Parental Migration in Childhood and Individual Wellbeing in Adulthood

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Abstract

Parental absence due to parental migration has been a prevalent phenomenon in developing countries, occurring on an exceptionally large scale in China. While previous literature focused on the concurrent effects of parental migration on children, this study aims to investigate whether the impact of parental absence during childhood is long-term and lasts into adulthood. This study examines how individuals with childhood experience of parental absence differ from their counterparts in their early adulthood, in terms of their mental wellbeing, physical health, and cognitive ability. This study uses a sample of 6031 individuals aged from 18 to 30 years old from a nationally representative dataset China Family Panel Studies. The results show that the childhood experience of both-parental absence is negatively associated with individual's mental and physical health while positively associated with cognitive ability in their early adulthood.

Keywords Parental Absence · Long-Term Effect · Migration · Wellbeing · China

Introduction

From a human development perspective, as childhood is a critical early stage for individual development, many scholars in different fields have been stressing the long-term consequences of childhood circumstances (Case et al., 2005; Hayward & Gorman, 2004; Palloni et al., 2009). Family is supposed to be a nurturing and protective environment for children, where parents are the main caregivers and provide children with nutrition, love, and knowledge that enable children to develop well physically, mentally, and cognitively. However, a large number of children have experienced the absence of parents during childhood. Parental absence may be caused by various reasons, including parental death, orphanage, single parenthood, parental separation and divorce, and

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parental migration. As parents provide the initial environment for the growth of individuals, it is crucial to understand how the experience of parental absence during childhood exerts an impact on individual development outcomes in the long run.

The role of family in children's development has been a major area of research (Lee & McLanahan, 2015). Scholars have found that children living with both of their biological parents generally fare better than those not living with both biological parents, in many respects of their lives, such as physical health, mental wellbeing, educational and occupational attainment, as well as their own family lives in adulthood (Amato, 2000, 2010; Aquilino, 1996; Fomby & Cherlin, 2007; Furstenberg et al., 1983; Gaydosh & Harris, 2018; Härkönen et al., 2017; McLanahan et al., 2013; Osborne & McLanahan, 2007).

In the context of developing countries, parental absence has been prevalent in recent decades, mainly due to parental migration, as labour migration has been a constant large trend in developing countries. The situation of children coping with parental absence due to migration would be very different from that in the case of divorce and may lead to different results, as parents working away from home are not divorced and families are still intact though not living together. Meanwhile, parents working away from home may often earn a higher income and thus can provide more economic resources for the children left behind at home. There is research literature showing insignificant or positive effects of parental migration and absence on children's wellbeing, in terms of physical, mental, and cognitive outcomes. However, the negative effects of parental absence documented in the context of parental separation and divorce were also found in the context of parental migration in the main body of the literature.

As previous studies focus on the effect of parental migration and absence on children development, it is worth examining whether the effect is long-term and lasting even in their adulthood, leading to their life outcome different from people who spend more time together with their parents during childhood.

However, research has not discussed the long-term effect of parental migration and absence on individual development, i.e., whether parental absence during childhood influences individual's outcomes and achievements in later lives in various aspects including mental and physical health, and cognitive achievements. As these questions are still under-investigated, this study addresses the research gap by examining the long-term effect of parental absence on individuals' well-being and life outcomes in terms of mental and physical health, and cognitive ability.

To study these questions, China is chosen to be the research setting. China, the biggest and most populous developing country in the world, has witnessed rapid economic development and tremendous social transformations in the past decades. With a large scale of urbanisation and industrialisation, there has been a massive internal migration of labour force in the country, from rural to urban areas, from smaller cities to bigger cities, and from the less developed hinterland to more advanced coastal regions. In 1982, there were only around 6.5 million migrants out of the total population of 1 billion, while the size increased

to around 221 million in a country of 1.3 billion people in 2010 (Liang, 2016). While a large number of migrants try to make a better living by finding jobs with higher payment in places other than their hometown, their families are facing the challenges of living separately, especially the children. Due to institutional and many other obstacles, it has been difficult for migrant workers to take their children to move and live with them in the town or city in which they work. Thus, many children have become "left-behind" by their parents and live with their grandparents, other relatives, caregivers or even by themselves at home. According to the 2010 Population Census in China, there were over 61 million left-behind children, including those living with one parent (Wang et al., 2017).

Among the great number of children who have been affected by this large-scale internal labour migration in China, those left behind by their parents at home seem to generally fare worse compared with their counterparts who can migrate and live together with their migrant parents. According to previous empirical studies, left-behind children tend to have more housework load and less time for study, sports, or leisure (Chang et al., 2011), unhealthy habits and behaviours (Gao et al., 2010; Yang et al., 2016), more mental problems due to the lack of parental care and communication (Zhao & Guoliang, 2016; Wu et al., 2015; Hu et al., 2014), higher risk of internet addiction and depression (Su et al., 2013; Liu et al., 2010; Guo et al., 2015; He et al., 2012; Shi et al., 2016), and poorer educational outcomes (Hu, 2012, 2013; Li et al., 2017; McKenzie & Rapoport, 2011; Zhao et al., 2014; Zhou et al., 2014). Although most research finds a negative effect of parental migration and absence on children's development and well-being, there are also inconsistent, unobvious, or even positive results (Ren & Treiman, 2016; Shen et al., 2015; Wen et al., 2015; Xu & Xie, 2015; Zhou et al., 2015).

