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From Migration to Return: The Impact of Migration on the Health and Well-being of Family Members in China

by

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Abstract

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This thesis explores the multifaceted impact of internal migration on the health and subjective well-being of family members in China, covering various stages of migration, including initial departure, urban settlement, and return migration. Employing panel data and econometric techniques—particularly fixed-effects models, the instrumental variables approach, and sample selection corrections—the thesis addresses key issues such as omitted variable bias and endogenous migration decisions, thereby strengthening causal inference.

The empirical chapters examine the effects of parental migration on the physical and psychological health of left-behind children, highlighting the dual influence of parental absence and remittances. The thesis critically assesses the applicability of the Healthy Immigrant Effect within China, analysing the health trajectories of rural-to-urban migrants and addressing sample selection issues using the Heckman correction method. It also investigates the subjective well-being of return migrants compared to non-migrants, emphasising the role of economic reintegration and relative income positions upon return.

The thesis concludes that while migration may generate economic benefits, it imposes substantial health and emotional costs. Effective policy interventions should therefore integrate economic support with improved healthcare access, psychological assistance, and targeted social programmes tailored to migrants' needs at different stages of migration. Acknowledging existing methodological limitations, the thesis recommends future longitudinal studies with richer data sources and econometric techniques to further strengthen causal analyses and inform policy design.

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Declaration of Authorship

Print name: Dingzhi Chen

Title of thesis: From Migration to Return: The Impact of Migration on the Health and Well-being of Family Members in China

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
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7. None of this work has been published before submission

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Chapter 1

Introduction

1.1 Background and Motivation

China's profound demographic transition and market-driven economic transformation have created a highly relevant context for studying large-scale internal migration. Since the late 1970s, economic reforms and rapid industrialisation have driven an unprecedented wave of rural-to-urban migration (Meng, 2012[65]; Cai, Park, & Zhao, 2008[18]). Tens of millions of rural workers have left agriculture to seek higher wages and better employment opportunities in urban areas. By 2020, China's floating population—defined as individuals living outside their registered hukou locality—had expanded to approximately 376 million, nearly doubling from 2010 levels. This demographic shift has been accompanied by rapid urbanisation, with the proportion of China's population residing in cities rising from just 18% in 1978 to over 60% in recent years (National Bureau of Statistics, 2020[68]).

The scale of this migration is largely driven by China's evolving demographic structure and economic transformation. Earlier periods of high birth rates resulted in a surplus of working-age labour, while the country's economic boom created substantial labour demand in urban manufacturing and service sectors. Researchers highlight that migrants have played a pivotal role in sustaining China's economic growth by reallocating labour to more productive industries (Chan, 2010)[20]. However, this large-scale migration has also introduced significant social and policy challenges. The hukou system continues to impose barriers to migrant integration, restricting access to urban public services such as education, healthcare, and social security. As a result, despite their substantial contributions to the urban economy, migrants are often treated as temporary residents, facing institutional constraints that hinder full integration into city life. China's ongoing demographic and economic shifts provide a compelling foundation for studying internal migration, offering valuable insights into its long-term socioeconomic implications.

1.1.1 The Chinese Hukou System and Migration

1. The Dual Urban–Rural Classification under the Hukou System

The Chinese hukou system of household registration, which was formally introduced in 1958, has served as a central mechanism through which the state supervises population movement and manages the distribution of public resources. Within this framework, every citizen is categorised according to two principal criteria, namely the type of hukou, which is either rural or urban, and the official place where the hukou is registered. Although individuals are legally permitted to relocate within the country, their hukou status ultimately determines whether they can secure equal access to essential public services such as schooling, medical provision and social security at their place of destination.

In contrast, the United States has never implemented a comparable system of household registration. Population administration in America relies upon the Social Security Number together with documentation of residence. American citizens are able to move freely across states without institutional restrictions based upon their place of registration. While there are variations in the quality and extent of public services between different states, for example in health care and education, these differences are not directly associated with birth place or registration status and therefore do not generate the structural disadvantages that characterise the Chinese hukou system.

2. Hukou Classification: Agricultural and Non-Agricultural Status (Rural& Urban)

Historically, China's hukou system divided the population into two main categories on the basis of place of residence and form of economic activity, namely the agricultural hukou, often referred to as rural hukou, and the non-agricultural hukou, also known as urban hukou. This distinction between countryside and city was defined by administrative boundaries, settlement patterns and population size. Those who possessed an agricultural hukou were identified as rural residents, whereas individuals with a non-agricultural hukou were considered to be urban dwellers.

Over time, however, this categorisation has become increasingly detached from the actual occupations and residential locations of individuals. In present-day China, hukou status is not assigned according to work or residence but is inherited directly from parents. This development reflects wider demographic and institutional changes, even though the legacy of the dual structure has not disappeared.

In recent years, a number of provinces such as Jiangsu, Anhui, Hubei, Sichuan and Henan have embarked on reforms designed to reduce the rural–urban division. Since 2014, these provinces have eliminated the official distinction between agricultural and non-agricultural hukou, introducing instead a unified registration called resident hukou. Nevertheless, despite the removal of the formal categories, pronounced inequalities in public service provision still remain. The reason is that administrative units in China continue to differentiate between rural jurisdictions such as counties or villages and urban jurisdictions. Consequently, those whose hukou is located in rural areas still receive inferior levels of welfare and public services compared with individuals whose hukou is based in urban areas, even though both are officially described as residents.

By comparison, the United States does not apply registration labels such as agricultural or urban population. Although population statistics distinguish rural and urban residents on the basis of density or settlement type, these labels have no impact on mobility rights or on access to education, medical care and other social services.

3. Hukou Registration Location: Distinction Between Local and Non-Local Residents

In addition to the type of hukou, each Chinese citizen is identified by the official place of hukou registration. This usually corresponds with the birthplace or the origin of the family and represents the city or county in which an individual is classified as a local resident. Such a distinction is highly significant in China because entitlement to many public services, including healthcare, education, social security and housing, is reserved primarily for those with local registration.

Those without local hukou, even if they have lived and worked in a city for many years, are frequently categorised as migrants or non-local inhabitants and encounter substantial barriers to accessing the same public services. In practice, this arrangement creates systematic disadvantage for internal migrants, particularly those from rural backgrounds, and reinforces spatial inequalities within urban communities.

Despite the combined restrictions created by hukou type and hukou registration location, migrants constitute a considerable proportion of the population in many large cities. According to data from the Beijing Municipal Bureau of Statistics, by the end of 2012 the population of Beijing had reached 20.7 million, of which 37.4 per cent were migrants without Beijing

registration. This group included holders of rural hukou as well as those registered in other urban locations.

In the United States, a person's place of residence is recognised through documents such as tax records, housing contracts or utility accounts. Americans are permitted to move to any state or municipality, and their eligibility for local services such as school enrolment or state health schemes is determined by residence rather than by place of birth or original registration. No resident is denied basic urban services on the sole basis of not being born in that locality.

4. Public Services and Welfare Entitlements Associated with Hukou Status

A central institutional difference between China and the United States lies in the way access to social welfare is organised. In the United States, eligibility for welfare support is largely determined by residence and contributions through taxation, whereas in China entitlements are linked to hukou status. Although citizens in China may legally move from one city to another, they continue to be subject to the welfare entitlements of their original place of registration unless they succeed in transferring their hukou to the new location.

As a result, a person might live in a large city such as Shanghai or Beijing for more than a decade but still be excluded from many important services if their hukou remains registered in a rural county of another province. These exclusions include access to compulsory schooling for children, eligibility for subsidised housing and participation in public medical insurance schemes.

By contrast, the United States follows a system based upon residence. For example, individuals who have established lawful residence in New York City and who contribute to local taxes are entitled to send their children to public schools and may also qualify for health assistance such as Medicaid. These rights apply regardless of their place of birth. Even immigrants from abroad, once granted legal status, are in most cases entitled to public education and other basic services without restrictions derived from place of origin.

The hukou system in China generates structural disadvantages for migrants in urban settings. Common examples of exclusion include:

- Limited access to education. Children whose parents do not hold local hukou often face difficulties in gaining entry to public schools. Families are frequently required to provide extensive documentation such as proof of employment, housing and social insurance, and in many cases pupils must return to their hukou origin to take major examinations. Regional differences in school quality and university admission are considerable. For instance, in 2020 Peking University admitted around 550 students from Beijing, the largest number from any single area. Moreover, Beijing candidates sit localised entry tests that differ from those used in most other provinces.

- Unequal participation in social insurance. China's social insurance system has five components, namely pensions, medical insurance, unemployment benefits, work injury cover and maternity protection. A significant proportion of rural migrants in urban areas cannot access the same insurance as locals, often because of bureaucratic restrictions or non-compliance by employers. Even when medical services are received in city hospitals, expenses for non-local residents tend to be higher. At retirement age, those who have not accumulated sufficient years of contributions or who lack urban hukou are usually confined to modest rural pension schemes irrespective of their urban employment history.

- Constraints on housing. A number of cities impose restrictions on the ability of those without local hukou to purchase property or to apply for subsidised housing programmes.

These arrangements have given rise to a pattern in which migrants are incorporated into urban economies yet excluded from full social citizenship. Migrant workers, especially those originating from the countryside, play a vital role in economic growth but remain outside the core system of civic entitlements.

5. Hukou Transfer and Conversion Policies in China

In China, hukou status is not automatically changed by residence in another location but can only be altered through formal approval of an application for transfer (Fleisher and Wang, 2004). The process of changing hukou is complex and subject to stringent administrative conditions, especially for those attempting to move from rural areas to cities or from small towns to major metropolitan centres. Such pathways have historically been tightly restricted.

At present, hukou transfer in China generally falls into several categories:

- Family-related transfer. Citizens may apply for hukou relocation on the grounds of marriage, family reunion or joining close relatives such as spouses or parents registered elsewhere.

- Employment-related transfer. A number of cities provide hukou access for highly educated or skilled personnel as part of talent attraction initiatives, yet the majority of rural workers are not able to meet such conditions.

- Property purchase or points-based systems. Some urban centres operate a scheme in which applicants accumulate points for length of residence, social insurance contributions, tax payments and other indicators, and only those who reach the threshold may apply for local hukou.

- Liberalisation through policy. In recent years, numerous medium-sized and small cities have reduced their hukou requirements, with some abolishing them entirely. Nevertheless, these places often lack the economic strength and welfare services of large cities, making it difficult for them to attract skilled migrants. By contrast, China's major cities such as Beijing, Shanghai, Guangzhou and Shenzhen continue to enforce strict controls with very limited quotas for transfer.

The United States, in comparison, does not operate a registration or transfer mechanism of this type. An American citizen becomes a resident of another city or state immediately upon moving, by updating their address, registering utilities, obtaining a driving licence or enrolling children in local schools. Although migrants in the United States may still face issues such as finding accommodation or employment, they possess the same rights of mobility and social inclusion as long-term residents.

Despite these institutional restrictions, internal migration in China has continued to expand. The country's more prosperous cities remain the principal destinations. In 2022, the floating population in China reached 390 million, representing almost 28 per cent of the national population and an increase of five million compared with 2021. Much of this migration was directed towards Beijing, Shanghai and the wealthier eastern provinces. By the end of 2022, for instance, Zhejiang province recorded a permanent population of 65.77 million, which was 370,000 more than the previous year, even though natural increase accounted for only 3,000. Similarly, Jiangsu province experienced a net inflow of 254,000 residents in 2022.

These statistics underline the ongoing significance of hukou-related mobility and demonstrate why the study of migrant health and well-being should be regarded as a central element of research on labour markets and social policy in contemporary China.

1.1.2 Challenges Faced by Rural to Urban Migrants

China has experienced substantial rural-to-urban migration in recent decades. According to the National Bureau of Statistics of China (NBS, 2023), the number of internal migrants reached 376 million in 2022, representing approximately 26.5 per cent of the total population. A large proportion of these migrants originate from rural areas and relocate to urban centres in search of improved employment opportunities. One important consequence of this migration has been the continued presence of left-behind children, referring to children who remain in rural areas while one or both parents migrate for work. Estimates from the All-China Women's Federation (2013) suggest that the number of left-behind children peaked at around 61 million in 2010, which accounted for nearly 38 per cent of all rural children at that time. Although this figure has declined in recent years, more than 30 million left-behind children were still reported in 2020 (NBS, 2021), indicating that the issue remains highly relevant.

These patterns reflect the ongoing structural constraints of the hukou system, which restrict migrants' access to public services in cities. As a result, many migrant parents are unable to bring their children with them, thereby maintaining a significant left-behind child population in rural areas. This highlights the importance of examining the long-term effects of parental migration on children's physical and psychological well-being.

Rural-to-urban migration has been a key driver of China's economic transformation, yet migrant workers continue to face significant structural barriers that limit their economic security and social mobility. Despite forming the backbone of China's industrial and service sectors, their employment is often characterised by low wages, physically demanding work, and job insecurity, constraining their ability to achieve financial stability over time. These economic constraints are further compounded by the need to remit a substantial proportion of their earnings to support family members in rural areas, reinforcing patterns of economic vulnerability. Institutional barriers, particularly the hukou system, further restrict their access to essential public services, hindering their long-term integration into urban society and limiting their prospects for upward mobility.

Despite their critical contributions to urban economic growth, rural migrants are disproportionately employed in low-wage, labour-intensive sectors such as manufacturing, construction, and domestic services. These jobs are often characterised by long working hours, hazardous conditions, and limited labour protections, exposing workers to wage arrears, workplace injuries, and sudden unemployment. Although labour demand continues to rise in certain sectors, hukou-based labour market segmentation prevents wage convergence, meaning that migrants typically earn significantly less than their urban hukou counterparts, even when performing similar tasks (Knight & Gunatilaka, 2010)[54]. Furthermore, firms have little incentive to invest in the training or career progression of migrant workers, resulting in limited opportunities for skills development and long-term economic mobility.

Beyond low wages, financial pressures are exacerbated by the expectation that migrants support family members remaining in rural areas. Many are the primary earners for their households, and remittances play a crucial role in sustaining rural livelihoods, improving household consumption, and funding children's education (De Brauw & Giles, 2008)[26]. However, the necessity of sending money home restricts their ability to accumulate savings, invest in their own human capital, or establish permanent roots in cities. This economic burden further discourages urban integration, reinforcing a pattern of circular migration in which workers move repeatedly between rural and urban areas without a clear long-term settlement strategy.

Institutional barriers further entrench migrants' marginalisation. The hukou system remains a significant constraint, limiting access to urban healthcare, education, and social security, making migrants particularly vulnerable to economic shocks (Meng, 2012)[65]. Healthcare disparities are especially pronounced, as many migrants remain covered by rural health insurance schemes, which offer lower reimbursement rates and limited coverage for urban medical services. Similarly, restrictions on education access pose challenges for migrant families, as hukou-based school enrolment policies often prevent migrant children from attending high-quality public schools in cities, forcing them into lower-quality private institutions or leaving them behind in rural areas. These barriers deepen educational inequalities and constrain intergenerational mobility.

Although rural migrants are essential to urban economies, they remain socially and economically excluded. The lack of stable employment, secure housing, and access to social services discourages long-term urban settlement, contributing to high rates of return migration

as workers struggle to sustain livelihoods in the city. Even as labour shortages emerge in certain industries, many migrants remain trapped in precarious work arrangements with little opportunity for advancement, reflecting persistent segmentation in China's labour market.

Despite these challenges, rural migrants continue to play an indispensable role in China's economic development. Their remittances provide essential financial support to rural communities, reinforcing the interdependence between rural and urban economies. However, the persistent obstacles they face—including unstable employment, financial insecurity, and institutional exclusion—continue to limit their ability to fully benefit from urbanisation. Addressing these challenges is not only essential for improving migrants' well-being but also for fostering sustained economic growth and a more inclusive development model.

1.1.3 Return Migration and Reintegration

Many rural-to-urban migrants eventually return to their home regions for various reasons, including family responsibilities, limited urban employment opportunities, or institutional constraints such as the hukou system, which restricts permanent urban settlement (Song & Sun, 2016)[79]. This phenomenon has generated increasing scholarly interest in understanding how return migrants adapt both economically and socially upon their reintegration into rural areas.

Economically, return migrants experience diverse outcomes. Some successfully utilise their savings, urban-acquired skills, and broader experiences to establish businesses or invest in agricultural modernisation, thereby enhancing their socioeconomic status within rural communities (Taylor et al., 2003)[81]. However, others encounter considerable challenges, such as underemployment, income instability, or difficulties in applying their urban-acquired skills in rural labour markets, which typically offer fewer economic opportunities (Meng, 2012)[65]. The rural economic environment—characterised by limited access to capital and insufficient infrastructure—can significantly shape the reintegration process. Importantly, the economic success or difficulties faced by return migrants not only affect their material well-being but also influence their social standing and psychological adjustment within their communities, illustrating that economic reintegration is inherently linked to social and psychological dimensions (Song & Sun, 2016)[79].

Social reintegration presents another layer of complexity in the return migration process. Studies highlight that returnees often struggle to readjust to rural life due to shifts in personal

values, expectations, and identities acquired in urban settings (Xu & Xie, 2015)[85]. Their experiences in the city may create a sense of alienation or marginalisation upon return, distancing them from those who never migrated. This social dissonance can negatively impact subjective well-being, as returnees may experience feelings of relative deprivation or social isolation when comparing themselves to urban peers or fellow villagers (Akay et al., 2012)[4]. However, there remains a lack of empirical research on how returnees reconstruct social networks and community ties, highlighting an important gap in understanding the social dimensions of reintegration and their effects on well-being.

Recent studies have begun examining the longer-term trajectory of returnees' subjective well-being, suggesting a complex and dynamic process. Many return migrants initially experience a decline in life satisfaction due to lower relative income, the loss of urban amenities, and the difficulties of readjustment. However, their well-being often improves over time as they re-establish family bonds, rebuild community relationships, and adjust their expectations to rural life (Knight & Gunatilaka, 2010)[54]. Despite these insights, most existing research relies on cross-sectional data, which limits the ability to capture long-term trends in well-being and economic reintegration. Comprehensive longitudinal studies of return migration remain scarce, representing an important gap in the literature and underscoring the need for further systematic investigation into the long-term outcomes of return migrants and their communities.

Overall, the literature on China's internal migration has evolved from a primarily economic perspective to a more multidimensional approach, incorporating social and health-related aspects. Researchers increasingly view migration as a dynamic process affecting not only migrants themselves but also their families and both sending and receiving communities. There has also been a growing intersection between economic research and studies in public health and sociology, broadening the analytical framework of migration studies. However, several gaps remain. Firstly, much of the existing evidence is based on cross-sectional studies, providing only static snapshots rather than capturing the evolving effects of migration over time. This limits the ability to assess causal relationships or to fully understand how migration impacts well-being at different stages. For example, there is still an incomplete understanding of how a migrant's health or a returnee's satisfaction evolves throughout the migration cycle. More longitudinal data and panel studies are needed to track migrants before, during, and after migration. Secondly, return migration remains significantly under-researched. While rural-to-

urban migration has received substantial academic attention, much less is known about the long-term outcomes of return migrants—particularly regarding their mental health, life satisfaction, social reintegration, and economic stability. This gap is particularly relevant in China, where a significant proportion of migrants eventually return home due to structural barriers to urban integration.

There is increasing recognition that a comprehensive understanding of internal migration in China requires consideration of the entire migration cycle—from initial departure and urban adaptation to return and rural reintegration. This broader perspective provides the foundation for more nuanced analyses of how migration shapes economic well-being, social structures, and health outcomes over time. The following sections build upon these discussions, using richer data and rigorous empirical methods to connect migration's economic benefits with its wider social and well-being implications.

The structure of this introduction is as follows: Section 1.2 critically reviews the existing literature on migration, identifying key strengths, limitations, and unresolved questions. Section 1.3 builds upon this literature review to articulate the research objectives, key research questions, and the study's significance and contributions. Section 1.4 introduces the research methodology and data sources. Finally, Section 1.5 outlines the overall structure of the thesis, summarising the content and analytical framework of each chapter.

1.2 Literature Review

Research on migration has expanded in recent years, yet many aspects of rural migrant families in China remain insufficiently explored. Much of the existing literature has predominantly focused on the economic consequences of migration, particularly its effects on income and labour market outcomes, while paying comparatively less attention to broader measures of well-being. A comprehensive analysis of migration requires consideration not only of migrants themselves but also of the family members they leave behind and those who eventually return.

This review examines three key dimensions: the well-being of left-behind family members, the health and adaptation of rural migrants in urban areas, and the reintegration experiences of return migrants. By analysing these aspects, this study seeks to identify research gaps and contribute to a more holistic understanding of the well-being of Chinese rural migrants and their families.

1.2.1 Migration and Left-Behind Family Members

Rural-to-urban labour migration has resulted in a substantial number of left-behind family members. Much of the existing literature emphasises the economic benefits of migration for these households, particularly through remittances, which can enhance living standards by improving nutrition, healthcare access, and overall living conditions. For instance, studies in Pakistan and Tajikistan have found that increased remittances contribute to better child nutrition and growth outcomes (Mansuri, 2006[62]; Böhme et al., 2015[15]), while similar positive effects on early childhood development have been observed in Central America (Macours & Vakis, 2010[60]). These findings suggest that the income gains from migration can enhance short-term well-being by increasing household consumption and investment in human capital.

However, while some research focuses on these economic benefits, less attention has been paid to the long-term well-being and development of left-behind family members. A growing body of literature suggests that the absence of a migrating parent or adult may have potentially adverse effects on the health and psychological well-being of those left behind. For example, along the U.S.-Mexico corridor, having a migrant mother has been associated with lower health investments in infants, such as reduced breastfeeding and immunisation rates, which may have lasting consequences for child health (Hildebrandt & McKenzie, 2005)[44]. These studies indicate that while migration improves household income, it does not always translate into better health outcomes in the absence of direct parental care.

It is not only children who are affected; the migration of working-age adults can also have profound implications for the elderly parents left behind. Emerging evidence highlights significant well-being challenges for older family members. While remittances from migrant children can improve material conditions for the elderly, the loss of daily care and companionship has been linked to declines in mental health. A study in Thailand, for example, finds that having a migrant child is associated with a higher likelihood of depression and loneliness among left-behind elders, despite no significant deterioration in their physical health. In many cases, remittances allow older adults to access healthcare more frequently, yet this financial support cannot fully substitute for emotional support and social contact, which are critical components of well-being (Adhikari et al., 2011)[3].

Methodological limitations also present challenges in this area of research. Many studies rely on cross-sectional data or short-term observations, limiting the ability to capture the long-term effects of migration on left-behind family members. For instance, while research suggests that young left-behind children may experience nutritional deficiencies or mental health issues early on, it remains unclear whether these effects persist, diminish, or reverse as they mature. The lack of longitudinal studies prevents researchers from distinguishing between short-term adaptation difficulties and negative consequences that accumulate over time. Moreover, the effects of migration on left-behind family members are inherently endogenous—households that opt for migration may differ systematically in socioeconomic background from those that do not, making it difficult to establish causality through simple comparative analyses.

Overall, while existing research suggests that migration has positive economic effects for left-behind families, its broader impact on well-being—particularly in terms of mental health and human capital accumulation—remains an underexplored area. Additionally, addressing the issue of endogeneity in migration studies remains crucial for advancing a more rigorous understanding of its long-term consequences.

1.2.2 Immigrant, Health, and Dynamic Effects

Migration is not merely an economic decision; it also entails significant changes in individual health. In the literature on international migration, studies on the United States, Canada, and Australia have found that new immigrants tend to exhibit lower rates of chronic diseases and obesity compared to native residents (McDonald & Kennedy, 2005[64]; Biddle et al., 2007[13]; Chiswick, Lee & Miller, 2008[23]). However, empirical evidence on the health outcomes of rural migrants in China remains inconclusive. Some studies suggest that migration to urban areas may lead to improvements in physical health, as cities offer better healthcare infrastructure and improved nutritional conditions (Song & Sun, 2016)[79]. Conversely, other research highlights that rural migrants frequently engage in labour-intensive, hazardous, and high-pollution jobs, which can result in the rapid deterioration of health (Chen, 2011)[21]. Additionally, internal migrants may exhibit a self-selection effect, whereby healthier individuals are more likely to migrate to cities. However, due to institutional constraints such as the hukou system, many rural migrants have limited access to the same healthcare services as urban residents, potentially exacerbating their health decline over time (Chan, 2010)[20].

Beyond physical health, existing research on migrant health has predominantly focused on physiological conditions, while mental health has received comparatively less attention. Some studies suggest that migrants experience heightened psychological stress and mental health challenges. A study on rural migrants in Beijing found that while they self-reported better physical health than urban residents, their mental health outcomes were significantly worse, likely due to the heightened stress of urban life—including precarious employment and social exclusion (Chen, 2011)[21]. Furthermore, findings from long-term studies are inconsistent: some research suggests that migrants' health eventually converges with that of urban residents, whereas others indicate that initial health improvements stagnate over time or even reverse (Song & Sun, 2016)[79]. These discrepancies suggest that the health effects of migration may be context-dependent, displaying diverging trends—physical health may improve due to better urban infrastructure, whereas mental health may deteriorate due to social pressures and adaptation challenges. Moreover, the long-term trajectory of migrants' health remains highly contested.

A critical review of the literature reveals several methodological limitations that hinder definitive conclusions regarding the health trajectories of migrants. A major concern is the lack of longitudinal studies, which makes it difficult to systematically track long-term health changes at the individual level. Most research on migrant health in developing countries relies on cross-sectional data (Gibson et al., 2011)[39], which compares different groups (e.g., migrants vs. non-migrants or short-term vs. long-term migrants) at a single point in time. Such study designs are susceptible to selection bias and fail to capture actual health changes within individuals. For example, healthier migrants may maintain better health not because migration improved their well-being, but simply because they were initially healthier than their peers. Similarly, observed health deterioration might not be a direct consequence of migration but rather a result of selective return migration, where migrants who experience declining health are more likely to return to rural areas. Without panel data or longitudinal surveys, many critical questions remain unanswered.

Furthermore, many studies focus exclusively on a single health dimension, such as physical health, while overlooking aspects like mental health and subjective well-being, leading to fragmented findings. Only a few studies employ rigorous econometric techniques, such as fixed-effects models to control for time-invariant individual traits or instrumental variable

approaches to address the endogeneity of migration decisions. These studies generally find more moderate effects of migration on health, highlighting the ongoing challenges of causal identification in this field.

Overall, the absence of long-term tracking studies on migration leaves several research gaps: How does the health status of rural migrants evolve throughout the migration process? How do migration duration and employment conditions shape health outcomes over time? Future research should incorporate longitudinal data analysis to provide a more comprehensive understanding of the long-term health effects of migration, with particular attention to mental health dynamics and adaptation challenges.

1.2.3 Reintegration of Return Migrants: Economic and Social Challenges

Return migration is a crucial phase of the migration cycle, yet it has received significantly less scholarly attention than out-migration and the experiences of migrants in destination areas. Returnees—migrants who return to their home regions after a period away—face distinct economic and social reintegration challenges that can significantly affect their well-being. In countries such as China, a substantial proportion of rural-to-urban migrants eventually return to their villages, often due to institutional barriers (e.g. the hukou system restricting permanent urban settlement) or personal and family obligations (Cai, Park & Zhao, 2008[18]; Meng, 2012[65]). While some research has examined the motives and macroeconomic effects of return migration, far fewer studies have explored what happens after migrants return in terms of livelihoods and overall life satisfaction.

From an economic perspective, return migrants exhibit varied outcomes. In some cases, migration provides returnees with new skills, savings, and networks that can facilitate entrepreneurial activities or lead to higher earnings upon their return. Successful return migrants may invest in farms or businesses, transfer skills acquired in urban areas, and improve their economic standing relative to those who never migrated. Evidence from several developing countries suggests that returnees often have higher rates of self-employment or business creation, leveraging the capital and experience gained from migration (Dustmann & Kirchkamp, 2002[34]; Wahba & Zenou, 2012[82]). However, not all return migrations result in economic advancement. Many returnees struggle with reintegration, particularly those who returned involuntarily or due to unmet migration objectives. Limited job opportunities in stagnating rural

economies, the non-transferability of urban-acquired skills, and constraints such as lack of capital, inadequate rural infrastructure, or social stigma towards returnees can hinder their ability to establish stable livelihoods. While some return migrants experience upward mobility, others face economic setbacks, sometimes ending up in a worse financial position than if they had never migrated. Existing studies have largely focused on these objective economic indicators—employment status, income, and investment behaviour—highlighting both positive and negative cases. However, less attention has been paid to how these economic outcomes translate into overall well-being and life satisfaction among returnees.

Beyond economic reintegration, social adjustment presents another major challenge. Time spent in urban areas often reshapes migrants' values, expectations, and social networks. Upon returning, they may find that their outlook and habits differ significantly from those of their rural peers, leading to a sense of alienation or reverse culture shock. Xu and Xie (2015)[85] document that Chinese rural migrants who returned after years in the city often struggled to readjust to village social norms, having internalised more individualistic and urban-oriented attitudes. Returnees may also find that their prior social connections have weakened, with friends and relatives having moved on, necessitating the re-establishment of community networks. Some studies suggest that return migrants often feel marginalised, belonging neither fully to the city nor entirely to their home villages, which can have adverse effects on mental and emotional well-being. Furthermore, returnees frequently need to renegotiate family roles—such as parents re-establishing relationships with children or spouses—which can be both rewarding and challenging. Despite some research highlighting these reintegration difficulties, systematic analysis of social adjustment remains limited. There is little empirical evidence on how returnees rebuild social capital and support networks, or how long it takes for them to feel reintegrated into their communities.

A particularly underexplored aspect of return migration is its impact on subjective well-being. Most migration studies examining happiness or life satisfaction focus on migrants while they are in destination cities, typically finding that although higher urban incomes can raise life satisfaction, the benefits are often offset by high living costs and social exclusion (Dolan, Peasgood & White, 2008[31]; Knight & Gunatilaka, 2010[54]). By contrast, the well-being of those who return to rural areas has received far less attention. Theoretically, the effects of return migration on subjective well-being are ambiguous. On the one hand, returning home can reunite

migrants with family and hometown communities, potentially restoring social support and a sense of belonging absent in urban settings. Returnees may also experience a local status boost, as migration experience and savings might elevate their standing among village peers. These factors would suggest that returnees could report higher life satisfaction compared to those who never migrated.

On the other hand, return migration may lead to a sense of relative deprivation or personal failure. After experiencing higher living standards in urban areas, returning to the relative economic disadvantages of rural life may be a difficult adjustment. Some return migrants compare themselves not to their rural neighbours but to their former urban peers or to their own previous aspirations; if return is perceived as an involuntary step backwards or an unfulfilled ambition, it can result in regret and lower life satisfaction (Luttmer, 2005[59]; Akay, Bargain & Zimmermann, 2012[5]). The reference group for returnees also shifts, and this is important: while urban migrants tend to compare themselves with city dwellers (where income disparities are often stark), returnees may instead compare themselves with fellow villagers, for whom their city earnings may still appear relatively high. This shift in reference point could either improve or diminish their well-being, depending on context (Clark, Frijters & Shields, 2008[24]; Ferrer-i-Carbonell, 2005[36]). The overall effect is thus an empirical question. Some studies in developing countries have documented "tunnel effects," whereby migrants remain hopeful and satisfied if they perceive their hardships as temporary or beneficial for long-term prospects (Hirschman, 1973[45]; Knight & Gunatilaka, 2010[54]). Such optimism may persist upon return if migrants believe their urban experience has enhanced their future opportunities. Conversely, if return migration is accompanied by social stigma or a decline in social status, subjective well-being may deteriorate.

