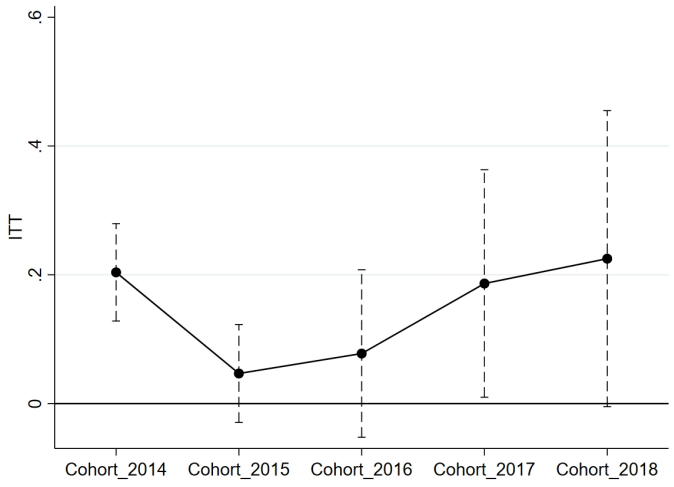
Note: Figure 3.18 presents the exposure effects of the OVOP program on junior high school (Grade 7 to Grade 9) students' study behaviour based on students' home distance to the town government. Confidence intervals are presented at 90% level.

3.6 Was the OVOP program becoming better?

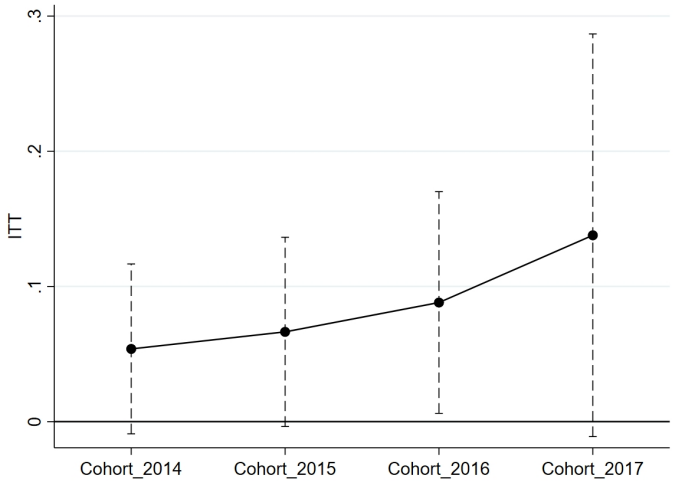
In policy evaluation studies, it is essential to assess the effects of a policy on each individual's lifelong trajectory and to evaluate the dynamic effects of a universal program over time on different cohorts. In other words, examining the effects of preschool participation on people's capital accumulation alone is not enough. Given that the universal preschool program is a long-term initiative, it is important to analyze the impact of the OVOP on different cohorts to determine whether the program can sustain or improve its effectiveness over time.

In this case, the policy effects are evaluated on cohorts exposed to the OVOP program in different years. The results are presented in Figures 3.19 and 3.20, with the x-axis representing the order of the cohorts since the launch of the OVOP. Figure 3.19 shows that the policy effects are significantly positive for the first cohort exposed in grade 1. The effects for the second and third cohorts are not significant, and the magnitude of the coefficients is lower than that of the first cohort. However, the impacts become significant again for the

Fig. 3.19 Effect on Exposed Students' Chinese Scores in Different Cohorts



(a) Grade 1

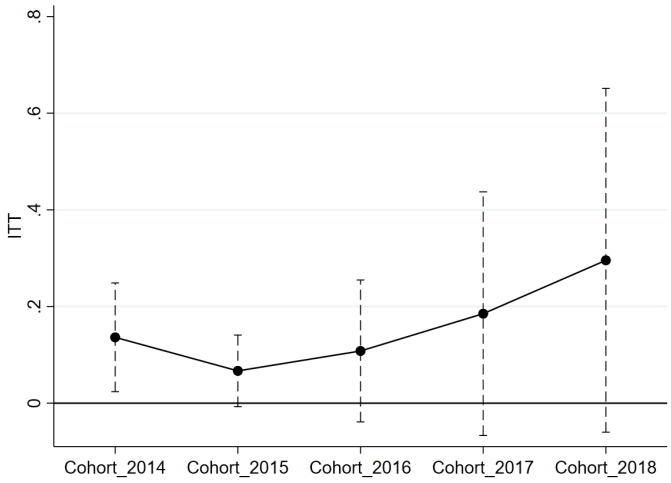


(b) Grade 2

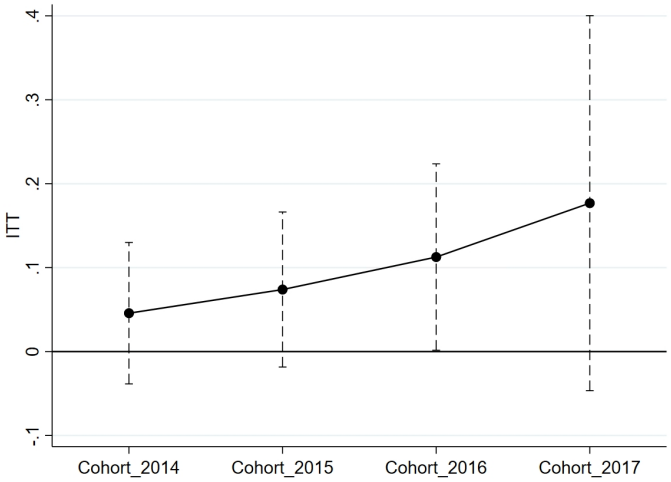
Data Source: Mabian Academic Records.

Note: Figure 3.19 presents the results of the impacts of OVOP on each cohort's grade 1 Chinese scores since the launch of the OVOP. Confidence intervals are presented at 90% level.

Fig. 3.20 Effect on Exposed Students' Math Scores in Different Cohorts



(a) Grade 1



(b) Grade 2

Data Source: Mabian Academic Records.

Note: Figure 3.20 presents the results of the impacts of OVOP on each cohort's grade 2 Chinese scores since the launch of the OVOP. Confidence intervals are presented at 90% level.

fourth and fifth cohorts. In grade 2, the results indicate that the magnitude of the OVOP impacts increases, which is consistent with the findings in Figure 3.20.

Overall, the results suggest that the impacts of the OVOP program increase over time. This could be due to several factors: the expansion of OVOP preschools over the years, making them more accessible to children from remote areas; teachers gaining more experience in bilingual teaching by years, as there was no preschool education in Mabian before the OVOP program, thus the effects of the OVOP program is small at the beginning years; and the enrichment of teaching resources for the OVOP program. For example, in the third year of the program in 2017, Mabian published preschool textbooks specifically designed for bilingual learning for Yi children, which could further support their early and rapid acquisition of Mandarin[30].

3.7 Discussion and Conclusion

Bilingualism is a highly valuable skill in the twenty-first century. This paper evaluates a bilingual preschool program, the OVOP program, implemented in Mabian, a poor county, which provides insights and experiences relevant to other multi-ethnic developing countries. Before the program's implementation, local ethnic minority children struggled academically due to language barriers, finding it difficult to learn Mandarin at school because they did not speak it at home. The OVOP program introduced these children to a Mandarin-speaking environment at an early stage, helping them adapt to good learning habits.

The study employed a difference-in-differences (DID) approach to analyze the impact of the OVOP program on students' academic performance and socio-emotional skills. The results indicate that the OVOP program effectively improved students' academic performance in primary school and enhanced their personality skills and academic engagement over the long term. Younger cohorts benefited more from the program due to its increasing effectiveness over time.

There are some limitations in this study. First, the cost-benefit analysis is limited. Because the benefited students are still young, thus it is hard to observe the relevant financial outcomes in the current phase. Second, due to budget constraints, it was not feasible to include all impacted students in the survey, which resulted in a failure of mechanism estimation from the survey data due to the limited sample size.

Many studies have found that the impact of preschool programs on academic performance tends to diminish over the long term (Andersen et al., 2022; Bailey et al., 2017; Whitaker

[30]http://www.scfz.org/news/3/14889.html

et al., 2023). However, this paper finds that the OVOP program's effects remain persistent at the primary stage. This persistence can be attributed to two main reasons.

First, the OVOP program impacts students' academic performance in two ways: through the language effect and the preschool participation effect. Mastery of Mandarin is essential for students to succeed in the education system, particularly for those at risk of dropping out, which is referred to as the language effect. This effect is persistent because language skills, once learned, are not easily forgotten.

Second, the OVOP program teaches students not only language skills but also good learning habits through daily teaching activities. Students may not aquisite adequate study habits and learning methods at home given the relatively low level of education in Mabian. Early access to good learning habits helps develop children's socio-emotional skills, which are crucial for their overall human capital accumulation.

Overall, the OVOP program offers evidence for reducing educational inequalities among ethnic minorities in developing countries. First, it helps ethnic minority students overcome language barriers, thus preventing them from falling behind. The program's positive effects on both cognitive and non-cognitive abilities are persistent. Second, the evidence shows that the benefits of bilingual education are greater when children have earlier access to it. Lastly, the program's impact has increased over time, likely due to the growing experience and improvements in implementation.

Appendix C

C.1 Town Background of Mabian

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Table C.1.1 Information of 20 towns or countryside in Mabian (2011)