While previous studies focus on the concurrent impact of parental absence on children, no research has investigated the outcomes of left-behind children in the longer term. Since the migration trend from the 1980s to now, among the individuals who once had experienced parental migration and absence during their childhood, some of them have now become adults. How have they been in their adulthood? Does the childhood experience of parental absence still have its influence and make this group of people more vulnerable than their counterparts?

As this is a large-scale phenomenon affecting a great number of people, it is imperative for researchers, policy-makers, and the general public to address these issues.

In this study, by identifying the long-term impact of parental absence on people's well-being in the general population, we could have better insights and understanding of the issue, and help formulate better social policies to improve people's welfare, for both urban families and rural families who become disadvantaged due to institutional barriers and rapid social and economic transformations.

Theoretical Background and Research Questions

Family, Parents, and Individual Development

It has also been theorised, emphasised and widely documented in many studies that individual characteristics, parental education, material resources, social capital, social support and relationships, positive health behaviours and family environment are crucially related to individuals' development and wellbeing. Both **family stress model** and **family investment model** underscore that economic and social resources are closely linked to the development of both children and wellbeing of adults (Conger et al., 2007), and economic hardship and financial difficulties often exacerbate family stress, which in turn leads to a higher risk of physical, emotional, behavioural problems, and lower cognitive development for children (Evans & English, 2002; McLoyd, 1998; Oakes & Rossi, 2003). In addition, parents with greater educational achievements would often invest more resources in children's education, and facilitate the development of cognitive functioning and human capital of their offspring from childhood into the adult years (Hoff, 2003; Mezzacappa, 2004).

In addition, parental acceptance-rejection theory postulates that experiences of parental rejection, such as neglect, could have negative consequences on children's wellbeing that could extend into adulthood and old age (Rohner et al., 2012). In this sense, the neglect caused by parental absence would have a negative impact on the left-behind children's wellbeing, and the effect may extend into their adulthood.

Early Attachment, Separation, and Later Outcomes

According to the attachment theory, an individual has an internal working model of the world, in which the working models of self and attachment figure are prominent and complementary, acquired through their prior social interactional experiences and patterns (Bowlby, 1973). If the children's need for both protection and independent exploration of the environment is respected by their attachment figure, the children tend to construct an internal working model of valued self; but if their needs are otherwise frequently neglected by the parents, the children tend to develop an internal working model of self as unworthy or incapable. The construction of working models lays a foundation for individuals' interpersonal behaviour patterns and interpretation of social interactions, which have important consequences in their later life. As the interaction experiences with the caregivers in the early years form the basis of the internal working model, Bowlby indicated the great influence of family micro-culture on the inheritance of mental health or illness, probably even greater than genetic inheritance (Bretherton, 1992).

Substantial research evidence over the decades has shown that early secure attachment is associated with better emotion regulation capabilities and social competence (Cassidy et al., 2013; Cassidy, 1994; Sroufe et al., 2005; Thompson, 2008). A secure tie with parents throughout childhood is essential for the acquisition of life skills and the development of confidence, as responsive parents can provide a secure base from which the children can boldly explore the environment and return for reassurance

(Ainsworth, 1982), which in turn facilitate the development of positive self-perception (Bowlby, 1973; Hazan & Shaver, 1987; Reis & Shaver, 1988). People who have an early secure attachment experience with caregivers tend to form working models of other people as supportive, and this perception of social support availability in adulthood again provides a safety net that allows more active exploration and experimentation in life and thus facilitates the acquisition of self-confidence, skills, and coping strategies (Sarason et al., 1990; Cutrona et al., 1994; Sarason et al., 1986). Whereas, as Bowlby posited that major repeated and continuous threats of rejection or abandonment by parenting figures and other adverse family experiences may cause excessive separation anxiety in children and considerable risk for unfavourable development, early adversity and disorganised attachment were found to be markedly predictive of later psychopathology and emotional difficulties (Carlson, 1998; Main et al., 2011; Van Ijzendoorn et al., 1999).

There has been also research on the linkage between early attachment and later health outcomes. The longitudinal study by Puig et al., (2013) documented that individuals identified as insecurely attached to mother at 18 months have a higher likelihood of reporting physical illnesses 30 years later. Studies also found that early insecure attachment was linked to higher rates of obesity in later years (Anderson & Whitaker, 2011; Anderson et al., 2012). A conceptual research model with empirical support proposes that early psychosocial experiences may become biologically embedded at the molecular level and impact later immune system functioning (Miller et al., 2011), and early adverse experiences may lead to neuroendocrine dysregulation and chronic inflammation, which is related to a range of ageing-related illnesses, such as cardiovascular disease, autoimmune diseases, and certain types of cancer (Chung et al., 2009; Cassidy et al., 2013). Evidence shows that early interactional experiences and attachment with caregivers influence the regulation of the HPA axis such as cortisol reactivity and diurnal cortisol rhythms, which is a system central to the body's stress response, inflammatory response, and immune system functioning (Gunnar & Quevedo, 2007; Luijk et al., 2010; Spangler & Grossmann, 1993; Adam et al., 2007). Besides, early warm experience of maternal care plays a protective role in buffering the impact of early adversity on later health (Chen et al., 2011). Research has also documented that attachment security is associated with better school readiness and adjustment in school as well as academic performance (Granot & Mayseless, 2001; Cassidy et al., 2013; Cutrona et al., 1994), as better coping and prosocial skills are able to enhance the executive functioning and facilitate acquisition of cognitive skills and learning (Bernier et al., 2012; Jacobsen et al., 1994; Sarason et al., 1986).