The limited empirical evidence available on returnees' well-being suggests a complex trajectory. One longitudinal study in rural China found that return migrants initially reported lower life satisfaction upon return—likely due to lost urban incomes and reduced amenities—but their well-being improved over subsequent years as they reintegrated into family life and their local communities (Knight & Gunatilaka, 2010)[54]. This aligns with the idea that the time horizon is critical: immediately after return, the contrast with urban life is starkest, but as returnees adjust their expectations and rebuild social ties, their subjective well-being may improve. However, such studies remain rare. Much of the existing research on return migration is cross-sectional,

offering only a static snapshot—such as a one-time comparison of returnees and non-migrants—which fails to capture these dynamic changes. Additionally, selection into return migration complicates empirical analysis: those who choose to return, or the timing of their return, may be influenced by unobservable factors (such as personal preferences or family obligations) that also affect well-being. This makes it difficult to determine causality—whether return migration itself drives changes in happiness—without careful longitudinal analysis or quasi-experimental approaches.

In summary, significant gaps remain in the literature on return migrant reintegration and well-being. While some studies have examined the economic challenges and social adjustments faced by returnees, the subjective dimension—how return migration affects life satisfaction and how well-being evolves post-return—has been largely neglected. The limited evidence suggests that return migration can have both positive and negative consequences for well-being, but without more systematic research, particularly longitudinal studies that track migrants across different phases of the migration cycle, our understanding remains incomplete. Future research should seek to fill this gap by focusing on the longer-term outcomes of return migration. By examining not only employment and income but also life satisfaction, mental health, and social reintegration over time, scholars can develop a more comprehensive understanding of what return migration means for individual well-being.

1.2.4 Research Gaps, Significance, Methodological Considerations

While extensive research has examined the economic and labour market effects of rural-to-urban migration, significant gaps remain in understanding its broader well-being implications, particularly across different stages of the migration cycle. Existing studies have predominantly focused on short-term economic benefits, such as increased income and remittances, while paying less attention to long-term physical and psychological well-being. This limitation is particularly evident in research on left-behind family members, rural migrants themselves, and return migrants, where economic indicators alone fail to capture the full welfare impact of migration.

First, studies on left-behind family members primarily highlight the positive economic spillovers of remittances, yet growing evidence suggests that financial gains do not always translate into improved long-term well-being. Left-behind children and elderly parents may

experience reduced parental care, emotional distress, and potential declines in nutrition or health outcomes, yet these effects remain underexplored in the literature.

Second, while research on rural migrants has examined their employment conditions and urban integration, there is no clear consensus on how migration affects their health outcomes over time. Some evidence suggests that urban migration improves access to healthcare and nutrition, while other studies highlight the precarious working conditions, social exclusion, and mental health stressors that may undermine these potential benefits. Moreover, much of the existing research relies on cross-sectional data, making it difficult to determine whether migrants' health trajectories are driven by migration itself or by pre-existing selection effects.

Third, the reintegration of return migrants remains an underdeveloped research area. Most studies focus on economic reintegration and employment outcomes, while neglecting social reintegration and subjective well-being. Returnees often experience relative deprivation, identity shifts, and difficulties readjusting to rural life, yet little is known about their long-term psychological adaptation or how their well-being evolves post-return.

To provide a more comprehensive analysis of migration's well-being impacts, this study adopts a three-stage perspective, focusing on:

1. Left-behind family members, particularly their physical and psychological well-being beyond the economic effects of remittances.

2. Rural migrants in urban areas, examining the evolution of their health and adaptation challenges over time.

3. Return migrants, assessing their economic, social, and psychological reintegration.

This framework allows for a holistic examination of migration's effects on both migrants and their families, ensuring that well-being is assessed beyond conventional economic indicators.

From a methodological perspective, most existing studies rely on cross-sectional data, limiting causal inference and the ability to track well-being dynamics over time. To address this, this research prioritises longitudinal analysis and panel data methods, enabling a distinction between short-term shocks and long-term well-being changes. The study also incorporates strategies to control for selection bias and endogeneity, which have been persistent challenges

in migration research. Additionally, it differentiates between physical health (objective measures) and mental health (subjective well-being) to provide a clearer understanding of migration's effects.

By addressing these gaps and employing a comprehensive and methodologically rigorous approach, this study aims to generate new insights into the well-being of rural-to-urban migrants and their families across different stages of migration, contributing to both academic discourse and policy interventions.

1.3 Research Objectives and Questions

Existing research has extensively examined the economic dimensions of migration, including labour market integration, income mobility, and remittance flows. However, the broader well-being implications of migration, particularly in relation to health and subjective well-being, remain relatively underexplored. Many studies adopt a cross-sectional approach, limiting the ability to assess the long-term trajectories of migrants and their families. Moreover, much of the literature focuses on the economic outcomes of urban migrants, with less attention paid to their health dynamics, as well as the experiences of left-behind family members and return migrants. Given that migration is a multi-stage process, research that captures only one phase—such as the transition to urban areas—risks providing an incomplete picture of its overall impact.

To address this gap, this study adopts a longitudinal perspective, examining migration's effects across different stages. Specifically, it focuses on three key aspects: (1) the well-being of left-behind family members, (2) the health trajectories of rural migrants in urban areas, and (3) the reintegration experiences of return migrants. By conceptualising migration as a continuous and evolving process, this research aims to provide a more comprehensive understanding of its long-term effects on individuals and families.

1.3.1 Research Objectives

The objective of this study is to examine the well-being implications of migration across different stages of the migration cycle. This requires analysing both economic and non-economic consequences, extending beyond conventional measures such as income and employment to include health and subjective well-being. The study is structured around three key objectives.

First, it investigates the well-being of left-behind family members in rural areas. The migration of working-age adults, particularly parents, has reshaped family structures in China, leaving behind a substantial population of children and elderly parents. While remittances provide financial support, the prolonged absence of migrants may have adverse effects on the physical and psychological well-being of those left behind. Although existing research has explored the economic trade-offs of migration, the long-term implications for family members' health and overall welfare remain insufficiently understood. This study examines whether the benefits of financial transfers outweigh the potential well-being costs of parental absence.

Second, it explores the health trajectories of rural-to-urban migrants. Migration offers potential health advantages, such as improved healthcare access and better living conditions, but it also introduces stressors related to employment, social integration, and discrimination. While some research suggests that migrants may initially exhibit better health outcomes, others indicate that prolonged urban exposure can lead to health deterioration due to poor working conditions and limited access to urban healthcare. However, much of this literature is based on cross-sectional data, limiting the ability to assess long-term health trends. This study adopts a longitudinal approach to track the evolution of migrant health, identifying factors that contribute to either sustained well-being or health decline over time.

Finally, this research examines the reintegration experiences and subjective well-being of return migrants. A significant proportion of rural migrants eventually return to their home villages, often due to economic constraints, family obligations, or hukou-related institutional barriers. However, return migration is frequently associated with economic downgrading, social reintegration challenges, and shifts in well-being. While some return migrants successfully reintegrate, others face relative deprivation and declining life satisfaction. This study explores the economic, social, and psychological factors that shape the well-being of returnees, highlighting the long-term consequences of migration beyond the urban employment phase.

1.3.2 Research Questions

1. How does migration affect the well-being of left-behind children?

Parental migration is a widespread phenomenon in rural China, driven primarily by economic incentives. While remittances can improve household financial conditions, their impact on the well-being of left-behind children remains uncertain. On the one hand, increased income may

enhance access to nutrition, healthcare, and education. On the other, the prolonged absence of parental care may lead to adverse effects, including emotional distress, weakened socialisation, and lower academic performance. These outcomes may vary depending on children's age, caregiving arrangements, and the extent of parental involvement. Unlike elderly family members, whose well-being is often shaped by economic security and social networks, children are particularly vulnerable to the absence of direct parental care. This study investigates how parental migration affects both the physical and psychological well-being of left-behind children and whether financial gains offset the consequences of parental absence.

2. How does migration duration influence the health trajectories of rural-to-urban migrants?

Rural-to-urban migration exposes individuals to both health risks and opportunities. Migrants may initially exhibit a health advantage due to positive self-selection, as those who migrate are often healthier and better equipped to manage the physical demands of urban employment. However, over time, exposure to precarious labour conditions, occupational hazards, and restricted healthcare access may contribute to health deterioration. The segmentation of the urban labour market often confines migrants to physically demanding jobs with long hours, low wages, and minimal social protection, heightening the risk of adverse physical and mental health outcomes. Furthermore, hukou-based exclusions from urban social services may limit access to timely healthcare, exacerbating long-term health disparities. This study examines whether migrants' initial health advantage endures, how migration duration correlates with health outcomes, and the role of employment conditions, healthcare access, and stress in shaping these patterns.

3. How does return migration influence subjective well-being and economic reintegration?

Return migration constitutes a crucial yet underexplored phase of the migration cycle, with important implications for labour mobility and rural development. Many migrants return not by choice but due to institutional constraints, economic instability, or family obligations, raising concerns about their economic and social reintegration. Upon return, migrants often struggle to secure stable employment, as skills acquired in urban areas may have limited applicability in rural labour markets. Simultaneously, returnees must rebuild social ties and renegotiate family roles, which can either facilitate or hinder reintegration. The impact of return migration on

subjective well-being remains ambiguous: while some returnees experience relative deprivation, comparing rural living standards unfavourably to their urban experiences, others benefit from lower living costs, family reunification, and renewed social capital. This study explores how return migration influences life satisfaction, the extent to which economic and social factors mediate well-being, and whether these effects evolve over time.

1.4 Research Design, Data and Limitation

1.4.1 Research Design

Migration and Its Impact on Left-Behind Families (Chapter 2)

This study examines how parental migration influences the well-being of left-behind children in rural China, particularly in terms of their physical and psychological health. Understanding these effects is essential for evaluating the broader consequences of migration beyond economic gains. To provide a more precise estimation, the study employs panel data with fixed-effects models, which allow for controlling unobserved, time-invariant individual and household characteristics such as parental background and persistent socioeconomic conditions. By using panel data, the study ensures that the estimated effects capture within-individual changes rather than cross-sectional differences between left-behind and non-left-behind children.

A major methodological challenge is the endogeneity of parental migration decisions. Families that choose to migrate may systematically differ from those who remain, introducing selection bias in estimating the impact of migration on child well-being. To address this concern, the study applies an instrumental variable (IV) approach, using local migration networks—measured as the proportion of individuals in a given region who have migrated in previous years—as an exogenous determinant of parental migration. Migration networks significantly reduce the costs and uncertainties associated with migration, making them a strong predictor of parental migration decisions while remaining exogenous to an individual child's health outcomes. This methodological framework allows for a more rigorous identification of the causal effects of migration on left-behind children.

The Health Trajectories of Migrants in Urban City (Chapter 3)

This study investigates the impact of parental migration on the well-being of left-behind children in rural China, with a particular focus on their physical and psychological health.

Understanding these effects is crucial for assessing the broader implications of migration beyond economic benefits. To achieve a more precise estimation, the study utilises panel data and employs fixed-effects models, which control for unobserved, time-invariant individual and household characteristics, such as parental background and persistent socioeconomic conditions. By leveraging panel data, the analysis captures within-individual changes rather than mere cross-sectional differences between left-behind and non-left-behind children.

A key methodological challenge is the endogeneity of parental migration decisions. Families that choose to migrate may systematically differ from those who do not, introducing selection bias in estimating migration's impact on child well-being. To address this, the study employs an instrumental variable (IV) approach, using local migration networks—defined as the proportion of individuals in a given region who have migrated in previous years—as an exogenous determinant of parental migration. Migration networks significantly lower the costs and uncertainties associated with migration, making them a strong predictor of parental migration while remaining exogenous to an individual child's health outcomes. This methodological framework strengthens the causal identification of migration's effects on left-behind children.

Economic and Social Reintegration of Return Migrants (Chapter 4)

This study examines the impact of return migration on subjective well-being, focusing on both economic reintegration and social adjustment challenges. It distinguishes between new returnees (migrants who moved between survey waves and returned by the second wave), long-term returnees (those who had already returned before the first survey wave), and non-migrant rural residents. The primary objective is to determine whether return migration enhances well-being or presents reintegration difficulties, particularly in relation to income stability and social belonging.

To address omitted variable bias, the study employs a panel data fixed-effects model, which controls for unobserved, time-invariant individual characteristics such as personality traits, early-life conditions, and cultural background. However, as return migration may cause short-term disruptions in well-being, the study also applies a first-difference (FD) model to capture immediate changes in life satisfaction following return migration. This approach provides a more direct assessment of how shifts in migration status influence well-being over time.

Conclusion

By employing these econometric techniques, this study systematically evaluates the impact of migration on individual and family well-being across different stages of the migration cycle. The integration of fixed-effects models, instrumental variable strategies, and selection correction methods enhances causal inference and mitigates biases related to migration selection and return migration. This research contributes to a more comprehensive understanding of the long-term social and health consequences of migration, offering empirical insights that are essential for designing policies to support both migrants and their families.

1.4.2 Data Sources

Migration and Its Impact on Left-Behind Families (Chapter 2)

This study utilizes longitudinal data from the China Family Panel Studies (CFPS), a nationally representative survey conducted by Peking University. The analysis focuses on rural children whose parents have migrated for work, examining the effects of parental migration on their physical and psychological health outcomes.

The key explanatory variable is parental migration, while remittances serve as a moderating factor to assess whether financial support mitigates the potential negative effects of parental absence. The dependent variables capture children's health and well-being, enabling an evaluation of how migration-induced household changes affect child development.

By comparing left-behind children with those in non-migrant households, this study aims to provide insights into the trade-offs between economic benefits and potential social and health costs of migration on family members remaining in rural areas.

The Health Trajectories of Migrants in Urban City (Chapter 3)

This study utilises longitudinal data from the China Family Panel Studies (CFPS), a nationally representative survey conducted by Peking University. The analysis focuses on rural children whose parents have migrated for work, assessing the impact of parental migration on their physical and psychological health outcomes.

The key explanatory variable is parental migration, while remittances serve as a moderating factor to examine whether financial support mitigates the potential adverse effects of parental

absence. The dependent variables capture children's health and well-being, allowing for an evaluation of how migration-induced household changes influence child development.

By comparing left-behind children with those in non-migrant households, this study seeks to provide insights into the trade-offs between the economic benefits of migration and its potential social and health costs for family members remaining in rural areas.

Economic and Social Reintegration of Return Migrants (Chapter 4)

This study draws on panel data from the Rural-Urban Migration in China (RUMiC) survey, encompassing a diverse sample of rural migrants in urban areas. It investigates whether migrants exhibit a health advantage upon arrival and how their health status evolves over time as they adjust to urban life.

The key explanatory variable is Years Since Migration (YSM), which tracks health trends among migrants in comparison to urban natives. The dependent variables capture overall health status and behavioural health indicators, reflecting both physical and mental well-being.

By examining how migrant health changes with increasing duration of stay in urban areas, this study aims to provide insights into the long-term health implications of internal migration and the potential risks associated with urban adaptation.

A summary of the datasets used in each chapter is presented in the table below:

Table 1.1 Data Sources

Chapter Name	Data base	Survey year
Migration and Its Impact on Left-Behind Children (Chapter 2)	China Family Panel Studies (CFPS) China Population Census China City Statistical Yearbook	Year:2014,2016
The Health Trajectories of Migrants in Urban City (Chapter 3)	The Rural-Urban Migration in China (RUMiC)	Year:2008,2009
Economic and Social Reintegration of Return Migrants (Chapter 4)	The Rural-Urban Migration in China (RUMiC) China City Statistical Yearbook	Year:2008,2009

Source: China Population Census and China City Statistical Yearbook, National Bureau of Statistics of China.

This study systematically examines the well-being of rural-to-urban migrants and their families by focusing on three key stages of migration: the impact on left-behind family members, the health trajectories of migrants themselves, and the reintegration experiences of return migrants. By considering both physical and psychological health outcomes, this research aims to provide a more comprehensive understanding of the long-term effects of migration. The use of longitudinal and panel data offers a dynamic perspective, enabling a nuanced analysis of how migration shapes well-being across different phases of the migration cycle.

1.4.3 Limitation of Database

A key limitation of the databases used in this dissertation is their restricted panel length, which limits the ability to observe long-term migration effects. While both CFPS and RUMiC provide panel data, their follow-up periods are relatively short. For instance, the CFPS study only utilises data from 2014 and 2016 because from 2018 onwards, the questionnaire structure was revised, making it impossible to construct a consistent long-term panel. Similarly, RUMiC only

covers 2008 and 2009, preventing an assessment of long-term reintegration among return migrants. This limitation is particularly relevant for new returnees, whose adjustment process may take several years. The short duration of the panels restricts the ability to analyse whether return migrants eventually regain economic stability or whether the initial effects of migration persist over time.

Another major constraint is the availability and construction of key variables. Relative income is not directly available in the datasets and must be approximated using external sources, such as statistical yearbooks, to infer regional income levels. This reliance on external data introduces potential measurement error and reduces the precision of income comparisons across migrant and non-migrant groups. Additionally, health indicators in RUMiC rely primarily on self-reported measures, such as self-rated health (SRH) and BMI, without incorporating objective medical data or healthcare utilisation records. This limits the ability to capture chronic illness progression, healthcare access, and other medically verified health conditions. Furthermore, CFPS lacks detailed information on caregiving arrangements for left-behind children, making it difficult to assess how different forms of parental absence impact child well-being. The absence of these key variables reduces the scope for investigating some of the mechanisms underlying migration's effects.

A further challenge concerns the identification of return migrants, particularly new returnees. The issue does not stem from attrition bias—where respondents drop out due to non-response—but rather from the structure of the dataset itself. Between the two survey waves in RUMiC (2008 and 2009), only 270 individuals were recorded as new returnees, as this figure represents the actual number of migrants who returned during this period. Consequently, the sample of new returnees is small, limiting statistical power and making it difficult to draw robust conclusions about their well-being. Moreover, the limited tracking period of RUMiC prevents a full analysis of the reintegration process, as the economic and social adjustments of returnees may take several years.

The instrumental variable (IV) strategy used to address endogeneity in migration decisions also faces limitations due to its reliance on external population census data to construct migration networks. While migration networks are a common instrument in migration research, they may still correlate with unobserved regional factors such as local economic development, infrastructure, and access to public services, which could independently influence health and

well-being outcomes. The validity of the IV strategy would be strengthened by additional robustness checks, such as alternative instruments or placebo tests, to confirm the exogeneity of migration networks.

Finally, the scope of available variables in all three databases presents additional constraints. In RUMiC, factors related to migrants' workplace conditions, job security, and social networks are not comprehensively recorded, making it difficult to assess the broader context of urban integration. Similarly, the CFPS study on subjective well-being does not include alternative psychological indicators, such as stress, anxiety, or social engagement, which could provide a more nuanced understanding of mental health outcomes. These limitations suggest that, while the datasets provide valuable insights, future research should incorporate longer panel structures, richer social and economic indicators, and improved measurement techniques to capture the full extent of migration's impact.

1.5 Structure of Thesis

Chapter 1: Introduction

The introduction establishes the overarching research framework for examining the multifaceted effects of migration and return migration on family members' health and subjective well-being in China. It contextualises internal migration within China's broader economic and demographic transformations, highlighting both the opportunities and challenges faced by migrants, left-behind family members, and returnees. This section outlines the rationale for focusing on three interconnected groups: left-behind children affected by parental migration (Chapter 2), rural migrants adapting to urban life (Chapter 3), and return migrants reintegrating into rural communities (Chapter 4). Furthermore, it identifies key theoretical and empirical gaps in the existing literature and introduces the econometric methods employed—primarily panel fixed-effects and first-difference models—emphasising their role in addressing unobserved heterogeneity and omitted variable bias in migration research.

Chapter 2: Parental Migration and the Well-being of Left-Behind Children

Using longitudinal data from the China Family Panel Studies (CFPS) for 2014 and 2016, this study examines the causal impact of parental migration on the physical and psychological well-being of left-behind children in rural China, with a particular focus on the moderating role of

remittances. To mitigate omitted variable bias arising from unobserved, time-invariant household characteristics, the analysis employs individual fixed-effects models. However, as parental migration decisions are inherently endogenous, potentially influenced by unobserved time-varying factors, an instrumental variable (IV) approach is applied, using local migration networks as an exogenous determinant of migration decisions.

The empirical findings reveal a dual effect of parental migration: while it significantly improves children's self-rated health, it also increases their risk of psychological distress and nutritional imbalances, as reflected in both underweight and overweight statuses. Mechanism analysis suggests that while remittances alleviate material deprivation, they do not sufficiently compensate for the emotional and psychological consequences of parental absence. Further heterogeneity analysis identifies gender differences: boys benefit more in terms of physical health but are at higher risk of becoming overweight, whereas girls are more vulnerable to psychological distress and undernutrition. These findings underscore the limitations of financial support in mitigating the adverse social and psychological consequences of parental migration. Policy recommendations call for an integrated approach that combines economic support with targeted social and emotional interventions, particularly gender-sensitive measures, to enhance the well-being of left-behind children.

Chapter 3: Migration and the Health Trajectories of Rural-to-Urban Migrants

This study utilises panel data from the Rural-Urban Migration in China (RUMiC) survey, covering 20 cities across two waves (2008 and 2009), to investigate whether the "Healthy Immigrant Effect" (HIE)—where migrants initially exhibit better health than local residents but experience health deterioration over time—applies to internal migration in China. The analysis employs panel fixed-effects models to control for unobserved, time-invariant individual heterogeneity, such as genetic predispositions and stable family background characteristics. To address potential selection bias resulting from non-random attrition due to return migration, the Heckman two-step selection correction method is used, with employment in the manufacturing sector serving as an instrumental predictor of attrition.

The empirical results indicate that internal migrants initially exhibit a significant health advantage over urban natives upon arrival, but this advantage diminishes over time, eventually converging to or even falling below that of the local population. Mechanism analysis suggests

that health deterioration is primarily driven by occupational exposure, particularly employment in physically demanding and unstable sectors such as manufacturing. Heterogeneity analysis reveals that males' health deterioration is closely linked to occupational hazards and lifestyle adjustments, whereas females experience greater psychological stress and social integration challenges. These findings highlight the necessity of policy interventions aimed at improving working conditions, ensuring healthcare accessibility, and implementing gender-sensitive strategies to sustain migrants' health advantages over time.

Chapter 4: Return Migration and Subjective Well-being

This chapter utilises panel data from the RUMiC survey (2008 and 2009) to examine how return migration influences subjective well-being among rural residents. The analysis explicitly distinguishes between three groups: "new returnees" (migrants who returned between the two survey waves), "old returnees" (those who had already returned before the first wave), and non-migrant rural residents. Panel fixed-effects and first-difference models are employed to control for unobserved, time-invariant individual heterogeneity, mitigating biases related to personality traits, early-life conditions, and family background.

Findings reveal that return migration has heterogeneous effects on subjective well-being. In the short term, returnees often report lower life satisfaction due to income reductions and readjustment difficulties. However, over time, well-being levels partially recover as returnees reintegrate socially and adjust their expectations. Further analysis indicates that higher-income returnees experience more substantial well-being improvements, suggesting that financial resources play a key role in facilitating successful reintegration. Robustness checks confirm that results hold when subjective well-being is modelled as both a continuous and binary variable. These findings offer valuable insights into the long-term implications of return migration and inform policy strategies to support rural returnees, particularly in relation to economic reintegration and social cohesion.

Chapter 5: Conclusion, Limitations and Policy Implications

The conclusion synthesises the key findings from each chapter, emphasising the dynamic and heterogeneous effects of migration and return migration on health and subjective well-being. It highlights the critical role of economic factors, social integration, and emotional support in shaping well-being outcomes across different migration stages. The study provides policy

recommendations advocating for a comprehensive approach that combines economic support with social and psychological interventions to improve the welfare of migrants and their families. Additionally, this chapter acknowledges the methodological limitations of the study, particularly in terms of data constraints and potential measurement biases, and proposes avenues for future research. By addressing these gaps, this thesis contributes to a more holistic understanding of internal migration's long-term effects on individual and family well-being in China.

Chapter 2

The Cost of Absence: Parental Migration, Remittances, and Child Health in Rural China

2.1 Introduction

Migration is a key driver of economic transformation, particularly in developing economies, where rural-to-urban labour mobility plays a crucial role in economic growth. Since the 1980s, China has undergone significant economic restructuring, transitioning from a planned economy to a market-driven system and integrating into the global economy (Wang et al., 2016)[83]. This transformation has led to large-scale internal migration, with millions of rural labourers relocating to urban centres in search of better economic opportunities (Taylor & Martin, 2001)[80]. By 2018, China's migrant population had reached 288.36 million, of whom 172.66 million were classified as migrant workers residing outside their registered hukou locations (National Bureau of Statistics of China, 2019)[68]. However, the institutional constraints of the hukou system have restricted migrants' access to essential public services such as healthcare, education, and housing (Liu et al., 2015)[57], making permanent urban settlement challenging. Consequently, many migrants leave their children behind in rural areas under the care of relatives or other guardians. The number of left-behind children has reached approximately 40.51 million, accounting for 15% of China's total child population (Duan, 2013)[33].

The effects of parental migration on left-behind children have been widely studied, but empirical findings remain inconclusive. One strand of literature suggests that parental absence has adverse psychological effects. Leng and Park (2010)[55] find that left-behind children in Gansu Province exhibit higher levels of violent behaviour and impulsive anger. Similarly, Deng and Li (2014)[29] document increased incidences of suicidal ideation, anxiety, depression, and substance abuse among left-behind children in Guizhou. These findings align with broader evidence suggesting that the absence of parental guidance and emotional support negatively affects children's mental health (Huifeng et al., 2020[75]; Kacenelenbogen et al., 2015[48]). However, other studies find no significant psychological effects. Xu and Xie (2015)[85], using propensity score matching (PSM), show that parental migration has no measurable impact on

child depression or loneliness, suggesting that other familial and social factors may mitigate the effects of parental absence.

The impact of migration on child physical health is equally ambiguous. Some studies report positive effects, particularly through improved nutrition and better growth indicators. Mansuri (2006)[62] finds that children in migrant households exhibit higher height-for-age Z-scores (HAZ), while Bohme et al. (2015)[15] and Macours & Vakis (2010)[60] suggest that increased household income from migration enhances child development. Conversely, other studies highlight potential adverse effects, particularly for older children. De Brauw & Mu (2011)[26] find that left-behind children over ten years old are more likely to be underweight, possibly due to increased household labour responsibilities that impact their diet and overall well-being.

Remittances are a crucial channel through which migration may influence child health outcomes. Empirical evidence suggests that remittances can alleviate poverty, improve nutrition, and increase healthcare access (Adams, 2006[2]; Yang, 2008[86]). Kanaiaupuni & Donato (1999)[50] find that remittances are associated with higher birth weights, while Anton (2010) and Bohme et al. (2015)[15] demonstrate that remittances improve child health indicators in various contexts. Research in Latin America and Africa similarly suggests that remittances enhance nutritional status and healthcare access (Nagarajan, 2009[67]; Ponce et al., 2011[72]). However, financial support alone may not fully compensate for the absence of parental care. Studies in Belgium and China indicate that children without parental presence experience heightened emotional distress, regardless of household financial stability (Kacenelenbogen et al., 2015[50]; Shi et al., 2020[75]). Moreover, remittances may have unintended consequences: for instance, increased household income may lead to greater consumption of unhealthy foods, contributing to obesity risks (De Brauw & Mu, 2011)[26].

Despite extensive research on migration and child well-being, several gaps remain. First, many studies fail to adequately address endogeneity concerns. Migration decisions are unlikely to be random and may be influenced by unobserved household characteristics, such as parental education levels or pre-existing economic conditions, which may also affect child health outcomes. Second, most existing research relies on cross-sectional data, limiting the ability to analyse long-term health changes and control for unobserved individual heterogeneity. Third, while some studies focus on physical health and others on psychological well-being, few examine both within the same empirical framework.

This paper seeks to address these gaps by investigating the following research questions: (1) How does parental migration affect the physical and psychological health of left-behind children? (2) To what extent do remittances mitigate the negative effects of parental absence? To answer these questions, we utilise panel data from the China Family Panel Studies (CFPS), covering multiple provinces and enabling a more rigorous examination of health outcomes over time. By incorporating individual fixed effects, we control for time-invariant household characteristics. Additionally, to address endogeneity concerns, we employ an instrumental variable (IV) approach, using a weighted wage difference (the interaction between migration and wage differentials) as an instrument for migration.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature; Section 3 describes the data and empirical strategy; Sections 4 to 6 present the results and additional discussion; and Section 7 discusses the findings and concludes with policy implications.

2.2 Literature Review

2.2.1 Parental Absence and Child Well-being

The absence of parents due to migration can significantly affect the health and well-being of left-behind children through multiple channels. One of the most evident pathways is through nutritional and physical health deficits. Hildebrandt et al., (2005)[44] examined migration between the United States and Mexico and found that children from migrant families had lower rates of breastfeeding and delayed early vaccinations, negatively impacting their immune system development. These findings suggest that parental migration may lead to early-life health disadvantages, particularly in the absence of adequate caregiving arrangements. However, a key limitation of this study is the non-random nature of migration decisions, which may introduce selection bias in estimating the effects. Addressing this issue, Gibson et al. (2011)[39] leveraged a random lottery system for Tongan families applying for immigration to New Zealand and found that left-behind children exhibited poorer physical development than their peers, with higher incidences of underweight. These results reinforce the argument that parental absence, even when coupled with economic benefits from migration, can lead to adverse health outcomes due to disrupted family structures and inadequate nutritional support.

Beyond physical health, mental health and psychological development are critical dimensions of child well-being affected by migration. Research in Belgium has identified impaired psychomotor development among infants raised without parental presence (Kacenelenbogen et al., 2015)[49]. In China, studies from Guizhou Province indicate that left-behind children experience higher rates of suicide, anxiety, depression, and substance abuse, largely attributable to emotional neglect and the absence of parental guidance (Deng & Li, 2014)[29]. Furthermore, Huifeng et al. (2020)[75] find that a lack of caregiver support and early childhood education exacerbates cognitive and emotional difficulties in left-behind children, leading to long-term developmental deficits. While these studies highlight the negative psychological effects of parental migration, they do not fully account for potential coping mechanisms and external support systems that may mitigate such effects, suggesting the need for more nuanced empirical analysis.

Another critical aspect of parental migration is its effect on household labour allocation and child responsibilities. The departure of parents often shifts domestic and caregiving burdens onto left-behind children. Mu and Van de Walle (2011)[66] show that left-behind children in China assume greater household responsibilities, including childcare, cooking, and agricultural work, which reduces their leisure time and may contribute to malnutrition and educational disadvantages. Xu and Xie (2015)[85] provide further evidence that left-behind children, particularly those in rural areas, face higher risks of being underweight, likely due to increased physical workload and reduced parental supervision over dietary habits. While some studies argue that older children may develop greater independence and resilience in response to migration-induced responsibilities, the broader evidence suggests that the absence of parental care is more often associated with greater emotional distress and heightened health risks.