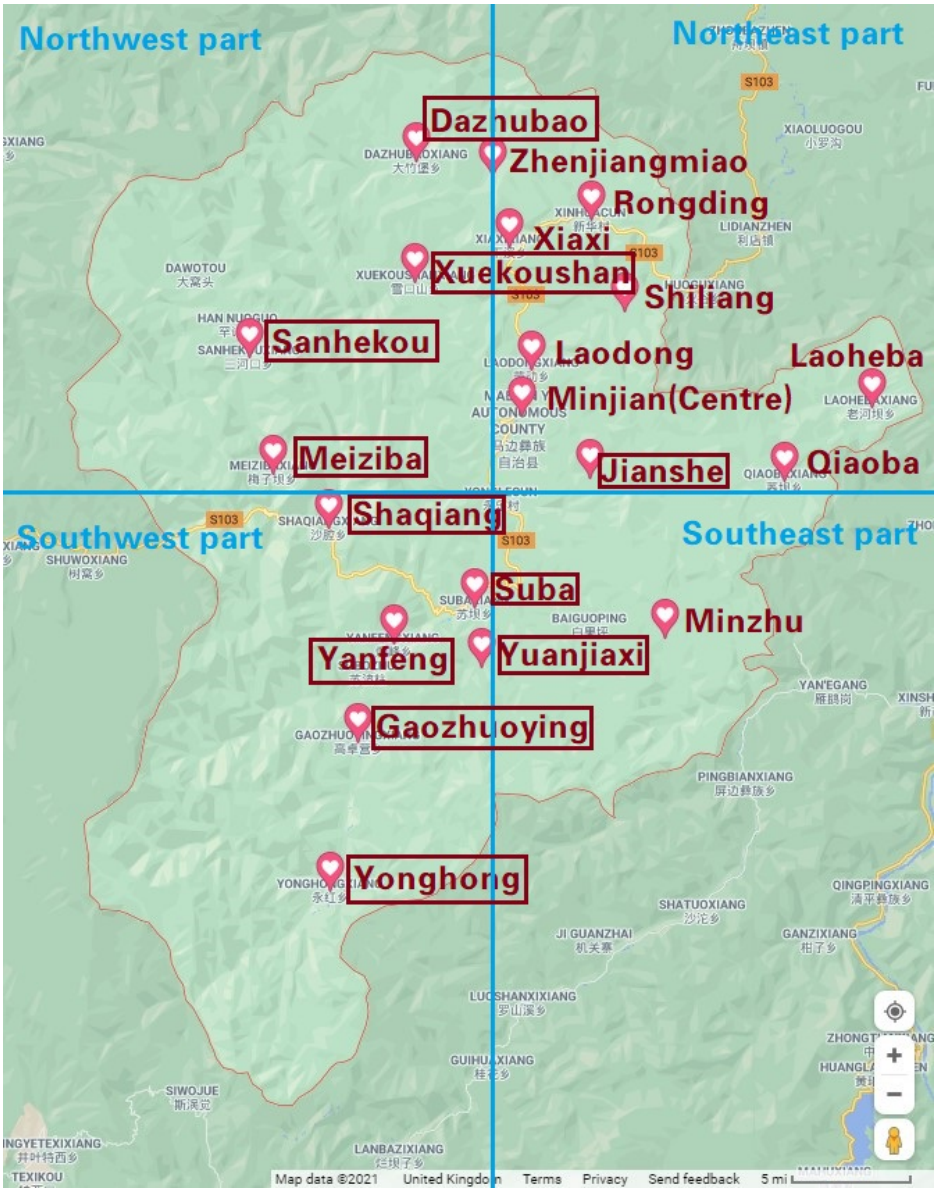
Town	Administrative division	Registered Population	Yi ethnic proportion	Urbanization rate	Number of Preschools	Number of OVOP Preschools (in 2016)
Northwest part						
Dazhubao	**Dazhubao**, Xinshan, Baiyanwan, Chaoyangping (4)	4217	57.9%	9.7%	0	4
Xuekoushan	**Liming**, Xiejiayan, Yangdianer, Tianerwan, Yongxing,Wenshuidang, Tianhuashui, Lanmageng (8)	13075	63.2%	6.9%	0	20
Sanhekou	**Sanhekou**, Baiyanzi,Yueerba, Xianjiapu, Xingxing, Jinjiagou, Shanziwan, Sheshuiba (8)	8507	99.1%	1.1%	0	15
Meiziba	**Waquwo**, Meiziba, Wahouku, Namuping (4)	3838	99.4%	0.6%	0	11
Southwest part						
Shaqiang	**Yanjiadiao**, Shaqiang, Gantianba, Hetaoping, Erping (5)	7066	100%	1.1%	0	11
Suba	**Shengli**, Yuesheng, Fengxi, Qianjin, Baiyangcao, Xiangyang (6)	14019	80.1%	3.1%	0	27
Yanfeng	**Yanfeng**, Meiziwan, Baijiawan, Erba, Dafengding (5)	9393	99.7%	2%	0	18
Yuanjiaxi	**Zhuangjiaba**, Eluo, Jianshee, Yuanjiaxi (4)	4320	100%	1.4%	0	15
Gaozhuoying	**Gaozhuoying**, Xinigou, Dayuanzi, Daheba, Ganxilada (5)	7423	100%	6%	0	18
Yonghong	**Wuma**, Luokua, Tuanbaozi, Zhushang (4)	4435	100%	1.7%	0	12
Northeast part						
Zhenjiangmiao	**Lianghekou**, Shilongmen, Yinxinyan (3)	4100	26%	4.6%	0	4
Rongding	***Jiefangjie***, Xinhua, Fenghuang, Xinqiao, Yuping, Manao, Guangrong, Houchi, Tonglin (9)	14943	13.6%	14.2%	3	23
Xiaxi	***Gonghe***,Guanyinyan, Yucangshan, Jinma,Dachitang, Longtuogou, Zhenzhuqiao, Sunjiashan (8)	12783	12.5%	11.7%	1	15
Shiliang	**Yongning**, Yonghe, Tuanjie, Gaofeng (4)	4423	4.1%	10.8%	0	7
Laodong	**Jinxing**, Fulai, Xianfeng, Baixiang, Bazifang, Hongchun, Bailin (7)	13800	15.6%	11%	1	11
Minjian (county centre)	***Minjian***, *Zhangba*, *Chengnan*, Xinglong, Dengganbao, Shuinianba, Hongqi, Guangming, Xicheng, Jianxin (10)	36711	43.9%	48.2%	2	17
Laoheba	**Taoxi**, Dengta, Pinghe, Huiding (4)	6112	Unknown, mainly Han	2.9%	0	5
Jianshe	**Guanghui**, Huangmaogeng, Sanxi, Wanergou, Gaoshitou, Lianhe, Shuiliuban, (7)	12200	51.5%	1.9%	0	11
Qiaoba	**Chaye**, Huibu, Shuipingxi, Shuanghe , Shizhangkong ,Dongsheng, Jinhua, Longqiao, Chunlin (9)	11357	5.2%	6.7%	1	17
Southeast part						
Minzhu	**Manaoo**, Fengchan, Guanghua, Datian, Xuefeng,Longyangping, Xiaoguxi, Dongwan, Youfang (9)	14068	24.3%	1.4%	1	23

* Villages in bold were where the town government was located. Texts in italics were urbanized areas. Underline refers to villages that were identified as poverty-stricken villages by Sichuan province. The under-wave line refers to the pure Yi community village.

** The urbanization rate was the proportion of people living in urbanised areas amongst the total population.

*** Table shows that there are officially 115 villages in Mabian. 95 villages were identified as poverty-stricken villages and 26 villages were Yi community villages.

Fig. C.1.1 Location of 20 towns in Mabian

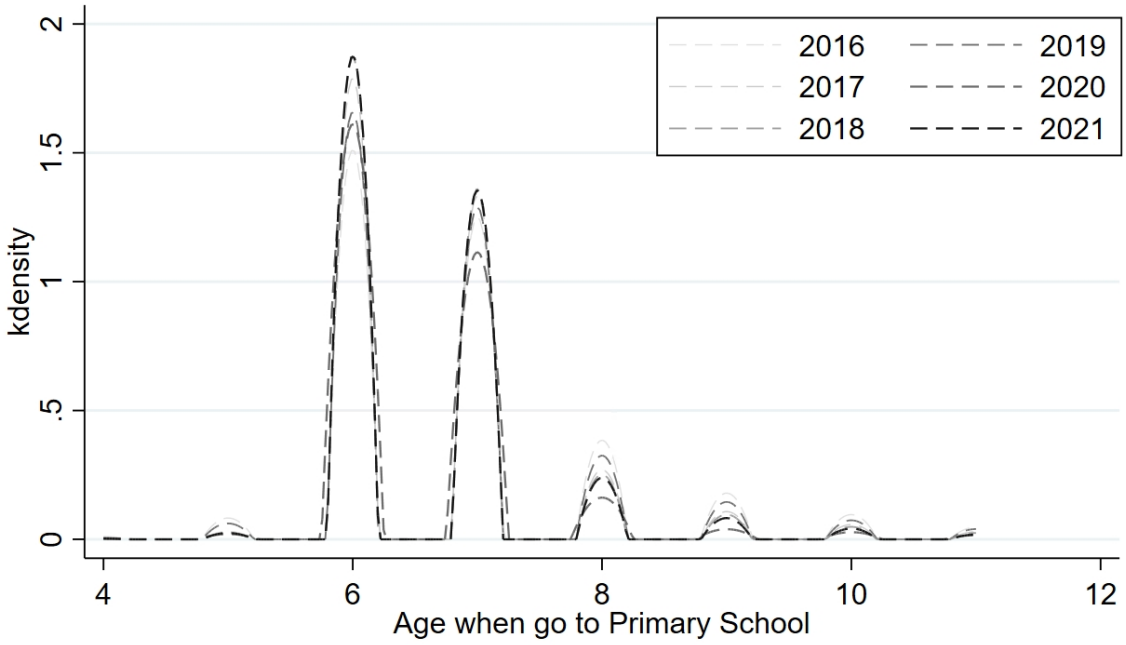


Map Source: Google Map.

Note: Figure C.1.1 presents the location of towns in Mabian. Villages in the box refers to the villages where the proportion of Yi people was over 50%. Mabian is roughly divided into west and east parts in this study. In the western part of Mabian, the landforms are more mountainous than the eastern part.

C.2 Student Age when Attend Primary School

Fig. C.2.1 Distribution of School Entry Age in Each Wave



Data Source: Mabian Academic Records.

Note: Figure C.2.1 presents the density of school entry age in Mabian. Most students go to primary school at ages six and seven. Younger cohorts are more likely to attend school at age six.

C.3 Robustness Check

C.3.1 Age Eligibility

Table C.3.1 Preschool Exposure Effect on Students' Academic Scores: Age Eligibility 3 to 6 Years Old

	Chinese		Math	
	(1)	(2)	(3)	(4)
Exposure	0.05*	0.05	0.06**	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)
Town Character $\times Birth$		Yes		Yes
Village Fixed Effect	Yes	Yes	Yes	Yes
Semester Fixed Effect	Yes	Yes	Yes	Yes
R-sqaure	0.09	0.12	0.08	0.11
Observation	143,221	106,377	140,654	135,348

* ***p <0.01, **p <0.05, *p <0.1

Data Source: Mabian Academic Records.

Note: Standard errors are clustered at the town level. Student age eligibility is identified as 1 if the child is 3 to 6 years old, which means the estimation considers the situation that many students would to primary school at age seven in Mabian.

C.3.2 Excluding the Always Treated Group

Table C.3.2 Preschool Exposure Effect on Students' Academic Scores: Without always treated group

	Chinese		Math	
	(1)	(2)	(3)	(4)
Exposure	0.05	0.05	0.07*	0.06
	(0.03)	(0.04)	(0.03)	(0.04)
Town Character $\times Birth$		Yes		Yes
Village Fixed Effect	Yes	Yes	Yes	Yes
Semester Fixed Effect	Yes	Yes	Yes	Yes
R-sqaure	0.09	0.12	0.08	0.11
Observation	127,395	95,707	124,874	97,885

* ***p <0.01, **p <0.05, *p <0.1

Data Source: Mabian Academic Records.

Note: Standard errors are clustered at the town level. Cohorts that are expected to be always treated are excluded.

C.3.3 Parallel Trend

Due to the nature of the data, this paper cannot estimate parallel trends by comparing the exposure effects on students' academic performance before they attended primary school and before the exposure to the OVOP program, as they did not take relevant cognitive tests. Instead, the study compares students' parallel trends based on the assumption that the Mandarin abilities of remote Yi children are not significantly influenced by family socioeconomic status and are primarily affected by the OVOP program. This assumption is reasonable only if there is no significant difference in family background between the treated and control groups. The results in Table C.3.3 support this rationale. Overall, the findings suggest that Yi students' Mandarin levels were comparable before exposure to the OVOP program.

Table C.3.3 Statistics of Yi Students' Family Background

	(1) Treated Group	(2) Control Group	Diff.
Gender	1.55	1.55	0.00
	(0.50)	(0.50)	
No. of Siblings	3.96	4.12	0.16
	(1.39)	(1.43)	
Father Education Level	1.34	1.36	0.02
	(0.62)	(0.61)	
Mother Education Level	1.14	1.15	0.01
	(0.52)	(0.46)	
Family Socio-Economic Index (6 yo)	2.29	2.27	-0.02
	(0.56)	(0.63)	
Family Language Environment (Yi=1) (6 yo)	0.13	0.10	-0.03
	(0.34)	(0.31)	
Father Mandarin speaking difficulty	2.72	2.75	0.03
	(1.06)	(1.08)	
Mother Mandarin speaking difficulty	3.52	3.65	0.13
	(1.12)	(1.09)	
Grandparents Mandarin speaking difficulty	4.16	4.03	-0.13
	(1.01)	(1.06)	
Observation	153	597	

* ***p <0.01, **p <0.05, *p <0.1

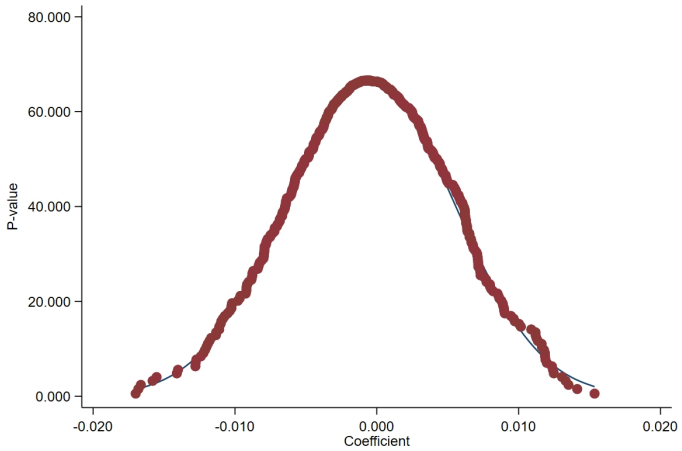
Source: Mabian Survey Data.

Note: The Socio-Economic Index constituted students' house materials, household possessions and family economic difficulties at six years old.