Life Course Perspective and Long-Term Consequences of Early Adversity

As suggested by the life course perspective, it is crucial to take a long-term view and consider the timing of the life events when studying the developmental processes and outcomes, and prior experiences presumably have influences on later life outcomes (Mayer, 2009; Elder et al., 2003). There has been a range of literature studying the long-term impact of early life conditions on individual development

and life-cycle wellbeing, demonstrating how early adversity and toxic stress can lead to later impairments in physical and mental well-being, learning, and behaviours (Currie & Rossin-Slater, 2015; Shonkoff et al., 2012; Mayer, 2009). Previous life course research has documented that health in adulthood is associated with early life conditions, and is affected by exposures to health-related stressors and risks for those disadvantaged populations with enduring economic strain and discriminatory experiences (Halfon & Hochstein, 2002; Pearlin et al., 2005). Poulton et al., (2002) use evidence from New Zealand and find that childhood experience of socio-economic disadvantage is associated with poorer health in adulthood. Another study based on New Zealand data has shown childhood maltreatment and early life stress are associated with a higher risk of inflammation and poorer health in adulthood (Danese et al., 2007). Ferraro et al., (2016) also reveal in their research based on the US dataset that childhood socioeconomic disadvantage and frequent parents abuse tend to associate with health problems in childhood, fewer social resources and lifestyle risks in adulthood, which in turn are related to the development of new health problems in adulthood. Oshio et al., (2010) draw on nationwide survey data from Japan and show that individuals with poorer family conditions in childhood would have lower educational attainment, higher poverty risks, poorer health, and feel less happy. Researchers have also found child abuse and neglect have long-term consequences on the economic wellbeing of individuals in their adulthood (Currie & Widom, 2010).

Resilience and Positive Development

From the perspective of the life course, the experience in childhood could impact their later life. From the aforementioned literature regarding the important influence of early childhood experience on later outcomes, adversity could be a factor with the negative consequence (McDermott et al., 2012; Suor et al., 2015; Tomalski & Johnson, 2010). Nevertheless, there is still some other literature on early adversity that suggests evidence in the opposite direction that the adversity may boost positive development later, resembling the posttraumatic growth and resilience in individual development (Linley & Joseph, 2004; Butler, 2010; Joseph et al., 2005; Malhotra & Chebiyan, 2016). For instance, some research has shown that childhood adversity can actually enhance certain aspects of cognitive performance and executive functioning in adults (Mittal et al., 2015). "Resilience is defined as the capacity of a system to adapt successfully to significant challenges that threaten its function, viability, or development" (Masten, 2018). Zimmerman et al., (2013) state that resilience occurs when environmental, social, and individual factors that are promotive factors which interrupt the trajectory from risk to pathology. In this sense, resilience theory could help us understand why some youths grow up to be healthy adults despite adverse circumstances or risk exposure (Zimmerman et al., 2013). Thus, while the other theories predict that children separated from their parents at a young age will experience negative consequences, it is not out of the question that we may find that in some (or even all) aspects of wellbeing, children who have been separated from

their parents will "bounce back" and do even better than children who have never experienced separation.

Parental Absence and Individual Wellbeing in China

Wellbeing refers to the state of being happy, healthy, or prosperous. More generally, well-being could include diverse aspects of development outcomes in an individual's life, such as having good mental health status, good physical health status, and the ability of cognition (Statham & Chase, 2010). Therefore, this study explores the research questions about how childhood experience of parental absence will impact life outcomes in adulthood, including mental health, physical health, and cognitive ability.

According to the theories of family and wellbeing, family environment and parents play crucial roles in promoting individuals' wellbeing and development outcomes. Based on the theoretical background of attachment theory, secure attachment bonds with parents are essential for one's wellbeing while separation from parents may cause insecurity and anxiety, which could have long-term detrimental consequences for individuals. Although early adversity may result in negative later outcomes, there are also scenarios that individuals may be resilient and have positive development especially when there are promotive factors that may help buffer the influence of adversity.

The theoretical background and empirical evidence in the previous literature about the influence of early attachment and adversity experiences on mental health condition, physical health condition, and acquisition of cognitive skills provides an initial empirical basis for us to further pursue this line of research and to provide evidence about the linkage between early experience with parents and later outcomes in adulthood, situated in a different cultural context, i.e., migration and family separation in China. Against the backdrop of the great migration tide in China, people migrate to work, live away from home, and in many cases leave their children behind at home without taking them to move and stay together in the destination cities. While it is critical for children to stay with parents and to form consistent secure ties with them, these left-behind children with the experience of separation from parents during childhood may hardly be able to find this close attachment with parents as their secure base to satisfy their needs for warmth and comfort as well as support for bold exploration of the outside world. The lack of this early secure attachment experience in childhood may well exert a lasting impact on individuals' growth and development and thus have consequences in their later outcomes in adulthood. On the other hand, however, those migrant parents may earn higher income and probably invest more in children's education and development, which may buffer the negative influence of their absence and may even boost the positive development of their children.