Taken together, these findings suggest that parental migration has multifaceted consequences for left-behind children, influencing their physical health, psychological well-being, and household responsibilities. While the economic benefits of migration may offer some compensation, the social and emotional costs remain substantial and warrant further investigation.

2.2.2 The Role of Remittances in Child Health

Remittances are widely recognised as a key mitigating factor in the relationship between parental migration and child well-being. Several studies suggest that financial transfers from

migrant parents can improve household living conditions, reduce poverty, and enhance child health outcomes. For example, in Moldova, Böhme et al. (2015)[15] find that remittances lead to higher Body Mass Index (BMI) scores and improved child health reports, suggesting positive nutritional effects. Similarly, Macours and Vakis (2010)[61] demonstrate that remittances enhance early cognitive development among left-behind children in Nicaragua, as financial resources help offset the short-term disadvantages of parental absence by improving access to nutrition, healthcare, and education.

In China, where rural infrastructure and healthcare systems remain underdeveloped, remittances play a crucial role in improving household living standards. Migrant workers frequently allocate remittances towards better housing conditions, access to clean drinking water, and general household improvements (Song, 2014[87]; Zuo & Li, 2011[87]). Anton (2010)[11] provides supporting evidence from Ecuador, where remittances improved child nutrition in the short and medium term, though their long-term effects remained inconclusive. This finding aligns with Kanaiaupuni and Donato (1999)[50], who demonstrate that remittances are associated with lower infant mortality rates among Mexican migrant families. Similarly, in Africa, remittances have been linked to increased healthcare utilisation and improved dietary diversity (Nagarajan, 2009[67]).

Despite the generally positive effects of remittances, empirical evidence remains mixed. Several studies indicate that the impact of remittances on child health depends on various factors, including the duration and stability of remittance flows, household financial management, and intra-household resource allocation. Ponce et al. (2011)[73] using an instrumental variable approach to analyse Ecuadorian migrant households, find that while remittances increased healthcare expenditure, they had no significant impact on child growth indicators. Similarly, Nobles (2007)[69] reports that children in Mexican migrant households exhibited lower height-for-age Z-scores (HAZ) despite receiving remittances, suggesting that financial resources alone may not fully address childhood malnutrition and growth deficiencies.

Methodological differences also contribute to the heterogeneity in findings on remittance effects. Studies employing different instrumental variables, such as migration prevalence rates, Western Union transaction data, and exogenous variations in international remittance costs, have produced inconsistent results (Anton, 2010[11]). Additionally, some researchers argue that remittances may inadvertently lead to unhealthy consumption patterns, as households may

allocate funds towards processed foods and non-essential goods rather than nutritious meals and healthcare services (De Brauw & Mu, 2011[26]).

Moreover, migration-induced remittances do not necessarily compensate for the emotional and psychological costs of parental absence. Studies in China and Belgium indicate that left-behind children experience higher levels of emotional distress and social isolation, even when remittances provide financial stability (Kacenelenbogen et al., 2015[50]; Shi et al., 2020[76]). This suggests that while remittances can alleviate some economic constraints associated with migration, they do not fully replace parental care and emotional support.

Overall, the literature highlights the complex role of remittances in shaping the well-being of left-behind children. While financial transfers can alleviate poverty and improve certain health indicators, they do not fully address the broader social and emotional consequences of migration. The net effect of remittances ultimately depends on household financial management, social support structures, and the extent to which parental absence disrupts family dynamics. The dual nature of parental migration is evident: while remittances enhance household income, nutrition, and healthcare access, the absence of parental care, supervision, and emotional support creates significant risks for child development and well-being. Furthermore, the heterogeneity of findings in the literature underscores the need for improved identification strategies to address potential endogeneity issues, as well as longitudinal studies to capture the evolving effects of migration over time.

Future research should focus on disentangling the causal pathways through which migration affects child health, considering the interplay between financial resources, household structures, and social support mechanisms. Additionally, policy interventions should aim to enhance caregiving support and community-based programmes for left-behind children, ensuring that the economic benefits of migration do not come at the expense of child welfare.

2.3. Data

2.3.1 Data Source

This study utilises data from the China Family Panel Studies (CFPS), a nationally representative longitudinal survey conducted by the Institute of Social Science Survey (ISSS) at Peking University. The CFPS collects biennial data at the individual, household, and community levels,

covering rural and urban areas across 25 provinces with diverse economic and geographical characteristics. The survey provides comprehensive information on family structure, education, employment, income distribution, social relationships, and health conditions, making it particularly well-suited for studying the well-being of left-behind children (CFPS, 2018).

For this analysis, we focus on the child module of the 2014 wave, which surveys children aged 10 to 18, and track the same individuals in the 2016 wave. After excluding observations with missing values, we obtain a balanced panel dataset comprising approximately 3,000 children over two years. By linking individual records with corresponding family and parental data, we construct an unbalanced panel dataset, enabling us to examine within-individual changes over time, mitigate omitted variable bias, and improve causal inference.

2.3.2 Dependent Variables: Child Health Outcomes

The primary outcome variable in this study is child health status, assessed through three key indicators: Self-Rated Health (SRH), Body Mass Index (BMI, including classifications for overweight and underweight), and Symptoms of Poor Mental Health (SPM).

Self-Rated Health (SRH) is a widely used subjective measure of health status in the CFPS. Respondents answer the question, “How would you rate your own health condition?” (WL1) on a five-point scale, where 1 = excellent and 5 = poor. To maintain consistency with standard health economics interpretations, the scale is reversed so that higher values indicate better health. Prior studies have established SRH as a strong predictor of mortality, life expectancy, and objective health outcomes (Idler & Kasl, 1995[47]; Dong et al., 2017[32]).

Body Mass Index (BMI) is calculated as weight (kg) divided by height squared (m^2). While the World Health Organization (WHO) defines standard BMI thresholds for adults (18.5–24.9 for normal weight, <18.5 for underweight, and $\geqslant$25 for overweight), children's BMI is assessed relative to age- and sex-specific percentiles to account for growth variability (De Onis et al., 2007[70]). Following Loh and Li (2013)[58], this study classifies children as overweight (BMI above the reference threshold, coded as 1) or underweight (BMI below the reference threshold, coded as 1) based on age- and gender-adjusted percentiles. This approach provides a more accurate assessment of nutritional status and growth development (WHO, 2023[84]).

Symptoms of Poor Mental Health (SPM) are measured using a subset of items adapted from the Centre for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1991[74]). The CFPS includes six psychological well-being indicators that assess emotional distress and depressive symptoms. A detailed description of these measures is provided in Appendix A. Each item is rated on a five-point scale, with higher summed scores indicating better psychological well-being, Consequently, the SPM ranged from 1-30. Previous research confirms the validity and reliability of this measure among Chinese adolescents (Chen et al., 2009[22]).

2.3.3 Explanatory Variables: Migration Status and Remittances

The key explanatory variable in this study is parental migration status. In the CFPS, an individual is classified as a migrant worker if they are employed outside their province of residence. The CFPS household survey records the unique IDs of migrant workers, enabling the identification of children whose parents have migrated. A child is categorised as left-behind (migration = 1) if at least one parent is a migrant worker; otherwise, migration = 0.

To examine the economic effects of migration, the study incorporates remittance data from the CFPS survey question: “In the past 12 months, how much money has been sent or brought back by family members working away from home?” (FO4). This variable allows for an assessment of whether financial transfers from migrant parents mitigate the potential adverse effects of parental absence. Additionally, an interaction term (Migration × Remittance) is constructed to investigate the moderating role of remittances in shaping child health outcomes, which is analysed in the mechanism section.

2.3.4 Control Variables

To mitigate potential omitted variable bias, this study incorporates a set of control variables at both the individual and household levels.

At the individual level, controls include the child’s age and its squared term to account for potential non-linear growth effects. Gender is also included to capture systematic differences in health outcomes between boys and girls. Additionally, parental characteristics such as age, education level, weight, and smoking status are controlled for, as these factors may influence both household health behaviours and economic conditions.

At the household level, several variables are incorporated to account for differences in family structure and living conditions. Household size is controlled for, as larger households may exhibit different resource allocation dynamics compared to smaller households. Urban residence is included to distinguish between rural and urban households, given the substantial disparities in infrastructure and access to public services between these areas. Furthermore, access to clean water is captured through a dummy variable indicating whether the household uses tap water, serving as a proxy for sanitation and overall living conditions. The use of clean energy is also controlled for, as household fuel type reflects economic well-being and environmental exposure. These variables provide a more comprehensive understanding of the household environment, allowing for a more precise estimation of the impact of migration on children's health outcomes.

Despite the inclusion of these controls, endogeneity concerns remain. The decision to migrate may be influenced by pre-existing household characteristics such as economic stability, health conditions, and local labour market opportunities, potentially introducing unobserved confounders. To address this, individual fixed effects are employed to control for time-invariant unobserved heterogeneity. However, future research should further refine the selection of control variables and explore additional strategies to enhance the robustness of the results.

2.3.5 Summary Statistics

The pooled sample from the 2014 and 2016 CFPS waves is presented in Table 2.1, providing an overview of the key variables used in the analysis.

Table 2.1 Data Description

	Having migration	Non-migration	T- test
Explained Variable			
SRH (Poor -Good)	4.00 (0.96)	3.96 (0.96)	
BMI	18.26 (3.42)	18.67 (3.71)	***
BMI overweight	11.50%	14.10%	***
BMI underweight	26.90%	20.10%	***
SPM (Poor-Good)	26.62 (3.34)	27.01 (3.27)	***
Remittance	21120.89 (19209.62)	0	***
Child Characteristics			
Age	13.48 (2.02)	13.47 (2.05)	
Age^2	185.90 (54.86)	185.73 (55.54)	
Urban	31.70%	51.10%	***
Parent Characteristics			
Father's age	42.00 (5.15)	42.08 (5.46)	
Mother's age	40.47 (5.11)	40.02 (5.12)	**
Father's weight (kg)	67.07 (10.32)	68.21 (11.09)	***
Mother's weight (kg)	58.09 (9.14)	58.13 (9.13)	
Father's education (year)	5.86 (3.32)	7.03 (4.18)	***
Mother's education (year)	4.46 (3.64)	6.05 (4.36)	***
Father's smoking (number)	10.36 (10.92)	9.45 (10.71)	**
Mother's smoking (number)	0.10 (1.35)	0.09 (1.21)	
Household Characteristics			
Household size	4.22 (1.62)	4.27 (1.45)	
Tap water	58.70%	74.50%	***
Fuel	54.50%	67.80%	***
Number of Observation	1221	1717	

Notes: Means (standard deviations) refer to continuous and categorical variables; percentages refer to dummy variables. Source from：CFPS 2014 & 2016.

T-test difference between migrants' households and non-migrant households.

Table 1 presents a comparative analysis of various indicators for children from migrant and non-migrant families, providing insights into potential disparities in health status, parental characteristics, and household conditions. The dependent variables in this study include self-rated health (SRH), body mass index (BMI), and symptoms of poor mental health (SPM). The results of the t-tests reveal statistically significant differences in several key variables, suggesting that parental migration may be associated with variations in child health and well-being.

In terms of health indicators, children from non-migrant families report slightly higher SRH scores on average, although the difference is not statistically significant. However, BMI differs significantly between the two groups, with children from non-migrant families exhibiting a higher mean BMI. The proportion of overweight children is higher among non-migrant families, whereas underweight prevalence is significantly greater among migrant children. These findings suggest that left-behind children may face greater nutritional challenges, potentially due to differences in dietary patterns, caregiving arrangements, and food security in households where parents have migrated. Additionally, children from migrant families report significantly lower SPM scores, indicating poorer mental health. This supports the hypothesis that the absence of parental care may contribute to heightened psychological distress among left-behind children.

Examining child-specific characteristics, there are no significant differences in age and age squared between the two groups, indicating that the age distribution is comparable across migrant and non-migrant children. However, a significantly lower proportion of migrant children reside in urban areas compared to their non-migrant counterparts. This finding aligns with the expectation that migration is predominantly driven by rural-to-urban labour mobility, with many left-behind children remaining in rural hometowns while their parents relocate to urban centres for employment.

Regarding parental characteristics, no significant differences are observed in the average ages of fathers and mothers between migrant and non-migrant households. However, notable differences exist in parental weight, with non-migrant fathers and mothers displaying slightly higher body weight on average. This may reflect lifestyle differences, as migration often entails physically demanding labour, altered dietary habits, and varying access to nutrition. More significantly, migrant parents tend to have lower levels of education compared to non-migrant

parents, suggesting that migration may be more common among individuals with lower educational attainment seeking employment opportunities in urban labour markets. This contrasts with some migration literature that associates migration with higher education and skills, highlighting the complexity of migration patterns in China. Additionally, fathers in migrant families exhibit a slightly higher prevalence of smoking than those in non-migrant families, potentially reflecting differences in stress levels, social behaviours, or occupational influences associated with migration.

In terms of household characteristics, there is no significant difference in household size between the two groups, suggesting that family composition remains relatively stable regardless of migration status. However, substantial disparities are observed in access to infrastructure and resources. A significantly lower proportion of migrant households have access to tap water and clean energy compared to non-migrant households. This disparity highlights potential economic and environmental inequalities, as access to these resources often reflects broader socioeconomic conditions. Migrant families may be more likely to reside in rural areas with limited infrastructure, or they may allocate financial resources towards other necessities rather than improving household living conditions.

In summary, the findings from Table 1 reveal notable differences between children from migrant and non-migrant families across various health, parental, and household indicators. Migrant children tend to exhibit poorer nutritional and mental health outcomes, likely linked to parental absence and differences in caregiving environments. The lower education levels among migrant parents suggest that economic necessity, rather than professional advancement, is a primary driver of migration. Furthermore, disparities in access to clean water and energy highlight broader economic and environmental challenges faced by migrant households.

2.4. Empirical Framework

2.4.1 Empirical Model

To assess the impact of parental migration on the health outcomes of left-behind children, this study employs a fixed effects (FE) regression model using panel data. The FE model controls for unobserved, time-invariant heterogeneity at the individual level, thereby reducing potential omitted variable bias. The baseline specification is presented as follows:

$$H_{it} = \alpha_0 + \alpha_1 M_{it} + \alpha_2 X_{it} + \lambda_t + \gamma_p + \mu_i + \epsilon_{it}$$

H_{it} represents the health outcome of child i at time t, measured by self-rated health (SRH), BMI overweight, BMI underweight, and symptoms of poor mental health (SPM).

M_{it} is the key explanatory variable, indicating whether at least one parent has migrated (M=1) or not (M=0).

X_{it} is a vector of control variables, including individual characteristics (age, age squared, urban residence), parental characteristics (education level, smoking behavior, weight, and age), and household characteristics (household size, access to tap water, and clean energy usage).

λ_t represents year fixed effects, controlling for time-specific shocks affecting child health.

γ_p represents province fixed effects, capturing regional unobserved heterogeneity.

μ_i denotes individual fixed effects, which control for all time-invariant unobservable factors at the individual level, such as genetic predisposition, childhood conditions, characteristics and persistent family background influences.

ϵ_{it} is the error term.

By employing individual fixed effects, we eliminate bias arising from unobserved heterogeneity that remains constant over time. However, endogeneity concerns persist, as parental migration decisions may be influenced by unobserved household economic conditions or pre-existing child health status. To address this issue, the subsequent analysis incorporates an instrumental variable approach to strengthen causal inference.

2.4.2 Baseline Estimation Results

Table 2.2 presents the baseline regression results, estimating the relationship between parental migration and four child health indicators.

Table 2.2: Parental Migration and Child Health: Fixed Effects Panel Estimation

	(1) SRH	(2) BMI overweight	(3) BMI underweight	(4) SPM
Migration(dummy)	0.071	0.052*	0.027	-1.308***
	(0.142)	(0.029)	(0.050)	(0.358)
Child Characteristics				
Age	0.961***	-0.156**	-0.087	-0.054
	(0.345)	(0.069)	(0.145)	(1.298)
Age^2	-0.028***	0.006***	0.004	-0.013
	(0.009)	(0.002)	(0.004)	(0.031)
Urban	0.206	0.147	-0.026	-1.087
	(0.216)	(0.134)	(0.043)	(0.798)
Parent Characteristics				
Father's age	-0.248	0.004	-0.096	-1.444**
	(0.237)	(0.069)	(0.079)	(0.685)
Mother's age	-0.305	0.027	-0.054	-1.740
	(0.366)	(0.076)	(0.143)	(1.089)
Father's weight	0.012	0.001	0.006	0.058
	(0.011)	(0.002)	(0.004)	(0.041)
Mother's weight	-0.021	-0.006	-0.000	-0.000
	(0.018)	(0.004)	(0.005)	(0.048)
Father's Edu	-0.127*	0.126**	-0.039	1.692
	(0.075)	(0.063)	(0.133)	(1.794)
Mother's Edu	0.121	-0.006	0.022	0.383**
	(0.084)	(0.012)	(0.038)	(0.181)
Father smoking	-0.012	-0.002	0.009***	0.008
	(0.009)	(0.001)	(0.003)	(0.030)
Mother smoking	-0.099	-0.020	-0.140	-0.840***
	(0.222)	(0.022)	(0.113)	(0.215)
Household Characteristics				
Household size	-0.050	-0.024*	0.038*	0.010
	(0.061)	(0.014)	(0.023)	(0.167)
Tap water	0.162	0.075	-0.016	1.971***
	(0.167)	(0.058)	(0.037)	(0.728)
Fuel	0.220	0.061	-0.002	-0.473
	(0.173)	(0.051)	(0.037)	(0.659)
Year dummy	Yes	Yes	Yes	Yes
Province dummy	Yes	Yes	Yes	Yes
N	3172	3172	3048	3028

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level
SRH (poor-good): self-rated health. BMI: body mass index. SPM (poor-good): symptoms of poor mental health.

Table 2.2 provides an initial assessment of the potential effects of parental migration on child well-being. The regression results indicate that parental migration does not have a statistically significant effect on self-rated health (SRH). The coefficient on migration in column (1) is positive (0.071) but not significant, suggesting that, on average, migration does not substantially alter children's self-perceived health status. However, this result may be influenced by selection effects, as families with healthier children or greater economic resources may be more likely to send a parent to migrate.

The findings further suggest that parental migration is positively associated with a higher likelihood of children being overweight (BMI overweight). Column (2) reports a positive and statistically significant coefficient (0.052, $p < 0.05$), indicating that left-behind children are more prone to overweight issues compared to their peers in non-migrant households. This effect could be driven by changes in dietary habits, reduced parental supervision, or increased consumption of processed foods among children in migrant families. However, no significant effect of migration is found on BMI underweight, as indicated by the statistically insignificant coefficient in column (3). This suggests that while migration may alter children's nutritional behaviours, it does not necessarily result in severe malnutrition or underweight conditions within this sample.

One of the most notable findings is the significant negative effect of parental migration on children's mental health (SPM). The coefficient in column (4) is -1.308 and statistically significant at the 1% level, indicating that left-behind children experience higher levels of psychological distress compared to those in non-migrant households. This finding aligns with existing literature highlighting the adverse psychological consequences of parental absence, likely stemming from reduced parental care, a lack of emotional support, and increased household responsibilities for left-behind children.

Several control variables provide further insights into the determinants of child health. The results suggest that age and its squared term exhibit a nonlinear relationship with child health. Age is positively associated with SRH, but the negative coefficient on Age^2 suggests diminishing returns—older children tend to report better health perceptions, but the rate of improvement declines with age. Parental education also plays a significant role, with higher paternal education associated with lower SRH and a greater likelihood of overweight BMI, whereas maternal education has a positive effect on mental health (SPM). This highlights the

differential influence of parental human capital on various aspects of child well-being. Additionally, household conditions are found to be important determinants of child health. Access to clean drinking water (tap water) is strongly associated with better mental health (SPM, $p < 0.01$), reinforcing the importance of environmental factors in shaping psychological outcomes for left-behind children.

While these OLS results offer useful initial insights, it is important to acknowledge that migration decisions are unlikely to be exogenous. Parents who choose to migrate may systematically differ from those who remain, leading to potential estimation bias. Unobserved factors such as household wealth, community infrastructure, and pre-existing child health conditions may influence both migration decisions and health outcomes, creating an endogeneity problem. Consequently, OLS estimates may be confounded by selection bias, as migration may be driven by pre-existing conditions rather than being an independent determinant of child health. To address this concern, the next section introduces an instrumental variable (IV) approach, leveraging a plausibly exogenous source of variation in migration to obtain more robust causal estimates.

2.4.3 Endogeneity Issue & Instrumental Variable

The migration decision is unlikely to be random, raising concerns about potential endogeneity bias in the OLS estimates. Families that choose to migrate may systematically differ from those that do not in ways that simultaneously affect both migration status and child health outcomes. For instance, adverse economic shocks, natural disasters, or poor local infrastructure may drive parents to migrate while also negatively impacting the well-being of left-behind children (Liang & Ma, 2004)[56]. Similarly, wealthier or more educated households may be more likely to engage in migration due to greater access to urban job opportunities while also providing better healthcare and nutrition for their children. If such unobserved factors are correlated with both migration decisions and child health, the OLS estimates may suffer from omitted variable bias, making it difficult to establish a causal relationship.

To address this concern, we employ an instrumental variable (IV) approach, a widely used method in migration research, to introduce exogenous variation in migration decisions. Specifically, following the literature (Taylor et al., 2003[81]) we use migration networks as an instrument for parental migration. Migration networks—defined as the prevalence of migration

within a given locality—are a key determinant of migration decisions, as they reduce the costs and risks associated with migration by facilitating access to job information, social connections, and financial support. Extensive empirical evidence confirms that individuals residing in areas with larger migration networks are more likely to migrate, as the presence of established migrants lowers uncertainty and provides critical resources for new migrants.

The migration network variable is constructed using sample-based population census data rather than full census counts. In China, full population censuses are conducted every ten years, with 1% national sample surveys undertaken every five years to provide publicly available demographic statistics (National Bureau of Statistics of China, 2020[68]). These sample-based surveys are randomly drawn and representative, making them a reliable source for estimating migration patterns. To measure the strength of migration networks in each city p at time t, we calculate the migration rate using the following formula:

$$Migration\ Network_{p,t} = \frac{Number\ of\ Migrants\ in\ Sample_{p,t}}{Total\ Sample\ Population_{p,t}}$$

where:

$Number\ of\ Migrants\ in\ Sample_{p,t}$ represents the number of individuals in the census sample who have been away from their registered residence for at least six months.

$Total\ Sample\ Population_{p,t}$ refers to the total number of individuals surveyed in the census sample within city p at time t.

This variable reflects the intensity of migration within a given locality, capturing the extent to which migration is prevalent across different regions. A higher migration network value indicates a more developed migration infrastructure, facilitating migration by reducing information asymmetry, lowering search costs, and providing financial and social support to prospective migrants.

One potential limitation of this approach is that certain cities, particularly remote or underdeveloped regions, may have relatively small sample sizes in the census data, which could introduce measurement error in the migration network variable. To improve precision, we supplement the census data with statistics from the *China City Statistical Yearbook*, incorporating migration-related figures from 2010, 2012, and 2013. By computing a three-year

average migration rate, we smooth out fluctuations in migration patterns and mitigate potential biases arising from temporary economic shocks or short-term migration surges. A similar approach is applied to the 2015 census data to construct migration networks for the 2016 CFPS sample.

To address the potential endogeneity of parental migration, we employ a two-stage least squares (2SLS) estimation, using migration networks as an instrumental variable for parental migration. The first-stage regression establishes the relevance of the instrument, confirming that migration networks significantly predict parental migration. The second-stage regression then estimates the causal impact of parental migration on child health outcomes. The baseline model is specified as follows:

First Stage: Predicting Parental Migration:

$$M_{it} = \beta_0 + \beta_1 Migration\ Network_{pt} + \beta_2 X_{it} + \lambda_t + \gamma_p + \mu_i + \nu_{it}$$

Second Stage: Estimating the Effect of Migration on Child Health:

$$H_{it} = \delta_0 + \delta_1 \widehat{M}_{it} + \delta_2 X_{it} + \lambda_t + \gamma_p + \mu_i + \varepsilon_{it}$$

where:

$Migration\ Network_{pt}$ represents the proportion of individuals engaged in migration activities within city p at time t.

$\widehat{M}_{it}$ is the predicted migration status from the first-stage regression.

The remaining terms are as defined above.

Table 3 presents the results of the instrumental variable (IV) regressions, where migration networks are used as an instrument for parental migration. The first-stage results confirm that migration networks are a significant predictor of parental migration, satisfying the relevance condition for a valid instrument. The second-stage results indicate that, after addressing endogeneity, the estimated effects of parental migration on child health outcomes differ from the OLS estimates. This highlights the importance of accounting for selection bias in migration studies. By employing an instrumental variable approach, this analysis provides a

more robust estimation of the causal impact of parental migration on the well-being of left-behind children.

Table 2.3: Parental Migration and Child Health: Instrumental Variable Estimation

	(1) SRH	(2) BMI overweight	(3) BMI underweight	(4) SPM
Migration	0.899**	0.284**	0.475***	-3.364**
	(0.408)	(0.120)	(0.163)	(1.347)
First Stage regression of IV				
IV	9.892***	9.897***	9.971***	9.91***
F-test	41.00	41.00	40.85	39.94
Child Characteristics				
Age	1.097***	-0.117	0.002	-0.367
	(0.380)	(0.078)	(0.166)	(1.320)
Age^2	-0.029***	0.006**	0.003	-0.011
	(0.009)	(0.002)	(0.004)	(0.032)
Urban	0.260	0.162	-0.015	-1.254
	(0.231)	(0.137)	(0.055)	(0.894)
Parent Characteristics				
Father's age	-0.244	0.005	-0.091	-1.453*
	(0.255)	(0.067)	(0.084)	(0.744)
Mother's age	-0.318	0.0230	-0.061	-1.743
	(0.372)	(0.076)	(0.143)	(1.124)
Father's weight	0.020*	0.003	0.011**	0.037
	(0.012)	(0.003)	(0.005)	(0.040)
Mother's weight	-0.027	-0.007*	-0.002	0.014
	(0.019)	(0.004)	(0.006)	(0.047)
Father's edu	-0.130	0.125**	-0.039	1.699
	(0.087)	(0.059)	(0.140)	(1.753)
Mother's edu	0.111	-0.008	0.019	0.409**
	(0.084)	(0.012)	(0.039)	(0.180)
Father smoking	-0.0130	-0.002	0.009**	0.008
	(0.009)	(0.002)	(0.004)	(0.030)
Mother smoking	-0.107	-0.022	-0.145	-0.821***
	(0.222)	(0.022)	(0.111)	(0.249)
Household Characteristics				
Household size	-0.036	-0.020	0.048*	-0.034
	(0.061)	(0.015)	(0.029)	(0.179)
Tap water	0.156	0.073	0.001	1.972***
	(0.143)	(0.055)	(0.051)	(0.695)
Fuel	0.207	0.057	-0.037	-0.411
	(0.177)	(0.054)	(0.050)	(0.602)
Year dummy	Yes	Yes	Yes	Yes
Province dummy	Yes	Yes	Yes	Yes
N	2476	2476	2302	2296

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*

Note: Clustering to household level

SRH (poor-good): self-rated health. BMI: body mass index. SPM (poor-good): symptoms of poor mental

health.

Table 2.3 presents the instrumental variable (IV) estimation results, addressing the potential endogeneity of parental migration by using migration networks as an instrument. The first-stage results confirm that migration networks strongly predict parental migration decisions, with highly significant coefficients and F-statistics exceeding 39 across all specifications, suggesting that weak instrument concerns are unlikely. The second-stage regressions provide a more robust estimation of the causal impact of migration on child health, revealing distinct patterns across different health indicators.

The results indicate that parental migration significantly improves self-rated health (SRH) among left-behind children, with a coefficient of 0.899 ($p < 0.05$). This suggests that, after accounting for endogeneity, children in migrant households perceive their health more positively than their peers in non-migrant households. A possible explanation is that remittances from migrant parents improve household financial conditions, facilitating better access to healthcare, nutrition, and living standards, all of which contribute to overall well-being. Additionally, some children may associate parental migration with greater economic security, reinforcing a sense of stability and optimism regarding their health.

However, despite the positive effect on self-rated health, parental migration has a significant negative impact on mental health (SPM), with a coefficient of -3.364 ($p < 0.05$). This suggests that the psychological costs of parental absence outweigh the financial benefits of migration. Separation from parents can lead to increased loneliness, anxiety, and emotional distress, as left-behind children experience reduced parental supervision and weaker emotional bonds. Additionally, in the absence of parents, children may assume greater household responsibilities, such as caring for younger siblings or undertaking domestic work, which can exacerbate stress and negatively affect their mental well-being. The contrasting effects on self-rated health and psychological health underscore the complexity of migration's impact on children: while economic benefits may improve material well-being, they do not necessarily compensate for the loss of parental emotional support.

Parental migration also exhibits a dual impact on weight-related health indicators. The results indicate that migration is significantly associated with an increased likelihood of both overweight (BMI overweight coefficient = 0.284, $p < 0.05$) and underweight (BMI underweight coefficient = 0.475, $p < 0.01$) conditions among left-behind children. This suggests that

migration alters dietary patterns and nutritional balance, albeit in different directions depending on household circumstances. Some children may experience over-nutrition due to increased household income, leading to greater consumption of processed and calorie-dense foods. Conversely, others may suffer from under-nutrition due to irregular meal patterns, inadequate caregiving, or financial mismanagement in the absence of direct parental supervision. These findings highlight the heterogeneous effects of migration on child nutrition, suggesting that while migration can enhance household economic conditions, it does not necessarily lead to improved dietary outcomes.

The inclusion of control variables provides additional insights into the determinants of child health. Age and age squared show a non-linear relationship with SRH, indicating that while older children tend to report better health, the rate of improvement diminishes over time. Parental education plays a critical role, particularly maternal education, which is positively associated with better mental health outcomes (SPM coefficient = 0.409, $p < 0.05$). This suggests that mothers with higher education levels may provide stronger emotional support and more effective caregiving, which in turn helps to mitigate some of the psychological costs of parental migration. Additionally, parental smoking has a significant negative effect on child health, reinforcing the importance of household environmental factors in shaping health outcomes.

These findings highlight the multifaceted impact of parental migration on different aspects of child health. While migration appears to improve self-rated health and household economic conditions, it simultaneously exacerbates mental health issues and introduces nutritional risks. The results suggest that economic improvements alone do not fully offset the psychological and social costs of parental absence, underscoring the need for a more comprehensive approach to supporting left-behind children.

Although the IV estimates provide stronger causal evidence than OLS, they also raise important questions regarding the potential role of remittances in moderating migration's effects on child health. If migration improves financial stability but worsens psychological well-being, to what extent can remittances mitigate the adverse effects of parental absence? Do households receiving greater remittances experience better health and nutrition outcomes? These questions will be explored in the next section, which investigates the compensatory role of remittances in mitigating the negative consequences of parental migration on left-behind children.

2.5 Heterogeneity Analysis

To examine potential variations, we conduct a heterogeneity analysis, focusing specifically on gender differences. Gender plays a critical role in shaping children's experiences and outcomes in the context of parental migration, as cultural expectations, caregiving responsibilities, and nutritional allocation often differ between boys and girls. The results of this analysis are presented in Table 2.4.