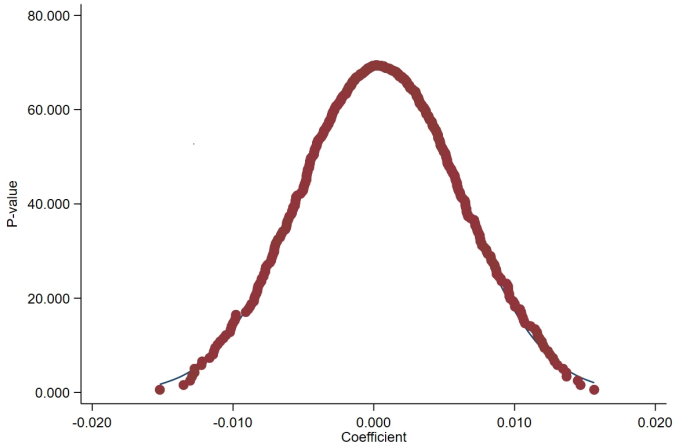
C.3.4 Placebo Test

To ensure that the results are not influenced by other unobserved trends, a placebo test was performed by randomly assigning villages as treated from 2014 to 2016 and estimating the effects 500 times. The estimates from these placebo tests are shown in Figure C.3.1. The results are consistent with the main findings, indicating that the randomly assigned exposure to OVOP has no effect on students' academic performance. Overall, these placebo test findings suggest that the main results are unlikely to be affected by unobserved trends.

Fig. C.3.1 Placebo Test



(a) Chinese



(b) Math

Note: Figure C.3.1 presents the placebo test of the OVOP policy. Treated villages were randomly assigned and the corresponding exposure effects were estimated 500 times.

C.4 Preschool Quality

Table C.4.1 Differences of Preschool Quality between Town Central Preschools and Remote Preschools in 2016

	Overall	Central Preschool	Countryside Preschool	Diff.
Mixed-age Preschool (yes=1)	0.79	0.68	0.81	-0.13
	(0.41)	(0.48)	(0.39)	
No. of students	32.85	53.82	28.33	25.49***
	(21.80)	(26.97)	(17.63)	
Yi students (%)	0.75	0.68	0.77	-0.09
	(0.34)	(0.36)	(0.34)	
Area (Square meter)	484.21	1328.73	388.94	1019.79***
	(1254.38)	(2801.91)	(390.58)	
Computer (yes=1)	0.32	0.59	0.27	0.33***
	(0.47)	(0.50)	(0.44)	
TV (yes=1)	0.90	0.91	0.89	0.01
	(0.30)	(0.29)	(0.30)	
Music player (yes=1)	0.62	0.64	0.62	0.02
	(0.49)	(0.49)	(0.49)	
No. of tutors	1.60	3.05	1.31	1.73***
	(1.22)	(1.73)	(0.84)	
Holding bachelor degree	0.08	0.05	0.09	0.04
	(0.28)	(0.21)	(0.29)	
Holding college degree	1.41	2.96	1.10	1.85***
	(1.24)	(1.70)	(0.84)	
Average age of tutors	26.61	25.58	26.82	1.25
	(4.57)	(3.09)	(4.81)	
Tutors holding teaching certificate(%)	0.85	1.00	0.81	0.19**
	(0.37)	(0.25)	(0.38)	
Tutors holding Mandarin certificate(%)	0.91	1.00	0.88	0.12**
	(0.31)	(0.21)	(0.31)	
Observations	131	22	109	

* ***p <0.01, **p <0.05, *p <0.1

Note: Table C.4.1 presents the difference in preschool qualities among central primary school-affiliated preschools and remote countryside preschools.

Table C.4.2 Differences of Preschool Quality between Town Central Preschools and Remote Preschools in Mabian West part (more remote area) in 2016

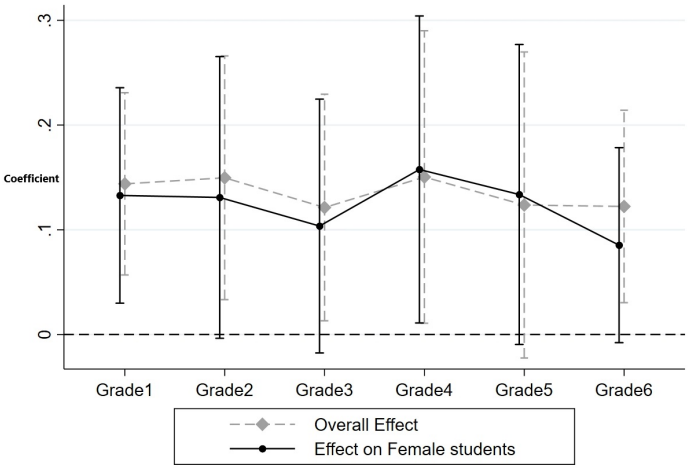
	Central Preschool	Countryside Preschool	Diff.
Mixed-age Preschool (yes=1)	0.67	0.68	-0.12
	(0.49)	(0.47)	
No. students	52.08	29.91	22.17***
	(20.05)	(15.19)	
Yi students (%)	0.95	0.94	0.01
	(0.09)	(0.15)	
Area (Square meter)	763.17	214.28	548.89***
	(1619.57)	(189.67)	
Computer (yes=1)	0.58	0.12	0.47***
	(0.51)	(0.32)	
TV (yes=1)	0.83	0.82	0.01
	(0.39)	(0.39)	
Music player (yes=1)	0.58	0.64	0.06
	(0.51)	(0.48)	
No. of tutors	3.08	1.26	1.82***
	(1.83)	(0.85)	
Holding bachelor degree	0.08	0.10	0.02
	(0.29)	(0.30)	
Holding college degree	2.92	1.05	1.87***
	(1.78)	(0.83)	
Average age of tutors	24.26	26.39	-2.12
	(2.16)	(4.98)	
Holding teaching certificate (%)	1.00	0.82	0.18**
	(0.29)	(0.39)	
Holding Mandarin certificate (%)	1.00	0.87	0.13**
	(0.29)	(0.33)	
Observations	12	61	

* ***p <0.01, **p <0.05, *p <0.1

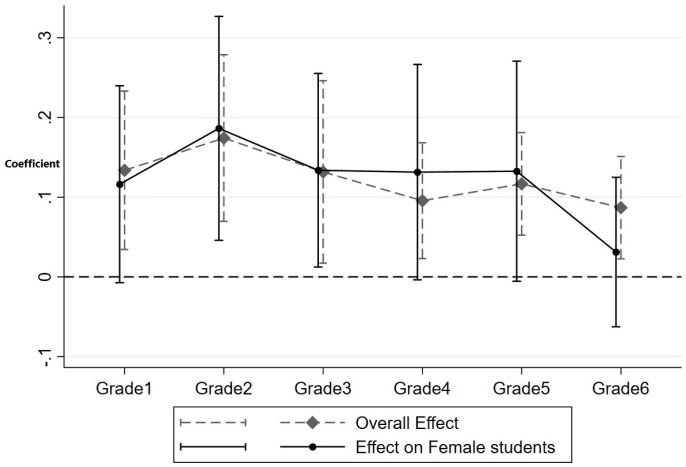
Note: Table C.4.2 presents the difference in preschool qualities among central primary school-affiliated preschools and remote countryside preschools in West Mabian. The west part of Mabian is more remote than the east part.

C.5 Heterogeneity Results on Gender

Fig. C.5.1 Exposure Effect on Female Students' Academic Scores in each grade



(a) Chinese



(b) Math

Note: Figure C.5.1 presents the exposure effects of the OVOP program on female students' standardized Math test scores compared with the overall sample. Confidence intervals are presented in 90% levels.

Chapter 4

Conclusion

There is increasing recognition that childhood development is closely linked to educational attainment, earnings, and employment outcomes (Currie and Thomas, 1999). Both early cognitive and non-cognitive skills are highly sensitive to influences from the home, school, and community environments. This thesis examines the cognitive and non-cognitive abilities of two groups of disadvantaged children through two projects: one investigates how parental migration negatively affects children's development, and the other evaluates the benefits of early childhood investments on children's development.

Chapter 1 assesses the impact of parental migration on children's literacy and math skills, as well as their school enjoyment and satisfaction, using a nationally representative dataset. Recent research suggests that parental migration adversely affects children's education and mental health in China (Hu, 2012; Jingzhong and Lu, 2011; Zheng et al., 2022). However, the effect on cognitive and non-cognitive abilities is less explored in the literature.

The IV estimation results in Chapter 1 reveal that parental absence significantly negatively affects both boys' and girls' school satisfaction and boys' school enjoyment, while it has no significant effect on cognitive test scores. This study also has limitations that could be addressed in future research. For example, the left-behind children (LBC) in the CFPS dataset are teenagers, meaning the study cannot examine the effects of parent-child separation during early childhood, which is a critical period for human development, particularly before age five.

This study finds that LBCs may not find compensation for accompanying in school which is absent at home and it is worthwhile to contribute to smoothing the pathway to education in urban areas where their parents work, which would require money transfers and policy support from the government.

In Chapter 2, a survey was conducted, and in Chapter 3, the survey data was combined with administrative data to evaluate whether early childhood investments, specifically the

OVOP program, help disadvantaged children who face language barriers by narrowing the academic achievement gap in elementary school and improving non-cognitive abilities in junior high school.

Survey results in Chapter 2 indicate that students' personality skills and school engagement are significantly linked to exposure to the OVOP program. Further analysis shows that these socio-emotional skills are also influenced by gender, family background, parental care, and parenting style.

Chapter 3 finds that exposure to the OVOP program during childhood leads to significant improvements in test scores, school engagement, and personality skills. Specifically, exposure to the OVOP program resulted in a 14% increase in standard deviation in test scores between the treatment and control groups. Ethnic minority children benefited from access to the OVOP program, although the effects were smaller than those observed in the overall treated group. Those who attend the OVOP program at an earlier age show greater benefits. With younger cohorts receiving more substantial effects, indicating that the program is improving over time.

The evidence of the OVOP program is important to the developing world. While promising results from U.S. preschool program evaluations (Bailey et al., 2021; Heckman et al., 2013) might set high expectations for similar programs in other contexts, the U.S. experience may not be directly applicable to developing countries. The preschool programs, as well as the families and children they target, differ in several potentially important ways.

Firstly, in terms of the target population, children in developing countries often face language barriers, similar to the challenges seen in preschool programs in Turkey (Basaran et al., 2021) and Arabic-speaking regions (DeMalach and Schlosser, 2024). The OVOP program, through rich and active daily language interactions, ensures that children's language skills develop at a high level, while also fostering personality development and preparing them for primary education.

Secondly, program expenditure per child in developing countries is usually lower, although it may represent a higher fraction of the family's income. Lower expenditure does not necessarily mean lower impacts, as diminishing marginal returns on investment could lead to higher impact per unit of investment.

Another difference in developing countries is that preschool providers often receive less training. In a study by Basaran et al. (2021), preschool teachers reported not receiving in-service training, despite it being part of the plans. Schools also had physical infrastructure deficiencies and were often not built to established standards. In a study by Alcott et al. (2020), it was noted that teachers in low socioeconomic areas of India had fewer opportunities to implement necessary activities compared to those in more prestigious schools. However,

the results of OVOP show that preschools in remote areas can still offer positive impacts to targeted students. It is worth conducting further analysis to explore the effects of programs targeting remote areas where students need the services most.

The study of the OVOP program has its limitations. While personality skills and good study habits gained from educational intervention can be important potential mediating factors that further boost academic performance, the survey data only reflect mid-term cognitive effects for two birth cohorts. Additionally, estimating the longer-term impacts of the OVOP program needs to wait till the cohorts are old enough, which would help the government perform cost-benefit analyses.

References

Abrahams, L., Pancorbo, G., Primi, R., Santos, D., Kyllonen, P., John, O. P., and De Fruyt, F. (2019). Social-emotional skill assessment in children and adolescents: Advances and challenges in personality, clinical, and educational contexts. *Psychological Assessment*, 31(4):460.

Acosta, P. (2011). School attendance, child labor, and remittances from international migration in El Salvador. *Journal of Development Studies*, 47(6):913–936.

Adida, C. L., Laitin, D. D., and Valfort, M.-A. (2014). Muslims in France: identifying a discriminatory equilibrium. *Journal of Population Economics*, 27:1039–1086.

Ajayi, K., Das, S., Delavallade, C., Ketema, T. A., and Rouanet, L. (2023). Which socio-emotional skills matter most for women's earnings?: New insights from sub-saharan Africa.

Alcaraz, C., Chiquiar, D., and Salcedo, A. (2012). Remittances, schooling, and child labor in Mexico. *Journal of Development Economics*, 97(1):156–165.