This controversy relating to the influence of parental absence on induvial deployment is one of the rationales for this study. As both socioeconomic resources and close parent–child relationships play important roles in individual development and wellbeing, the paradox or trade-off exists between parents' migration for work

purposes to obtain better economic resources (*money*) and children's lack of companionship due to separation from parents (*time*).

Thus, taking a long-term view in line with the life course perspective, this study raises the research question: whether and how does parental absence in childhood influence individuals' wellbeing in adulthood, specifically their mental health, physical health, and cognitive ability?

Data and Methods

Data

The data used in this study is from the China Family Panel Studies. Specifically, the sample in this study includes 6031 adults aged from 18 to 30 years old from the 2010 CFPS survey, who were born in or after 1980, since China's reform and the internal labour migration began. Thus, these adults might have experienced parental migration and absence during childhood.

Measures

Dependent Variables

Several dimensions of individual development outcomes are employed as the dependent variables in this study: mental health, physical health, and cognitive ability. The measures in this study include two subjective indicators, including mental and physical health, and also one objective indicator, cognitive ability.

Mental Health Status Mental health is a key dependent variable used to measure individual wellbeing. Mental health is measured by a set of questions relating to symptoms of depression, based on the Kessler K6 mental distress scale (Prochaska et al., 2012) which is widely used in the study of psychological health. CFPS 2010 applied a psychological scale consisting of six items to measure the mental state of adults and children aged above 10 years old. The items ask respondents to evaluate their perception of depressive mood, including whether they "feel depressed and cannot cheer up no matter what you are doing", "feel nervous", "feel upset and cannot remain calm", "feel hopeless about the future", "feel that everything is difficult", "think life is meaningless". The respondent has been asked to report the frequency of having these feelings in the past month, on a 5-point Likert scale (from "almost every day" to "never"). The items have high internal consistency, showing that all six questions relate to a single dimension and meet the needs of general analysis. The aggregate score of these six items is then used as a measure of the respondent's mental health status, ranging from 6 to 30, with the higher score showing a less depressed and healthier mental health status. Apart from using the aggregate score, this study further conducts robustness checks using the Cronbach alpha score of the six indicators to corroborate the results.

Physical Health Status To measure physical health, the respondent's self-rated health status is used as the measure of the variable. The item is reflected by a 5-point Likert scale (healthy to very unhealthy); the options are then reversely recoded as "1" for "very unhealthy", "2" for "unhealthy", "3" for "relatively unhealthy", "4" for "fair", "5" for "healthy".

Cognitive Ability To measure cognitive ability, the 2010 CFPS baseline survey has applied the word test and math test to assess and evaluate cognitive ability. The aggregate score of the word test and the math test is used to represent the cognitive ability of the individual, ranging from 0 to 58.

Independent Variable

Childhood Experience of Parental Absence This variable is about whether the individual had the experience of both parents working away from home and not living with them before age 12 during their childhood. In the CFPS 2010, questions regarding the period of parents were not living together with the child before age 3 and during ages 4 to 12 were asked and thus can be combined to create the variable "childhood experience of parental absence", which is coded as a binary variable with "0" representing "no parental absence during childhood before age 12", and "1" indicating "experienced parental absence before age 12".

Control variables

As many other factors may influence an individual's wellbeing, including individual characteristics, socioeconomic status, family environment, and broader social environment, this study uses several control variables.

The definitions and descriptive statistics of the explanatory variables in the analytical sample of adults are presented in Table 1, showing the mean or percentage of the variable value distribution for the group of individuals who had experienced parental absence in childhood and the group who did not have the experience, respectively. There are very few missing values in the sample, as many variables have no missing values and some variables have only fewer than 1% missing values. For some other variables that have a higher percentage of missing values, the highest percentage is 6.38% for the variable **family income,** which is still in a relatively small and acceptable range. The information is missing randomly due to the unavailable response by the respondents to the questionnaire, and this would not cause a significant influence on the results. Thus, the missing cases were omitted from the analysis.

Analytic Strategy

Multiple linear regression is used to examine the effects of independent variables on an individual's mental, physical, and cognitive outcomes. The model estimations are represented by the following equation, with β representing the estimated coefficients, and ε as the error term.

Table 1 Definitions and descriptive statistics of the explanatory variables

Variables	Definition	Mean (S.D.) or percentage		
	(Range / Category)	Total sample	Parental absence	Parental presence
Childhood experience of parental absence	Yes = 1	19.58%	100%	-
	No = 0	76.04%	-	100%
Male	Male = 1	47.01%	46.99%	47.03%
	Female = 0	52.99%	53.01%	52.97%
Age Urban residence	18–30 years old	23.95 (3.70)	23.69 (3.70)	24.06 (3.69)
	Urban = 1	47.52%	44.37%	48.98%
	Rural = 0	52.48%	55.63%	51.02%
Father's education (1–7)	Illiterate / semi-illiterate = 1	2.61 (1.12)	2.64 (1.12)	2.62 (1.12)
Mother's education (1–8)	Primary school = 2	2.13 (1.11)	2.10 (1.12)	2.16 (1.11)
Education (1–8)	Junior high school = 3	3.29 (1.24)	3.25 (1.19)	3.34 (1.25)
	Senior high school = 4			
	2- or 3-year college = 5			
	4-year college/bachelor's degree = 6			
	Master's degree = 7			
	Doctoral degree = 8			
Number of siblings	0–8	1.38 (1.19)	1.40 (1.10)	1.36 (1.21)
Family income	In Chinese Yuan (5–2042105)	44311.68 (71943.97)	45903.19 (100169.8)	44472.41 (64430.19)
	Log family income (1.61–14.53)	10.27 (0.92)	10.26 (0.93)	10.29 (0.91)
Having a job	Yes = 1	49.21%	50.21%	48.74%
	No = 0	46.06%	44.62%	46.84%