Table 2.4: IV Estimates of Parental Migration Effects on Child Health: By Child's Gender

	Boys (Gender=1)				Girls (Gender=0)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SRH	BMI overweight	BMI underweight	SPM	SRH	BMI overweight	BMI underweight	SPM
Migration	1.948***	0.437**	0.661**	-1.201	-0.13	0.172	0.310*	-4.91***
	(0.662)	(0.179)	(0.281)	(1.78)	(0.472)	(0.159)	(0.174)	(1.807)
First Stage regression of IV								
IV	9.01***	9.01***	9.42***	10.17***	11.12***	11.12***	10.91***	11.15***
F-test	45.24	17.67	18.91	18.35	29.06	29.06	27.54	27.3
All Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1312	1312	1198	1212	1122	1122	1062	1046

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level
SRH (poor-good): self-rated health. BMI: body mass index. SPM (poor-good): symptoms of poor mental health.

Table 2.5: IV Estimates of Parental Migration Effects on Child Health: By Migrating Parent (Father vs. Mother)

	Only Father Migration				Only Mather Migration			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SRH	BMI overweight	BMI underweight	SPM	SRH	BMI overweight	BMI underweight	SPM
Migration	2.063***	0.246	0.480**	-4.112	1.332	1.070*	1.662*	-0.918
	(0.777)	(0.171)	(0.234)	(2.649)	(1.975)	(0.551)	(0.966)	(6.867)
First Stage regression of IV								
IV	7.327***	7.327***	7.570***	6.887***	3.081***	3.081***	2.824**	3.260***
F-test	18.22	18.22	20.8	16	6.84	6.84	5.77	6.65
All Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1742	1742	1622	1606	1242	1242	1178	1146

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level
SRH (poor-good): self-rated health. BMI: body mass index. SPM (poor-good): symptoms of poor mental health

Table 2.6: IV Estimates of Parental Migration Effects on Child Health: By Number of Migrating Parents

	Single-Parent Migration				Both-Parent Migration			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SRH	BMI overweight	BMI underweight	SPM	SRH	BMI overweight	BMI underweight	SPM
Migration	1.484**	0.225*	0.396**	-3.074	1.026	0.487**	1.028**	-2.76
	(0.606)	(0.133)	(0.186)	(1.981)	(0.860)	(0.219)	(0.489)	(2.977)
First Stage regression of IV								
IV	9.007***	9.007***	9.131***	8.755***	8.081***	8.081***	6.824**	7.260***
F-test	26.16	26.16	27.64	23.63	12.07	12.07	11.75	11.92
All Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1914	1914	1782	1764	1492	1492	1412	1386

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level
SRH (poor-good): self-rated health. BMI: body mass index. SPM (poor-good): symptoms of poor mental health.

Table 2.4 presents the instrumental variable (IV) estimation results, examining the differential effects of parental migration on boys and girls separately. The findings reveal significant gender disparities in how migration influences self-rated health, BMI indicators, and mental health (SPM).

For boys, parental migration has a strong positive impact on self-rated health (SRH coefficient = 1.948, $p < 0.01$), suggesting that left-behind boys perceive their overall health more favourably than those in non-migrant households. This may be attributed to increased household income from remittances, which could improve access to better nutrition, healthcare, and overall well-being. However, despite these perceived benefits, boys also exhibit a significantly higher likelihood of being overweight (BMI overweight coefficient = 0.437, $p < 0.05$) and underweight (BMI underweight coefficient = 0.661, $p < 0.05$). This suggests a nutritional imbalance, possibly driven by inconsistent dietary habits, reduced parental supervision, or increased autonomy over food choices. The lack of parental oversight may lead some boys to consume more processed or calorie-dense foods, while others may face irregular meal patterns or food insecurity, contributing to both overweight and underweight risks.

Interestingly, migration does not have a statistically significant effect on boys' mental health (SPM coefficient = -1.201, not significant). One possible explanation is that boys may experience different societal expectations and socialisation patterns that encourage independence and emotional resilience, making them less likely to report psychological distress. Additionally, boys may have stronger peer networks or alternative sources of social support, which could mitigate some of the negative psychological effects of parental absence. However, this does not necessarily imply that migration has no emotional impact on boys—mental health issues may manifest in less overt ways, such as aggressive behaviour or disengagement from academic activities, which future research should explore further.

For girls, parental migration does not significantly affect self-rated health (SRH coefficient = -0.13, not significant), indicating that migration does not strongly influence their perception of overall health. However, migration is significantly associated with an increased likelihood of underweight status (BMI underweight coefficient = 0.310, $p < 0.10$), raising concerns about nutritional deficiencies and inadequate caregiving. Unlike boys, girls may have less autonomy over food choices and meal planning, making them more vulnerable to the effects of insufficient caregiving in the absence of parents. The absence of a parent, particularly the mother, may

disrupt dietary routines, meal preparation, and nutritional intake, leading to a higher prevalence of underweight conditions.

Moreover, parental migration has a strong and highly significant negative impact on girls' mental health (SPM coefficient = -4.91, $p < 0.01$). This suggests that girls experience greater psychological distress, emotional insecurity, and social isolation due to parental absence. Girls may be more emotionally dependent on parental guidance and support, and their psychological well-being may be more closely tied to family stability and caregiving arrangements. The heightened vulnerability of girls to anxiety, depression, and emotional distress underscores the need for targeted mental health interventions for left-behind female children.

The results in Table 2.4 highlight significant gender disparities in how migration affects child health, emphasising the need for gender-sensitive policies and interventions. The nutritional challenges faced by both boys and girls indicate a need for enhanced dietary support, school-based nutrition programmes, and community interventions to ensure balanced and adequate nutrition for left-behind children.

Furthermore, the severe negative impact of migration on girls' mental health calls for stronger psychological support systems, including school counselling, peer support networks, and targeted interventions aimed at providing emotional stability and social integration. Given that boys may underreport mental health struggles, future research should explore alternative indicators of psychological distress, such as behavioural changes, academic performance, and social interactions, to fully capture the emotional consequences of parental migration.

These findings underscore the complex and multi-dimensional impact of migration on child well-being, reinforcing the importance of context-specific, gender-responsive policies to mitigate the adverse effects of parental absence and promote the holistic development of left-behind children.

The IV estimation results reported in Tables 2.5 and 2.6 provide robust evidence on the differentiated roles that fathers and mothers play in childcare, and how their migration affects child health outcomes. The findings underscore that the identity of the migrating parent, as well as whether one or both parents migrate, critically shapes children's physical and mental well-being.

When only the father migrates, children report a significantly higher level of self-rated health (SRH coefficient = 2.063, $p < 0.01$), whereas the corresponding effect under mother-only

migration is weaker and statistically insignificant (coefficient = 1.332). This discrepancy suggests that the mother's continued presence in the household may be pivotal in sustaining day-to-day caregiving routines that promote children's overall perception of health. Mothers are more likely to ensure dietary regularity, emotional reassurance, and consistent healthcare practices. In contrast, when the mother is absent, these stabilising caregiving functions may be disrupted, even if remittance income increases.

Nutritional outcomes further illustrate the asymmetry in parental caregiving. Under father-only migration, the risk of being overweight rises modestly (coefficient = 0.246), and the likelihood of being underweight increases significantly (coefficient = 0.480, $p < 0.05$). However, these effects are markedly amplified when only the mother migrates: the overweight coefficient more than quadruples (1.070, $p < 0.10$), and the underweight coefficient more than triples (1.662), albeit not statistically significant. These patterns highlight the irreplaceable role of mothers in dietary oversight and daily care. Fathers may struggle to replicate maternal functions such as meal planning, nutrition monitoring, and responsive caregiving, resulting in heightened risks of both under- and over-nutrition in the mother's absence.

This divergence becomes even more salient in Table 2.6, which distinguishes between single-parent and both-parent migration. In households where one parent remains, children continue to benefit from improved SRH (coefficient = 1.484, $p < 0.05$), and while the risks of being overweight (0.225, $p < 0.10$) and underweight (0.396, $p < 0.05$) are elevated, they remain moderate. In contrast, when both parents migrate, the SRH benefit diminishes (coefficient = 1.026, not significant), and nutritional risks become substantially larger (BMI overweight = 0.487, $p < 0.05$; BMI underweight = 1.028, $p < 0.05$). These findings point to the compounding disadvantage faced by children who lack access to any parental caregiver, regardless of household income gains from migration.

Mental health results further support the centrality of maternal caregiving. The most pronounced decline in symptoms of poor mental health (SPM) occurs when only the father migrates (coefficient = -4.112), suggesting that the mother's presence offers significant emotional stability. In contrast, mother-only migration yields a smaller negative effect on mental health (coefficient = -0.918), implying that paternal caregiving alone may be insufficient in addressing children's psychological needs. A similar pattern is observed in the comparison between single-parent and both-parent migration (Table 2.6), where both-parent migration is associated with a sizable, albeit statistically insignificant, decline in mental health (SPM

coefficient = -2.760). These results indicate that maternal absence—especially when coupled with paternal absence—exacerbates children's emotional vulnerability.

Taken together, the magnitude and direction of the coefficients across both tables provide empirical support for the notion that mothers occupy a central, non-substitutable role in both the physical and emotional development of children. Fathers contribute economically through migration, but their absence is more easily compensated for within the household caregiving structure. In contrast, maternal absence, whether alone or jointly with paternal absence, is associated with pronounced negative outcomes, particularly with respect to nutrition and mental health.

These findings highlight the necessity of gender-sensitive social policies that recognise the caregiving asymmetry between fathers and mothers. Programmes aimed at supporting left-behind children should prioritise households where mothers—or both parents—have migrated, by strengthening school-based nutrition services, offering community-based caregiving support, and expanding access to psychosocial services in rural areas. Such targeted interventions are essential for mitigating the multidimensional costs of parental absence and ensuring that migration-induced income gains do not come at the expense of child well-being.

2.6 Mechanism Analysis

While the previous analysis establishes the causal impact of parental migration on child health, it remains unclear whether remittances serve a compensatory role in mitigating the potential negative effects of migration. Migration often disrupts family structures and reduces parental supervision, which may adversely affect children’s health and psychological well-being. However, remittances—financial transfers from migrant parents—could offset some of these negative consequences by improving nutrition, enhancing access to healthcare, and stabilising household economic conditions. This section investigates whether remittances mitigate or fail to mitigate the adverse effects of parental migration.

To explicitly differentiate between the effects of migration with and without remittances, we introduce two interaction terms:

Migration × *Remittance:* Indicates households where at least one parent migrates and remittances are received.

Migration × No Remittance: Indicates households where at least one parent migrates but no remittances are received.

For non-migrant households, both variables are set to zero. This specification allows us to compare three groups:

1. Children in migrant households with remittances (Migration × Remittance = 1).

2. Children in migrant households without remittances (Migration × No Remittance = 1).

3. Children in non-migrant households (reference group).

Thus, the following two regression models are estimated separately:

$$H_{it} = \varphi_0 + \varphi_1 Migration_{Remittance_{it}} + \varphi_2 X_{it} + \lambda_t + \gamma_p + \mu_i + \epsilon_{it}$$

$$H_{it} = \omega_0 + \omega_1 Migration_{No-Remittance_{it}} + \omega_2 X_{it} + \lambda_t + \gamma_p + \mu_i + \epsilon_{it}$$

By replacing the standard migration variable with Migration × Remittance and Migration × No Remittance, this specification allows us to explicitly examine the differential impact of migration on child health depending on whether remittances are received. This approach offers several advantages. First, it enables a distinction between the pure effect of parental absence and the potential compensatory role of financial transfers, providing deeper insights into the economic and social mechanisms driving migration's impact on child well-being. Second, by comparing these results to the baseline regression, where migration was treated as a single variable, we can assess whether the observed effects were primarily driven by financial improvements (via remittances) or by parental absence itself.

If the health outcomes of children in Migration × Remittance households resemble those of non-migrant households more closely than those in Migration × No Remittance households, this would suggest that remittances help buffer the negative effects of migration. Conversely, if Migration × Remittance and Migration × No Remittance produce similar results, it would indicate that economic transfers alone are insufficient to offset the adverse consequences of parental absence.

By comparing three sets of results— (1) the original undifferentiated migration effect, (2) migration with remittances, and (3) migration without remittances—we can quantify the extent to which remittances mitigate or fail to mitigate the health risks associated with parental migration. If Migration × Remittance is positively associated with better self-rated health and

lower underweight prevalence, while Migration × No Remittance has either no effect or a negative effect, this would indicate that remittances improve child health by alleviating economic constraints and enhancing access to nutrition, healthcare, and improved living conditions. However, if Migration × Remittance still results in worse mental health outcomes (SPM), this would confirm that remittances cannot compensate for the emotional and psychological costs of parental separation, reinforcing the notion that financial support alone does not substitute for parental presence.

Thus, this mechanism analysis allows us to evaluate whether remittances serve as an effective compensatory factor in migration's impact on child health. If remittances prove beneficial, policy interventions could focus on enhancing financial literacy, improving the efficiency of remittance utilisation, and ensuring better targeting of funds toward child welfare. However, if the negative effects of migration persist despite remittances, alternative support structures—such as psychological counselling, social integration programmes, and enhanced community caregiving—may be necessary to mitigate the long-term costs of parental absence. The empirical results presented in Table 2.7 provide direct evidence on this question, shedding light on the role of remittances as a potential buffer in the migration-health relationship.

Table 2.7: The Role of Remittances: Instrumental Variable Estimation

	Migration，Remittance				Migration，No-Remittance			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SRH	BMI overweight	BMI underweight	SPM	SRH	BMI overweight	BMI underweight	SPM
Migration*Remittance	1.044***	0.254**	0.417***	-3.828***	1.906	2.593	4.244	-3.938
	(0.358)	(0.123)	(0.146)	(1.416)	(5.391)	(3.054)	(7.136)	(20.48)
First Stage regression of IV								
IV	10.09***	10.09***	10.26***	10.17***	1.46	1.46	1.18	1.06
F-test	45.24	45.24	46.26	44.47	0.72	0.72	0.45	0.37
All Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2246	2246	2098	2082	1194	1194	1132	1106

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level
SRH (poor-good): self-rated health. BMI: body mass index. SPM (poor-good): symptoms of poor mental health.

Based on the results from Table 2.7, remittances play a nuanced role in shaping the health outcomes of left-behind children. For self-rated health (SRH), the coefficient of the interaction term Migration × Remittance is positive and statistically significant (1.044, $p < 0.01$), indicating that left-behind children in remittance-receiving households report better self-perceived health compared to those in non-migrant households. This suggests that remittances contribute to improvements in nutrition, healthcare access, and overall living conditions, enhancing children's health perception. However, for mental health (SPM), the coefficient of Migration × Remittance is negative and highly significant (-3.828, $p < 0.01$), suggesting that even when remittances are received, left-behind children experience considerable psychological distress. This highlights that while financial support may enhance physical well-being, it does not compensate for the emotional and psychological costs of parental absence.

The contrasting effects on SRH and SPM suggest that remittances alleviate material deprivation but not emotional deprivation. A similar pattern is observed in the BMI-related indicators. Both BMI overweight (0.254, $p < 0.05$) and BMI underweight (0.417, $p < 0.01$) are significantly associated with Migration × Remittance, implying that remittances influence dietary habits but do not necessarily lead to balanced nutritional outcomes. While some children may benefit from improved food security, others may develop unhealthy eating patterns due to changes in household consumption behaviour.

Comparing these results with Table 2.3, where migration was treated as a single variable, we observe that in Table 2.3, migration had a negative impact on SPM (-3.364, $p < 0.05$) but a positive effect on SRH (0.899, $p < 0.05$). In contrast, in Table 2.5, remittance-receiving children report even better SRH but suffer from a sharper decline in SPM. This suggests that while remittances enhance physical well-being, they may also intensify emotional strain, as children may feel the emotional cost of parental absence more acutely when financial resources are available but direct parental support is missing.

Additionally, the results for Migration × No Remittance indicate statistically insignificant coefficients across all health outcomes, with larger standard errors, suggesting a weaker association. This implies that in the absence of remittances, migration's impact on child health is more ambiguous, potentially due to heterogeneous coping mechanisms. The large standard errors further suggest that left-behind children in non-remittance households experience highly

variable outcomes depending on other unobserved factors, such as the quality of alternative caregiving or community support.

Several factors may explain these findings. First, caregiving arrangements are likely to be a critical determinant of child health. When parents migrate, children are often left in the care of grandparents, older siblings, or extended family members. If caregivers provide adequate supervision and health support, children may maintain stable physical health despite parental absence. However, if caregiving quality is poor, the lack of direct parental care may lead to worse psychological outcomes.

Second, children's adaptability and self-regulation may influence their self-rated health. Some children may develop coping strategies, such as peer reliance, school engagement, or independent health management, allowing them to maintain a positive perception of their health despite parental absence. However, these strategies are less effective in addressing psychological distress, as emotional support from parents is difficult to replace with financial transfers.

Third, community resources and social networks may play a role in mitigating the health risks associated with parental migration. In some rural areas, local governments or non-governmental organisations provide targeted support for left-behind children, including nutrition programmes, psychological counselling, and after-school services. These resources may help explain why some children in migrant households maintain stable physical health despite lacking direct parental care.

Finally, it is important to note that the Migration × No Remittance group is significantly smaller than the Migration × Remittance group, reflecting the reality that most migrant parents send financial support home. The smaller sample size may introduce greater variability in estimates, explaining the larger standard errors observed in the no-remittance subgroup.

In summary, remittances appear to mitigate some of the negative physical health effects of migration but fail to address the emotional and psychological burden faced by left-behind children. The findings from Table 2.7 underscore the non-monetary costs of migration, suggesting that interventions focused on mental well-being—such as emotional counselling, school-based support programmes, and community-building initiatives—are necessary to complement the economic benefits of remittances. These findings contribute to a more comprehensive understanding of migration's effects on child health, highlighting the need for

policy measures that extend beyond financial assistance to address the broader well-being of left-behind children.

2.7 Conclusion

This study examines the impact of parental migration on the health of left-behind children, with particular attention to the role of remittances and gender heterogeneity. Using panel data from the CFPS and employing fixed-effects and instrumental variable approaches, we provide robust evidence on how migration influences self-rated health, BMI (overweight and underweight), and mental health. Our findings highlight the dual nature of migration's effects: while remittances alleviate some economic hardships, they do not fully offset the psychological and social costs of parental absence.

A key contribution of this study is demonstrating that remittances function as a partial but incomplete compensatory mechanism. Children in migrant households receiving remittances report better self-rated health and are less likely to be underweight, suggesting that financial support enhances nutrition, healthcare access, and overall living conditions. However, remittances fail to mitigate the adverse effects of parental migration on mental health, indicating that economic transfers alone cannot substitute for parental presence and emotional support.

This study also uncovers significant gender disparities in migration's effects. Boys in migrant household's report improved self-rated health but face a higher risk of being overweight, potentially due to lifestyle and dietary changes associated with remittance-fuelled consumption. In contrast, girls exhibit greater vulnerabilities in both nutrition and mental health, with a higher likelihood of being underweight and experiencing psychological distress. These findings suggest that migration affects children through distinct mechanisms, necessitating policy interventions that account for gender-specific risks.

A methodological strength of this study is the use of an instrumental variable approach, leveraging city-level migration networks to strengthen causal inference. Future research could refine this approach by employing historical migration rates (lagged variables) instead of contemporary migration networks, reducing the influence of short-term economic shocks and aligning more closely with economic theories that suggest migration networks persist over time. Additionally, using the working-age population (15–64 years old) as the denominator, rather than the total population, would provide a more precise measure of migration exposure. While

our IV strategy addresses endogeneity concerns, further robustness tests—such as falsification exercises or alternative IV specifications—could reinforce confidence in the results.

Despite its contributions, this study has limitations. Although the IV approach improves causal identification, it does not fully account for all unobservable factors that influence both migration decisions and child health outcomes. Future research should incorporate more detailed measures of social networks, migration costs, and household decision-making processes to further isolate the effects of migration. Moreover, this study primarily focuses on short-term health outcomes, leaving long-term impacts on educational attainment, labour market trajectories, and adult well-being unexplored. Another limitation is the absence of detailed information on caregiving arrangements, which may significantly shape child health outcomes. While two-year panel data enable the use of fixed effects and difference-in-differences strategies to control for time-invariant unobserved heterogeneity, the short time frame imposes several limitations. Firstly, it constrains the ability to capture long-term effects or dynamic adjustment processes that may unfold over a longer period. Secondly, the limited number of time points reduces the statistical power to detect subtle temporal trends or causal lag effects. Thirdly, it increases vulnerability to transitory shocks or measurement errors, as there are few opportunities to smooth out fluctuations. Future studies should examine how differences in caregiver quality, parental communication, and household support structures influence children's health trajectories.

These findings carry important policy implications. Given the persistent negative effects of migration on mental health, expanding rural mental health services should be prioritised through school-based counselling, peer support networks, and psychological interventions. Nutritional policies should address both underweight and overweight risks by promoting balanced dietary interventions for left-behind children. Finally, facilitating parental engagement through improved digital communication infrastructure and community-based support programmes could help mitigate the emotional costs of migration.

In conclusion, while parental migration improves household financial stability, it also imposes substantial non-economic costs on left-behind children. Remittances provide some compensation for physical health but fail to address psychological well-being, particularly for girls. A comprehensive policy approach that integrates financial support, mental health services, and strengthened caregiver networks is essential to safeguarding the well-being of left-behind children amid rising labour migration.

Chapter 3

Exploring the Healthy Immigrant Effect: Does this hypothesis apply to China?

3.1 Introduction

The process of migration, in which individuals or families relocate from one geographical region to another, typically involves movement from less developed areas to more economically prosperous urban centres. Many migrants seek improved economic opportunities to enhance their living conditions and health status. However, this process can also introduce new health risks, including lifestyle changes and the stress associated with adapting to new environments and policies (Averett, Argys, & Kohn, 2012[12]). The health status of migrants can, to some extent, reflect their level of integration into the local community, which is crucial in the formulation of immigration policies (Constant et al., 2018[25]). Consequently, understanding the relationship between migration and health has become an important area of research.

In developed countries, the "Healthy Immigrant Effect" (HIE) hypothesis suggests that migrants often enjoy an initial health advantage upon arrival in their host country. However, this advantage tends to diminish over time, eventually converging with or even falling below the health levels of native residents (Antecol & Bedard, 2006[9]). Several explanations account for this phenomenon. Firstly, self-selection among migrants implies that only those with inherent advantages—such as better health or financial resources—are more likely to migrate, meaning that migrants often arrive in better health than the general population (Farré, 2016[35]). Secondly, destination countries also play a role in selecting migrants through policies that favour individuals with higher levels of education or wealth, facilitating migration for this demographic and reinforcing the positive correlation between wealth, education, and health status (Chiswick, Lee, & Miller, 2008[23]). As a result, migrants often enter with better health than the local population. The third explanation relates to cultural and behavioural factors. Migrants may bring healthier lifestyle habits from their home country, including dietary preferences and physical activity routines, which contribute to their physical and mental well-being (Abraido-Lanza et al., 1999[1]).

The convergence of health outcomes over time within the framework of the HIE is often

attributed to "negative acculturation." The longer migrants remain in their host country, the more likely they are to adopt local dietary and exercise habits, which may lead to adverse health consequences (Anderson, 2004[8]). For immigrants in Canada, the United States, and Australia, adopting local behaviors can lead to deterioration of dietary habits and an increase in obesity (García-Pérez, 2016[37]; McDonald & Kennedy, 2004[63]). However, some studies suggest that if migrants maintain strong cultural ties to their home country or reside in ethnically concentrated communities, the negative health effects of assimilation may be mitigated (Hao & Kim, 2009[43]).

While there is considerable empirical support for the HIE in developed countries, findings for developing countries are more mixed. Some studies on China suggest that although migrant populations may initially exhibit a health advantage upon arrival, this advantage does not necessarily diminish over time. Contrary to the typical pattern observed in the HIE, migrants may experience short-term health improvements due to increased income, which facilitates better access to healthcare and improved living conditions. However, this does not necessarily translate into significant long-term health changes (Song & Sun, 2016[79]; Chen, 2011[21]). This divergence from the traditional HIE framework challenges conventional understandings of migrant health dynamics. Similarly, a study on 20th-century Irish immigrants to England found that certain newborns born to migrant mothers had poorer health outcomes compared to local Irish newborns. This disparity was attributed to the psychological and physical stress experienced by migrants prior to their relocation (Delaney, Fernihough & Smith, 2013[27]).

Beyond the debate surrounding the HIE, China has a substantial internal migrant population. According to data from the National Bureau of Statistics, China’s migrant population reached 221 million in 2010. These characteristics provide a suitable empirical context for studying migration and health outcomes.

Given this background, this study examines the existence of the "Healthy Immigrant Effect" in the context of China’s internal migration. Specifically, it compares health indicators between migrants and native residents across different cities and explores the correlation between health outcomes and migration duration. The study aims to determine whether the HIE holds in China’s internal migration context and, if so, whether its effects vary across different time horizons. Additionally, by focusing on a developing country, this research contributes to a broader understanding of migrant health beyond the traditional developed-country framework. The findings have policy implications for improving healthcare access and designing targeted

interventions for internal migrants in China and other developing economies.

The structure of this paper is as follows: the next section reviews the literature on the "Healthy Immigrant Effect," followed by a discussion of the data and methodology in Section 3. Section 4 outlines the empirical framework, while Sections 5 and 6 present the results and discussion. Section 7 concludes with policy implications and directions for future research.

3.2 Literature Review

3.2.1 Health Advantage or Disadvantage

In many developed countries, including Australia, Canada, Germany, Sweden, the United Kingdom, and the United States, extensive research consistently shows that immigrants tend to have better health outcomes than the local population upon their initial arrival, despite most immigrants coming from developing countries with lower life expectancy indicators (Antecol & Bedard, 2006[1]; McDonald & Kennedy, 2005[64]; Biddle, Kennedy, & McDonald, 2007[13]; Chiswick, Lee, & Miller, 2008[23]). A common explanation for this health advantage is that healthier individuals are more likely to migrate. Studies on income and education levels support this hypothesis, suggesting that higher-income individuals have access to healthier diets and better medical care, closely associated with their health status (Abraido-Lanza et al., 1999[1]). Farré (2016)[35] validated this perspective in his study on Ecuadorian immigrants, finding that the cost of migration increases with the distance to the destination, leading people from more remote areas to be healthier to compensate for higher migration costs.

Another explanation is that host countries' immigration policies select for healthier individuals (Constant et al., 2018[25]). Additionally, research on foreign immigrants in the United States indicates that immigrants often adopt healthier lifestyle habits (such as lower rates of smoking and alcohol consumption), resulting in lower obesity rates than the host country population (Antecol & Bedard, 2006[9]). Thus, healthy lifestyle habits from their countries of origin also contribute to their health advantage. Moreover, Hao and Kim (2009)[43] found that the health advantage of immigrants might be due to the return migration of unhealthy individuals, providing an alternative explanation for the immigrant health advantage.

However, according to the "Healthy Immigrant Effect," immigrants are healthier than the residents of the destination country. This implies that residents from high-income societies have worse health conditions in the host country than immigrants from low- and middle-income

societies, a phenomenon that seems contradictory at first glance.

Some studies have also identified a phenomenon known as the "health disadvantage." For instance, refugees arriving in Australia benefit from more lenient entry policies compared to economic immigrants. As a result of this selective immigration policy, refugees generally exhibit significantly poorer health compared to regular economic immigrants and local residents (Chiswick, Lee, & Miller, 2008[23]). Another example of negative health selection is found in studies of Irish immigrants to the United Kingdom. Contrary to the common "healthy immigrant effect" (HIE), these immigrants not only have worse health than the local population but also fare worse than people in Ireland. This health deterioration is attributed to psychological issues among the immigrants, some of whom have experienced mental and sexual abuse (Delaney, Fernihough, & Smith, 2013[27]). These studies indicate that not all immigrant groups possess health advantages; the health status of immigrants varies across different groups, influenced by factors such as economic conditions and social status.

Additionally, research on the obesity rates among European immigrants has not consistently found that immigrants have healthier BMI levels than the local population. The health status, as reflected by BMI, often varies depending on the immigrants' countries of origin (Kirchengast & Schober, 2006[53]; Bongard et al., 2002[16]). More direct evidence comes from a study on the risks of overweight and obesity among Austrian youth. Immigrants from Turkey and Yugoslavia even exhibit higher rates of obesity and overweight compared to locals. Thus, the healthy immigrant effect is not a universal phenomenon and largely depends on the immigrants' origins and characteristics (Akresh & Frank, 2008[6]). This suggests that research on national immigration should go beyond the binary of native-born versus foreign-born and avoid simplifying all immigrant subgroups as similar communities.

Even studies on internal migration within China yield inconsistent results. One study on the health of migrants in Beijing confirmed a physical health advantage among migrants, and this advantage of migrants from remote areas weakens significantly with the increase of migration time. However, their mental health levels were lower than the local population, though they gradually improved with the length of stay (Chen, 2011[21]). This study's limitations include data based solely on 2009 cross-sectional data from a specific area in Beijing, leading to strong community-specific results. Another study, which attempted to address this limitation by using data from various cities nationwide, found that internal migrants in China do not exhibit a health advantage. Their health status showed a positive impact from migration in the short term, but

no significant long-term change (Song & Sun, 2016[79]).

3.2.2 Diminishing Health Advantage

Prior studies have also delved extensively into the phenomenon of diminishing health advantages among immigrants. Within this process, the assimilation of lifestyle plays a pivotal role. As time progresses, immigrants tend to adopt local customs and dietary habits, gradually experiencing a decline in physical well-being that aligns more closely with the health norms of the local population (Antecol & Bedard, 2006[9]). Research by Hao & Kim (2009)[43] conducted in North American countries and Australia revealed an increasing trend in obesity rates among immigrants with longer residency durations. This health deterioration can be attributed to the convergence of their lifestyle choices and exercise habits with those of the local populace. It's noteworthy that the assimilation process appears to slow down among immigrants from regions with distinct religious or cultural roots, particularly evident among immigrants residing in ethnically concentrated communities (Abraido-Lanza et al., 1999[1]).

Most of current investigations into the healthy immigrant effect and its convergence rely on cross-sectional data. Giuntella and Stella (2017)[40] identified the "HIE" in their study. Specifically, they found that recently arrived immigrants exhibit higher obesity rates compared to their predecessors, and these newcomers tend to align more rapidly with the obesity rates of the local population through cohort analysis. Similarly, research on immigrant women in the United States revealed that within the initial decade of arrival, these women lose up to 90% of their initial health advantage (Antecol & Bedard, 2006[9]). Apart from the duration of arrival, the speed of health convergence also correlates with educational level, with immigrants holding less than a college degree observed to converge faster (Kaushal, 2009[51]).

Another study including various European nations and Israel suggests that immigrants moving to Israel face significantly worse health conditions compared to locals. This health disadvantage persists for up to 20 years of residence before gradually converging with that of the local population (Constant et al., 2018[25]). However, this outcome may be influenced by geopolitical and environmental factors, which could adversely affect the health and well-being of the sample. Conversely, immigrants relocating to Europe exhibit markedly better health conditions than locals, with their health advantage enduring for an extended period and gradually diminishing after 20 years. These divergent outcomes are attributed to Israel's unrestricted admission and support for Jewish immigrants worldwide, highlighting the crucial role of host country

immigration policies in shaping immigrant health quality. It's important to note that the study sample is limited to individuals aged 50 and above, inevitably influenced to some extent by their own health conditions.