Alcott, B., Banerji, M., Bhattacharjea, S., Nanda, M., and Ramanujan, P. (2020). One step forward, two steps back: Transitions between home, pre-primary and primary education in rural India. *Compare: A Journal of Comparative and International Education*, 50(4):482–499.

Alexander, K. L., Entwisle, D. R., and Olson, L. S. (2004). Schools, achievement, and inequality: A seasonal perspective. In *Summer Learning*, pages 25–52. Routledge.

All China Women's Federation Research Group (ACWF) (2013). Research report into the situation of rural left behind children and rural to urban migrant children. *China Women's Movement*, 6:30–34.

Almlund, M., Duckworth, A. L., Heckman, J., and Kautz, T. (2011). Personality psychology and Economics. In *Handbook of the Economics of Education*, volume 4, pages 1–181. Elsevier.

Anderberg, D. and Olympiou, C. (2023). Children's social care and early intervention policy: Evidence from sure start. *Economica*, 90(359):953–977.

Andersen, S. C., Bodilsen, S. T., Houmark, M. A., and Nielsen, H. S. (2022). Fade-out of educational interventions: statistical and substantive sources.

Ansong, D., Okumu, M., Bowen, G. L., Walker, A. M., and Eisensmith, S. R. (2017). The role of parent, classmate, and teacher support in student engagement: Evidence from Ghana. *International Journal of Educational Development*, 54:51–58.

Antman, F. M. (2011a). The intergenerational effects of paternal migration on schooling and work: What can we learn from children's time allocations? *Journal of Development Economics*, 96(2):200–208.

Antman, F. M. (2011b). International migration and gender discrimination among children left behind. *American Economic Review*, 101(3):645–649.

Antman, F. M. (2012). Gender, educational attainment, and the impact of parental migration on children left behind. *Journal of Population Economics*, 25(4):1187–1214.

Appleton, J. J., Christenson, S. L., and Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools*, 45(5):369–386.

Araujo, M. C., Carneiro, P., Cruz-Aguayo, Y., and Schady, N. (2016). Teacher quality and learning outcomes in kindergarten. *The Quarterly Journal of Economics*, 131(3):1415–1453.

Arlini, S. M., Yeoh, B. S., Yen, K. C., and Graham, E. (2019). Parental migration and the educational enrolment of left-behind children: evidence from rural ponorogo, Indonesia. *Asian Population Studies*, 15(2):190–208.

Arnold, L. E., Hodgkins, P., Kahle, J., Madhoo, M., and Kewley, G. (2020). Long-term outcomes of adhd: academic achievement and performance. *Journal of attention disorders*, 24(1):73–85.

Attanasio, O., Blundell, R., Conti, G., and Mason, G. (2020a). Inequality in socio-emotional skills: A cross-cohort comparison. *Journal of Public Economics*, 191:104171.

Attanasio, O., Cattan, S., and Meghir, C. (2022). Early childhood development, human capital, and poverty. *Annual Review of Economics*, 14:853–892.

Attanasio, O., De Paula, Á., and Toppeta, A. (2020b). The persistence of socio-emotional skills: Life cycle and intergenerational evidence. Technical report, National Bureau of Economic Research.

Bailey, D., Duncan, G. J., Odgers, C. L., and Yu, W. (2017). Persistence and fadeout in the impacts of child and adolescent interventions. *Journal of research on educational effectiveness*, 10(1):7–39.

Bailey, M. J., Sun, S., and Timpe, B. (2021). Prep school for poor kids: The long-run impacts of Head Start on human capital and Economic self-sufficiency. *American Economic Review*, 111(12):3963–4001.

Baker, C. (2011). *Foundations of bilingual education and bilingualism*. Multilingual Matters.

Balart, P., Oosterveen, M., and Webbink, D. (2018). Test scores, noncognitive skills and Economic growth. *Economics of Education Review*, 63:134–153.

Balliet, D., Li, N. P., Macfarlan, S. J., and Van Vugt, M. (2011). Sex differences in cooperation: a meta-analytic review of social dilemmas. *Psychological bulletin*, 137(6):881.

Bargain, O. and Boutin, D. (2015). Remittance effects on child labour: Evidence from Burkina faso. *The Journal of Development Studies*, 51(7):922–938.

Barger, M. M., Kim, E. M., Kuncel, N. R., and Pomerantz, E. M. (2019). The relation between parents' involvement in children's schooling and children's adjustment: A meta-analysis. *Psychological bulletin*, 145(9):855.

Barnett, W. S. (1992). Benefits of compensatory preschool education. *Journal of Human resources*, pages 279–312.

Barnett, W. S. and Frede, E. C. (2017). Long-term effects of a system of high-quality universal preschool education in the United States. In *Childcare, Early Education and Social Inequality*. Edward Elgar Publishing.

Barnett, W. S., Yarosz, D. J., Thomas, J., Jung, K., and Blanco, D. (2007). Two-way and monolingual English immersion in preschool education: An experimental comparison. *Early Childhood Research Quarterly*, 22(3):277–293.

Bartlett, L. (2012). South-south migration and education: The case of people of Haitian descent born in the Dominican Republic. *Compare: A Journal of Comparative and International Education*, 42(3):393–414.

Basaran, M., Dursun, B., Gur Dortok, H. D., and Yilmaz, G. (2021). Evaluation of preschool education program according to cipp model. *Pedagogical Research*, 6(2).

Basu, A., Coe, N. B., and Chapman, C. G. (2018). 2sls versus 2sri: A ppropriate methods for rare outcomes and/or rare exposures. *Health Economics*, 27(6):937–955.

Batalova, J. and McHugh, M. (2010). Number and growth of students in us schools in need of English instruction.

Bevelander, P. (2011). The employment integration of resettled refugees, asylum claimants, and family reunion migrants in sweden. *Refugee Survey Quarterly*, 30(1):22–43.

Bøe, T., Øverland, S., Lundervold, A. J., and Hysing, M. (2012). Socioeconomic status and children's mental health: results from the bergen child study. *Social psychiatry and psychiatric epidemiology*, 47:1557–1566.

Bonneville-Roussy, A., Bouffard, T., and Vezeau, C. (2017). Trajectories of self-evaluation bias in primary and secondary school: Parental antecedents and academic consequences. *Journal of school psychology*, 63:1–12.

Bono, E. D., Francesconi, M., Kelly, Y., and Sacker, A. (2016). Early maternal time investment and early child outcomes. *The Economic Journal*, 126(596):F96–F135.

Bouoiyour, J. and Miftah, A. (2015). Migration, remittances and educational levels of household members left behind: Evidence from rural Morocco.

Boutin-Martinez, A., Mireles-Rios, R., Nylund-Gibson, K., and Simon, O. (2019). Exploring resilience in latina/o academic outcomes: A latent class approach. *Journal of Education for Students Placed at Risk (JESPAR)*, 24(2):174–191.

Bradley, D. (1979). Proto-loloish/scandinavian institute of Asian studies.

Budría, S., Martinez de Ibarreta, C., and Swedberg, P. (2017). The impact of host language proficiency across the immigrants' earning distribution in Spain. *IZA Journal of Development and Migration*, 7:1–27.

Buri, J. R. (1991). Parental authority questionnaire. *Journal of personality assessment*, 57(1):110–119.

Burks, S. V., Lewis, C., Kivi, P. A., Wiener, A., Anderson, J. E., Götte, L., DeYoung, C. G., and Rustichini, A. (2015). Cognitive skills, personality, and Economic preferences in collegiate success. *Journal of Economic Behavior & Organization*, 115:30–44.

Cadsby, C. B., Song, F., and Yang, X. (2019). Dishonesty among children: Rural/urban status and parental migration. In *Dishonesty in Behavioral Economics*, pages 31–52. Elsevier.

Cai, B., Small, D. S., and Have, T. R. T. (2011). Two-stage instrumental variable methods for estimating the causal odds ratio: analysis of bias. *Statistics in medicine*, 30(15):1809–1824.

Cai, H. and Li, S. (2015). Bilingual curriculum construction and implementation of preschool education in Tibetan areas. *Studies in Literature and Language*, 10(4):124.

Calero, C., Bedi, A. S., and Sparrow, R. (2009). Remittances, liquidity constraints and human capital investments in Ecuador. *World Development*, 37(6):1143–1154.

Callaway, B. and Sant'Anna, P. H. (2021). Difference-in-differences with multiple time periods. *Journal of econometrics*, 225(2):200–230.

Caminal, R., Cappellari, L., and Di Paolo, A. (2021). Language-in-education, language skills and the intergenerational transmission of language in a bilingual society. *Labour Economics*, 70:101975.

Campos, B. C., Ren, Y., and Petrick, M. (2016). The impact of education on income inequality between ethnic minorities and han in China. *China Economic review*, 41:253–267.

Carneiro, P. M. and Heckman, J. J. (2003). Human capital policy.

Cascio, E. U. (2023). Does universal preschool hit the target?: Program access and preschool impacts. *Journal of Human Resources*, 58(1):1–42.

Center for Child Rights and Corporate Social Responsibility (2013). They are also parents: A study on migrant workers with left-behind children in China.

Central Government of the People's Republic of China (2017). Liangshan, sichuan 'one village and one preschool' make up for the shortcomings of preschool education in yi area (sichuansheng liangsha yicunyiyou buqi yiqu xueqian jiaoyu duanban).

Chai, X., Li, X., Ye, Z., Li, Y., and Lin, D. (2019). Subjective well-being among left-behind children in rural China: The role of ecological assets and individual strength. *Child: care, health and development*, 45(1):63–70.

Chang, F., Jiang, Y., Loyalka, P., Chu, J., Shi, Y., Osborn, A., and Rozelle, S. (2019). Parental migration, educational achievement, and mental health of junior high school students in rural China. *China Economic Review*, 54:337–349.

Chater, N. and Christiansen, M. H. (2018). Language acquisition as skill learning. *Current opinion in behavioral sciences*, 21:205–208.

Chen, S., Adams, J., Qu, Z., Wang, X., and Chen, L. (2013). Parental migration and children's academic engagement: The case of China. *International Review of Education*, 59(6):693–722.

Chen, S., Chen, Z., Shi, J., Chen, C., Snow, C. E., and Lu, M. (2019). Long-term effects of China's one village one preschool program on elementary academic achievement. *Early Childhood Research Quarterly*, 49:218–228.

Chen, S. X. and Bond, M. H. (2010). Two languages, two personalities? examining language effects on the expression of personality in a bilingual context. *Personality and Social Psychology Bulletin*, 36(11):1514–1528.

Chen, X., Huang, Q., Rozelle, S., Shi, Y., and Zhang, L. (2014a). Effect of migration on children's educational performance in rural China. In *China's Economic Development*, pages 206–224. Springer.

Chen, Y. and Feng, S. (2013). Access to public schools and the education of migrant children in China. *China Economic Review*, 26:75–88.

Chen, Z., Lu, M., and Xu, L. (2014b). Returns to dialect: Identity exposure through language in the Chinese labor market. *China Economic Review*, 30:27–43.

Chetty, R., Hendren, N., Lin, F., Majerovitz, J., and Scuderi, B. (2016). Childhood environment and gender gaps in adulthood. *American Economic Review*, 106(5):282–288.

Chi, W. and Qian, X. (2016). Human capital investment in children: An empirical study of household child education expenditure in China, 2007 and 2011. *China Economic Review*, 37:52–65.

Chi, X., Huang, L., Wang, J., and Zhang, P. (2020). The prevalence and socio-demographic correlates of depressive symptoms in early adolescents in China: Differences in only child and non-only child groups. *International journal of environmental research and public health*, 17(2):438.

China Development Research Foundations (2017). A mountain village kindergarten plan to change the status quo of preschool education in China (yichang shancun youeryuan jihua, gaibian zhongguo xueqianjiaoyu xianzhuang).

China National Bureau of Statistics, United Nations Children's Fund, and United Nations Children's Fund (2023). China's child population 2020: Facts and figure.

Chiswick, B. R. and Miller, P. W. (2002). Immigrant earnings: Language skills, linguistic concentrations and the business cycle. *Journal of population Economics*, 15:31–57.

Chiswick, B. R. and Miller, P. W. (2015). International migration and the Economics of language. In *Handbook of the Economics of international migration*, volume 1, pages 211–269. Elsevier.

Chow, C., Zhou, X., Fu, Y., Jampaklay, A., and Jordan, L. P. (2023). From left-behind children to youth labor migrants: The impact of household networks, gendered migration, and relay migration in southeast Asia. *Social Sciences*, 12(3):135.