Table 1 (continued)

Variables	Definition	Mean (S.D.) or percentage		
	(Range / Category)	Total sample	Parental absence	Parental presence
Marital status	Never married = 1	48.40%	48.18%	48.52%
	Married = 2	50.21%	50.80%	49.93%
	Cohabitation = 3	0.66%	0.59%	0.70%
	Divorced = 4	0.60%	0.34%	0.70%
	Widowed = 5	0.08%	-	0.11%

In the analytical sample of adults, the age range is 18–30 years old. $N=6031$. Data are from the CFPS 2010. Family income refers to the total calculation of the five parts of income of the household, i.e., wage income, total business income, property income, transfer income, and other income from all the family members who are economically connected

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon$$

Y refers to individual's mental, physical, and cognitive outcomes; x_1 represents "parental absence" ("no parental absence before age 12" as reference category); x_2 represents individual characteristics, i.e., gender and age; x_3 represents the family environment and parents' characteristics (i.e., parents' education level, urban or rural residence, and the number of siblings); and x_4 represents individual's education level and family income at the current stage. This study first uses Ordinary Least Square (OLS) regression to examine the effects; specifically, nested regression models are utilized to estimate the effects of independent variables on dependent variables.

To corroborate the validity of the results and deal with the endogeneity issue due to unobserved or confounding variables, this study uses the propensity score matching (PSM) approach (Abadie & Imbens, 2016; Heckman et al., 1998; Rosenbaum & Rubin, 1983) to further estimate the linkage between early parental absence and later outcomes, which could help reduce the bias by 58 to 96 per cent (Shadish et al., 2008). As the differences between individuals who had early parental absence experience and those who did not may result from factors that influenced the parents' decision to migrate other than the parental migration and absence per se, such as parental education level, it is important to extract and distinguish the influence of the parental migration and absence from other factors. The PSM method is therefore used to achieve this purpose, by matching the individuals in the treatment group (who had the parental absence experience) with the individuals in the control group (who did not) based on selected individual and family characteristics and then comparing the outcome differences between the two matched samples. To do so, the probability or propensity of the individual receiving the treatment, i.e., experiencing parental absence, is first estimated by regressing the treatment variable (parental absence) on other covariates (individual and family characteristics), and the estimated results are propensity scores, which are then used to match each individual in the treatment group to the nearest neighbour in the control group, i.e., the individual having the closest propensity score. In this sense, as the individuals in both groups are almost identical in all aspects except for whether or not having received the treatment itself, the differences in the outcomes between the two groups can be attributed to the effect of the treatment, i.e., parental absence experience (Lu & Treiman, 2011; Xu & Xie, 2015; Zhou et al., 2014). The mean of the differences between the matched nearest neighbours, termed as the average effect of the treatment on the treated, is thus estimated, and the estimated value is considered as the effect of the parental absence experience on individuals' outcomes in this study.

OLS Results

Parental Absence and Individuals' Mental Health

This section first examines the linkage between parental absence during childhood and individuals' mental health in adulthood. Table 2 demonstrates the OLS

	Dependent variable: Mental health		
Table 2 Regression estimates of parental absence on mental health status	Model 1	Model 2	Model 3
Parental absence	-0.844***	-0.842***	-0.834***
	(-8.28)	(-8.06)	(-7.61)
Gender (ref = female)	0.119	0.095	0.229**
	(1.45)	(1.12)	(2.51)
Age	0.558***	0.531***	0.311*
	(3.46)	(3.25)	(1.75)
Age^2	-0.011***	-0.011***	-0.007**
	(-3.38)	(-3.15)	(-2.05)
Father's education		0.032	0.015
		(0.74)	(0.31)
Mother's education		0.011	-0.002
		(0.23)	(-0.04)
Urban residence		0.018	0.012
		(0.20)	(0.12)
No. of siblings		-0.048	-0.037
		(-1.22)	(-0.87)
Education			0.076
			(1.64)
Log family income			0.084
			(1.56)
Having a job			0.018
			(0.19)
Marital status (ref = never married)			
Married			0.595***
			(4.89)
Cohabitation			0.110
			(0.20)
Divorced			-0.962
			(-1.61)
Widowed			-1.749
			(-1.28)
Constant	20.629***	20.886***	22.885***
	(10.82)	(10.79)	(10.55)
N	5738	5375	4809
R^2	0.015	0.015	0.022
Adjusted R^2	0.014	0.014	0.019
F	21.245	10.540	7.140

T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

regression results of the experience of parental absence during childhood on individuals' current mental health condition in their young adulthood. The independent variable of interest is parental absence, and the dependent variable is mental health, and different control variables are included in Model 1 – Model 3. Model 1 only controls for individual characteristics, i.e., gender and age (Model 1: $\beta = -0.844$, $p < 0.01$). Model 2 not only controls for individual characteristics, but also the family environment and wider social environment, i.e., parents' education, rural–urban residency, and the number of siblings (Model 2: $\beta = -0.842$, $p < 0.01$). Based on Model 2, Model 3 further controls for individuals' own education level, log of family income, employment status, and marital status (Model 3: $\beta = -0.834$, $p < 0.01$). The coefficients of parental absence in Model 1-Model 3 consistently show that individuals' mental health status is significantly and negatively associated with parental absence during childhood. Robustness check using the Cronbach alpha score of the six indicators for mental health status has also been conducted, and consistent results are presented in Table 13 in the Appendix.