Furthermore, research indicates that as immigration duration increases, the decline in immigrants' health advantages may even fall below the health levels of local residents. According to Grove and Zwi (2006)[42], immigrants at their destination may not enjoy equal access to healthcare services, while local alienation and discrimination exacerbate their health deterioration, resulting in health levels below the local average. Similarly, a study in the United States also found a "continued decline" in immigrants' health advantages, possibly due to immigrants' own disadvantages such as low language proficiency and education levels, making them more prone to engaging in low-income, high-risk occupations. The risks associated with these occupations ultimately lead to immigrants' long-term health levels falling even below those of the local population (Orrenius & Zavodny, 2009)[71].

In summary, uncertainties persist regarding whether new immigrants arrive with better health conditions compared to the local population, as well as how their health status evolves over time, due to the disparities in economic levels among different cities in China and the costs associated with immigration distances. This paper aims to explore this issue by utilizing panel data from domestic migration, selecting samples from cities with differing economic levels. The study will focus on the health status between immigrants and locals, examine the impact of immigration duration on immigrant health, and provide potential explanations for the long-term dynamics of immigrant health.

3.3 Data

3.3.1 Data Description

The study utilises the Rural-Urban Migration in China (RUMiC) database, established through collaboration between researchers from the Australian National University, Beijing Normal University, the National Bureau of Statistics of China, and the Institute for the Study of Labour. The RUMiC database provides extensive coverage of regions with diverse economic conditions across China, offering detailed individual- and household-level data, including income and expenditure, employment status, household structure, and various socio-economic characteristics. In addition to its comprehensive scope and rich sample representation, RUMiC conducted two survey waves in 2008 and 2009, making it well-suited for panel data analysis.

The outcome variables are designed across three dimensions. The first is self-rated health (SRH), a categorical variable ranging from 1 to 5, derived from the questionnaire's self-assessment of recent health status, with the scale adjusted so that higher values indicate better health. The second is unhealthy BMI, a binary variable calculated from height and weight, with Body Mass Index (BMI) defined as weight (kg) divided by the square of height (m^2). Following World Health Organization (WHO) guidelines, a BMI below 18.5 is classified as underweight, while a BMI of 25 or above is considered overweight. Individuals in either category are classified as having an unhealthy BMI, while those with BMI values in the range 18.5–24.9 serve as the reference group. The third variable, smoking, is a binary indicator of whether the respondent is a regular smoker, serving as a proxy for unhealthy lifestyle behaviours. Due to database limitations, additional indicators of risky behaviours are unavailable.

The key explanatory variable is Years Since Migration (YSM), included in linear form. Control variables are included at both the individual and household levels to account for socio-economic factors influencing health outcomes. At the individual level, controls include age, gender, marital status, education level, and number of children. At the household level, homeownership and household size are included to capture economic conditions and living arrangements. Since current income may be endogenous in health status estimations, homeownership is used as a proxy for long-term economic stability, aligning with the theoretical framework that highlights cultural, social, and economic factors as key determinants of health.

The study selects approximately 30,864 observations from 20 cities within the database. After removing outliers, Years Since Migration (YSM) ranges from 0 to 40 years, where 0 represents non-migrant urban residents. This structure facilitates a broad analysis of migrant health outcomes across different migration durations and enables a comparison between migrants and native residents in destination cities, providing insights into long-term health trends among China's internal migrant population.

Table 3.1 provides a summary description of the variables.

Table 3.1: Summary Statistics

	First Wave (2008)		Second Wave (2009)		Total
Outcome variable	**Immigrants**	**Natives**	**Immigrants**	**Natives**	
Health Status	4.23 (0.75)	3.77 (0.80)	3.97 (0.77)	3.66 (0.76)	3.86 (0.80)
BMI	21.60 (2.71)	22.63 (2.87)	22.30 (2.97)	22.73 (2.90)	22.40 (2.89)
Unhealthy BMI	21.80%	24.90%	25.50%	26.30%	25%
Smoking	32.30%	23.40%	33.40%	21.70%	25.74%
Independent variable					
Years since Migration	8.83 (6.29)	0	10.54 (6.21)	0	2.97 (5.62)
Up to 5 YSM	37.38%	-	24.80%	-	33.85%
6 to 10 YSM	29.48%	-	32.20%	-	30.24%
11 to 15 YSM	17.86%	-	23.80%	-	19.53%
16 to 20 YSM	9.50%	-	11.50%	-	10.05%
21 or more YSM	5.78%	-	7.70%	-	6.33%
Socio-demographic characteristics					
Gender (male)	57.40%	49.60%	57.00%	49.70%	52.11%
Age	31.43 (10.26)	44.72 (15.18)	33.51 (10.04)	45.72 (15.19)	41
Year of education	8.83 (2.75)	11.35 (3.60)	8.78 (2.83)	11.39 (3.72)	10.53
Number of children	0.89 (0.90)	1.08 (0.86)	1.05 (0.90)	1.12 (0.94)	1.05
Married	63.50%	81.30%	73.50%	82.10%	76.78%
Household size	2.06 (1.14)	3.15 (0.97)	2.52 (1.25)	3.18 (0.98)	2.85 (1.14)
Economic characteristics					
Employment	92.00%	54.10%	91.90%	54.30%	69.39%
Number of observations	7094	10509	2762	10499	30864

Notes: Means (standard deviations) refer to continuous and categorical variables; percentages refer to dummy variables.

From Table 3.1, we observe that in the first wave of data, migrants report a higher average self-rated health (SRH) score of 4.23, compared to 3.77 among non -migrants. Additionally, the

proportion of migrants classified as having an unhealthy BMI is 23.8%, slightly lower than the 24.9% recorded for non-migrants. A similar trend is observed in the second wave of data. However, across different survey years, we note a deterioration in health indicators for all groups, with declining SRH scores and a rising proportion of individuals with unhealthy BMI over time. Despite this overall decline, migrants consistently report better health outcomes than non-migrants.

One notable exception to this trend is smoking behaviour. Migrants exhibit a smoking rate approximately 10% higher than that of non-migrants, suggesting a further deterioration in lifestyle habits. This discrepancy may be attributed to heightened stress levels associated with migration and adaptation challenges in urban destinations. Moreover, this gap widens over time, indicating a potential long-term impact of migration on lifestyle behaviours.

In terms of individual and household characteristics, migrants have an average of 8.83 years of education, significantly lower than the 11.35 years recorded for non-migrants. Additionally, migrants tend to be younger and predominantly male. Only 4.3% of migrants own housing, compared to 97% of non-migrants, reflecting significant disparities in economic security and long-term settlement. The average household size for migrants is 2, compared to 3 among non-migrants. Given the well-established link between education, income, and health outcomes, these differences may partially explain migrants' relatively poorer health status. Lower education levels and economic constraints may limit access to healthcare services, preventive health measures, and health-related information.

Regarding marital status, non-migrants consistently exhibit higher marriage rates than migrants. However, as the years since migration (YSM) increase, the proportion of married migrants rises sharply, suggesting that prolonged urban residence may facilitate family formation or cohabitation.

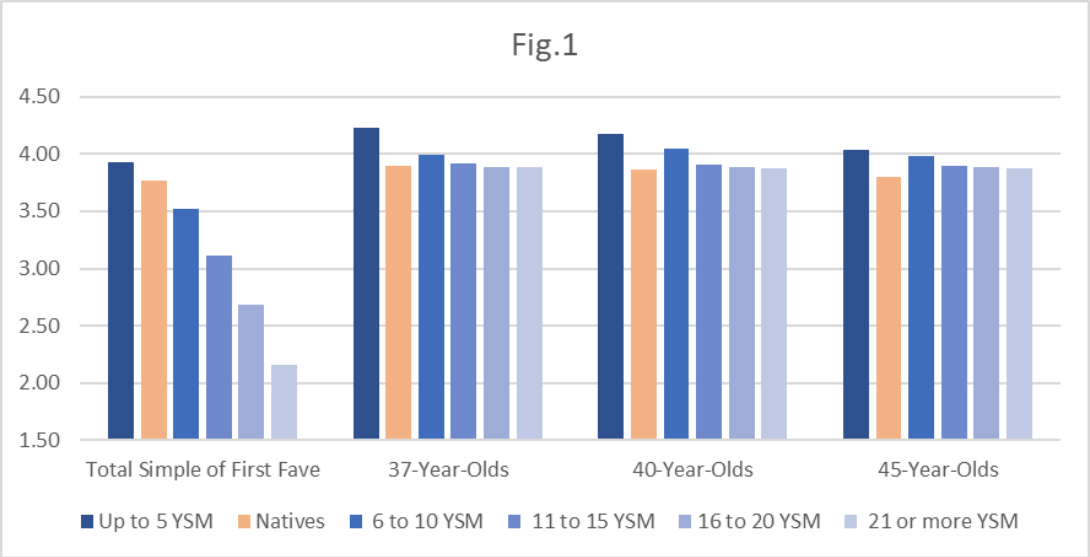
Overall, significant differences exist between migrants and non-migrants across key health, demographic, and economic indicators. Migrants generally exhibit lower levels of education, weaker economic standing, and different lifestyle behaviours, which could influence long-term health outcomes. Despite their initial health advantage, potential risk factors—such as economic precarity and lifestyle changes—may contribute to gradual health deterioration over time.

The years since migration (YSM) serves as the key independent variable, ranging from 1 to 40

years, with non-migrants (YSM = 0) as the reference group. Our hypothesis is that the duration of urban residence may influence health outcomes, with potential acculturation effects shaping the long-term health trajectory of migrants.

To visually examine the distribution of self-rated health status across different migration durations, we introduce a categorical classification for YSM with five levels: ≤ 5 years, 6–10 years, 11–15 years, 16–20 years, > 20 years. Non-migrants serve as the reference group. This classification provides a preliminary insight into the relationship between migration duration and health outcomes. The results are presented in Figure 1:

Figure 1: Mean health status of natives and immigrants by Different Sample Groups



(Mean health status of natives and immigrants by YSM: Total sample. The same trend was also observed when separately plotting the first and second waves, but here we only present the results of the first sample.

Note: Calculations are based on the pooled sample from waves 1 and 2 of the RUMiC survey, totaling 30,864 observations, with 9,856 migrants and 21,008 locals. Among the migrants, 33.85% have YSM ≤ 5; 30.24% have YSM between 6-10; 19.53% have YSM between 11-15; 10.05% have YSM between 16-20; and 6.33% have YSM ≥ 21.)

As the histogram clearly illustrates, evidence of the Healthy Immigrant Effect (HIE) is present in the sample. Migrants report a significantly higher self-rated health (SRH) score of 4.215 during their initial five years of migration, compared to a lower SRH score of 3.715 among non-migrants. However, as years since migration (YSM) increase, a declining trend in SRH

scores emerges, with migrants' health status gradually converging toward that of non-migrants.

This pattern suggests that while migrants initially enjoy a health advantage, their health deteriorates over time, aligning with the broader HIE literature. To further investigate this trend and test the underlying mechanisms driving these changes, we will proceed with empirical analysis to formally evaluate the validity of the HIE hypothesis in the Chinese context.

3.4 Empirical Framework & Result

We first conducted separate ordinary least squared (OLS) for each year's data to gain initial insights into the impact of YSM on health and the trends in the data across different years.

$$H_i = \alpha_0 + \alpha_1 YSM_i + +\alpha_2 X_i + \epsilon_i$$

In the health equation, our outcome variable H_i represents three health indicators: "health status," "unhealthy BMI," and "smoking". The explanatory variables include the linear variable YSM (Years Since Migration) and X_i which represent the individual and household-level control variables mentioned in the data description. The results are presented in Table 3.2:

Table 3.2: OLS Regression Results for Health Indicators in Each Waves

	(1)	(2)	(3)
Wave 1 (Year 2008)	**Health Status**	**Unhealthy BMI**	**Smoking**
Year since migration	0.011***	0.0004	0.011***
	(0.002)	(0.001)	(0.001)
Socio-demographic characteristics	Yes	Yes	Yes
Economic characteristics	Yes	Yes	Yes
R-sq	0.158	0.045	0.046
N	16455	16455	16455
	(4)	**(5)**	**(6)**
Wave 2 (Year 2009)	**Health Status**	**Unhealthy BMI**	**Smoking**
Year since migration	0.012***	0.003**	0.006***
	(0.002)	(0.001)	(0.001)
Socio-demographic characteristics	Yes	Yes	Yes
Economic characteristics	Yes	Yes	Yes
R-sq	0.131	0.004	0.025
N	13181	13181	13181

Pooled (2 Waves)	(7) Health Status	(8) Unhealthy BMI	(9) Smoking
Year since migration	0.009***	0.002**	0.007***
	(0.001)	(0.001)	(0.001)
Socio-demographic characteristics	Yes	Yes	Yes
Economic characteristics	Yes	Yes	Yes
R-sq	0.158	0.005	0.053
N	29604	29604	29601

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

From the OLS results, it appears that Years Since Migration (YSM) has a statistically significant and positive impact on all three health indicators. This suggests that, over time, there is a rising trend in unhealthy BMI and smoking habits among migrants as YSM increases. However, despite these deteriorating lifestyle factors, migrants tend to report more positive self-assessments of their health status as their duration of residence increases. This finding highlights the need to further account for individual heterogeneity and time dynamics to ensure a more robust interpretation of the results.

Additionally, we observed substantial sample attrition in the second wave of data, which may introduce potential selection bias and affect the comparability of estimates over time. This issue will be addressed in further robustness checks and discussed in subsequent sections.

To more rigorously test the Healthy Immigrant Effect (HIE), we construct panel data using both survey waves and develop a new health model that accounts for individual fixed effects and time fixed effects, clustering standard errors at the household level. The specification is given by the following equation:

$$H_{it} = \beta_i + \beta_1 YSM_{it} + \beta_2 (YSM_{it} \times Year\_dummy_t) + \beta_3 X_{it} + \mu_t + \epsilon_{it}$$

H_{it} represents the health status of individual i at time t. YSM denotes the number of years since migration. X_{it} stands for the control variables. μ_t represents the year fixed effects.

In addition, we have introduced an interaction term $YSM \times Year\_dummy$. This interaction term allows us to examine whether the effect of YSM varies over time, distinguishing the impact of YSM at each time point. The main effects and interaction effects together provide a more accurate explanation of how these influences change over time.

The following Table 3.3 presents the results of the regression.

Table 3.3: Health and YSM: Fixed Effects Regression of Full Sample

	(1)	(2)	(3)
	Health Status	**Unhealthy BMI**	**Smoking**
Year since migration	-0.082**	0.018	0.051***
	(0.041)	(0.014)	(0.016)
YSM * Year dummy	-0.000	-0.000	-0.003**
	(0.003)	(0.001)	(0.001)
Year dummy	-0.123***	0.014**	-0.013***
	(0.013)	(0.005)	(0.004)
Socio-demographic characteristics			
Age	-0.031*	-0.001	-0.009
	(0.018)	(0.009)	(0.007)
Age sq.	0.000**	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Gender	-0.048	0.0470	0.077*
	(0.082)	(0.050)	(0.046)
Year of education	0.004	0.003*	0.003**
	(0.004)	(0.002)	(0.002)
Number of children	-0.011	0.008	0.008
	(0.019)	(0.009)	(0.007)
Married	-0.007	0.002	-0.029
	(0.050)	(0.025)	(0.020)
Economic characteristics			
Employment	0.070**	-0.023*	0.016*
	(0.028)	(0.013)	(0.010)
R-sq	0.030	0.002	0.004
N	29604	29604	29601

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 3.3 presents the relationship between Years Since Migration (YSM) and health status, providing further insights into how migrants' health evolves over time. The results indicate that

the interaction term YSM × year dummy is not statistically significant for health status and unhealthy BMI, suggesting that the overall impact of YSM on these health indicators remains relatively stable across different years. However, the interaction term shows a significant negative effect on smoking, implying that the influence of YSM on smoking habits diminishes over time.

In the first column, the coefficient of YSM on health status is negative and statistically significant, suggesting that after controlling for individual fixed effects and year fixed effects, immigrants' health status deteriorates as YSM increases. Conversely, smoking appears to be positively associated with YSM, indicating that as immigrants gradually integrate into local society, more of them adopt smoking habits. This shift towards unhealthy behaviours could be a potential mechanism underlying the observed decline in health status.

Furthermore, the year dummy variables indicate an overall downward trend in health status over time, accompanied by an increase in unhealthy BMI levels. This likely reflects broader social and environmental changes, such as a decline in physical labour among highly educated populations and a more sedentary lifestyle, both of which contribute to a greater prevalence of overweight individuals. At the household level, family size is negatively associated with health status, suggesting that immigrants with greater family responsibilities may experience adverse health effects due to increased stress and financial burdens.

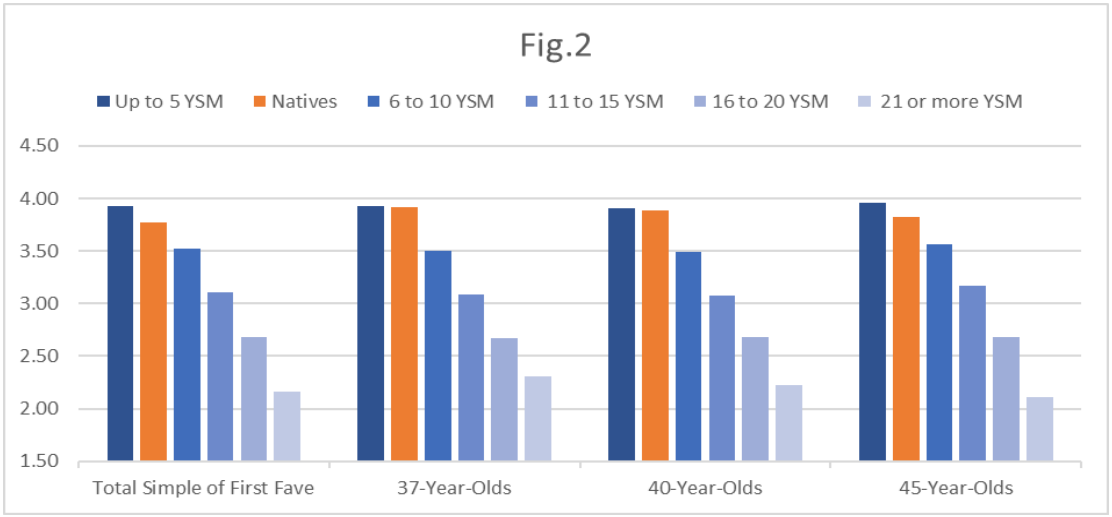
Interestingly, the effect of YSM on unhealthy BMI is not statistically significant, suggesting that weight changes following migration are complex and multifaceted. One possible explanation is that migrants often engage in higher labour participation while earning relatively lower incomes, which may result in inadequate nutritional intake. Additionally, the stress of migration and adaptation could lead to heightened anxiety, which in turn affects dietary habits and overall health—as evidenced by the increase in smoking. Moreover, given that immigrants have a low homeownership rate at their destination, they may face institutional barriers related to hukou restrictions, which could limit their access to public welfare and healthcare services. Consequently, even if migrants experience unhealthy weight changes, their lack of access to medical diagnosis and treatment may contribute to the insignificant association observed in the regression results.

A notable discrepancy arises between the single-year regressions (Table 3.2) and the panel regression (Table 3.3). Specifically, the single-year regressions for 2008 and 2009 yield positive

coefficients for YSM, suggesting a positive correlation between YSM and health status in each individual year. However, when considering the two-year panel data with fixed effects, the coefficient for YSM becomes negative, indicating a decline in health status over time. This divergence may stem from sample selection bias or attrition, as certain individuals may be more likely to remain in the sample in 2009, while others—who may have distinct health characteristics—drop out between survey waves. If healthier individuals are more likely to continue residing in the destination areas, while those with worsening health are more likely to return to their hometowns, due to the medical insurance policy, they are unable to enjoy more cost-effective medical care locally. this could introduce selection effects, leading to the observed negative coefficient in the panel regression. This potential bias will be explored in greater depth in the following sections.

Overall, the results in Table 3.3 provide empirical support for the Healthy Immigrant Effect (HIE) hypothesis, which suggests that migrants initially experience a health advantage upon arrival but gradually experience health deterioration with increasing years of residence. To further illustrate this trend, we use the panel regression estimates from Table 3.3 to predict and plot the mean health status across different age groups, as shown in Figure 3.2 below:

Figure 2: Postestimation of Health Status (Mean) by Different Sample Groups



(Predicted mean health status of natives and immigrants across YSM in different group: Total sample, 37-year-olds group, 40-year-olds group, 45-year-olds group. 'Natives (in orange)' representing the mean of health for the control group.

Note: Calculations are based on the sample from wave 1 of the RUMiC data, The same trend was also observed in second wave and other ages, here we present the three age groups with the largest sample sizes.)

Figure 2 presents the estimated mean health status of the sample based on the panel regression results, offering a clearer depiction of how migrants' health evolves over time. The results indicate that immigrants initially exhibit a health advantage in the early years following migration, with this advantage persisting for approximately the first five years. However, as YSM increases, the average health status of immigrants gradually declines.

Notably, once migrants' health converges with that of the local population, the declining trend continues, suggesting that the initial advantage does not stabilise but instead deteriorates further over time. This pattern is consistent across sub-samples stratified by specific age groups, reinforcing the Healthy Immigrant Effect (HIE) hypothesis, which posits that while migrants may arrive in relatively better health, the effects of prolonged exposure to new environments, changing lifestyles, and work-related stress contribute to long-term health deterioration.

3.4.1 Return Migration: immigrants only

Based on the results from Tables 3.2 and 3.3, despite incorporating individual and year-fixed effects in the panel regression, non-random sample loss due to return migration remains a concern, introducing potential sample selection bias into the analysis.

The descriptive statistics indicate that a significant proportion of migrants left their destination by the second wave of the survey, as shown in Table 3.4. This attrition may systematically affect the estimated health trends, as individuals who remain in the sample may differ in unobserved characteristics from those who return. Further analysis is needed to assess the potential impact of this selection bias on the validity of the findings.

Table 3.4: Attrition Rate

	(1) **Natives**	(2) **Immigrants**
Wave 1 (Year 2008)	10509	7094
Wave2 (Year 2009)	10499	2762
Tracked	10486	2762
Wave1 Attrition	23	**4332 (60%)**

Note: The data is derived from the RUMiC sample included in the study.

Table 3.4 indicates that a substantial proportion of migrants left their destinations by the second year, with approximately 60% of the initial migrant population no longer present in the survey. Notably, the survey was conducted in 2008–2009, a period marked by the Financial Crisis of 2007–2008, which had a profound impact on global credit and capital markets, triggering economic recessions in many countries. This economic downturn likely influenced migrants' employment expectations, leading many to leave their destinations. Therefore, it is essential to develop a new model to assess whether health factors or economic conditions were the primary drivers of migrant departures.

One of the key effects of the Financial Crisis of 2007–2008 was a sharp decline in demand, which significantly impacted China's manufacturing sector. The contraction in both domestic demand and exports forced numerous enterprises to shut down, leaving a large number of workers unemployed (Chan, 2010[20]). Additionally, economic fluctuations and technological advancements accelerated de-industrialisation, particularly in labour-intensive industries. The manufacturing and industrial sectors, being more vulnerable to automation, robotics, and outsourcing, faced widespread job losses, increasing the risk of unemployment. In contrast, the service sector, which is more labour-intensive, exhibited greater resilience to these changes, experiencing lower unemployment risks despite economic fluctuations.

Given this survey context, we introduce the variable "whether engaged in manufacturing" to capture the impact of the financial crisis on returning migrants. This model allows us to assess the extent to which the economic shock influenced return migration and whether health factors played a significant role in migrant departures. The empirical model is specified as follows:

$$Return_i = \gamma_0 + \gamma_1 YSM_i + \gamma_2 H_i + \gamma_3 Manufacturing_i + \gamma_4 X_i + \epsilon_i$$

The distinction from the basic regression design lies in the fact that this model specifically targets migrants. We examine the migrants in the first wave of panel data, identifying those who left in the second wave and marking them as "return=1," while those who remained at their destination in the second wave are marked as "return=0."

H_i represents two health factors. Smoking behavior is excluded in this context because there is no clear evidence suggesting that smoking behavior impacts migrants' decisions to return. The dummy variable $Manufacturing_i$ indicates whether the migrant is engaged in the manufacturing sector.

Table 3.5 displays the results of the regression.

Table 3.5: Return Migration: OLS Regression for Immigrants

	(1)	(2)
	Return	**Return**
Health indicator		
Health Status	0.011	
	(0.010)	
Unhealthy BMI		-0.013
		(0.014)
Industry Classification		
Manufacturing	0.122***	0.123***
	(0.014)	(0.014)
Other Characteristics		
Age	0.000	-0.000
	(0.001)	(0.001)
Year of education	-0.009***	-0.009***
	(0.003)	(0.003)
Number of children	-0.023	-0.023
	(0.015)	(0.015)
Married	-0.065***	-0.064***
	(0.024)	(0.024)
Household size	-0.053***	-0.053***
	(0.009)	(0.009)
Employment	0.002	0.002
	(0.023)	(0.023)
R-sq	0.048	0.047
N	7075	7075

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 3.5 presents the effects of health factors and industry type on migrants' return status, with columns (1) and (2) examining health conditions and industry effects, respectively. The coefficient for the manufacturing sector remains consistently positive and statistically significant across all three models, indicating that migrants employed in manufacturing were more likely to return. However, the regression results do not find a significant impact of health

conditions on return migration. This suggests that sample attrition was primarily driven by economic factors, particularly the financial crisis, rather than pre-existing health conditions.

Education level has a negative effect on return migration, indicating that individuals with higher education levels were less likely to leave. This is likely because more educated individuals are better equipped to navigate economic uncertainty, as they are more likely to secure stable, higher-income employment. These advantages provide greater financial security during economic downturns, reducing the likelihood of returning to their place of origin.

Additionally, marital status and household size play significant roles in shaping return migration decisions. The findings suggest that larger households and marriage impose greater family responsibilities, making migrants more inclined to remain at their destination to ensure the financial stability and well-being of their families. These results highlight the important role of family constraints in migration decisions.

The findings imply that sample selection bias may be present in the panel fixed-effects regression results in Table 3.3, as returning migrants are not randomly distributed across the sample. Since manufacturing workers were more likely to leave, the two-year panel sample is not entirely random but influenced by occupational factors. To address this concern, the subsequent analysis will verify this hypothesis to ensure the statistical validity and robustness of the findings.

3.4.2 Sample Selection Bias: The Heckman Test

To mitigate estimation bias caused by sample selection, we employ a sample selection model. In the first-stage regression equation, the dependent variable is defined as "Status of Stay," indicating whether a migrant left the destination in the second survey wave. Notably, this variable is not included in the second-stage outcome model.

Additionally, an exogenous variable, "Manufacturing," is introduced in the first stage. Based on the OLS regression results on return migration in Table 3.5, this variable directly influences the likelihood of migrants leaving in the second wave. The explanatory variables in the selection equation include all explanatory variables from the original regression model.

Thus, the estimation equation, following the Heckman two-step approach, is specified as follows:

Selection Equation:

$$Stay_i = \beta_0 + \beta_1 YSM_i + \beta_2 X_i + \beta_3 Manufacturing_i + \mu_i$$

Outcome Equation:

$$Health\ diff_i = \delta_0 + \delta_1 YSM_i + \delta_2 X_i + \delta_3 \widehat{Stay_i} + \varepsilon_i$$

Stay_i represents whether the immigrates stayed in second wave. YSM denotes the number of years since migration. X_i stands for the control variables (same with the baseline regression), and $Manufacturing_i$ represents the type of occupation engaged in, $\widehat{Stay_i}$ is inverse Mills ration.

Differently, we designed a new variable $Health\ diff_i$, representing the difference in two health indicators (Health status, Unhealthy BMI) of individual i between 2009 and 2008. Therefore, the explanatory variables at this point are the values from the first wave, while the dependent variable is the difference between the first and second waves. This design allows us to directly observe the extent of changes in the dependent variables over the two years under the influence of sample selection bias.

The results of the Heckman estimation based on this model are presented in Table 3.6:

Table 3.6 Heckman Estimation Results for Immigrants

	(1) Diff_Health Status	(2) Diff_Unhealthy BMI
Outcome Model		
YSM	0.000	-0.001
	(0.004)	(0.002)
Socio-demographic characteristics	Yes	Yes
Economic characteristics	Yes	Yes
Selection Model (Stay Status)		
YSM	0.009***	0.009***
	(0.003)	(0.003)
Manufacturing	-0.343***	-0.342***
	(0.041)	(0.043)
Socio-demographic characteristics	Yes	Yes
Economic characteristics	Yes	Yes
rho	-0.128	-0.284
	(0.267)	(0.299)
sigma	-0.066**	-0.783***
	(0.029)	(0.058)
The inverse Mills ratio	-0.119	-0.126
N	7078	7078

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

The rho value obtained from the Heckman two-step method measures the correlation between the errors in the main equation and the selection equation. A small and statistically insignificant rho value suggests that sample selection bias does not significantly impact the main regression results, thereby reinforcing the robustness of our previous panel regression conclusions.

Across both specifications, the correlation coefficient between the selection and outcome equations (*rho*) was statistically insignificant (Model 1: $\rho = -0.128$, $p = 0.63$; Model 2: $\rho = -0.278$, $p = 0.34$), indicating no evidence of selection bias. The Wald test of independence further supports this conclusion (Model 1: $\chi^2(1) = 0.23$, $p = 0.6301$; Model 2: $\chi^2(1) = 0.90$, $p = 0.3417$), failing to reject the null hypothesis that the error terms in the selection and outcome equations are uncorrelated. The inverse Mills ratio (*lambda*) was also non-significant in both models.

These results suggest that attrition is not systematically related to the health outcomes analysed, and that the main regression estimates are unlikely to be biased by non-random sample loss. According to the National Bureau of Statistics of China, the number of migrants reached 201 million in 2008 and 211 million in 2009. supporting the view that attrition in the panel is more likely attributable to survey design or tracking limitations, implying that the observed attrition in the panel is more plausibly due to survey design or respondent mobility rather than return migration induced by the global financial crisis.

The results from the selection equation indicate that Years Since Migration (YSM) positively influences the likelihood of immigrants staying at their destination. Over time, migrants gradually adapt to the local culture, language, and social environment, which facilitates their integration into the local community, enhances job opportunities, and strengthens social connections. These social networks provide support, resources, and employment prospects, making immigrants more inclined to remain at their destination.

Conversely, employment in the manufacturing sector negatively impacts the probability of staying, suggesting that migrants working in manufacturing are more likely to leave in the second survey wave. The manufacturing industry is particularly vulnerable to economic cycles and market fluctuations, leading to periodic job instability. Given that the survey was conducted during the 2008 financial crisis, economic uncertainty may have driven many migrants to return to their hometowns or seek more stable employment elsewhere. Additionally, working conditions in the manufacturing sector—such as long hours, repetitive labor, and limited career advancement—may lead to job dissatisfaction, prompting migrants to relocate in pursuit of better opportunities.