Coneus, K., Laucht, M., and Reuß, K. (2012). The role of parental investments for cognitive and noncognitive skill formation—evidence for the first 11 years of life. *Economics & Human Biology*, 10(2):189–209.

Conti, G., Heckman, J. J., and Pinto, R. (2016). The effects of two influential early childhood interventions on health and healthy behaviour. *The Economic Journal*, 126(596):F28–F65.

Cueto, S., Guerrero, G., León, J., Seguin, E., and Muñoz, I. (2009). Explaining and overcoming marginalization in education: a focus on ethnic/language minorities in peru. Technical report, UNESCO.

Cunningham, W., Torrado, M., and Sarzosa, M. (2016). Cognitive and non-cognitive skills for the peruvian labor market: Addressing measurement error through latent skills estimations. *World Bank Policy Research Working Paper*, (7550).

Currie, J. and Thomas, D. (1999). Early test scores, socioEconomic status and future outcomes.

Damm, A. P., Mattana, E., and Nielsen, H. S. (2022). Effects of school displacement on academic achievement and wellbeing of ethnic minorities. *Labour Economics*, 79:102266.

De Brauw, A. and Giles, J. (2018). Migrant labor markets and the welfare of rural households in the developing world: Evidence from China. *The World Bank Economic Review*, 32(1):1–18.

De Houwer, A. (1999). Two or more languages in early childhood: Some general points and practical recommendations. eric digest.

Dee, T. S. (2007). Teachers and the gender gaps in student achievement. *Journal of Human resources*, 42(3):528–554.

Del Bono, E., Etheridge, B., and Garcia, P. (2024). The Economic value of childhood socio-emotional skills. Technical report, Institute for Social and Economic Research.

Del Bono, E., Kinsler, J., and Pavan, R. (2020). Skill formation and the trouble with child non-cognitive skill measures. Technical report, IZA Discussion Papers.

DeMalach, E. and Schlosser, A. (2024). Short-and long-term effects of universal preschool: Evidence from the Arab population in Israel.

Deming, D. (2009). Early childhood intervention and life-cycle skill development: Evidence from Head Start. *American Economic Journal: Applied Economics*, 1(3):111–134.

Deng, Z. and Law, Y. W. (2020). Rural-to-urban migration, discrimination experience, and health in China: Evidence from propensity score analysis. *PLoS One*, 15(12):e0244441.

Deslandes, R., Royer, E., Turcotte, D., and Bertrand, R. (1997). School achievement at the secondary level: Influence of parenting style and parent involvement in schooling. *McGill Journal of Education/Revue des sciences de l'éducation de McGill*, 32(003).

Dillon, M. and Walsh, C. A. (2012). Left behind: The experiences of children of the Caribbean whose parents have migrated. *Journal of Comparative Family Studies*, 43(6):871–902.

DiPrete, T. A. and Jennings, J. L. (2012). Social and behavioral skills and the gender gap in early educational achievement. *Social Science Research*, 41(1):1–15.

Doepke, M. and Zilibotti, F. (2017). Parenting with style: Altruism and paternalism in intergenerational preference transmission. *Econometrica*, 85(5):1331–1371.

Dogan, U. (2015). Student engagement, academic self-efficacy, and academic motivation as predictors of academic performance. *The Anthropologist*, 20(3):553–561.

Dollmann, J., Kogan, I., and Weißmann, M. (2024). When your accent betrays you: the role of foreign accents in school-to-work transition of ethnic minority youth in Germany. *Journal of Ethnic and Migration Studies*, pages 1–44.

Domitrovich, C. E., Durlak, J. A., Staley, K. C., and Weissberg, R. P. (2017). Social-emotional competence: An essential factor for promoting positive adjustment and reducing risk in school children. *Child development*, 88(2):408–416.

Donnellan, M. B., Oswald, F. L., Baird, B. M., and Lucas, R. E. (2006). The mini-ipip scales: tiny-yet-effective measures of the Big Five factors of personality. *Psychological assessment*, 18(2):192.

Dornbusch, S. M., Ritter, P. L., Leiderman, P. H., Roberts, D. F., and Fraleigh, M. J. (2016). The relation of parenting style to adolescent school performance. In *Cognitive and moral development, academic achievement in adolescence*, pages 276–289. Routledge.

Dotterer, A. M. and Wehrspann, E. (2016). Parent involvement and academic outcomes among urban adolescents: Examining the role of school engagement. *Educational Psychology*, 36(4):812–830.

Dovì, M.-S. (2019). Does higher language proficiency decrease the probability of unemployment? evidence from China. *China Economic Review*, 54:1–11.

Duan, C. (2008). Hukou Zhidu 50 nian (the Hukou system at 50). *Renkou Yanjiu (Population Research)*, 32(1):43–50.

Duan, C.-r. and Yang, G. (2009). On China's floating population: Based on the analysis of 1% national population sample survey 2005 [j]. *Journal of Nanjing College for Population Programme Management*, 4.

Duckworth, A. L. and Yeager, D. S. (2015). Measurement matters: Assessing personal qualities other than cognitive ability for educational purposes. *Educational researcher*, 44(4):237–251.

Duncan, G., Kalil, A., Mogstad, M., and Rege, M. (2023). Investing in early childhood development in preschool and at home. *Handbook of the Economics of Education*, 6:1–91.

Duncan, G. J. and Magnuson, K. (2013). Investing in preschool programs. *Journal of Economic perspectives*, 27(2):109–132.

Dustmann, C. (1994). Speaking fluency, writing fluency and earnings of migrants. *Journal of Population Economics*, 7(2):133–156.

Dustmann, C. (1999). Temporary migration, human capital, and language fluency of migrants. *scandinavian Journal of Economics*, 101(2):297–314.

Dustmann, C. and Fabbri, M. (2003). Language proficiency and labour market performance of immigrants in the UK. *The Economic journal*, 113(489):695–717.

Education Department of Sichuan Province (2016). Liangshan prefecture in sichuan province made solid progress in the construction of one village and one child (sichuansheng Liangshanzhou zhashi tuijin yicunyiyou jianshen).

Education Department of Sichuan Province (2019). Work at the forefront to strengthen the cornerstone of intergenerational transmission of poverty (ganzai shichu, zouzai qianlie, hangshi zuduan pinkun daiji chuandi jishi).

Edwards, A. L. (1953). The relationship between the judged desirability of a trait and the probability that the trait will be endorsed. *Journal of applied Psychology*, 37(2):90.

Elango, S., García, J. L., Heckman, J. J., and Hojman, A. (2015). Early childhood education. In *Economics of means-tested transfer programs in the United States, Volume 2*, pages 235–297. University of Chicago Press.

Elgar, F. J., Roberts, C., Tudor-Smith, C., and Moore, L. (2005). Validity of self-reported height and weight and predictors of bias in adolescents. *Journal of Adolescent Health*, 37(5):371–375.

Engle, P. L., Fernald, L. C., Alderman, H., Behrman, J., O'Gara, C., Yousafzai, A., De Mello, M. C., Hidrobo, M., Ulkuer, N., Ertem, I., et al. (2011). Strategies for reducing inequalities and improving developmental outcomes for young children in low-income and middle-income countries. *The Lancet*, 378(9799):1339–1353.

Escamilla, K., Hopewell, S., Butvilofsky, S., Sparrow, W., Soltero-González, L., Ruiz-Figueroa, O., and Escamilla, M. (2014). *Biliteracy from the start: Literacy squared in action*. Caslon Publishing Philadelphia, PA.

Etikan, I. and Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal*, 5(6):00149.

Executive Office of the President Council of Economic Advisers (2016). Inequality in early childhood and effective public policy interventions. *Economic Report of the President (2016)*.

Fan, X. and Chen, M. (2001). Parental involvement and students' academic achievement: A meta-analysis. *Educational psychology review*, 13:1–22.

Fang, J., Fleck, M., Green, A., McVilly, K., Hao, Y., Tan, W., Fu, R., and Power, M. (2011). The response scale for the intellectual disability module of the whoqol: 5-point or 3-point? *Journal of Intellectual Disability Research*, 55(6):537–549.

Feng, B. (2010). Economic exclusion and educational equity for migrant children. *2010 Annual Meeting of the Chinese Economic Association on Education, Wuhan*.

Ferrer-i Carbonell, A. and Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness? *The Economic journal*, 114(497):641–659.

Fielding, R. and Harbon, L. (2022). Dispelling the monolingual myth: Exploring literacy outcomes in australian bilingual programmes. *International Journal of Bilingual Education and Bilingualism*, 25(3):997–1020.

Fields, G. and Song, Y. (2020). Modeling migration barriers in a two-sector framework: A welfare analysis of the Hukou reform in China. *Economic Modelling*, 84:293–301.

Flege, J. E., Yeni-Komshian, G. H., and Liu, S. (1999). Age constraints on second-language acquisition. *Journal of memory and language*, 41(1):78–104.

Fredricks, J. A., Reschly, A. L., and Christenson, S. L. (2019). *Handbook of student engagement interventions: Working with disengaged students*. Academic Press.

Frick, P. J. (1991). Alabama parenting questionnaire (apq). *https://www.youthcoalition.net/wp-content/uploads/2022/06/APQ.pdf*.

Fu, M., Bo, W. V., Xue, Y., and Yuan, T.-F. (2017). Parental absence accompanies worse academic achievements: Evidence based upon a sample of left-behind children in rural China. In *Frontiers in Education*, volume 2, page 38. Frontiers Media SA.

Gándara, P., Escamilla, K., et al. (2017). Bilingual education in the United States. *Bilingual and multilingual education*, 12(1):439–452.

Ganzach, Y. (2000). Parents' education, cognitive ability, educational expectations and educational attainment: Interactive effects. *British Journal of Educational Psychology*, 70(3):419–441.

Gao, Q., Yang, S., Zhang, Y., and Li, S. (2018). The divided Chinese welfare system: do health and education change the picture? *Social Policy and Society*, 17(2):227–244.

García, J. L., Heckman, J. J., and Ronda, V. (2023). The lasting effects of early-childhood education on promoting the skills and social mobility of disadvantaged African Americans and their children. *Journal of Political Economy*, 131(6):1477–1506.

Ge, Y., Se, J., and Zhang, J. (2015). Research on relationship among internet-addiction, personality traits and mental health of urban left-behind children. *Global journal of health science*, 7(4):60.

Geary, D. N. and Pan, Y. (2003). A bilingual education pilot project among the kam people in guizhou province, China. *Journal of Multilingual and Multicultural Development*, 24(4):274–289.

Genesee, F., Lindholm-Leary, K., Saunders, W., and Christian, D. (2006). Educating English learners: A synthesis of research evidence.

Gensowski, M. (2018). Personality, IQ, and lifetime earnings. *Labour Economics*, 51:170–183.

Gil, A. J., Antelm-Lanzat, A. M., Cacheiro-González, M. L., and Pérez-Navío, E. (2021). The effect of family support on student engagement: Towards the prevention of dropouts. *Psychology in the Schools*, 58(6):1082–1095.

Gil, L. and Ceja, A. (2015). English learner (el) students who are Hispanic/latino. *Retrieved from the Office of English Language Acquisition http://www2. ed. gov/about/offices/list/oela/fastfacts/ffhisplatino1. pdf*.

Goldammer, P., Annen, H., Stöckli, P. L., and Jonas, K. (2020). Careless responding in questionnaire measures: Detection, impact, and remedies. *The Leadership Quarterly*, 31(4):101384.

Good, J. (2017). Niger-congo languages. *The Cambridge handbook of areal linguistics*, pages 471–499.

Goodall, J. and Montgomery, C. (2014). Parental involvement to parental engagement: A continuum. *Educational review*, 66(4):399–410.

Goodman, R. (1997). The strengths and difficulties questionnaire: a research note. *Journal of Child Psychology and Psychiatry*, 38(5):581–586.

Gray-Lobe, G., Pathak, P. A., and Walters, C. R. (2023). The long-term effects of universal preschool in Boston. *The Quarterly Journal of Economics*, 138(1):363–411.

Grosjean, F. (2022). *The mysteries of bilingualism: Unresolved issues*. John Wiley & Sons.

Gruijters, R. J. and Behrman, J. A. (2020). Learning inequality in francophone Africa: School quality and the educational achievement of rich and poor children. *Sociology of Education*, 93(3):256–276.

Gruijters, R. J., Raabe, I. J., and Hübner, N. (2021). Socio-emotional skills and the socioEconomic achievement gap. *Sociology of Education*, page 00380407231216424.