Parental Absence and Individuals' Physical Health

To examine the association between parental absence during childhood and individuals' physical health in adulthood, this section estimates this linkage and presents the OLS regression results in Table 3 below. Model 1 only controls for individual characteristics, including gender and age (Model 1: $\beta = -0.103$, $p < 0.01$). Model 2 adds in family background and wider social environment, including parental education, living residence in urban or rural areas, and the number of siblings (Model 2: $\beta = -0.098$, $p < 0.01$). On the basis of Model 2, Model 3 further adds in individuals' own education level, log of family income, employment status, and marital status (Model 3: $\beta = -0.083$, $p < 0.01$). In all of three models, individuals' physical health status is significantly and negatively associated with parental absence during childhood. It could also be noted in Model 3 that education and family income positively contribute to physical health. As suggested by previous research, more education may contribute to more health knowledge and better health habits, and higher income may contribute to better nutrition, living conditions, and healthier lifestyles (Conger et al., 2007). This result also implies that with higher educational levels and higher family income, that is better socioeconomic resources, individuals tend to have better health conditions.

Parental Absence and Individuals' Cognitive Ability

Table 4 presents regression results of the impact of parental absence on individuals' cognitive ability during childhood. Model 1 only controls for individual characteristics (Model 1: $\beta = 0.003$); Model 2 adds in family background and wider social environment (Model 2: $\beta = 0.725$, $p < 0.10$); and Model 3 further controls for individuals' own educational level, log of family income, employment status, and marital status (Model 3: $\beta = 1.056$, $p < 0.01$). Interestingly, an individual's cognitive ability appears to be positively associated with parental absence during childhood. In

Table 3 Regression estimates of parental absence on physical health status

| | Dependent variable: Physical health | | |
	Model 1	Model 2	Model 3
Parental absence	-0.103***	-0.098***	-0.083***
	(-5.15)	(-4.66)	(-3.80)
Gender (ref = female)	0.033**	0.031*	0.022
	(2.05)	(1.81)	(1.20)
Age	0.082***	0.090***	0.059*
	(2.59)	(2.73)	(1.67)
Age^2	-0.002***	-0.002***	-0.002**
	(-3.18)	(-3.32)	(-2.28)
Father's education		0.007	0.002
		(0.85)	(0.16)
Mother's education		0.004	-0.009
		(0.40)	(-0.87)
Urban residence		0.017	-0.006
		(0.92)	(-0.30)
No. of siblings		0.010	0.011
		(1.30)	(1.25)
Education			0.022**
			(2.37)
Log family income			0.023**
			(2.15)
Having a job			0.021
			(1.12)
Marital status (ref = never married)			
Married			-0.010
			(-0.41)
Cohabitation			0.072
			(0.65)
Divorced			-0.081
			(-0.68)
Widowed			-0.353
			(-1.29)
Constant	3.904***	3.778***	3.899***
	(10.39)	(9.74)	(9.00)
N	5764	5399	4832
R^2	0.018	0.019	0.023
Adjusted R^2	0.018	0.018	0.020
F	26.707	13.198	7.416

T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

Table 4 Regression estimates of parental absence on cognitive ability

	Dependent variable: Cognitive ability		
	Model 1	Model 2	Model 3
Parental absence	0.003	0.725*	1.056***
	(0.01)	(1.94)	(3.58)
Gender (ref = female)	1.226***	0.385	0.462*
	(3.64)	(1.27)	(1.89)
Age	-2.434***	-2.964***	-5.613***
	(-3.69)	(-5.08)	(-11.75)
Age^2	0.036***	0.050***	0.104***
	(2.64)	(4.09)	(10.60)
Father's education		2.407***	0.549***
		(15.48)	(4.33)
Mother's education		1.677***	0.041
		(10.05)	(0.30)
Urban residence		3.685***	0.448*
		(11.18)	(1.68)
No. of siblings		-2.041***	-0.653***
		(-14.48)	(-5.72)
Education			7.111***
			(57.10)
Log family income			0.424***
			(2.96)
Having a job			-2.594***
			(-10.11)
Marital status (ref = never married)			
Married			-0.521
			(-1.59)
Cohabitation			-2.023
			(-1.37)
Divorced			0.706
			(0.44)
Widowed			-8.158**
			(-2.22)
Constant	75.445***	71.778***	84.789***
	(9.67)	(10.40)	(14.55)
N	5761	5396	4829
R^2	0.043	0.277	0.595
Adjusted R^2	0.042	0.276	0.594
F	64.613	258.259	472.183

T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

Model 1, the coefficient of parental absence is insignificant. The coefficient becomes significant at the 10% level in Model 2 with controlling factors of the family environment. In Model 3, the coefficient becomes even larger and more significant at the 1% level when adding control variables of individuals' own socioeconomic conditions. This increased level of effect is particularly due to the adding of the variable of individuals' educational level. Although the coefficient of parental absence is less significant in the model with fewer control variables, adding more control variables makes the estimated coefficient of parental absence more significant and stronger. This could imply that the influence of parental absence on cognitive ability is associated with the influence of other variables, and its effect could be confounded when the essential covariates are omitted in the model. To further test this result, the next section conducts propensity score matching.