Consistent with the OLS estimates in Table 3.5, education, marital status, and household size also play significant roles in determining return migration decisions. Migrants with higher education levels are more likely to secure stable employment, which helps them withstand

financial uncertainties and reduces their likelihood of returning home. Additionally, married individuals and those with larger household sizes tend to have greater family responsibilities, making them more inclined to stay at their destination to ensure financial stability and household well-being.

3.5 Heterogeneity Test

To explore potential variations by gender, we conducted a heterogeneity analysis, focusing specifically on differences between male and female residents. Table 3.7 presents the panel fixed-effects regression results, separately estimating the impact of Years Since Migration (YSM) on health outcomes for male and female migrants. By estimating the model for each gender separately, we aim to determine whether the health trajectories of male and female migrants follow distinct patterns over time.

Table 3.7: Health and YSM: Fixed Effects Regression by Gender Type

	Male		
	(1)	(2)	(3)
	Health Status	**Unhealthy BMI**	**Smoking**
Year since migration	-0.063	0.032**	0.042**
	(0.048)	(0.017)	(0.018)
2009.Ysm * Year dummy	-0.001	-0.002	-0.003**
	(0.004)	(0.001)	(0.002)
Year dummy	-0.111***	0.022***	-0.017**
	(0.014)	(0.008)	(0.008)
Socio-demographic characteristics			
Age	-0.028	-0.013	-0.000
	(0.026)	(0.016)	(0.015)
Age sq.	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Year of education	0.004	0.004	0.005**
	(0.004)	(0.003)	(0.003)
Number of children	-0.011	0.001	0.015
	(0.023)	(0.012)	(0.013)
Married	-0.067	0.003	-0.029
	(0.065)	(0.034)	(0.034)
Household size	-0.110***	0.014	0.010
	(0.029)	(0.015)	(0.015)
Economic characteristics			
Employment	0.062	-0.016	0.050**
	(0.042)	(0.020)	(0.022)
N	15488	15488	15486

	Female		
	(4)	(5)	(6)
	Health Status	**Unhealthy BMI**	**Smoking**
Year since migration	-0.168***	-0.023	0.066***
	(0.053)	(0.029)	(0.019)
2009.Ysm * Year dummy	0.005	0.004	-0.001
	(0.004)	(0.002)	(0.002)
Year dummy	-0.126***	0.007	-0.005**
	(0.015)	(0.007)	(0.002)
Socio-demographic characteristics			
Age	-0.025	0.015	-0.003
	(0.024)	(0.013)	(0.004)
Age sq.	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
Year of education	0.005	0.001	0.000
	(0.006)	(0.003)	(0.001)
Number of children	-0.009	0.015	0.003
	(0.023)	(0.012)	(0.005)
Married	0.055	-0.011	-0.024
	(0.069)	(0.037)	(0.015)
Household size	-0.001	-0.006	0.004
	(0.036)	(0.017)	(0.010)
Economic characteristics			
Employment	0.084**	-0.029*	-0.006
	(0.034)	(0.016)	(0.006)
N	14116	14116	14115

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

In Table 3.7, we conducted a heterogeneity analysis to examine how migration duration influences health outcomes, with a particular focus on gender differences. The results reveal

notable disparities between male and female migrants across various health indicators.

For males, the interaction term between Years Since Migration (YSM) and year dummy variables is significantly negative for smoking behavior, indicating that male smokers are more likely to quit smoking in the second year after migration. However, in the long run, an increase in YSM is associated with a significant rise in Unhealthy BMI and smoking prevalence. This suggests that, over time, male migrants may be more susceptible to lifestyle and dietary changes in their new environments, leading to a greater likelihood of developing unhealthy BMI levels. This pattern may be attributed to increased exposure to high-calorie, high-fat diets and changes in physical activity levels, reflecting adaptations to urban dietary cultures and work-related lifestyle shifts.

For females, a longer migration duration is associated with a significant decline in overall health status, while the impact of YSM on male health status is not statistically significant. Additionally, YSM has a positive and significant effect on female smoking behavior, indicating a rising trend in female smoking rates with longer migration durations. In contrast, marriage and homeownership have a negative effect on female smoking, which may reflect women's greater sensitivity to social and family dynamics. Women are often subject to stronger social norms and family responsibilities, which may influence their health outcomes more profoundly than for men. Additionally, female migrants may face greater psychological stress in adapting to a new social and cultural environment, potentially exacerbating health deterioration.

The year effects on health status are negative for both genders, suggesting that health outcomes deteriorate over time, regardless of migration duration. However, the year effects on smoking behavior are also negative, indicating a decline in smoking rates over time. This suggests that while migration initially increases smoking prevalence, broader lifestyle adjustments or health interventions may contribute to a gradual reduction in smoking rates in later years.

These gender-specific patterns highlight the importance of considering gender as a critical factor in understanding migration-health dynamics. The findings suggest that male health outcomes are more strongly influenced by dietary and lifestyle changes, while female health outcomes are shaped more by social and family-related pressures. Given that smoking remains a prevalent health risk among both male and female migrants, interventions should address gender-specific challenges in promoting healthier lifestyle choices.

To further investigate gender heterogeneity in selection bias, we apply the Heckman model

separately to male and female samples, allowing us to assess whether return migration selection mechanisms differ by gender. The estimation results are presented in Table 3.8.

Table 3.8: Heckman Estimation Results for Immigrants by Gender Type

Male

	(1) Diff_Health Status	(2) Diff_Unhealthy BMI
Outcome Model		
YSM	-0.002	-0.004*
	(0.005)	(0.002)
Socio-demographic characteristics	Yes	Yes
Economic characteristics	Yes	Yes
Selection Model (Stay Status)		
YSM	0.006*	0.006*
	(0.004)	(0.004)
Manufacturing	-0.327***	-0.327***
	(0.046)	(0.046)
Socio-demographic characteristics	Yes	Yes
Economic characteristics	Yes	Yes
rho	-0.062	-0.374
	(0.246)	(0.257)
sigma	-0.063***	-0.794***
	(0.023)	(0.065)
N	4069	4069

	Female	
	(3) Diff_Health Status	(4) Diff_Unhealthy BMI
Outcome Model		
YSM	-0.004	-0.002
	(0.008)	(0.003)
Socio-demographic characteristics	Yes	Yes
Economic characteristics	Yes	Yes
Selection Model (Stay Status)		
YSM	0.014***	0.014***
	(0.005)	(0.005)
Manufacturing	-0.400***	-0.406***
	(0.077)	(0.063)
Socio-demographic characteristics	Yes	Yes
Economic characteristics	Yes	Yes
rho	-0.405	-0.146
	(0.741)	(0.358)
sigma	-0.031	-0.774***
	(0.181)	(0.045)
N	3009	3009

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 3.8 presents the Heckman selection model results for male and female migrants separately, allowing for a gender-specific assessment of return migration patterns.

For female migrants, the results largely align with those of the overall sample. Years Since Migration (YSM) has a positive and significant effect on females' likelihood of remaining in

the destination area, suggesting that female migrants are more likely to stay over time. Additionally, higher levels of education significantly increase the likelihood of staying, as better-educated women are more capable of securing stable employment, thereby enhancing their resilience against economic uncertainties, including financial crises.

Furthermore, marital status and household size play key roles in female migrants' decisions to remain in urban areas, reinforcing the importance of family factors in shaping migration decisions. These findings suggest that social and familial support structures are more influential for female migrants, who may depend more on establishing stable social networks in their destination areas. However, despite their higher tendency to stay, female migrants may still struggle to adapt to new environments, particularly when faced with social and occupational pressures. This greater sensitivity to social and environmental changes may push them toward seeking stability through strong social relationships and long-term settlement.

For male migrants, YSM does not exhibit a significant effect on return migration decisions, suggesting that the duration of stay alone does not strongly influence their migration behaviour. Instead, male return migration is primarily driven by education, marriage, family size, and employment conditions. Similar to females, males working in the manufacturing sector are more likely to leave, particularly during periods of economic downturns. However, higher education levels and greater family responsibilities increase their likelihood of staying, indicating that better-educated men with strong family commitments tend to be more invested in remaining in urban areas.

Overall, these findings highlight notable gender differences in migration patterns. Females tend to seek long-term stability and are more likely to stay, but they also face greater challenges in adapting to new environments, possibly due to social expectations, gender norms, and occupational differences. In contrast, males exhibit more flexible migration behaviours, with their decisions primarily influenced by employment and family responsibilities rather than a desire for long-term settlement.

These insights underscore the importance of gender-sensitive migration policies, particularly in ensuring better social and occupational support for female migrants, who may require additional assistance in adapting to urban environments and establishing stable livelihoods.

3.6 Conclusion

This study utilises panel data from RUMiC to examine the health disparities between migrants and local residents across 20 cities in China, covering migration durations ranging from 0 to 40 years. By employing a fixed-effects approach, we investigate the relationship between Years Since Migration (YSM) and key health indicators, including self-reported health status, unhealthy BMI, and smoking behaviour. To account for potential temporal variations, we incorporate interaction terms between YSM and year dummy variables, assessing whether the health effects of migration duration change over time.

Despite the increasing significance of internal migration in China, empirical evidence on migrant health remains limited. Much of the existing literature is constrained by regional specificity, failing to provide a comprehensive perspective across diverse urban contexts. Our findings confirm the presence of a healthy migrant effect across multiple cities, demonstrating that migrants initially exhibit superior health compared to local residents. However, this advantage diminishes over time, with health status declining after approximately five years. This suggests that prolonged exposure to urban environments contributes to health deterioration, potentially driven by poor working conditions, social stress, and limited access to healthcare. Long-term migrants may also experience persistent economic and social disadvantages, further hindering their ability to maintain health outcomes comparable to those of local populations.

To explore the mechanisms underlying migrant health decline, we analyse two key pathways: smoking behaviour and occupational exposure in the manufacturing sector. First, we examine smoking as a potential channel linking migration duration to deteriorating health. The results indicate a significant increase in smoking prevalence among migrants over time, suggesting that migration-induced stressors—such as economic instability, social isolation, and lifestyle changes—may encourage unhealthy coping behaviours. Precarious employment conditions, limited social networks, and cultural adaptation challenges likely exacerbate this trend. Additionally, manufacturing workplaces, which often employ a high proportion of migrants, may reinforce smoking habits through workplace norms and peer influence.

To address potential selection bias in estimating migrant health outcomes, we apply the Heckman two-step approach. Our findings indicate that selection bias does not significantly distort estimates of key health indicators, reinforcing the robustness of our fixed-effects results. The selection equation also provides insights into return migration, demonstrating that migrants

employed in manufacturing are more likely to leave during economic downturns, reflecting the sector's sensitivity to cyclical economic fluctuations.

Gender heterogeneity further underscores the complexity of migration's impact on health. Our results reveal that as migration duration increases, women's health deteriorates more significantly than men's. This disparity may stem from greater social and family responsibilities, which disproportionately affect female migrants. Women are more likely to experience stress from caregiving obligations, social isolation, and employment instability, leading to worse long-term health outcomes. Additionally, female migrants are more likely to leave urban destinations during economic downturns, further complicating their health trajectories. In contrast, male migrants exhibit greater occupational stability, with employment and financial considerations playing a more prominent role in their migration decisions. These findings suggest that migrant health policies should account for gender-specific vulnerabilities, ensuring stronger social protections and workplace support for female migrants.

This study makes several key contributions to understanding migrant health disparities in China. First, it provides robust evidence confirming the healthy migrant effect, demonstrating that while migrants initially enjoy better health than local residents, this advantage diminishes over time. Second, it addresses concerns about selection bias, showing that health decline is not solely driven by self-selection into poor health conditions. Third, it highlights gender differences in health deterioration, emphasising the need for more inclusive labour and health policies.

By clarifying these critical issues, this study enhances the understanding of health disparities among internal migrants and offers valuable policy insights. The findings underscore the importance of improving working conditions in manufacturing, expanding healthcare access for migrants, and addressing economic and social stressors that contribute to long-term health decline. Future research should further examine the role of workplace environments, healthcare accessibility, and policy interventions in shaping migrant health outcomes, ensuring that migration remains a pathway to economic and social mobility rather than a driver of health vulnerabilities.

Chapter 4

Exploring the Impact of Return Migration on Subjective Well-Being: Evidence from Rural China

4.1 Introduction

Return migration represents a significant yet often overlooked aspect of the migration process. Over the past few decades, China has experienced large-scale internal migration as individuals sought better economic opportunities. According to the National Bureau of Statistics of China, the number of migrants reached 201 million in 2008 and 211 million in 2009. However, due to the household registration system (hukou), while individuals can migrate and work temporarily across the country, permanent migration entails substantial costs. Migrants from rural areas or those with non-local hukou face restricted access to healthcare, welfare, and insurance benefits in their destination cities (Cai, Park, & Zhao, 2008[18]). Consequently, many migrants unable to settle permanently in urban areas choose to return to their hometowns, making their post-migration experiences equally worthy of attention (Meng, 2012[65]).

Most studies on migrant well-being focus on urban migrants, with limited research on the circumstances of returnees after they relocate to their hometowns. Research by Dolan, Peasgood, and White (2008)[31] suggests that higher urban incomes contribute to greater happiness among migrants, with relative income also playing a crucial role in well-being. Individuals assess their income in relation to reference groups, which significantly influences their life satisfaction and happiness. Migration involves not only economic mobility but also changes in social status and psychological adjustments, all of which shape personal happiness. Migrants may experience relative deprivation, where—despite earning more than before migration—they perceive an income gap compared to their urban peers, negatively affecting their happiness (Luttmer, 2005[59]; Clark, Frijters, & Shields, 2008[24]). This "status effect", often linked to envy and social comparisons, is widely documented in empirical studies from developed countries. However, findings regarding migrants in developing countries remain inconclusive. Some studies highlight a positive "signal effect" or "tunnel effect" associated with relative income (Hirschman, 1973[45]). Migrants in cities might be hopeful about high-income prospects, with this ambition positively influencing their happiness (Knight & Gunatilaka, 2010[54]; Akay, Bargain, & Zimmermann, 2012[5]). The reference group for relative income is a key factor in

shaping migrant well-being. Possible comparisons include other migrants, stayer individuals, and local city residents. Unlike urban migrants, returnees to rural areas may compare themselves to fellow villagers or county residents, where income and social status differentials influence their happiness.

This study focuses on the subjective well-being of return migrants and rural residents. First, it examines how absolute and relative income affect happiness in these groups. Absolute income refers to an individual's actual earnings, while relative income is defined as the average income of a reference group. Second, by controlling for income levels, this study compares the happiness of rural residents and returnees to determine whether returnees derive greater happiness from their migration experience. This provides a clearer understanding of the well-being of migrants and non-migrant rural residents, offering better empirical evidence on the subjective well-being of returnees.

The structure of this paper is as follows: Section 2 reviews the existing literature; Section 3 describes the data and descriptive statistics; Section 4 outlines the empirical methods; Sections 5 to 7 present the results and discussion; and the final section concludes with key findings and policy implications.

4.2 Literature

4.2.1 Relative Income of Return Migration

Many studies on income and happiness have shown that income positively affects subjective well-being (SWB) (Clark, Frijters, & Shields, 2008[24]; Graham, Eggers, & Sukhtankar, 2004[41]). Relative income is also crucial in this process. Research based on German panel data indicates that happiness is strongly influenced by relative income (Ferrer-i-Carbonell, 2005[36]). A study in the United States also found that the happiness derived from income is also influenced by comparisons with others; if the reference group also experiences income increases or has a higher income level, the happiness boost from income may be nullified (Luttmer, 2005[59]). Almost all studies on relative income in developed countries indicate a negative impact of relative income on happiness.

However, some studies from low-income countries have found that relative income sometimes positively affects happiness. Kingdon and Knight (2007)[52] discovered in their South African study that the impact on SWB varies depending on the reference group. Only when comparing

with socially or racially distant "far neighbors" does relative income have a negative impact; the impact is positive when comparing with "near neighbors." Similarly, another study using cross-sectional data from the European Social Survey (ESS) found that relative income positively affects happiness in Eastern European countries. This is because people perceive higher relative income as a signal of future expectations, improving their outlook on future economic conditions. In contrast, result from developed Western European countries show the opposite results.

4.2.2 Determinants of Happiness

The factors influencing happiness within economics are diverse, extending beyond income to include three broad categories. First one is personal characteristics, these include age, gender, personality, education, health, and more (Blanchflower & Oswald, 2004[14]; DeNeve & Cooper, 1998[28]). Numerous psychological studies have examined the relationship between personality and subjective well-being, finding that many subscales of the General Health Questionnaire (GHQ), which can be interpreted as personality variables (e.g., self-esteem), are positively correlated with life satisfaction. There is a close relationship between subjective well-being and health, with diseases such as heart attacks and strokes reducing happiness (Shields & Wheatley Price, 2005[77]).

On the other hand, the social environment, representing the economic, social, and political context, also plays a significant role. Key factors such as unemployment rates and inflation are commonly examined. These factors typically impact happiness through expectations about the future; when people are concerned about unemployment and their livelihoods, their happiness tends to decrease (Alesina, Di Tella, & MacCulloch, 2004[7]). Besides, some evidence suggests that living in large cities is detrimental to life satisfaction, whereas residing in rural areas is beneficial (Hudson, 2006[46]; Dockery, 2003[30]). It is important to note that many of these studies control for income to some extent. Since income levels are often lower in rural areas, this might create the illusion that happiness is higher in rural areas.

The final category is personal experiences, which include job type, unemployment, and how people manage their time. For migrants, higher urban incomes improve their income prospects, and this effect is especially pronounced for those who wish to settle permanently (Akay, Bargain, & Zimmermann, 2012[5]). For return migrants, the focus of this study, individual psychological

expectations change upon returning to their place of origin. How this experience of returning affects their happiness remains uncertain.

In summary, past research indicates that researchers should consider the impacts of income, relative income, health, and personal circumstances in their analyses. The choice of reference groups for relative income will also affect the interpretation of results.

4.3 Data

4.3.1 Data base

The Rural-Urban Migration in China (RUMiC) database serves as the primary data source for this research. The database was established through a collaborative effort involving the Australian National University, Beijing Normal University, the National Bureau of Statistics of China, and the Institute for the Study of Labor. It encompasses regions with diverse economic conditions across China, collecting detailed individual- and household-level information, including income and expenditure, employment status, household structure, and various socio-economic characteristics. Due to its comprehensive coverage and rich sample attributes, the RUMiC database provides a robust foundation for panel studies, with two waves of surveys conducted in 2008 and 2009.

The survey consists of three distinct components: the Urban Household Survey (UHS), the Rural Household Survey (RHS), and the Migrant Household Survey (MHS). This study primarily relies on RHS questionnaires from both survey waves, which include individuals aged 16 to 70 who are either stayer rural residents or return migrants. By focusing on this subpopulation, the study aims to analyse the economic and social reintegration of return migrants and compare their well-being with that of rural residents who have never migrated.

4.3.2 Measures of Subject well-being

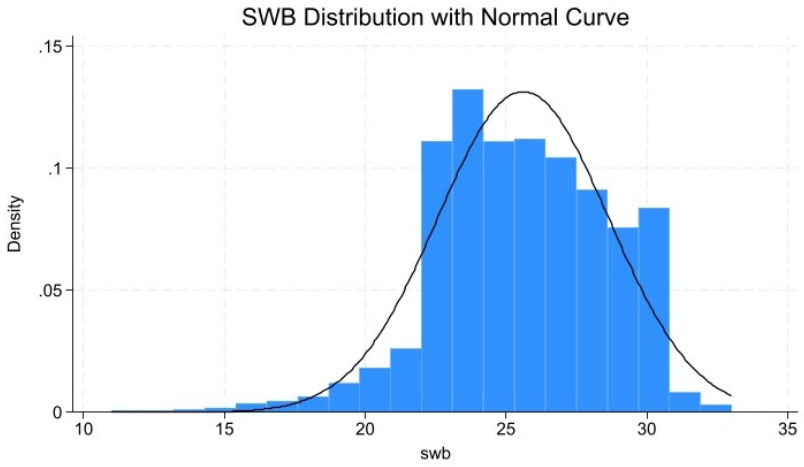
The Rural Household Survey (RHS) collects data on psychological health using the General Health Questionnaire (GHQ). Specifically, GHQ-12 is available for all individuals aged 16 and above who were present at the time of the survey[1]. This questionnaire consists of 12 questions that assess household members' emotional well-being and overall outlook on life. Responses are recorded on a 4-point Likert scale, where lower scores indicate better emotional well-being

[1] This means that current migration individuals will not have their subjective well-being (SWB) included in the GHQ-12. As a result, current migration individuals will be excluded from the subsequent research sample.

and a more positive outlook, whereas higher scores reflect greater psychological distress and a more negative perspective.

The aggregate score, GHQ-12, ranges from 0 (indicating the best psychological well-being) to 48 (indicating the worst psychological state). For readability and consistency in interpretation, we reverse the scale in our analysis, so that higher values represent greater happiness and better psychological well-being. This transformation ensures that a score of 48 corresponds to the highest level of subjective well-being, making the results more intuitive. This method has been widely used and does not affect the presented results (Akay, Bargain, & Zimmermann, 2012[5]; Gardner & Oswald, 2006[38]). The distribution of SWB is presented in the figure below.

Figure 1： SWB Distribution with Normal Curve



Notes: RUMiC 2008 and 2009.

GHQ-12 index obtained by summing 12 questions of the GHQ.

Figure 1 illustrates that the distribution of the data exhibits a slight left skew (negative skewness). Although the SWB variable is not perfectly symmetric, the deviation from symmetry is minor, and it largely conforms to a normal distribution. This finding is consistent with the results reported in other studies on subjective well-being.

4.3.3 Measures of return migration

The key variable in this study is migration status, which is classified based on responses from the Rural-Urban Migration in China (RUMiC) survey. Rural residents are categorised into two broad groups: stayer individuals and Returnees.

- Returnees are defined as individuals who have previously worked away from home but have not lived outside their local area for more than six months in the current year.
- Stayer individuals are those who have never migrated and have not spent more than six months away from their local area in the current year.

To further refine this classification, returnees are divided into two distinct subgroups based on their migration trajectories and settlement patterns: Old Returnees and New Returnees. These classifications are determined using migration status across two survey waves (2008 and 2009) and rural residency indicators.

- Old Returnees: This group comprises individuals who had already returned to their rural hometowns by 2008 and remained there in 2009. Formally, these individuals are identified if their return status equals 1 in both survey waves. Old Returnees reflect long-term resettlement in rural areas, suggesting an earlier, more permanent or semi-permanent decision to leave urban centres.
- New Returnees: This group consists of individuals who were residing in rural areas in 2008 but had not yet returned at that time, and subsequently became returnees in 2009. Technically, New Returnees are defined as those whose return status equals 0 in 2008 and 1 in 2009. This subgroup represents more recent return migration, capturing immediate shifts in migration behaviour.
- Stayer (Control Group): For comparison purposes, a control group, referred to as stayer individuals, includes those who remained in rural areas across both survey waves without migrating. This group is identified by having a rural status of 1 in both 2008 and 2009.

Distinguishing between Old and New Returnees allows for an investigation into heterogeneity in socioeconomic and psychological outcomes, as these groups may differ in terms of timing, motivations, and circumstances of return migration. Moreover, comparing returnees to stayer individuals provides a baseline for assessing the effects of return migration on subjective well-being and other key indicators.

In the RUMiC 2008 and 2009 datasets, we identified approximately 13,000 samples of stayer individuals and 2,400 returnees, among which only 270 were classified as New Returnees. Although the New Returnees sample size is relatively small, findings from this subgroup still offer valuable insights and serve as a useful reference for future research.

4.3.4 Other characteristic variables

Relative income is measured using the per capita disposable income of the sample's place of residence (rural/urban). This variable is obtained from the statistical yearbooks[2] of the sample's respective cities, where urban per capita disposable income is used for returnees and rural per capita disposable income is applied to stayer individuals.

Health status is derived from the survey question:" How would you rate your own health status?" It is measured as a categorical variable ranging from 1 to 5, where higher values indicate better health. In our analysis, health status is included as a control variable to account for its potential influence on subjective well-being (SWB).

The study design also incorporates a range of socio-demographic and economic characteristics, including age, gender, education, number of children, marital status, and employment status. A detailed breakdown of these variables is provided in the data description that follows.

4.3.5 Descriptive Statistics

Based on Wave 1 of the RUMiC database, we selected a sample of individuals aged between 16 and 70, who were subsequently tracked in Wave 2, allowing us to construct a two-year panel dataset. This panel structure enables a more comprehensive analysis of temporal dynamics, allowing us to observe changes over time rather than relying solely on cross-sectional comparisons. The descriptive statistics of the selected sample are presented in Table 4.1.

[2] The urban statistical yearbooks are sourced from the official government websites of each city and reported by the local statistics bureau at the beginning of the second year. The statistical data from 2007 and 2008 are used for wave 1 and wave 2, respectively.

Table 4.1: Summary statistics

	Wave 1		Wave 2		Whole Sample	
	Stayers	**Returnees**	**Stayers**	**Returnees**	**Stayers**	**Returnees**
Subjective well-being	25.72 (3.01)	25.88 (2.95)	25.40 (3.09)	25.90 (2.87)	25.56 (3.05)	25.89 (2.91)
Socio-demographic characteristics						
Health Status	3.83 (0.83)	3.94 (0.80)	3.73 (0.83)	3.90 (0.80)	3.78 (0.83)	3.92 (0.80)
Age	50.01 (10.06)	45.40 (9.91)	51.16 (10.01)	46.53 (10.00)	50.57 (10.05)	46.03 (9.97)
Gender (Male)	57%	77%	56%	77%	56%	77%
Primary or no school	44%	27%	45%	26%	45%	27%
Junior middle school	41%	56%	40%	54%	41%	55%
Senior middle or above	14%	18%	15%	20%	15%	19%
No Children	3%	4.3%	2%	3.2%	2.5%	3.7%
One child	26%	33%	26%	33%	26%	33%
Two children	41%	41%	41%	43%	41%	42%
More than two children	31%	21%	31%	21%	31%	21%
Married	98%	98%	98%	97%	98%	98%
Household size	4.00 (1.39)	4.00 (1.23)	4.04 (1.43)	4.04 (1.31)	4.02 (1.41)	4.00 (1.28)
Economic characteristics						
Employed	84%	92%	85%	93%	84%	93%
Relative Income	5.25 (2.20)	13.26 (4.13)	6.00 (2.44)	15.01 (4.57)	5.61 (2.35)	14.23 (4.46)
Number of observations	6824	1085	6556	1355	13380	2440

Notes: Means (standard deviations) refer to continuous and categorical variables; percentages refer to dummy variables.

The descriptive statistics reveal significant differences between returnees and stayers in terms of socio-economic characteristics and subjective well-being (SWB). Across the sample, returnees exhibit a slightly higher average SWB score (25.89) compared to stayers (25.56). This pattern is consistent with disparities in health status, where returnees report a higher mean health score (3.92) relative to the stayer's population (3.78). These findings suggest that individuals with migration experience tend to have better physical health and higher overall well-being compared to those who remain in rural areas.

A notable demographic distinction is that returnees tend to be younger than stayer individuals. The average age of returnees is 46.03 years, while stayer individuals have a significantly higher mean age of 50.57 years. This indicates that migration is more prevalent among younger and potentially healthier individuals, which may partially explain the observed differences in health and well-being outcomes.

Educational attainment also differs markedly between the two groups. A significantly larger proportion of returnees (55%) have completed at least senior middle school education, compared to only 41% among stayer individuals. This suggests that higher education levels may increase an individual's likelihood of seeking employment opportunities outside their home region, potentially leading to better access to urban labour markets, higher wages, and improved living conditions upon return.

Economic characteristics further highlight the advantages of return migrants. Using per capita disposable income as a proxy for urban earnings, returnees report an average income of 14.23k, more than double that of stayer individuals, whose mean income stands at 5.61k. This substantial income gap suggests that returnees may have gained financial benefits through urban employment, either by accumulating savings or securing better-paying opportunities upon returning to their rural hometowns.

These trends are consistently observed across both waves of data, reinforcing the persistent advantages of return migrants in terms of SWB, health status, education, and income. Notably, differences in employment rates and income levels indicate that returnees have accumulated greater economic resources and social capital, which may contribute to their higher subjective and objective well-being.

4.4 Empirical approach

4.4.1 Determinants of Subjective Well-Being in Rural Area

To estimate the factors affecting the subjective well-being of rural residents, we employ the following OLS model:

$$SWB_i = \beta_0 + \beta_1 Migration\ Status_i + \beta_2 Control\ Variables_i + \gamma Year_i + \varepsilon_i$$

SWB_i represent subjective well-being of individuals.

Migration Status$_i$ is the core variable representing migration status, where stayer =0 and returnees=1.

Control Variables$_i$ encompassing socio-demographic characteristics and Economic characteristics.

Year$_i$ is a year dummy variable and ε_i is error term.

Based on the design of this model, OLS regressions were conducted separately for New Returnees, Old Returnees, and the overall sample.

The results are presented in the following tables. Specifically, Tables 2.1 and 2.2 report the OLS estimates for old returnees and overall returnees in Wave 1, as new returnees can only be identified in Wave 2. Tables 3.1 to 3.3 present the OLS results for the three categories of returnees in Wave 2. Finally, Tables 4.1 to 4.3 summarise the pooled OLS estimates across both waves, capturing the overall trends observed among all respondents.

By treating different types of returnees as the treatment group and conducting regressions at multiple time points, this approach captures heterogeneous effects across returnee groups, distinguishing between short-term and long-term impacts. Running regressions in both Wave 1 and Wave 2 helps address selection bias by providing a baseline for comparison and allowing for a better understanding of how return migration influences subjective well-being (SWB) over time. The inclusion of pooled OLS estimates further enhances robustness by capturing overall trends while controlling for macroeconomic fluctuations. This design strengthens causal interpretations and provides a comprehensive perspective on the economic and psychological effects of return migration.