Grüning Parache, L., Vogel, M., Meigen, C., Kiess, W., and Poulain, T. (2024). Family structure, socioeconomic status, and mental health in childhood. *European Child & Adolescent Psychiatry*, 33(7):2377–2386.

Guo, S., Li, N., Sun, X., Peng, J., and Fraser, M. W. (2023). The moderating effects of school resources on the impact of a school-based intervention on the social information-processing skills of third graders in rural China. *Journal of community psychology*, 51(2):539–559.

Haider, Z. F. and von Stumm, S. (2022). Predicting educational and social–emotional outcomes in emerging adulthood from intelligence, personality, and socioEconomic status. *Journal of Personality and Social Psychology*, 123(6):1386.

Han, J. (2017). Education of migrant children in China. *A Multi-Country Study on the Education of Migrant Children*, pages 90–107.

Han, W.-J. (2012). Bilingualism and academic achievement. *Child development*, 83(1):300–321.

Harrell, S. (1990). Ethnicity, local interests, and the state: Yi communities in southwest China. *Comparative Studies in Society and History*, 32(3):515–548.

Harrell, S. (2001). *Perspectives on the Yi of Southwest China*, volume 26. Univ of California Press.

Hayfron, J. E. (2001). Language training, language proficiency and earnings of immigrants in Norway. *Applied Economics*, 33(15):1971–1979.

Heckman, J., Pinto, R., and Savelyev, P. (2013). Understanding the mechanisms through which an influential early childhood program boosted adult outcomes. *American Economic Review*, 103(6):2052–2086.

Heckman, J. J. (2011). The Economics of inequality: The value of early childhood education. *American Educator*, 35(1):31.

Heckman, J. J. and Kautz, T. (2013). Fostering and measuring skills: Interventions that improve character and cognition. *NBER Working paper*.

Heckman, J. J., Stixrud, J., and Urzua, S. (2006). The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor Economics*, 24(3):411–482.

Hess, R. D. and Holloway, S. D. (1984). Family and school as educational institutions. *Review of child development research*, 7:179–222.

Hill, N. E. et al. (2015). Including fathers in the picture: A meta-analysis of parental involvement and students' academic achievement. *Journal of Educational Psychology*, 107(4):919.

Hill, N. E. and Tyson, D. F. (2009). Parental involvement in middle school: a meta-analytic assessment of the strategies that promote achievement. *Developmental psychology*, 45(3):740.

Holmlund, H. and Silva, O. (2014). Targeting noncognitive skills to improve cognitive outcomes: Evidence from a remedial education intervention. *Journal of Human Capital*, 8(2):126–160.

Hosokawa, R. and Katsura, T. (2019). Role of parenting style in children's behavioural problems through the transition from preschool to elementary school according to gender in japan. *International Journal of Environmental Research and Public Health*, 16(1):21.

Howard, J. M., Nicholson, B. C., and Chesnut, S. R. (2019). Relationships between positive parenting, overparenting, grit, and academic success. *Journal of College Student Development*, 60(2):189–202.

Hoynes, H., Page, M., and Stevens, A. H. (2011). Can targeted transfers improve birth outcomes? evidence from the introduction of the WICorway program. *Journal of Public Economics*, 95(7-8):813–827.

Hsu, S.-C. (2018). *Empirical Essays on Family and Education Economics*. PhD thesis, Texas A&M University.

Hu, B., Wu, H., Winsler, A., Fan, X., and Song, Z. (2020). Parent migration and rural preschool children's early academic and social skill trajectories in China: Are 'left-behind'children really left behind? *Early Childhood Research Quarterly*, 51:317–328.

Hu, F. (2012). Migration, remittances, and children's high school attendance: The case of rural China. *International Journal of Educational Development*, 32(3):401–411.

Hu, F. (2013). Does migration benefit the schooling of children left behind? evidence from rural northwest China. *Demographic Research*, 29:33–70.

Hu, R. (2016). The age factor in second language learning. *Theory and practice in language studies*, 6(11):2164–2168.

Hu, S. (2018). Parents' migration and adolescents' transition to high school in rural China: The role of parental divorce. *Journal of Family Issues*, 39(12):3324–3359.

Huang, A. and Santos, P. (2022). Improving the reliability and validity of data on Big Five personality traits in developing countries. Technical report, Monash University, Department of Economics.

Huang, m. (2016). *China Administrative Division Canon, Sichuan province*. China Social Press.

Jackson, D. N. and Messick, S. (1958). Content and style in personality assessment. *Psychological bulletin*, 55(4):243.

Jingzhong, Y. and Lu, P. (2011). Differentiated childhoods: impacts of rural labor migration on left-behind children in China. *The Journal of peasant studies*, 38(2):355–377.

Johnson, J. S. and Newport, E. L. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive psychology*, 21(1):60–99.

Karsidi, R., Humona, R., Budiati, A. C., and Wardojo, W. W. (2013). Parent involvement on school committees as social capital to improve student achievement. *Excellence in Higher Education*, 4(1):1–6.

Kautz, T., Heckman, J. J., Diris, R., Ter Weel, B., and Borghans, L. (2014). Fostering and measuring skills: Improving cognitive and non-cognitive skills to promote lifetime success. *NBER Working paper*.

Keels, M. (2009). Ethnic group differences in early Head Start parents' parenting beliefs and practices and links to children's early cognitive development. *Early Childhood Research Quarterly*, 24(4):381–397.

Klugman, J. (2009). Human development report 2009. overcoming barriers: Human mobility and development. *Overcoming Barriers: Human Mobility and Development (October 5, 2009). UNDP-HDRO Human Development Reports*.

Klugman, J. and Medalho Pereira, I. (2009). Assessment of national migration policies: An emerging picture on admissions, treatment and enforcement in developing and developed countries. *United Nations Human Development Research Paper*, (48).

Koo, A., Ming, H., and Tsang, B. (2014). The doubly disadvantaged: How return migrant students fail to access and deploy capitals for academic success in rural schools. *Sociology*, 48(4):795–811.

Kosterelioglu, I. (2018). Effects of parenting style on students' achievement goal orientation: A study on high school students. *Educational Policy Analysis and Strategic Research*, 13(4):91–107.

Krosnick, J. A. (2018). Questionnaire design. *The Palgrave Handbook of survey research*, pages 439–455.

Kulkarni-Joshi, S. (2019). Linguistic history and language diversity in India: Views and counterviews. *Journal of Biosciences*, 44(3):62.

Kusurkar, R. A., Ten Cate, T. J., Vos, C., Westers, P., and Croiset, G. (2013). How motivation affects academic performance: a structural equation modelling analysis. *Advances in health sciences education*, 18:57–69.

Laajaj, R., Macours, K., Pinzon Hernandez, D. A., Arias, O., Gosling, S. D., Potter, J., Rubio-Codina, M., and Vakis, R. (2019). Challenges to capture the Big Five personality traits in non-weird populations. *Science advances*, 5(7).

Lacey, L. (2023). The physical and mental health returns of Head Start 25 years after participation: Evidence from income eligibility cutoffs. *Economic Inquiry*.

Lai, F., Liu, C., Luo, R., Zhang, L., Ma, X., Bai, Y., Sharbono, B., and Rozelle, S. (2014). The education of China's migrant children: The missing link in China's education system. *International Journal of Educational Development*, 37:68–77.

Lam, S.-f., Jimerson, S., Wong, B. P., Kikas, E., Shin, H., Veiga, F. H., Hatzichristou, C., Polychroni, F., Cefai, C., Negovan, V., et al. (2014). Understanding and measuring student engagement in school: the results of an international study from 12 countries. *School Psychology Quarterly*, 29(2):213.

Lang, J. (2022). Employment effects of language training for unemployed immigrants. *Journal of Population Economics*, 35(2):719–754.

Lavenda, O. (2011). Parental involvement in school: A test of hoover-dempsey and sandler's model among Jewish and Arab parents in Israel. *Children and Youth Services Review*, 33(6):927–935.

Lebrun, L. A. (2012). Effects of length of stay and language proficiency on health care experiences among immigrants in Canada and the United States. *Social science & medicine*, 74(7):1062–1072.

Lee, M.-H. (2011). Migration and children's welfare in China: The schooling and health of children left behind. *The Journal of Developing Areas*, pages 165–182.

Leshan Bureau of Statistics (2015). Leshan statistical yearbook. *Leshan: China Statistics Press*.

Leshan Bureau of Statistics (2021). Bulletin of the seventh national census of Leshan city (no. 1-6) (Leshanshi diqici quanguo renkou pucha gongbao no.1-6).

Lewis, G. and Gerard, S. (2022). International personality item pool. *https://ipip.ori.org/*.

Li, G., Yin, X., and Ji, X. (2022). Early bilingual vocabulary development among low-ses ethnic minority learners in China: The case of Uyghur and Kazak children. *Chinese Journal of Applied Linguistics*, 45(3):323–339.

Li, J., Luo, E., and Cockx, B. (2023). The long-term impact of parental migration on the health of young left-behind children. *CESifo Working Paper*.

Li, L., Wang, L., and Nie, J. (2017). Effect of parental migration on the academic performance of left-behind middle school students in rural China. *China & World Economy*, 25(2):45–59.

Li, Y., Lv, Y., and Huntsinger, C. S. (2015). Does preschool education exposure predict children's academic and behavioural outcomes in China? *Early Child Development and Care*, 185(1):121–137.

Li, Z., Jiang, Y., Li, M., and Lu, C. (2018). Inequalities in socio-emotional development and positive parenting during childhood: Evidence from China 2010–2014. *SSM-Population Health*, 5:8–16.

Liang, Y. and Yu, S. (2022). Are non-left-behind children really not left behind? the impact of village migration on children's health outcomes in rural China. *Applied Economics*, 54(60):6901–6918.

Liang, Z. and Chen, Y. P. (2007). The educational consequences of migration for children in China. *Social science research*, 36(1):28–47.

Liao, C., Gu, X., Wang, J., Li, K., Wang, X., Zhao, M., and Feng, Z. (2022). The relation between neuroticism and non-suicidal self-injury behavior among college students: Multiple mediating effects of emotion regulation and depression. *International journal of environmental research and public health*, 19(5):2885.

Lindholm-Leary, K. (2017). Bilingual and biliteracy skills in young Spanish-speaking low-ses children: Impact of instructional language and primary language proficiency. In *Immersion Education in the Early Years*, pages 26–41. Routledge.

Lindholm-Leary, K. and Block, N. (2010). Achievement in predominantly low ses/Hispanic dual language schools. *International Journal of Bilingual Education and Bilingualism*, 13(1):43–60.

Lindley, J. (2002). The English language fluency and earnings of ethnic minorities in Britain. *Scottish Journal of Political Economy*, 49(4):467–487.

Liu, L. A., Friedman, R. A., and Chi, S.-c. (2005). 'ren qing" versus the 'Big Five'the role of culturally sensitive measures of individual difference in distributive negotiations. *Management and Organization Review*, 1(2):225–247.

London, J. D. (2013). Welfare regimes in the wake of state socialism: China and Vietnam. *Chinese social policy in a time of transition*, pages 18–47.

Long, H., Li, J., and Liu, H. (2022). Internal migration and associated carbon emission changes: Evidence from cities in China. *Energy Economics*, 110:106010.

Lu, J., Jiang, M., Li, L., and Hesketh, T. (2019). Relaxation in the Chinese Hukou system: effects on the psychosocial well-being of children affected by migration. *International Journal of Environmental Research and Public Health*, 16(19):3744.

Lu, M., Jin, F., Zhixin, D., Yan, C., Zhiping, W., Xiang, Z., Bojiao, L., and Tianxue, D. (2020). Report on the development of preschool education in western China (in Chinese). *Journal of East China Normal University*, 38(1):97–126.

Lu, N., Lu, W., Chen, R., and Tang, W. (2023). The causal effects of urban-to-urban migration on left-behind children's well-being in China. *International Journal of Environmental Research and Public Health*, 20(5):4303.

Lu, T. and Myerson, R. (2020). Disparities in health insurance coverage and access to care by English language proficiency in the USA, 2006–2016. *Journal of General Internal Medicine*, 35:1490–1497.

Lv, B., Zhou, H., Guo, X., Liu, C., Liu, Z., and Luo, L. (2016). The relationship between academic achievement and the emotional well-being of elementary school children in China: The moderating role of parent-school communication. *Frontiers in psychology*, 7:191975.