PSM Results

First-Stage Regression

This section conducts propensity score matching to test the robustness of the OLS results, and starts with the first stage logistic regression. Table 5 shows the results of the first stage logistic regression of parental absence on the relevant covariates. In PSM models, the covariates determining the propensity score are those independently influencing both the treatment variable (whether or not had the parental absence experience) and the outcome variable (current mental health, physical health, or cognitive ability). Thus, both individual characteristics (individuals' gender and age) and family background (parental educational level, number of siblings, and living residence in urban or rural areas) are controlled for in Model 1 in Table 5. However, the individual's current education, family income, employment status, and marital status are not included in the models, because these variables represent the current conditions in adulthood that happen after childhood experiences.

With the intention to improve the first stage regression in Model 1, Model 2 further includes another four covariates that may determine the propensity of parental absence, i.e., hardwork_m, famrich_f, talent_f, and network_m. These four covariates reflect the attitudes and perspectives of the individual's parents towards life and society. *Hardwork_m* represents the mother's attitude toward hard work, measured by a 5-point Likert scale on the extent of agreement with the following statement: "In today's society, hard work is rewarded". *Famrich_f* represents the father's perception of the role of family wealth in a child's success, measured by a 5-point Likert scale on the extent of agreement with the following statement: "A child from a rich family has a better chance of succeeding in the future; a child from a poor family has a worse chance of succeeding in the future." *Talent_f* represents the father's attitude towards the role of talent in one's success, measured by a 5-point Likert scale on the extent of agreement with the following statement: "The most important factor affecting one's future success is his/her talent." *Network_m* represents the mother's perception about the role of the social network in one's success, measured by a 5-point Likert scale on the extent of agreement with the following statement: "The most important

Table 5 First stage logistic regression of parental absence on the relevant covariates

	Parental absence	
	Model 1	Model 2
Gender (ref = female)	-0.011	0.027
	(-0.16)	(0.23)
Age	-0.025***	-0.022
	(-2.69)	(-1.31)
Father's education	0.056	0.064
	(1.57)	(1.11)
Mother's education	-0.052	-0.109*
	(-1.36)	(-1.77)
Urban residence	-0.121	-0.183
	(-1.61)	(-1.46)
No. of siblings	0.021	-0.013
	(0.67)	(-0.23)
Hardwork_m		0.160**
		(2.03)
Famrich_f		-0.155***
		(-2.94)
Talent_f		0.162***
		(2.80)
Network_m		0.140**
		(2.12)
Constant	-0.788***	-2.149***
	(-3.06)	(-3.54)
N	5401	2345
Pseudo R^2	0.0030	0.0172

T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

factor affecting one's future success is whether his/her family has 'connections'". The answers to these questions are coded as "1" for "strongly disagree", "2" for "disagree", "3" for "neither agree nor disagree", "4" for "agree", and "5" for "strongly agree". The availability of information on the individuals' parents depends on whether their parents live together with the individuals in the same household and whether their parents have valid questionnaires. In the dataset, the information of the parents' attitudes is available for about half of the individuals in our analytical sample. Although it is not ideal that the data is only available for about half of the analytical sample, using the available information could still provide us with an idea of how the attitudes of parents may influence their propensity to migrate away from home for work purposes.

As shown in Table 5, adding the four attitudinal covariates does improve the model, and these variables are significantly related to parental absence. Mother's acknowledgement of the role of hard work and social network, and father's acknowledgement of the importance of talent in one's success are associated with a higher probability of parental migration and absence. This indicates their aspiration for a

Table 6 PSM estimates of parental absence on mental health status

	ATET Coef	AI Robust Std. Err	z	*P*>z	[95% Conf. Interval]		N
(1) PSM	-0.9081951	.1318406	-6.89	0.000	-1.166598	-.6497923	5375
(2) PSM with extra variables	-0.5678392	.2323521	-2.44	0.015	-1.023241	-.1124374	2329

After including covariates of parental attitudes in the (2) PSM with extra variables, as some samples include missing values, the number of samples was reduced

better life outcome, and aim for a better future by investing in more effort, which could increase their propensity of migration to look for better opportunities. However, father's acknowledgement of the role of family wealth is associated with a lower likelihood of parental migration. This may indicate that if the father believes family wealth can be a determinant factor for one's success, then he tends to belittle the role of personal effort, which may reduce his motivation for migrating away. These attitudes not only influence the likelihood of their own migration decisions, but may also be associated with their offspring's growth and developmental outcomes.

PSM Results

By matching people in families with similar characteristics, we could reduce the selection bias and compare those individuals with a similar probability of experiencing parental absence. In doing so, we could better detect the effect of the parental absence per se, rather than being confounded by the family characteristics that may have an influence on both parental absence and individuals' outcomes.