Table 4.2.1: Determinants of Subjective Well-Being in Rural Area

(Old returnees, Wave 1)

Dependent variable: SWB	**(1)**	**(2)**	**(3)**	**(4)**
Return migration	-0.360***	-0.309***	-0.851***	-0.504***
	(0.105)	(0.098)	(0.169)	(0.157)
Socio-demographic characteristics				
Age	-0.030***	-0.003	-0.030***	-0.003
	(0.005)	(0.005)	(0.005)	(0.005)
Gender (Male)	0.897***	0.736***	0.900***	0.739***
	(0.070)	(0.066)	(0.070)	(0.066)
Junior middle school	0.538***	0.452***	0.523***	0.446***
	(0.081)	(0.076)	(0.081)	(0.076)
Senior middle or above	0.637***	0.540***	0.601***	0.526***
	(0.110)	(0.105)	(0.110)	(0.105)
One child	0.306	0.274	0.232	0.245
	(0.245)	(0.231)	(0.243)	(0.230)
Two children	0.209	0.151	0.187	0.143
	(0.244)	(0.229)	(0.242)	(0.228)
More than two children	-0.116	-0.143	-0.107	-0.139
	(0.255)	(0.240)	(0.252)	(0.239)
Married	0.753***	0.517**	0.779***	0.528**
	(0.249)	(0.229)	(0.248)	(0.229)
Household size	0.010	-0.013	0.017	-0.010
	(0.030)	(0.028)	(0.030)	(0.028)
Health Status		1.171***		1.163***
		(0.049)		(0.050)
Economic characteristics				
Relative income			0.062***	0.024*
			(0.016)	(0.015)
Employed	0.753***	0.559***	0.813***	0.584***
	(0.119)	(0.111)	(0.120)	(0.112)
Number of observations	7639	7639	7639	7639

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.2.2: (Overall sample, Wave 1)

Dependent variable: SWB	**(1)**	**(2)**	**(3)**	**(4)**
Return migration	-0.350***	-0.297***	-0.816***	-0.468***
	(0.104)	(0.097)	(0.167)	(0.156)
Socio-demographic characteristics				
Age	-0.029***	-0.00200	-0.029***	-0.002
	(0.005)	(0.004)	(0.005)	(0.004)
Gender (Male)	0.896***	0.735***	0.900***	0.738***
	(0.068)	(0.065)	(0.068)	(0.065)
Junior middle school	0.542***	0.456***	0.528***	0.451***
	(0.079)	(0.075)	(0.079)	(0.075)
Senior middle or above	0.641***	0.532***	0.606***	0.520***
	(0.107)	(0.103)	(0.107)	(0.103)
One child	0.269	0.221	0.203	0.197
	(0.236)	(0.226)	(0.234)	(0.225)
Two children	0.163	0.0910	0.147	0.085
	(0.236)	(0.225)	(0.233)	(0.224)
More than two children	-0.153	-0.196	-0.139	-0.191
	(0.247)	(0.236)	(0.245)	(0.235)
Married	0.761***	0.534**	0.783***	0.543**
	(0.243)	(0.224)	(0.241)	(0.224)
Household size	0.0130	-0.0100	0.0180	-0.008
	(0.029)	(0.028)	(0.029)	(0.028)
Health Status		1.168***		1.161***
		(0.048)		(0.049)
Economic characteristics				
Relative income			0.058***	0.021
			(0.015)	(0.015)
Employed	0.761***	0.561***	0.818***	0.583***
	(0.117)	(0.109)	(0.118)	(0.110)
Number of observations	7909	7909	7909	7909

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.2.3: (New returnees, Wave 2)

Dependent variable: SWB	**(1)**	**(2)**	**(3)**	**(4)**
Return migration	0.179	0.125	-0.210	0.070
	(0.167)	(0.158)	(0.225)	(0.213)
Socio-demographic characteristics				
Age	-0.027***	0.002	-0.027***	0.002
	(0.005)	(0.005)	(0.005)	(0.005)
Gender (Male)	1.191***	0.975***	1.197***	0.976***
	(0.072)	(0.069)	(0.072)	(0.069)
Junior middle school	0.495***	0.403***	0.482***	0.401***
	(0.088)	(0.082)	(0.088)	(0.082)
Senior middle or above	0.696***	0.574***	0.671***	0.571***
	(0.116)	(0.106)	(0.116)	(0.107)
One child	0.034	-0.048	0.037	-0.047
	(0.368)	(0.348)	(0.368)	(0.348)
Two children	-0.128	-0.228	-0.088	-0.223
	(0.368)	(0.349)	(0.368)	(0.348)
More than two children	-0.547	-0.570	-0.486	-0.561
	(0.379)	(0.359)	(0.379)	(0.359)
Married	0.842***	0.492	0.813***	0.488
	(0.304)	(0.311)	(0.304)	(0.311)
Household size	-0.023	-0.041	-0.019	-0.041
	(0.031)	(0.029)	(0.031)	(0.029)
Health Status		1.296***		1.294***
		(0.050)		(0.050)
Economic characteristics				
Relative income			0.042**	0.006
			(0.017)	(0.016)
Employed	0.622***	0.500***	0.662***	0.506***
	(0.129)	(0.117)	(0.129)	(0.117)
Number of observations	6826	6826	6826	6826

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.2.4: (Old returnees, Wave 2)

Dependent variable: SWB	**(1)**	**(2)**	**(3)**	**(4)**
Return migration	-0.140	-0.127	-0.532***	-0.223
	(0.102)	(0.095)	(0.163)	(0.151)
Socio-demographic characteristics				
Age	-0.027***	0.002	-0.027***	0.002
	(0.005)	(0.005)	(0.005)	(0.005)
Gender (Male)	1.167***	0.953***	1.173***	0.956***
	(0.069)	(0.066)	(0.069)	(0.066)
Junior middle school	0.542***	0.437***	0.529***	0.434***
	(0.084)	(0.078)	(0.083)	(0.078)
Senior middle or above	0.807***	0.674***	0.781***	0.668***
	(0.108)	(0.100)	(0.108)	(0.100)
One child	0.172	0.0310	0.163	0.029
	(0.343)	(0.323)	(0.343)	(0.324)
Two children	0.057	-0.097	0.088	-0.089
	(0.344)	(0.325)	(0.344)	(0.325)
More than two children	-0.317	-0.411	-0.260	-0.397
	(0.355)	(0.335)	(0.355)	(0.335)
Married	0.811***	0.515*	0.792***	0.511*
	(0.293)	(0.296)	(0.293)	(0.295)
Household size	-0.017	-0.037	-0.011	-0.035
	(0.030)	(0.028)	(0.030)	(0.028)
Health Status		1.296***		1.292***
		(0.048)		(0.048)
Economic characteristics				
Relative income			0.044***	0.011
			(0.014)	(0.013)
Employed	0.647***	0.503***	0.688***	0.513***
	(0.127)	(0.115)	(0.127)	(0.115)
Number of observations	7639	7639	7639	7639

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.2.5: (Overall sample, Wave 2)

Dependent variable: SWB	**(1)**	**(2)**	**(3)**	**(4)**
Return migration	-0.077	-0.077	-0.426***	-0.158
	(0.092)	(0.086)	(0.153)	(0.142)
Socio-demographic characteristics				
Age	-0.027***	0.002	-0.027***	0.001
	(0.005)	(0.005)	(0.005)	(0.005)
Gender (Male)	1.170***	0.957***	1.177***	0.959***
	(0.068)	(0.065)	(0.068)	(0.065)
Junior middle school	0.534***	0.428***	0.522***	0.426***
	(0.082)	(0.077)	(0.082)	(0.077)
Senior middle or above	0.811***	0.677***	0.784***	0.672***
	(0.105)	(0.098)	(0.106)	(0.098)
One child	0.110	0.0220	0.104	0.021
	(0.329)	(0.311)	(0.329)	(0.311)
Two children	-0.008	-0.110	0.023	-0.103
	(0.330)	(0.313)	(0.330)	(0.312)
More than two children	-0.382	-0.419	-0.329	-0.407
	(0.342)	(0.323)	(0.341)	(0.323)
Married	0.774***	0.476*	0.756***	0.473*
	(0.284)	(0.285)	(0.283)	(0.285)
Household size	-0.023	-0.042	-0.018	-0.040
	(0.030)	(0.027)	(0.030)	(0.028)
Health Status		1.292***		1.289***
		(0.047)		(0.047)
Economic characteristics				
Relative income			0.039***	0.009
			(0.014)	(0.013)
Employed	0.646***	0.493***	0.683***	0.502***
	(0.124)	(0.113)	(0.124)	(0.113)
Number of observations	7911	7911	7911	7911

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Based on the regression results, the negative impact of return migration on the subjective well-being (SWB) of old returnees remains significant, but its magnitude has declined over time. As shown in Table 4.2.4, the coefficient for return migration in Wave 2 (column 3) is -0.532, which

is notably lower than the coefficient of -0.816 observed in the overall sample of Wave 1 (Table 4.2.1, column 3). This decline in magnitude suggests that, over time, old returnees have gradually adapted to rural life, improved their economic conditions, and possibly benefitted from an overall rise in rural income levels. These factors likely contributed to the reduction in the negative impact on their well-being.

In contrast, the subjective well-being of new returnees in Wave 2 does not exhibit a significant effect. According to the regression results in Table 4.2.3, the coefficient for return migration ranges from -0.210 to 0.179 across columns (1) to (4), with none of the estimates reaching statistical significance. This suggests that, in the short term, new returnees may experience some level of disruption to their happiness following their return. However, this impact does not manifest as a significant negative consequence. One possible explanation is that new returnees are still in the early stages of adapting to rural life, where factors such as income decline and the need to rebuild social networks may temporarily affect their well-being. Furthermore, the effects on the subjective well-being of new returnees may require a longer observation period or a larger sample size to reveal clearer trends.

The regression results for the overall sample (Table 4.2.5) also indicate that the negative effect of return migration on well-being has significantly diminished in Wave 2. The coefficient for return migration in column (3) is -0.426, which is significant at the 1% level. However, compared to the -0.816 coefficient in Wave 1, the negative impact has notably decreased. This trend may reflect a combination of two factors: the diminishing negative impact on old returnees and the non-significant changes in the well-being of new returnees, which collectively reduce the overall negative effect. Additionally, over time, returnees may gradually rebuild their sense of belonging within their families and communities, which could enhance their subjective well-being. However, for new returnees, these positive effects may take longer to materialise.

The following tables (Tables 4.3.1-4.3.3) present the results for the two-year pooled sample.

Table 4.3.1: Determinants of Subjective Well-Being in Rural Area

(New returnees, Two waves sample)

Dependent variable: SWB	(1)	(2)	(3)	(4)
Return migration	0.208	0.157	-0.220	0.111
	(0.167)	(0.158)	(0.220)	(0.206)
Socio-demographic characteristics				
Age	-0.025***	0.003	-0.026***	0.003
	(0.004)	(0.004)	(0.004)	(0.004)
Gender (Male)	1.045***	0.860***	1.050***	0.861***
	(0.061)	(0.057)	(0.061)	(0.057)
Junior middle school	0.528***	0.438***	0.514***	0.436***
	(0.073)	(0.067)	(0.073)	(0.067)
Senior middle or above	0.644***	0.533***	0.617***	0.531***
	(0.099)	(0.091)	(0.099)	(0.091)
One child	0.140	0.050	0.121	0.0480
	(0.240)	(0.220)	(0.239)	(0.220)
Two children	-0.022	-0.133	-0.002	-0.131
	(0.240)	(0.220)	(0.239)	(0.219)
More than two children	-0.424*	-0.481**	-0.381	-0.476**
	(0.250)	(0.229)	(0.249)	(0.229)
Married	1.087***	0.730***	1.061***	0.728***
	(0.217)	(0.201)	(0.217)	(0.201)
Household size	0.006	-0.015	0.011	-0.014
	(0.026)	(0.024)	(0.026)	(0.024)
Health Status		1.220***		1.219***
		(0.042)		(0.042)
Economic characteristics				
Relative income			0.046***	0.005
			(0.016)	(0.014)
Employed	0.677***	0.517***	0.722***	0.522***
	(0.101)	(0.091)	(0.101)	(0.091)
Time Characteristics				
Year dummy	-0.278***	-0.195***	-0.313***	-0.199***
	(0.043)	(0.042)	(0.044)	(0.044)
Number of observations	13650	13650	13650	13650

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*

Note: Clustering to household level

Table 4.3.2: (Old returnees, Two waves sample)

Dependent variable: SWB	(1)	(2)	(3)	(4)
Return migration	-0.250***	-0.216***	-0.688***	-0.360***
	(0.088)	(0.080)	(0.142)	(0.129)
Socio-demographic characteristics				
Age	-0.027***	0.001	-0.028***	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Gender (Male)	1.022***	0.837***	1.028***	0.839***
	(0.059)	(0.055)	(0.059)	(0.055)
Junior middle school	0.545***	0.449***	0.531***	0.444***
	(0.070)	(0.064)	(0.070)	(0.064)
Senior middle or above	0.724***	0.610***	0.692***	0.600***
	(0.093)	(0.086)	(0.093)	(0.086)
One child	0.261	0.184	0.218	0.170
	(0.234)	(0.215)	(0.232)	(0.215)
Two children	0.153	0.0580	0.158	0.0590
	(0.234)	(0.216)	(0.232)	(0.215)
More than two children	-0.193	-0.244	-0.160	-0.233
	(0.244)	(0.226)	(0.243)	(0.225)
Married	1.029***	0.710***	1.002***	0.702***
	(0.219)	(0.201)	(0.218)	(0.200)
Household size	-0.002	-0.023	0.007	-0.020
	(0.025)	(0.023)	(0.025)	(0.023)
Health Status		1.236***		1.231***
		(0.040)		(0.040)
Economic characteristics				
Relative income			0.052***	0.017
			(0.013)	(0.012)
Employed	0.700***	0.527***	0.750***	0.544***
	(0.100)	(0.090)	(0.100)	(0.090)
Time Characteristics				
Year dummy	-0.247***	-0.170***	-0.292***	-0.186***
	(0.040)	(0.039)	(0.041)	(0.041)
Number of observations	15280	15280	15280	15280

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.3.3: (Overall sample, Two waves sample)

Dependent variable: SWB	(1)	(2)	(3)	(4)
Return migration	-0.200**	-0.173**	-0.608***	-0.302**
	(0.082)	(0.074)	(0.136)	(0.123)
Socio-demographic characteristics				
Age	-0.028***	-0.0003	-0.028***	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
Gender (Male)	1.031***	0.844***	1.037***	0.847***
	(0.058)	(0.054)	(0.058)	(0.054)
Junior middle school	0.536***	0.440***	0.523***	0.437***
	(0.069)	(0.063)	(0.069)	(0.063)
Senior middle or above	0.725***	0.605***	0.694***	0.595***
	(0.091)	(0.083)	(0.091)	(0.084)
One child	0.218	0.151	0.183	0.140
	(0.225)	(0.209)	(0.224)	(0.208)
Two children	0.106	0.020	0.114	0.023
	(0.225)	(0.209)	(0.224)	(0.208)
More than two children	-0.236	-0.276	-0.202	-0.265
	(0.236)	(0.219)	(0.234)	(0.219)
Married	0.746***	0.487**	0.746***	0.488**
	(0.215)	(0.203)	(0.214)	(0.203)
Household size	-0.005	-0.026	0.001	-0.024
	(0.025)	(0.023)	(0.025)	(0.023)
Health Status		1.231***		1.226***
		(0.039)		(0.039)
Economic characteristics				
Relative income			0.048***	0.015
			(0.012)	(0.011)
Employed	0.738***	0.554***	0.780***	0.568***
	(0.099)	(0.089)	(0.099)	(0.089)
Time Characteristics				
Year dummy	-0.278***	-0.195***	-0.313***	-0.199***
	(0.043)	(0.042)	(0.044)	(0.044)
Number of observations	15820	15820	15820	15820

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.3.3 presents the impact of return migration status on subjective well-being (SWB) for the overall sample. In columns (1)– (4), the regression models progressively include health status and relative income as control variables to assess their role in explaining return migrants'

well-being.

Overall, the coefficient for Return migration remains negative across all models and is significant in several specifications. This suggests that, compared to non-migrants in rural areas, return migrants report lower levels of subjective well-being. Gender significantly influences well-being, with males exhibiting higher subjective well-being by approximately 0.844–1.037 units on average, a consistent effect across all models. Educational attainment also has a significant positive impact, as individuals with junior high school and senior high school or higher education report an average increase of 0.440–0.537 and 0.605–0.725 units in well-being, respectively. This suggests that higher education levels are associated with greater well-being, likely due to improved economic conditions or enhanced social status. Regarding family characteristics, both household size and the number of children have a negative impact on well-being, potentially due to increased family responsibilities. Additionally, the year dummy variable indicates that subjective well-being in 2009 was significantly lower than in 2008, reflecting the possible influence of external factors such as economic downturns.

As health status and relative income are added to the models, the coefficient for Return migration exhibits a dynamic change—initially weakening (column 2) before strengthening (column 3). This suggests that health and income act as mediating factors in explaining well-being differences among return migrants. Health status is a significant determinant of subjective well-being, with a coefficient of 1.231, highlighting the importance of health resources and welfare support for rural populations. When health status is not controlled for, some health-related disparities may be incorrectly attributed to Return migration, thereby amplifying its negative effect. In column (3), after including relative income, the negative coefficient for Return migration increases substantially to -0.608, suggesting that return migrants generally have higher relative income. When income is not controlled for, its positive impact on well-being may mask the negative effects of return migration.

After controlling for income, the negative effect of return migration on well-being becomes more pronounced, potentially due to social adaptation costs, psychological stress, or family burdens associated with migration. Despite the positive effect of income on well-being, for return migrants, income growth alone may be insufficient to fully offset the non-economic costs of migration. The negative impact of return migration may stem from discrepancies between income gains and actual living conditions in rural areas, which may contrast sharply with initial expectations. Although return migrants may earn higher incomes than stayer residents, this

relative advantage may shape their self-perception and influence overall well-being. Typically, higher income is associated with better living standards, social status, and increased disposable resources, all of which can contribute to higher well-being.

However, despite earning higher incomes, return migrants' actual living conditions may be inferior to those experienced in urban areas. In cities, they may have enjoyed better infrastructure, employment benefits, and higher-quality public services. Even if their income remains relatively higher after returning, the contrast with their previous urban experiences may diminish their well-being, leading to dissatisfaction and a sense of loss.

This long-term sense of relative deprivation may help explain why old returnees exhibit significantly lower levels of SWB in the pooled OLS results. In contrast, new returnees do not show a significant decline in well-being. One possible explanation is that many new returnees may view their return as temporary or transitional, often due to short-term shocks such as illness, unemployment, or family needs. The belief that they might re-migrate in the near future may buffer the negative psychological impact of returning. In comparison, old returnees are more likely to have made a permanent return, having settled back in rural areas. Their expectations have had more time to adjust, and the enduring contrast between their current living conditions and previous urban life may intensify their dissatisfaction.

The following tables (Table 4.3.2 and Table 4.3.3) present regression results for new returnees and old returnees in the two-wave pooled sample, serving as a comparison and supplement to the overall sample. In the overall sample (Table 4.3.3), the coefficient for Return migration is negative and significant, indicating that return migrants experience lower well-being. However, when analyzing new returnees and old returnees separately, we observe substantial differences in the magnitude and significance of return migration's impact. For new returnees, the coefficient for Return migration is positive but not statistically significant, whereas for old returnees, the coefficient is negative and significant.

Health status consistently exhibits a positive effect in both groups, suggesting that better health is strongly associated with higher well-being. This result aligns with economic research on the health-well-being relationship, confirming health as a crucial determinant of subjective well-being. For new returnees, the coefficient for relative income is significantly positive (0.046), indicating that individuals with higher relative income tend to report greater well-being. In contrast, for old returnees, relative income does not significantly influence well-being,

suggesting that over time, income differences may have a weaker effect or be overshadowed by other factors. Regarding education and marital status, both new and old returnees with higher educational attainment and stable marital relationships generally report higher well-being, indicating that social stability contributes positively to subjective well-being.

For new returnees, the coefficient for Return migration is positive (0.208) but not significant. This suggests that the advantages of migration may still be dominant for new returnees shortly after returning. However, given the small sample size (only 270 new returnees), this result should be interpreted with caution due to potential statistical bias. In contrast, the regression results for old returnees show that the coefficient for Return migration is negative and significant (-0.250), indicating that old returnees experience lower well-being than the stayer group. As the benefits of migration fade, returnees face new challenges related to social integration and rural labour markets, which negatively impact their well-being.

The OLS regressions above may be influenced by sample characteristics or unobserved heterogeneity, meaning that changes in regression coefficients do not necessarily imply causal relationships. While the stepwise regression analysis highlights the important roles of health and income, further First difference regressions are necessary to validate the causal effect of return migration on well-being and explore its underlying mechanisms. The upcoming difference-in-differences analysis will further examine the robustness and dynamic nature of migration status' impact on well-being.

4.4.2 Changes in Migration Status and Subjective Well-Being

In the preceding analysis, we examined the determinants of subjective well-being (SWB) among rural residents. To further explore the impact of returnees' migration experiences on the SWB of rural residents, we employed a First-difference approach, comparing changes in sample characteristics between wave 1 and wave 2. The new analytical model is specified as follows:

$$Diff\_SWB_i = \alpha_0 + \alpha_1 Diff\_\ Migration\ Status_i + \alpha_2\ Time\text{-}variant\ variables_{\ i} + \varepsilon_i$$

Diff_SWB_i represents the change in subjective well-being for the sample between wave 2 and wave 1.

Diff_ Migration Status indicates the change in migration status.

Time-variant variables $_i$ represents changes in socio-demographic characteristics and economic characteristics. ε_i is the error term.

In this first-difference analysis, individuals who consistently remained in the stayer group serve as the control group, coded as 0. Similar to the previous pooled OLS approach, we define the treatment group as consisting of three categories: new returnees, old returnees, and overall returnees. New returnees represent individuals who migrated and subsequently returned within the two-year period, while old returnees refer to those who had already returned before Wave 1 (Although their migration status remains unchanged between the two waves, they are still classified as "1" in the first-difference framework to facilitate a consistent comparison across returnee groups).

By separately analysing these three treatment groups, this approach enables a more precise identification of the differential impacts of return migration at distinct stages. The distinction between new and old returnees allows us to differentiate the immediate effects of return migration from long-term adjustments, providing insight into whether the benefits (or disadvantages) of return migration persist over time.

Additionally, compared to pooled OLS, the first-difference method eliminates time-invariant unobserved heterogeneity, thereby improving the robustness of the estimates. Since this method focuses on within-individual variations, it helps control for individual-specific characteristics that remain constant across waves, reducing potential biases arising from omitted variables. The regression results, presented in Tables 4.4.1 to 4.4.3, provide a comparative analysis of the three groups, enabling a more rigorous assessment of how return migration influences subjective well-being and other socio-economic outcomes over time.

Table 4.4.1: Determinants of changes in subjective well-being (New returnees)

Dependent variable: Diff_ SWB	**(1)**	**(2)**	**(3)**	**(4)**
Diff_ Migration Status	0.415**	0.417**	0.652	0.396
	(0.207)	(0.203)	(0.693)	(0.681)
Socio-demographic characteristics				
Diff_Married	0.436	0.337	0.437	0.337
	(0.288)	(0.291)	(0.288)	(0.291)
Diff_Health Status		0.648***		0.648***
		(0.059)		(0.059)
Economic characteristics				
Diff_Income			-0.025	0.002
			(0.072)	(0.071)
Diff_Employed	0.310***	0.268**	0.311***	0.268**
	(0.109)	(0.107)	(0.109)	(0.107)
Number of observations	6891	6891	6891	6891

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.4.2: Determinants of changes in subjective well-being (Old returnees)

Dependent variable: Diff_ SWB	**(1)**	**(2)**	**(3)**	**(4)**
Migration Status	0.270**	0.245**	0.299**	0.268*
	(0.105)	(0.103)	(0.140)	(0.138)
Socio-demographic characteristics				
Diff_Married	0.371	0.275	0.372	0.276
	(0.276)	(0.277)	(0.276)	(0.277)
Diff_Health Status		0.649***		0.649***
		(0.054)		(0.054)
Economic characteristics				
Diff_Income			-0.033	-0.026
			(0.106)	(0.105)
Diff_Employed	0.337***	0.288***	0.337***	0.289***
	(0.107)	(0.105)	(0.107)	(0.105)
Number of observations	7707	7707	7707	7707

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.4.3: Determinants of changes in subjective well-being (Overall Sample)

Dependent variable: Diff_ SWB	**(1)**	**(2)**	**(3)**	**(4)**
Diff_ Migration Status	0.299***	0.279***	0.284**	0.248**
	(0.096)	(0.094)	(0.115)	(0.112)
Socio-demographic characteristics				
Diff_Married	0.400	0.296	0.401	0.298
	(0.276)	(0.276)	(0.276)	(0.276)
Diff_Health Status		0.658***		0.658***
		(0.053)		(0.053)
Economic characteristics				
Diff_Income			0.006	0.012
			(0.026)	(0.025)
Diff_Employed	0.328***	0.278***	0.328***	0.278***
	(0.105)	(0.103)	(0.105)	(0.103)
Number of observations	7977	7977	7977	7977

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

The regression results in Tables 4.4.1 to 4.4.3 reveal a significant relationship between return migration status and changes in subjective well-being. By controlling for individual-level changes between the two time points, the First Difference (FD) model effectively eliminates constant factors that could influence subjective well-being, such as individual characteristics and initial conditions.

For new returnees, the regression results in Table 4.4.1 indicate a significant positive relationship between changes in migration status and subjective well-being. This suggests that the "migration dividend"—the social and economic opportunities gained after returning—contributes to improvements in well-being. Although the relatively small sample size may introduce greater variability in the coefficient for new returnees, the overall positive impact of

return migration on subjective well-being remains evident.

For old returnees, the regression results in Table 4.4.2 show that the change in migration status still has a positive effect on subjective well-being. While this effect is smaller than that observed for new returnees, likely due to the longer adaptation period, the relationship remains statistically significant. This suggests that old returnees have already adapted to rural life and integrated into local social and economic networks. As a result, despite a diminished migration dividend compared to new returnees, the change in migration status continues to have a positive impact on their well-being.

In the overall sample analysis (Table 4.4.3), a similar positive relationship between return migration status and subjective well-being is observed. Regardless of whether they are new or old returnees, return migrants generally experience an increase in subjective well-being. The significance of the regression coefficients in the overall sample suggests that return migrants, on average, benefit from improved well-being after returning.

In contrast to the static OLS model, the First Difference (FD) model eliminates fixed effects that do not vary over time, allowing for a more precise estimation of the adaptive changes experienced by return migrants. The OLS model, which captures static relationships between time points, fails to fully account for the adaptation process that return migrants undergo over time—especially the differences between new and old returnees. This explains why return migration appears to have a negative effect on well-being in the OLS regression, whereas in the First Difference model, return migration is associated with positive changes in well-being.

Overall, the First Difference regression results suggest that changes in return migration status positively influence subjective well-being, with this effect being more pronounced for new returnees. This could be attributed to new returnees gradually overcoming initial challenges during the adaptation period, leading to improvements in well-being over time. In contrast, old returnees experience a more gradual and stable change in well-being, as their adaptation process has already been underway for a longer period. This helps explain the differing patterns of adaptation and their impact on subjective well-being between new and old returnees at different time points.

4.5 Heterogeneity Test

In this study, gender emerged as a highly significant factor across several regression results,

with men comprising 77% of the return migrant sample. To further investigate the potential heterogeneity of gender effects on subjective well-being, we divided the sample into male and female groups. We conducted separate regression analyses for men and women while ensuring that the control variables remained consistent with the previous design. This gender-based grouping aims to reveal the distinct roles that gender plays in subjective well-being and its associated influencing factors. As an important social variable, gender can significantly impact individuals' life experiences, social interactions, and psychological perceptions. Therefore, understanding the differences in well-being between men and women will enhance our comprehension of the mechanisms influencing subjective well-being.

Tables 4.5.1 and 4.5.2 present the OLS regression results separately for males and females, while Tables 4.6.1 and 4.6.2 report the corresponding first-difference estimates for each gender group. Given the substantial reduction in sample size after disaggregation, we do not further differentiate between new and old returnees in these regressions. Instead, all results are based on the overall returnee’s category to ensure sufficient statistical power and reliable inference.

Table 4.5.1: Determinants of Subjective Well-Being (Male)

Dependent variable: SWB	**(1)**	**(2)**	**(3)**	**(4)**
Return migration	-0.185**	-0.174**	-0.452***	-0.244*
	(0.087)	(0.080)	(0.143)	(0.130)
Socio-demographic characteristics				
Age	-0.024***	0.002	-0.024***	0.002
	(0.004)	(0.004)	(0.004)	(0.004)
Junior middle school	0.466***	0.349***	0.459***	0.348***
	(0.083)	(0.077)	(0.083)	(0.077)
Senior middle or above	0.597***	0.458***	0.584***	0.455***
	(0.102)	(0.094)	(0.102)	(0.094)
One child	0.296	0.260	0.260	0.251
	(0.243)	(0.228)	(0.242)	(0.227)
Two children	0.150	0.0740	0.141	0.072
	(0.242)	(0.227)	(0.242)	(0.227)
More than two children	-0.046	-0.093	-0.038	-0.091
	(0.253)	(0.238)	(0.253)	(0.238)
Married	0.896***	0.624***	0.901***	0.626***
	(0.242)	(0.222)	(0.242)	(0.222)
Household size	-0.008	-0.023	-0.005	-0.022
	(0.025)	(0.023)	(0.026)	(0.024)
Health Status		1.177***		1.175***
		(0.045)		(0.045)
Economic characteristics				
Relative income			0.032**	0.008
			(0.013)	(0.012)
Employed	1.006***	0.719***	1.023***	0.724***
	(0.150)	(0.132)	(0.150)	(0.132)
Time Characteristics				
Year dummy	-0.107**	-0.047	-0.136***	-0.054
	(0.045)	(0.044)	(0.046)	(0.045)
Number of observations	9427	9427	9427	9427

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.5.2: Determinants of Subjective Well-Being (Female)

Dependent variable: SWB	**(1)**	**(2)**	**(3)**	**(4)**
Return migration	-0.225	-0.143	-0.840***	-0.331
	(0.162)	(0.146)	(0.227)	(0.207)
Socio-demographic characteristics				
Age	-0.032***	-0.003	-0.034***	-0.004
	(0.006)	(0.006)	(0.006)	(0.006)
Junior middle school	0.597***	0.535***	0.573***	0.528***
	(0.106)	(0.098)	(0.106)	(0.098)
Senior middle or above	0.973***	0.891***	0.890***	0.866***
	(0.168)	(0.158)	(0.168)	(0.159)
One child	-0.0350	-0.155	0.0150	-0.139
	(0.463)	(0.419)	(0.459)	(0.418)
Two children	-0.088	-0.187	0.028	-0.151
	(0.469)	(0.425)	(0.466)	(0.424)
More than two children	-0.661	-0.688	-0.506	-0.640
	(0.486)	(0.440)	(0.482)	(0.439)
Married	0.482	0.293	0.430	0.279
	(0.386)	(0.383)	(0.383)	(0.382)
Household size	0.0001	-0.033	0.009	-0.030
	(0.040)	(0.037)	(0.040)	(0.037)
Health Status		1.302***		1.293***
		(0.060)		(0.060)
Economic characteristics				
Relative income			0.071***	0.022
			(0.019)	(0.018)
Employed	0.554***	0.433***	0.632***	0.458***
	(0.120)	(0.109)	(0.120)	(0.109)
Time Characteristics				
Year dummy	-0.407***	-0.306***	-0.470***	-0.326***
	(0.058)	(0.058)	(0.060)	(0.061)
Number of observations	6393	6393	6393	6393

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

The OLS results indicate a negative association between return migration and subjective well-being (SWB) for both men and women, with this effect being more pronounced for women. In Table 4.5.1, for males, the coefficient for return migration is negative and significant across multiple models (e.g., -0.185 in Column 1, -0.452 in Column 3). However, in Table 4.5.2, the magnitude of the negative effect is even greater for females, with the coefficient reaching -0.840 in Column 3, suggesting that women experience a more substantial decline in SWB upon returning to rural areas.