Ma, R. (2017). putonghua learning and modernization of ethnic minorities in China (in Chinese). *Social policy research*, 1:110–124.

MacCann, C., Jiang, Y., Brown, L. E., Double, K. S., Bucich, M., and Minbashian, A. (2020). Emotional intelligence predicts academic performance: A meta-analysis. *Psychological bulletin*, 146(2):150.

Macdonald, M. (2022). The Economic returns to bilingualism in the US labor market.

Magnuson, K. A., Meyers, M. K., Ruhm, C. J., and Waldfogel, J. (2004). Inequality in preschool education and school readiness. *American educational research journal*, 41(1):115–157.

Malone, L. (2007). Migrants' remittances and investments in children's human capital: The role of asymmetric preferences in Mexico.

Mansuri, G. (2006). Migration, school attainment, and child labor: evidence from rural Pakistan. *World Bank Policy Research Working Paper*, (3945).

McCrae, R. R. and Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of personality and social psychology*, 52(1):81.

Meade, A. W. and Craig, S. B. (2012). Identifying careless responses in survey data. *Psychological methods*, 17(3):437.

Mendez, I. (2015). The effect of the intergenerational transmission of noncognitive skills on student performance. *Economics of Education Review*, 46:78–97.

Meng, X. and Yamauchi, C. (2017). Children of migrants: The cumulative impact of parental migration on children's education and health outcomes in China. *Demography*, 54(5):1677–1714.

Middleton, J., Llamas-Flores, S., and Guerra-Lombardi, P. (2013). English language learning and learning academic language in mathematics. *Academic language in second language learning*, pages 201–224.

Mihret, A. M., Dilgasa, G. S., and Mamo, T. H. (2019). Parenting style as correlates of adolescents' academic achievement motivation of bate secondary school, Haramaya, Ethiopia. *International Journal of Education and Literacy Studies*, 7(2):172–176.

Miller, D. L., Shenhav, N., and Grosz, M. (2023). Selection into identification in fixed effects models, with application to Head Start. *Journal of Human Resources*, 58(5):1523–1566.

Ming, H. (2014). Migrant workers' children and China's future: the educational divide. *The Asia-Pacific Journal*, 12(9):1–13.

Ministry of Education of China (2011a). Chinese curriculum standards for compulsory education (2011 edition). Technical report.

Ministry of Education of China (2011b). Mathematics curriculum standards for compulsory education (2011 edition). Technical report.

Ministry of Education of the People's Republic of China (2019). Focus on deeply impoverished areas, and promote the 'three districts and three states' education poverty alleviation (jujiao shendu pinkun diqu, tuijin sanqusanzhou jiaoyu tuopin).

Mitchell, M., Favara, M., Porter, C., and Sánchez, A. (2023). Human capital development: New evidence on the production of socio-emotional skills. *Journal of Human Resources*.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., Houts, R., Poulton, R., Roberts, B. W., Ross, S., et al. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the national Academy of Sciences*, 108(7):2693–2698.

Montanari, S. (2014). A case study of bi-literacy development among children enrolled in an Italian–English dual language program in southern California. *International Journal of Bilingual Education and Bilingualism*, 17(5):509–525.

Moroni, G., Nicoletti, C., and Tominey, E. (2019). Child socio-emotional skills: The role of parental inputs.

Mu, R. and De Brauw, A. (2015). Migration and young child nutrition: evidence from rural China. *Journal of Population Economics*, 28(3):631–657.

Nguyen, C. V. (2016). Does parental migration really benefit left-behind children? comparative evidence from Ethiopia, India, peru and Vietnam. *Social Science & Medicine*, 153:230–239.

Nieuwenhuis, J. and Shen, X. (2023). The effect of meeting opportunities on local urban residents' prejudice against migrant children in China. *Urban Studies*, 60(5):847–868.

Padilla, A. M., Fan, L., Xu, X., and Silva, D. (2013). A mandarin/English two-way immersion program: Language proficiency and academic achievement. *Foreign Language Annals*, 46(4):661–679.

Pages, R., Bailey, D. H., and Duncan, G. J. (2023). The impacts of abecedarian and Head Start on educational attainment: Reasoning about unobserved mechanisms from temporal patterns of indirect effects. *Early Childhood Research Quarterly*, 65:261–274.

Palacios-Hidalgo, F. J., Huertas-Abril, C. A., and Gómez-Parra, M. E. (2021). Language teaching and bilingual education policies in Scotland and Andalusia: a language-use-based comparative study. *Research in Comparative and International Education*, 16(2):140–159.

Park, J. H. (1999). The earnings of immigrants in the United States: the effect of English-speaking ability. *American Journal of Economics and Sociology*, pages 43–56.

Pippins, J. R., Alegría, M., and Haas, J. S. (2007). Association between language proficiency and the quality of primary care among a national sample of insured Latinos. *Medical care*, 45(11):1020–1025.

Postiglione, G. A. (2009). The education of ethnic minority groups in China. In *The Routledge international companion to multicultural education*, pages 501–511. Routledge.

Pottie, K., Ng, E., Spitzer, D., Mohammed, A., and Glazier, R. (2008). Language proficiency, gender and self-reported health: an analysis of the first two waves of the longitudinal survey of immigrants to Canada. *Canadian Journal of Public Health*, 99:505–510.

Puerta, M. L. S., Valerio, A., and Bernal, M. G. (2016). Taking stock of programs to develop socioemotional skills: A systematic review of program evidence. *The World Bank*.

Qubie, y. and Li, l. (2020). Thoughts on traditional culture education of Yi nationality children from the perspective of cultural bilingual. *Wen jiao Zi liao*, 0(864):119–123.

Radloff, L. S. (1977). A self-report depression scale for research in the general population. *Applied Psychol Measurements*, 1:385–401.

Raimondo, G. (2019). The Chinese Hukou system: Reforming institutions of inequality between the need for roots and the demands of change. *Revue québécoise de droit international*, 32(1):139–171.

Rammstedt, B. (2007). The 10-item Big Five inventory. *European Journal of Psychological Assessment*, 23(3):193–201.

Rammstedt, B., Goldberg, L. R., and Borg, I. (2010). The measurement equivalence of big-five factor markers for persons with different levels of education. *Journal of research in personality*, 44(1):53–61.

Rammstedt, B., Kemper, C. J., Klein, M. C., Beierlein, C., and Kovaleva, A. (2013). A short scale for assessing the Big Five dimensions of personality: 10 item Big Five inventory (bfi-10). *methods, data, analyses*, 7(2):17.

Ravens-Sieberer, U., Kaman, A., Erhart, M., Devine, J., Schlack, R., and Otto, C. (2022). Impact of the Covid-19 pandemic on quality of life and mental health in children and adolescents in Germany. *European child & adolescent psychiatry*, 31(6):879–889.

Ren, Y. and Chan, K. W. (2018). *Children of Migrants in China in the 21st Century*. Taylor & Francis.

Reynolds, A. J., Temple, J. A., and Ou, S.-R. (2010). Preschool education, educational attainment, and crime prevention: Contributions of cognitive and non-cognitive skills. *Children and Youth Services Review*, 32(8):1054–1063.

Robles, V. F. and Oropesa, R. S. (2011). International migration and the education of children: Evidence from lima, peru. *Population research and policy review*, 30(4):591–618.

Rumbaut, R. G. (2014). *English plus: Exploring the socioEconomic benefits of bilingualism in Southern California*. eScholarship, University of California.

Saltalı, N. D. and İmir, H. M. (2018). Parenting styles as a predictor of the preschool children's social behaviours. *Participatory educational research*, 5(2).

Santibañez, L. and Zárate, M. E. (2014). Bilinguals in the US and college enrollment. *The bilingual advantage: Language, literacy, and the US labor market*, pages 211–233.

Sapungan, G. M. and Sapungan, R. M. (2014). Parental involvement in child's education: Importance, barriers and benefits. *Asian Journal of Management Sciences & Education*, 3(2):42–48.

Savelyev, P. A. and Tan, K. T. (2019). Socioemotional skills, education, and health-related outcomes of high-ability individuals. *American Journal of Health Economics*, 5(2):250–280.

Schachter, A., Kimbro, R. T., and Gorman, B. K. (2012). Language proficiency and health status: are bilingual immigrants healthier? *Journal of health and social behavior*, 53(1):124–145.

Schady, N. (2011). Parents' education, mothers' vocabulary, and cognitive development in early childhood: Longitudinal evidence from Ecuador. *American Journal of public health*, 101(12):2299–2307.

Schwartz, M. (2014). The impact of the first language first model on vocabulary development among preschool bilingual children. *Reading and writing*, 27(4):709–732.

Seghers, J. and Claessens, A. L. (2010). Bias in self-reported height and weight in preadolescents. *The Journal of Pediatrics*, 157(6):911–916.

Shernoff, D. J. and Schmidt, J. A. (2008). Further evidence of an engagement–achievement paradox among us high school students. *Journal of Youth and Adolescence*, 37:564–580.

Shi, J., Qiu, H., and Ni, A. (2023). The moderating role of school resources on the relationship between student socioEconomic status and social-emotional skills: Empirical evidence from China. *Applied Research in Quality of Life*, 18(5):2349–2370.

Song, J., Ma, C., and Ruan, Y. (2021). Left-behind children's grandparent–child and parent–child relationships and loneliness: A multivariable mediation model. *Family Relations*, 70(1):195–206.

Song, Q. and Smith, J. P. (2019). Hukou system, mechanisms, and health stratification across the life course in rural and urban China. *Health & place*, 58:102150.

Song, Y. (2014). What should economists know about the current Chinese Hukou system? *China Economic Review*, 29:200–212.

Sørensen, R. J., Iversen, J. M., From, J., and Bonesrønning, H. (2024). Parenting styles and school performance: evidence from second-generation immigrants in Norway. *Scandinavian Journal of Educational Research*, 68(2):289–305.

Specht, J., Bleidorn, W., Denissen, J. J., Hennecke, M., Hutteman, R., Kandler, C., Luhmann, M., Orth, U., Reitz, A. K., and Zimmermann, J. (2014). What drives adult personality development? a comparison of theoretical perspectives and empirical evidence. *European Journal of Personality*, 28(3):216–230.

Steele, J. L., Slater, R. O., Li, J., Zamarro, G., Miller, T., and Bacon, M. (2018). Dual-language immersion education at scale: An analysis of program costs, mechanisms, and moderators. *Educational Evaluation and Policy Analysis*, 40(3):420–445.

Steele, J. L., Slater, R. O., Zamarro, G., Miller, T., Li, J., Burkhauser, S., and Bacon, M. (2017). Effects of dual-language immersion programs on student achievement: Evidence from lottery data. *American Educational Research Journal*, 54(1_suppl):282S–306S.

Stepping Stones (2010). About migrant schools. *https://steppingstonesChina.net/who-we-are/about-migrant-schools/*.

Taherdoost, H. (2019). What is the best response scale for survey and questionnaire design: review of different lengths of rating scale/attitude scale/likert scale. *Hamed Taherdoost*, pages 1–10.

Tam, K. W. and Page, L. (2016). Effects of language proficiency on labour, social and health outcomes of immigrants in australia. *Economic Analysis and Policy*, 52:66–78.

Tan, q. (2018). Research on the development policy and practice innovation of preschool education in ethnic areas——taking the "one village, one child" program in Liangshan prefecture, sichuan province as an example. *Journal of Sichuan culture college*, (3):119–123.

Tang, W., Wang, G., Hu, T., Dai, Q., Xu, J., Yang, Y., and Xu, J. (2018). Mental health and psychosocial problems among Chinese left-behind children: A cross-sectional comparative study. *Journal of affective disorders*, 241:133–141.

Terza, J. V. (2017). Two-stage residual inclusion estimation: A practitioners guide to stata implementation. *The Stata Journal*, 17(4):916–938.

Terza, J. V., Basu, A., and Rathouz, P. J. (2008a). Two-stage residual inclusion estimation: addressing endogeneity in health econometric modeling. *Journal of health Economics*, 27(3):531–543.

Terza, J. V., Bradford, W. D., and Dismuke, C. E. (2008b). the USe of linear instrumental variables methods in health services research and health Economics: a cautionary note. *Health services research*, 43(3):1102–1120.

Thompson, O. (2018). Head Start's long-run impact evidence from the program's introduction. *Journal of Human Resources*, 53(4):1100–1139.

Ting, R. S.-K. and Sundararajan, L. (2017). *Culture, cognition, and emotion in China's religious ethnic minorities: Voices of suffering among the Yi*. Springer.

Tourangeau, R., Rips, L. J., and Rasinski, K. (2000). The psychology of survey response.

Tsang, M. C. (1996). Financial reform of basic education in China. *Economics of Education Review*, 15(4):423–444.

Ubalde, J., Alarcón, A., and Lapresta, C. (2017). Evolution and determinants of language attitudes among catalan adolescents. *International Journal of Intercultural Relations*, 60:92–103.

Umansky, I. M. and Reardon, S. F. (2014). Reclassification patterns among latino English learner students in bilingual, dual immersion, and English immersion classrooms. *American Educational Research Journal*, 51(5):879–912.

Veiga, F. H. (2016). Assessing student engagement in school: Development and validation of a four-dimensional scale. *Procedia-Social and Behavioral Sciences*, 217:813–819.

Vendryes, T. (2011). Migration constraints and development: Hukou and capital accumulation in China. *China Economic Review*, 22(4):669–692.

Vukojević, M., Zovko, A., Talić, I., Tanović, M., Rešić, B., Vrdoljak, I., and Splavski, B. (2017). Parental socioeconomic status as a predictor of physical and mental health outcomes in children–literature review. *Acta Clinica Croatica*, 56(4.):742–748.

Walker, S. P., Wachs, T. D., Grantham-McGregor, S., Black, M. M., Nelson, C. A., Huffman, S. L., Baker-Henningham, H., Chang, S. M., Hamadani, J. D., Lozoff, B., et al. (2011). Inequality in early childhood: risk and protective factors for early child development. *The lancet*, 378(9799):1325–1338.

Wan, G. and Jun, Y. (2008). How China best educates its ethnic minority children: strategies, experience and challenges. In *The education of diverse student populations: A global perspective*, pages 139–157. Springer.

Wang, C. (2010). Understanding of urban adaptation of the second generation of the rural-urban floating population. *Population Research*, 34(2):31–34.

Wang, F., Lin, L., Lu, J., Cai, J., Xu, J., and Zhou, X. (2020a). Mental health and substance use in urban left-behind children in China: A growing problem. *Children and Youth Services Review*, 116:105135.

Wang, H., Cheng, Z., and Smyth, R. (2019a). Health outcomes, health inequality and mandarin proficiency in urban China. *China Economic Review*, 56:101305.

Wang, H., Chu, J., Loyalka, P., Xin, T., Shi, Y., Qu, Q., and Yang, C. (2016). Can social–emotional learning reduce school dropout in developing countries? *Journal of Policy Analysis and Management*, 35(4):818–847.

Wang, L., Zheng, Y., Li, G., Li, Y., Fang, Z., Abbey, C., and Rozelle, S. (2019b). Academic achievement and mental health of left-behind children in rural China. *China Agricultural Economic Review*.

Wang, S. and Mao, Y. (2018). The effect of boarding on campus on left-behind children's sense of school belonging and academic achievement: Chinese evidence from propensity score matching analysis. *Asia Pacific Journal of Education*, 38(3):378–393.

Wang, Y. (2008). Rural education and the social migration of peasants: A case study of ying county. *Beijing: Shehui kexue wenxian*.

Wang, y., Liu, y., and Wen, j. (2020b). Research on the precision and inform ed status of targeted poverty alleviation in the southw est minority poverty- stricken areas——a case study about target poverty alleviation on Mabian Yi autonom ous country of sichuan province. *Science and Technology Vision*, 299(5):182–184.

Wang, Y., Yang, Z., Zhang, Y., Wang, F., Liu, T., and Xin, T. (2019c). The effect of social-emotional competency on child development in western China. *Frontiers in psychology*, 10:431937.

Warwick, D. P. and Lininger, C. A. (1975). *The sample survey: Theory and practice.* McGraw-Hill.

Waterman, E. A. and Lefkowitz, E. S. (2017). Are mothers' and fathers' parenting characteristics associated with emerging adults' academic engagement? *Journal of family issues*, 38(9):1239–1261.

Wei, C. (2007). New-generation rural-urban migrants and their adaptation to urban society. *Journal of Hubei Radio and Television University*, 2:66–67.

Whitaker, A. A., BurChinal, M., Jenkins, J. M., Watts, T. W., Duncan, G. J., Hart, E. R., and Peisner-Feinberg, E. (2023). Why are preschool programs becoming less effective? edworkingpaper no. 23-885. *Annenberg Institute for School Reform at Brown University*.

White, J., Connelly, G., Thompson, L., and Wilson, P. (2013). Assessing wellbeing at school entry using the strengths and difficulties questionnaire: Professional perspectives. *Educational Research*, 55(1):87–98.

Whitehead, A. L., Julious, S. A., Cooper, C. L., and Campbell, M. J. (2016). Estimating the sample size for a pilot randomised trial to minimise the overall trial sample size for the external pilot and main trial for a continuous outcome variable. *Statistical methods in medical research*, 25(3):1057–1073.

Wikle, J. and Wilson, R. (2023). Access to Head Start and maternal labor supply: Experimental and quasi-experimental evidence. *Journal of Labor Economics*, 41(4):1081–1127.

Windmeijer, F. A. and Santos Silva, J. M. (1997). Endogeneity in count data models: an application to demand for health care. *Journal of applied econometrics*, 12(3):281–294.

World Bank (2009). Country social analysis: Ethnicity and development in Vietnam.

Wu, L. (2013). Decentralization and Hukou reforms in China. *Policy and Society*, 32(1):33–42.

Wu, Q., Lu, D., and Kang, M. (2015). Social capital and the mental health of children in rural China with different experiences of parental migration. *Social science & medicine*, 132:270–277.

Xia, T. (2023). Childhood left-behind experiences and senior secondary education in China does parental domestic labor migration lead to "diverging destinies"? *Annals of Family Studies*, 48:75–89.

Xie, Y. and Hu, J. (2014). An introduction to the China Family Panel Studies (cfps). *Chinese sociological review*, 47(1):3–29.

Xie, Y. and Lu, P. (2015). The sampling design of the China Family Panel Studies (cfps). *Chinese journal of sociology*, 1(4):471–484.

Xing, C. and Wei, Y. (2017). Does migrating with children influence migrants' occupation choice and income? *Journal of the Asia Pacific Economy*, 22(1):156–172.

Xiong, Y. (2015). The broken ladder: Why education provides no upward mobility for migrant children in China. *China Q.*, page 161.

Xu, C. and Liu, X. (2023). The Economic value of language in China: How important is mandarin proficiency in the Chinese labor market? a bounding approach. *Labour Economics*, 84:102393.

Yang, D. (2008). International migration, remittances and household investment: Evidence from Philippine migrants' exchange rate shocks. *The Economic Journal*, 118(528):591–630.

Yang, D., Chen, P., Wang, K., Li, Z., Zhang, C., and Huang, R. (2023). Parental involvement and student engagement: a review of the literature. *Sustainability*, 15(7):5859.

Yang, J. (2013). Social exclusion and young rural-urban migrants integration into a host society in China. *The Annals of the American Academy of Political and Social Science*, 648(1):52–69.

Yang, x. (2020). The current situation and consideration of " one village,one child" construction in ethnic areas under the background of targeted poverty alleviation——taking the construction of "one village,one child" in Yi area of Leshan city. *Journal of Leshan Normal University*, 35(6):113–118.

Yang, Y., Liu, K., Li, M., and Li, S. (2022). Students' affective engagement, parental involvement, and teacher support in emergency remote teaching during the Covid-19 pandemic: Evidence from a cross-sectional survey in China. *Journal of Research on Technology in Education*, 54(sup1):S148–S164.

Yang, y., Qin, x., He, l., Yang, q., and Huang, h. (2019). Research on "cultural poverty alleviation" under targeted poverty alleviation in minority areas – taking Mabian Yi autonomous county as an example. *Modern Business trade industry*, 35(1):3–5.

Yao, J. and Mao, Y. (2008). Rural left-behind children's academic psychology in western China and the school management countermeasures. *Frontiers of Education in China*, 3:535–546.

Yao, Y., Ohinata, A., and van Ours, J. C. (2016). The educational consequences of language proficiency for young children. *Economics of Education Review*, 54:1–15.

Yao, Y. and Van Ours, J. C. (2015). Language skills and labor market performance of immigrants in the Netherlands. *Labour Economics*, 34:76–85.

Yin, J. and Yao, Z.-y. (2009). Identification of the new peasant-workers and the hindrances concerned——based on a sample survey of the peasant-workers in Changsha city [j]. *Journal of Hunan Agricultural University (Social Sciences)*, 3.

Youlu, S. (2017). "migrating" or being "left behind": The education dilemma of rural children in mainland China. *Chinese Education & Society*, 50(3):217–244.

Zena, Y. M. and Heeralal, P. (2021). The relationship between parenting style and preschool children's social-emotional development. *Universal Journal of Educational Research*, 9(8):1581–1588.

Zhang, B., Li, Y. M., Li, J., Luo, J., Ye, Y., Yin, L., Chen, Z., Soto, C. J., and John, O. P. (2022). The Big Five inventory–2 in China: A comprehensive psychometric evaluation in four diverse samples. *Assessment*, 29(6):1262–1284.

Zhang, D., Li, X., and Xue, J. (2015a). Education inequality between rural and urban areas of the people's republic of China, migrants' children education, and some implications. *Asian Development Review*, 32(1):196–224.

Zhang, f. and Bian, s. (2018). Problem and countermeasure of the implementation of"one village, one kindergarten"in Liangshan autonomous prefecture. *Journal of Xichang University Social Science Edition*, 30(2):106–110.

Zhang, H., Qin, X., and Zhou, J. (2020). Do tiger moms raise superior kids? the impact of parenting style on adolescent human capital formation in China. *China Economic Review*, 63:101537.

Zhang, J., Wang, R., and Lu, C. (2019). A quantitative analysis of Hukou reform in Chinese cities: 2000–2016. *Growth and Change*, 50(1):201–221.

Zhang, N., Bécares, L., Chandola, T., and Callery, P. (2015b). Intergenerational differences in beliefs about healthy eating among carers of left-behind children in rural China: A qualitative study. *Appetite*, 95:484–491.

Zhang, Q.-M. (2009). Affecting factors of native-like pronunciation: A literature review. *Korea Education & Research Institute*, 27(2):33–52.

Zhang, S. (2017). Effects of attending preschool on adolescents' outcomes: evidence from China. *Applied Economics*, 49(27):2618–2629.

Zhang, y., Zhao, q., Bi, y., and Zeng, q. (2010). A study on the impact of traditional cultural customs on poverty in ethnic areas – a case study of Mabian Yi autonomous county in sichuan province. *Rural economy and technology*, 21(11):26–28.

Zhang, z. and He, p. (2020). Effect analysis of targeted poverty alleviation in poverty-stricken minority areas – based on research data of Mabian Yi autonomous county. *Science and Technology Vision*, 299(5):179–181.

Zhao, C., Wang, F., Li, L., Zhou, X., and Hesketh, T. (2017). Long-term impacts of parental migration on Chinese children's psychosocial well-being: mitigating and exacerbating factors. *Social psychiatry and psychiatric epidemiology*, 52:669–677.

Zhao, Q., Yu, X., Wang, X., and Glauben, T. (2014). The impact of parental migration on children's school performance in rural China. *China Economic Review*, 31:43–54.

Zheng, X., Fang, Z., Wang, Y., and Fang, X. (2022). When left-behind children become adults and parents: The long-term human capital consequences of parental absence in China. *China Economic Review*, 74:101821.

Zhou, A. and Lv, C. (2021). Research on poverty alleviation effect of education in "three districts and three states" deeply impoverished areas(sanqu sanzhou, shendu pinkun diqu jiaoyu fupin chengxiao yanjiu). *Shandong High Education*, 9(1):17–23.

Zhou, M., Murphy, R., and Tao, R. (2014). Effects of parents' migration on the education of children left behind in rural China. *Population and Development Review*, 40(2):273–292.

Zhou, S. and Cheung, M. (2017). Hukou system effects on migrant children's education in China: Learning from past disparities. *International social work*, 60(6):1327–1342.

Zhou, Y., Cheng, Y., Liang, Y., Wang, J., Li, C., Du, W., Liu, Y., and Liu, Z. (2020). Interaction status, victimization and emotional distress of left-behind children: A national survey in China. *Children and Youth Services Review*, 118:105348.