A possible explanation lies in the differences in socio-economic reintegration experiences between men and women. In rural China, men are traditionally expected to be the primary breadwinners, and return migration may be associated with better economic opportunities or social recognition, which could partially offset the negative effects of relocation. In contrast, women often assume greater caregiving and household responsibilities, which may intensify upon their return, leading to a more significant decline in well-being. These findings highlight the gendered dimensions of return migration, suggesting that women may face greater challenges in adapting to rural life compared to their male counterparts.

Table 4.6.1: Determinants of changes in subjective well-being (Male)

Dependent variable: Diff_ SWB	**(1)**	**(2)**	**(3)**	**(4)**
Return migration	0.264**	0.239**	0.293**	0.250**
	(0.108)	(0.106)	(0.126)	(0.124)
Socio-demographic characteristics				
Diff_Married	0.296	0.214	0.295	0.213
	(0.331)	(0.316)	(0.331)	(0.316)
Diff_Health Status		0.730***		0.730***
		(0.064)		(0.064)
Economic characteristics				
Diff_Income			-0.012	-0.004
			(0.027)	(0.027)
Diff_Employed	0.521***	0.470***	0.521***	0.470***
	(0.158)	(0.151)	(0.158)	(0.152)
Number of observations	4738	4738	4738	4738

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.6.2: Determinants of changes in subjective well-being (Female)

Dependent variable: Diff_ SWB	(1)	(2)	(3)	(4)
Return migration	0.166	0.165	-0.008	-0.022
	(0.184)	(0.181)	(0.222)	(0.217)
Socio-demographic characteristics				
Diff_Married	0.568	0.438	0.576	0.446
	(0.462)	(0.484)	(0.463)	(0.484)
Diff_Health Status		0.547***		0.549***
		(0.081)		(0.081)
Economic characteristics				
Diff_Income			0.063	0.068
			(0.049)	(0.047)
Diff_Employed	0.218*	0.174	0.215	0.170
	(0.130)	(0.129)	(0.131)	(0.130)
Number of observations	3239	3239	3239	3239

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

A key observation from the results is the difference between the OLS and first-difference estimates, which aligns with trends observed in the full sample. The OLS models estimate cross-sectional associations between return migration and subjective well-being (SWB), capturing the overall correlation between these variables. In contrast, the first-difference model focuses on within-individual changes over time, effectively eliminating time-invariant unobserved heterogeneity, such as fixed family background, long-standing social roles, or innate personality traits. The OLS approach captures both long-term structural factors and short-term variations, while the first-difference model isolates the impact of return migration from other stable individual characteristics.

The first-difference estimates in Tables 4.6.1 and 4.6.2 reveal a different pattern. For males (Table 4.6.1), return migration has a positive and significant effect on the change in SWB (e.g., 0.264 in Column 1, 0.293 in Column 3), suggesting that men experience an improvement in

well-being over time after returning. This contrasts with the OLS results, which previously indicated a negative relationship. By eliminating time-invariant confounders, the first-difference model suggests that return migration does not inherently decrease male well-being—instead, the OLS results may have been influenced by unobserved pre-existing differences between migrants and non-migrants.

For females (Table 4.6.2), however, return migration does not show a statistically significant effect on changes in SWB, with coefficients fluctuating around zero (e.g., 0.166 in Column 1, -0.008 in Column 3). This suggests that while migration is associated with lower SWB in the OLS models, when accounting for individual changes over time, the negative effect disappears or weakens. This may indicate that women's lower well-being upon return is not necessarily due to migration itself but rather pre-existing gendered constraints and social expectations, which persist over time.

Across both OLS and first-difference models, health status remains a strong and significant predictor of SWB for both genders. In Table 4.5.1, for men, the coefficient for health status is 1.177, while for women (Table 4.5.2), it is 1.302, both significant at the 1% level. Similarly, in the first-difference models (Tables 4.6.1 and 4.6.2), changes in health status significantly increase SWB, emphasizing that health remains a crucial determinant of well-being, regardless of gender.

Employment also plays an important role, particularly for men. In Table 4.6.1, for males, the coefficient for changes in employment status is positive and significant (0.521 in Column 1), indicating that gaining employment after returning significantly improves SWB. However, for females (Table 4.6.2), the effect of employment is weaker and often not statistically significant, suggesting that labour market participation may not yield the same well-being benefits for women as it does for men.

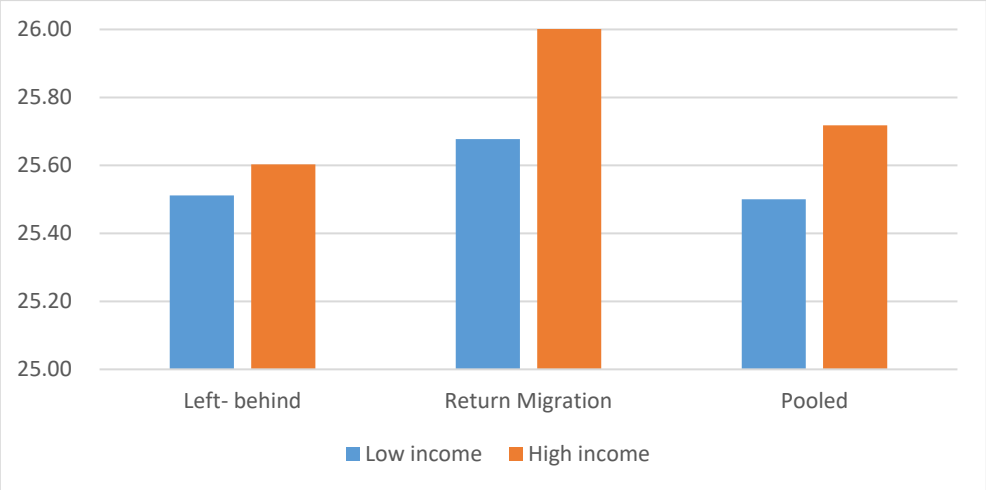
Relative income exhibits a more complex pattern. In OLS models, income has a significant positive effect on SWB for both genders, but in first-difference models, the effect weakens or disappears. This suggests that while income is strongly correlated with well-being across individuals, within-person changes in income do not necessarily translate into substantial well-being improvements—possibly due to the adaptation effect or relative income comparisons.

4.7 Mechanism test

To explore the mechanisms behind the relationship between return migration and subjective well-being (SWB), the analysis focuses on relative income as a key mediating variable.

We will calculate the median relative income for return migrants, stayer, and the overall sample, then the samples will be divided into high-income and low-income categories by medians values as thresholds, and the mean well-being scores of these two groups will be computed. The results are presented in Figure 2:

Figure 2: Mean Subjective Well-Being by Income Level



Note: The relative income threshold is defined as the median relative income for each group.

Obviously, within the stayer group, the subjective well-being (SWB) of high-income individuals (25.60) is slightly higher than that of low-income individuals (25.51). This difference is more pronounced in the return migration group, where high-income returnees have an average SWB of 26.12, which is significantly higher than their low-income counterparts (25.68). This pattern is consistent in the pooled sample, supporting the hypothesis that income positively contributes to well-being, particularly among return migrants. One possible explanation is that high-income individuals in this group have greater access to economic opportunities, social support, and social recognition, leading to higher levels of well-being. In contrast, while low-income individuals may experience some economic improvement through return migration, their happiness increases less significantly due to challenges related to social adaptation and role transitions.

To further examine the impact of income on SWB, particularly within the high-income group, we conducted a subgroup regression analysis focusing on high-income individuals. While the simple mean comparison suggests that high-income individuals generally report higher SWB than their low-income counterparts, an analysis based solely on group averages may fail to fully capture the potential causal relationship between income and SWB. Therefore, conducting regression analysis within the high-income group allows for a more precise quantification of the specific effect of income changes on SWB.

Through regression analysis, we can control for other factors that may influence SWB, such as health status, education level, and family structure, thereby better isolating the independent relationship between income and SWB. Tables 4.7.1–4.7.3 present the OLS regressions, while Table 4.8 provides the first-difference estimates.

Table 4.7.1: Determinants of Subjective Well-Being

(High income, Wave 1)

Dependent variable: SWB	**(1)**	**(2)**
Return migration	-0.407***	-0.248**
	(0.122)	(0.113)
Control Variable		
Socio-demographic characteristics	Yes	Yes
Employed	Yes	Yes
Year dummy	Yes	Yes
Number of observations	3588	3588

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.7.2: Determinants of Subjective Well-Being

(High income, Wave 2)

Dependent variable: SWB	**(1)**	**(2)**
Return migration	0.009	0.087
	(0.104)	(0.096)
Control Variable		
Socio-demographic characteristics	Yes	Yes
Employed	Yes	Yes
Year dummy	Yes	Yes
Number of observations	3588	3588

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.7.3: Determinants of Subjective Well-Being

(High income, Overall sample)

Dependent variable: SWB	**(1)**	**(2)**
Return migration	-0.174*	-0.054
	(0.094)	(0.085)
Control Variable		
Socio-demographic characteristics	Yes	Yes
Employed	Yes	Yes
Year dummy	Yes	Yes
Number of observations	7891	7891

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.8: Determinants of changes in subjective well-being (High income)

Dependent variable: Diff_ SWB	**(1)**	**(2)**
Diff_Return migration	0.361***	0.337***
	(0.106)	(0.104)
Socio-demographic characteristics		
Diff_Married	0.333	0.294
	(0.424)	(0.409)
Diff_Health Status		0.616***
		(0.071)
Economic characteristics		
Diff_Employed	0.120	0.089
	(0.137)	(0.135)
Number of observations	4352	4352

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

The regression results in Tables 4.7.1 and 4.7.2 indicate that the change in subjective well-being (SWB) among high-income returnees is particularly pronounced. In the first-difference models, the coefficients for return migration are 0.361 and 0.337, both significant at the 1% level. While OLS estimates suggest a short-term negative effect of return migration, the first-difference approach (Table 4.8) reveals a significant improvement in SWB over time for high-income individuals. This suggests that high-income returnees are better positioned to leverage economic opportunities and social resources associated with migration, facilitating a smoother reintegration process and ultimately enhancing their well-being.

Although the overall pattern aligns with the results for the full sample, a key distinction is that the coefficient for "return migration" is consistently higher for the high-income subgroup than for the total sample. This implies that high-income returnees are better able to adapt to the economic and social environment post-migration, effectively translating their migration experience into a substantial improvement in SWB. While well-being among returnees in the general sample also improves over time, high-income individuals benefit more due to greater economic resilience and stronger social capital.

Comparing high-income returnees with the full sample further reinforces the conclusion that higher income levels are associated with greater improvements in SWB after migration. Not only do high-income returnees experience a greater increase in well-being compared to their lower-income counterparts, but this effect becomes more pronounced as income rises. These findings support the conclusion that higher income is positively associated with SWB, highlighting the crucial role of economic resources and social capital in mitigating the challenges of return migration and enhancing long-term well-being.

4.7 Robustness

To validate the robustness of the empirical findings, we examine whether the definition of subjective well-being (SWB) affects the results. In this robustness check, SWB is transformed into a binary variable (high well-being vs. low well-being) using the sample median as the threshold. We then re-estimate the models using OLS regression to assess whether the findings remain consistent with the original OLS results. This approach helps verify whether the conclusions are sensitive to the way SWB is measured and categorised.

Table 4.9: Determinants of Subjective Well-Being in Rural Area: OLS Model

Group	OLS (Continuous SWB)	OlS (Binary SWB)	All Control Variables	Year dummy
Pooled Sample	β = -302***	β = -0.034*	Yes	Yes
Pooled Old Returnees	β = -360***	β = -0.040*	Yes	Yes
Pooled New Returnees	β = 0.111	β = 0.029	Yes	Yes
Wave1 Overall Sample	β = -0.504***	β = -0.056**	Yes	/
Wave1 Old Returnees	β = -0.468***	β = -0.059**	Yes	/
Wave1 New Returnees	/	/	/	/
Wave2 Overall Sample	β = -0.158	β = -0.014	Yes	/
Wave2 Old Returnees	β = -0.223	β = -0.020	Yes	/
Wave2 New Returnees	β = 0.070	β = 0.017	Yes	/

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

Table 4.10: Determinants of changes in subjective well-being

Group	FD (Continuous SWB)	FD (Binary SWB)	All Control Variables
Overall Sample	β =0.248**	β = 0.237*	Yes
Old Returnees	β = 0.268*	β = 0.267*	Yes
New Returnees	β = 0.396	β = 0.396	Yes

*Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*
Note: Clustering to household level

The results in Table 4.9 indicate that converting SWB into a binary variable does not alter the overall conclusions. Across different specifications, the sign and statistical significance of the key coefficients remain largely unchanged, suggesting that the negative effect of return migration on SWB is robust to alternative variable definitions. Specifically, for the pooled sample and old returnees, the estimated coefficients in the binary SWB model are still negative and statistically significant, though their absolute values are smaller compared to the continuous

SWB model. This is expected, as dichotomising a continuous outcome typically reduces variation and attenuates coefficient magnitudes. The new returnees, however, remain an exception. As in the original regression, their coefficients are insignificant in both continuous and binary SWB models, indicating that return migration may not have an immediate or uniform effect on their well-being.

Table 4.10 further examines changes in SWB using the first difference (FD) approach. The results show that the estimated coefficients in the FD binary SWB model are similar to those in the FD continuous SWB model, both in terms of magnitude and significance level. This suggests that the dynamic patterns of SWB change over time are not driven by how SWB is measured. Notably, for old returnees, the estimates remain highly consistent across different SWB definitions, reinforcing the notion that their well-being trajectories are relatively stable. For new returnees, while the FD estimates are still insignificant, the coefficient magnitudes remain unchanged, implying that their well-being adjustments may involve additional unobserved factors beyond migration status alone.

Overall, these findings confirm that the impact of return migration on SWB is not driven by the choice of variable definition. The consistency of the sign, significance, and relative magnitude of coefficients across models indicates that the core conclusions hold, regardless of whether SWB is treated as a continuous or binary measure. The attenuation of effect sizes in the binary model aligns with expectations, as categorisation inevitably reduces the granularity of variation. These results provide further confidence in the robustness of our analysis.

4.8 Summary

T This study examines the determinants of subjective well-being (SWB), with a particular focus on return migrants in rural China. The primary findings indicate that return migration initially has a negative impact on happiness, as returnees often face changes in living conditions, income disparities, and reintegration pressures, all of which contribute to a decline in overall well-being. Specifically, return migrants may struggle with the contrast between their previous urban living standards and rural conditions, leading to dissatisfaction and social dislocation.

Two key control variables—health status and relative income—play a crucial role in shaping SWB. When considered separately, both variables partially mitigate the negative effects of return migration, suggesting that better health and higher income improve well-being. However, when health and income are simultaneously controlled for, the negative impact of return

migration becomes statistically insignificant, implying that these two factors act as key buffers against the well-being decline associated with return migration.

To further examine the dynamic changes in subjective well-being, we employ first-difference analysis across the two survey waves. The results reveal that, over time, return migrants experience an increase in SWB, suggesting that they gradually adapt to rural lifestyles and social environments. This improvement is likely driven by stronger familial and community connections, which foster greater life satisfaction. The shift from OLS estimates (which initially suggest a negative impact of return migration) to first-difference estimates (which show a positive effect over time) highlights the role of adaptation in well-being dynamics. These findings suggest that while return migration presents short-term challenges, long-term integration into rural society can lead to an eventual improvement in life satisfaction.

Given that the majority of return migrants in the sample are male, our heterogeneity analysis focuses on gender differences in the determinants of SWB. The results indicate that men's happiness is more directly influenced by return migration and health status, whereas women place greater emphasis on family, children, and social stability. Additionally, men appear to adapt more quickly to changes in migration status than women, who may face greater social and caregiving responsibilities upon returning home. These differences underscore the importance of gender-specific policies to support return migrants more effectively.

Further analysis of income disparities reveals that higher-income return migrants exhibit consistently higher levels of well-being, reinforcing the notion that economic resources are critical in shaping life satisfaction. Compared to stayer individuals—who often face financial and social support challenges, particularly at lower income levels—return migrants, especially those with higher earnings, experience greater improvements in happiness. Additionally, health remains a significant determinant of well-being across all groups, with improvements in health status strongly associated with higher SWB scores. These findings highlight the necessity of addressing both economic and health disparities to improve the overall well-being of return migrants and stayer individuals alike.

Overall, this research provides new insights into the complex interactions between migration status, income, and health in shaping subjective well-being, filling an important gap in the literature on return migration. The findings suggest that the misalignment between return migrants' expectations of urban-like living standards and the realities of rural life contributes to

their initial decline in happiness. However, the advantages of higher income and better health can offset these negative effects, facilitating a more successful reintegration process. On a dynamic level, as return migrants adjust to rural life, their well-being tends to stabilise and even improve over time. These insights emphasise the need for targeted interventions, particularly in economic support and healthcare access, to enhance the quality of life for both return migrants and stayer populations.

Chapter 5: Conclusion, Limitations and Policy Implications

5.1 Summary of Key Findings

This thesis has examined the impact of migration on the health and well-being of family members in China, focusing on three interrelated aspects: the health outcomes of left-behind children, the Healthy Immigrant Effect (HIE) among rural-to-urban migrants, and the subjective well-being of return migrants. Each study contributes to a broader understanding of how migration shapes individual and family well-being, highlighting both economic benefits and social costs.

The first study focused on the impact of parental migration on left-behind children in rural China. Using panel data from the China Family Panel Studies (CFPS) and employing fixed-effects and instrumental variable approaches, the study provided robust evidence on how migration affects children's self-rated health, nutritional status (BMI overweight/underweight), and mental health. The findings revealed that while remittances improve children's nutrition and reduce underweight prevalence, they fail to mitigate the negative psychological effects of parental absence. Boys exhibited a higher risk of overweight due to changes in diet, while girls suffered greater mental health burdens. These results highlight the dual nature of migration's effects: while increased income alleviates some economic hardships, it does not fully compensate for the emotional and social costs of parental absence.

The second study investigated whether the Healthy Immigrant Effect (HIE) applies to China's internal migrants, testing whether rural migrants enjoy better health than urban natives upon arrival and whether their health advantage erodes over time. Using longitudinal data from the Rural-Urban Migration in China (RUMiC) database, the study examined changes in self-rated health, BMI, and chronic illness incidence among migrants compared to non-migrants. The results confirmed that migrants initially experience a health advantage, supporting the HIE hypothesis, but this advantage diminishes over time due to occupational hazards, urban stress, and limited healthcare access. Migrants working in high-stress or sedentary jobs experienced faster health deterioration, while those in physically active roles maintained their health advantage for longer. These findings underscore the importance of healthcare access and workplace protections for migrants to prevent long-term health declines.

The third study explored the subjective well-being (SWB) of return migrants, focusing on whether returnees report higher or lower life satisfaction compared to rural stayers. Using RUMiC panel data and fixed-effects regressions, the study found that return migration has heterogeneous effects: some returnees benefit from economic security and strong family ties, leading to higher well-being, while others struggle with job insecurity and social reintegration, leading to lower happiness levels. A key finding was that relative income plays a crucial role: returnees who compare themselves to local villagers feel wealthier and more satisfied, while those who compare themselves to their former urban peers experience lower well-being due to downward mobility. The study also found that social reintegration plays a critical role, with returnees who maintain strong family networks and community engagement reporting higher well-being.

Together, these three studies provide a comprehensive picture of migration's effects on different family members, highlighting the trade-offs between economic gains and social costs at each stage of the migration cycle. The findings emphasize that migration policies should not only focus on economic benefits but also address mental health, social integration, and well-being of affected individuals and families.

5.2 Limitations and Future Research Directions

This dissertation has several limitations that open avenues for future research. First, while the study on left-behind children provides strong evidence of the negative psychological impact of parental migration, it does not fully account for variation in caregiving arrangements. Some children are left in the care of grandparents, other relatives, or boarding schools, and these different arrangements could significantly influence health outcomes. Future research could investigate how different caregiving structures impact children's well-being, particularly in terms of nutrition, education, and emotional support. Additionally, this study focuses on teenager term effects, but longitudinal tracking of left-behind children into adulthood would provide deeper insights into the long-term consequences of parental migration on life outcomes, labour market participation, and family formation.

Furthermore, although the study employs an instrumental variable (IV) approach to address endogeneity concerns in estimating the effect of parental migration on child health, the robustness of the IV could be further tested. While migration networks serve as a reasonable instrument, additional robustness checks—such as using alternative instruments or placebo

tests—could further strengthen the causal claims. One potential limitation is that migration networks might not be entirely exogenous, as they may correlate with other unobserved regional characteristics, such as local economic development, public infrastructure, and healthcare availability, which could also influence child health outcomes. Future studies could explore alternative IV designs, such as using historical migration trends or policies affecting migration patterns, to enhance the credibility of causal inference.

Additionally, in the regression analysis, the selection of control variables could be further refined. While the study controls for household and child characteristics, some unobserved factors—such as caregiver parenting styles, household stress levels, and local healthcare access—may introduce omitted variable bias. Including more detailed indicators of household environments (e.g., parental mental health, caregiving intensity, or school quality) would provide a more comprehensive understanding of how migration affects child well-being.

Second, while the Healthy Immigrant Effect (HIE) study establishes that migrants initially enjoy a health advantage, the mechanisms behind health deterioration remain underexplored. What specific lifestyle changes contribute to declining health? Is it poor diet, increased stress, workplace hazards, or a combination of factors? More detailed qualitative research on migrant workers' lived experiences, including dietary habits, work conditions, and healthcare-seeking behaviours, would be valuable.

A significant limitation of this study is that it does not fully account for the role of income and economic status in explaining migrant health deterioration. While the analysis includes job type and workplace conditions, income is not explicitly modelled as a mediating factor. Migrants who experience greater wage growth may have better access to healthcare, higher-quality food, and safer living conditions, while those in low-paying, high-stress jobs may suffer from greater exposure to health risks. Future studies should incorporate income as a key explanatory variable and investigate whether income levels moderate the rate of health deterioration. Specifically, a decomposition analysis could be used to separate the effects of occupational conditions and income growth on migrant health, shedding light on whether income growth mitigates or exacerbates health deterioration. Expanding the analysis to include psychosocial stressors—such as job insecurity, discrimination, lack of social mobility, and work-life balance—would provide a more complete picture of how urban environments shape migrant health. Additionally, the role of healthcare accessibility should be explored further. While it is well-documented that migrants face barriers to healthcare due to the hukou system, a more nuanced analysis of which

subgroups of migrants (e.g., different age groups, industries, or education levels) experience the greatest healthcare gaps would help refine policy recommendations.

Third, the study on return migrants highlights the role of relative income in shaping well-being, but it does not fully capture the dynamics of social mobility. Some returnees may experience temporary economic struggles before adjusting to rural life, while others may face persistent disadvantages. Future research could explore the long-term economic trajectories of return migrants, including their entrepreneurial activities, re-entry into the agricultural workforce, and access to rural credit markets. A key question that remains unanswered is whether returnees eventually regain their pre-migration economic status or remain in a state of economic precarity after returning. Tracking returnees over a longer period would provide deeper insights into the long-term economic implications of return migration.

Additionally, a gendered analysis of return migration could provide deeper insights into how male and female returnees face different reintegration challenges based on labour market opportunities, social expectations, and family obligations. Women, for example, may face greater difficulties re-entering the workforce due to childcare responsibilities or gender norms in rural areas, while men may experience greater pressure to contribute economically but face limited job opportunities. Expanding the analysis to include gender-specific labour market reintegration patterns could enhance our understanding of the social dimensions of return migration.

Another area for future research involves the psychological and emotional adjustments of returnees. While the study focuses primarily on subjective well-being in terms of life satisfaction and income comparisons, more nuanced mental health indicators—such as depression, anxiety, and stress levels—should be included in future studies. Returnees who struggle with reintegration may experience higher rates of mental health issues, particularly if they feel socially alienated or unable to reintegrate into rural life after living in urban areas for an extended period.

Finally, future studies should examine the impact of digital communication and technology on return migration outcomes. As mobile technology and social media platforms become more prevalent, returnees may maintain urban networks and job contacts, potentially facilitating new business opportunities or part-time urban employment. Examining whether returnees with stronger digital connectivity experience better economic outcomes and social reintegration

could provide policy-relevant insights into how digital tools can help smooth the reintegration process.

5.3 Policy Contributions and Recommendations

The findings of this dissertation have significant policy implications for migration management, rural development, and social welfare programmes. Addressing the challenges faced by left-behind children, improving healthcare access for migrant workers, and facilitating the reintegration of return migrants should be key priorities in policy design.

First, expanding mental health services in rural areas is crucial for mitigating the adverse psychological effects of parental migration on left-behind children. Establishing school-based counselling programmes, peer support networks, and mobile mental health clinics would provide essential emotional and psychological support. In addition, nutrition policies should be designed to address both underweight and overweight risks among left-behind children. Ensuring balanced dietary interventions and improving the nutritional quality of school meals would help mitigate the negative effects of inadequate parental supervision on children's health. Furthermore, policies that promote family reunification should be considered. Introducing temporary urban residence permits for migrant children or offering incentives for employers to adopt family-friendly work arrangements could help reduce the long-term emotional costs of parental migration.

Second, ensuring better healthcare access and working conditions for migrant workers is essential for safeguarding their well-being. The expansion of urban healthcare provision for non-hukou residents should be a priority, enabling migrants to access preventive care, routine health screenings, and comprehensive insurance coverage. In addition, workplace health programmes should be introduced, focusing on occupational safety, stress management, and nutrition education. Such initiatives would help mitigate the risks associated with hazardous working environments and physically demanding labour. Improving housing policies is also necessary to ensure that migrant workers are not forced into overcrowded and unsanitary living conditions, which significantly contribute to long-term health deterioration.

Finally, supporting return migrants requires a multi-dimensional approach that addresses both economic and social reintegration. Job creation programmes in rural areas should prioritise skills-based employment opportunities rather than relying solely on traditional agriculture, which may not be sufficient to sustain returning workers in the long term. Encouraging

entrepreneurship among return migrants could provide alternative pathways to economic stability, with policies supporting access to microfinance, rural business incubators, and targeted training programmes. In addition to economic measures, social reintegration programmes should be developed to facilitate returnees' transition back into their communities. Community-building activities, rural leadership training, and peer mentorship initiatives could play an important role in fostering a sense of belonging and reducing the risk of social isolation upon return.

These policy interventions, if implemented effectively, could help mitigate the economic and social costs of migration while ensuring that both migrants and their families experience improved well-being. A comprehensive policy framework that integrates healthcare, employment, and social support mechanisms would be instrumental in addressing the challenges faced by migrants at different stages of the migration cycle.

5.4 Final Thoughts

This dissertation provides a comprehensive and multidimensional analysis of how migration affects different family members, integrating insights from three interrelated studies. While migration offers significant economic opportunities—such as higher wages, improved living standards, and enhanced financial security—it also imposes substantial social and psychological costs, which can have long-term implications for the well-being of individuals and families. By examining migration at different stages of the migration cycle—parental migration and its impact on left-behind children, the health of migrant workers, and the subjective well-being of returnees—this study presents a holistic perspective on the consequences of migration in China. The findings reinforce the necessity of developing migration policies that extend beyond economic incentives to encompass social protection, family support mechanisms, and mental health interventions.

One of the key contributions of this dissertation is its multi-level approach, which highlights the diverse ways in which migration reshapes family life. For left-behind children, the economic benefits of migration—particularly through remittances—are insufficient to compensate for the psychological costs of parental absence. The results suggest that while financial transfers improve material well-being, they do not alleviate the emotional distress and social isolation experienced by children growing up without parental care. For migrant workers, the study confirms the presence of the Healthy Immigrant Effect (HIE) upon arrival in urban areas but

also demonstrates how this health advantage deteriorates over time due to factors such as hazardous working conditions, heightened urban stress, and limited access to healthcare services. Finally, for return migrants, the findings indicate that subjective well-being is strongly influenced by relative income comparisons and reintegration challenges. Returnees who compare themselves to their urban peers often experience dissatisfaction and stress, whereas those who perceive themselves as relatively better off within rural contexts report higher well-being.

These findings suggest that while migration can serve as a mechanism for economic mobility, it also introduces new vulnerabilities that require targeted policy interventions. The study underscores the need for migration policies that balance economic development with social protection, ensuring that migrants and their families do not bear disproportionate costs in pursuit of better opportunities. The dual nature of migration—promoting economic growth while simultaneously exacerbating social inequalities—must be carefully managed through well-designed government programmes and community-based initiatives.

As China continues its process of urbanisation and economic modernisation, migration will remain a defining force in shaping the country's social structures and development trajectory. However, current migration policies often fail to address the social dimensions of migration, focusing predominantly on labour market efficiency and economic growth. Future policy efforts must place greater emphasis on the well-being of migrant families, recognising that economic progress cannot come at the cost of human welfare. Expanding mental health services for left-behind children, improving social protection mechanisms for migrant workers, and fostering rural development initiatives for return migrants will be critical to mitigating the adverse effects of migration and ensuring long-term family stability. By incorporating these considerations into migration policy, China can achieve more equitable and sustainable development while safeguarding the well-being of its migrant population and their families.

Appendix

Psychological Well-Being Indicators (CES-D Questions)[3]

The following six questions from the CFPS child module are adapted from the Center for Epidemiologic Studies Depression Scale (CES-D) and used to assess children's psychological well-being:

1. Feeling depressed and unable to cheer up (WQ601)
2. Experiencing frequent anxiety (WQ602)
3. Feeling agitated and unable to stay calm (WQ603)
4. Having a hopeless outlook on the future (WQ604)
5. Finding everything difficult (WQ605)
6. Feeling that life has no meaning (WQ606)

Each item is rated on a five-point scale, where 1 = almost every day and 5 = never. The scores are summed to generate an overall SPM index, where higher values indicate better psychological well-being.

General Health Questionnaire (GHQ-12)[4]

1. When you are doing something, do you find that

(1) Can concentrate; (2) Attention occasionally diverted; (3) Attention sometimes diverted;

(4) Attention frequently diverted, cannot concentrate

2. Do you often lose sleep over worry?

(1) Not at all; (2) Occasionally; (3) Fairly often; (4) Very often

3. Can you play a useful part in things?

(1) Always can; (2) Can play some positive roles; (3) Can play positive roles poorly;

[3] Source: CFPS 2007
[4] Source: RUMiC 2007

(4) Cannot play a positive role

4. Are you capable of making decisions?

(1) Always have own opinions; (2) Sometimes have own opinions; (3) Do not have many own opinions; 4) Do not have any personal opinion at all

5. Are you constantly under strain?

(1) Never; (2) Sometimes; (3) Fairly often; (4) Very often

6. Do you feel you couldn't overcome difficulties?

(1) Never; (2) Sometimes; (3) Fairly often; (4) Very often

7. Are you able to enjoy day-to-day activities?

(1) Very interesting; (2) Fairly interesting; (3) Not very interesting;

(4) Not interesting at all

8. Are you able to face problems?

(1) Never; (2) Seldom; (3) Sometimes; (4) Always

9. Do you feel depressed?

(1) Not at all; (2) A little bit; (3) Fairly seriously;

(4) Very seriously

10. Do you always lack confidence?

(1) Not at all; (2) A little bit; (3) Fairly seriously;

(4) Very seriously

11. Do you often think that you have no value?

(1) Not at all; (2) A little bit; (3) Fairly seriously; (4) Very seriously

12. Are you happy when you consider each aspect of your life?

(1) Very happy; (2) Fairly happy; (3) Not very happy; (4) Not happy at all

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