Table 6 presents the PSM estimates of parental absence on mental health status. The first row reports the result of the PSM model that only includes the covariates of individuals' characteristics and family background. The second row reports the result of the PSM model that includes the covariates of individuals' characteristics, family background, as well as parents' attitudes. The results of the two models are consistent in demonstrating the significant negative effect of parental absence during childhood on individuals' current mental health status in their adulthood, although the second model shows a relatively smaller effect.

Table 7 presents the PSM estimates of parental absence on physical health status. Likewise, the first row reports the result of the PSM model that only includes

Table 7 PSM estimates of parental absence on physical health status

	ATET Coef	AI Robust Std. Err	z	*P*>z	[95% Conf. Interval]		N
(1) PSM	-0.1272906	.0260196	-4.89	0.000	-.1782881	-.0762931	5399
(2) PSM with extra variables	0.004397	.0409818	0.11	0.915	-.0759258	.0847198	2344

Table 8 PSM estimates of parental absence on cognitive ability

	ATET Coef	AI Robust Std. Err	z	*P*>z	[95% Conf. Interval]		N
(1) PSM	0.9924633	.4880675	2.03	0.042	.0358686	1.949058	5396
(2) PSM with extra variables	1.376574	.8725449	1.58	0.115	-.3335823	3.086731	2342

the covariates of individuals' characteristics and family background, which shows a significant and negative effect of parental absence on physical health. The second row reports the result of the PSM model that includes the covariates of individuals' characteristics, family background, as well as parents' attitudes, but the coefficient becomes insignificant.

Table 8 presents the PSM estimates of parental absence on cognitive ability. The first row reports the result of the PSM model that only includes the covariates of individuals' characteristics and family background, which shows a significant and positive effect of parental absence on cognitive ability. The second row reports the result of the PSM model that includes the covariates of individuals' characteristics, family background, as well as parents' attitudes, but the coefficient becomes insignificant.

Comparison of the OLS and PSM Results

After examining the relationship between parental absence and individuals' outcomes with both OLS and PSM methods, this section compares the results from different models, as shown in Table 9. These comparisons provide insights into the estimates of the effects of parental absence and helped us to draw more robust and nuanced conclusions.

The first row shows the results from the OLS models that have been presented in the previous section demonstrating that parental absence in childhood has a significantly negative influence on individuals' mental and physical health in adulthood but a significantly positive effect on cognitive ability. The second row shows the results from the OLS models where the four parental attitudinal variables have been further controlled for (please refer to the full table of these OLS models that are presented in Table 13 in the Appendix). The results are generally consistent with those in the first row, but the coefficient for physical health is insignificant. The third

Table 9 Comparison of the coefficients in different models

	Mental health	Physical health	Cognitive ability
(1) OLS	-0.834***	-0.083***	1.056***
(2) OLS with extra variables	-0.709*** -0.018		1.222***
(3) PSM	-0.908***	-0.127***	0.992**
(4) PSM with extra variables	-0.568**	0.004	1.377

* *p*<0.10. ** *p*<0.05. *** *p*<0.01

and fourth rows collate the results of the PSM estimates presented in the previous section. The results from the third row remain consistent with the OLS results in the first row. However, in the fourth row, only the effect on mental health remains significantly negative, despite a smaller effect. The effects on physical health and cognitive ability become insignificant.

Robustness Checks

The Absence of Father/Mother and the Timing

On the basis of the previous main results, this section conducts robustness checks and further disentangles the effects of parental absence on individuals' outcomes. In the main results, the independent variable is whether the individual had experienced any parental absence during childhood before 12 years old. This section intends to examine whether the absence of father or mother and the timing of their absence would have any different effects on individuals' outcomes. As shown in Table 10, mother-only absence before age 3 has a negative association with individuals' mental health, but both-parental absence before age 3 tends to be positively associated with later mental and physical health. Although parental absence before age 3 shows a mixed result, parental absence between 4 and 12 years old tends to show consistent results with the main results demonstrated in previous sections. Specifically, father-only absence during ages 4–12 has a significantly negative association with mental and physical health but a significantly positive association with cognitive ability. The effects of both-parental absence during ages 4–12 follow the same pattern but are relatively larger than the effects of father-only absence. The results suggest that father's absence is particularly important in affecting individuals' outcomes, which could be due to the fact that more fathers migrate than mothers.

Duration of Parental Absence

This section examines whether the duration of parental absence makes a difference in affecting individuals' outcomes. As shown in Table 11, the duration of parental absence is negatively associated with mental and physical health conditions, but not with cognitive ability. This indicates that a longer duration of parental absence in childhood could lead to a lower level of mental wellbeing and physical health in adulthood.

Interaction of Parental Absence and Age

This section examines whether individuals' age has an interaction effect with parental absence. Table 12 shows that the coefficients of the interaction term *Parental absence# Age* are significant and negative for mental health conditions. This indicates that the ageing process may intensify the adverse effect of parental absence in childhood on mental health in adulthood, but not on physical health and cognitive ability.

Table 10 Regression estimates of the absence of father/mother and the timing

	Mental health	Physical health	Cognitive ability
Parental absence before age 3 (ref = father and mother present)			
Father absent, mother present	-0.348	-0.004	-0.308
	(-1.48)	(-0.09)	(-0.48)
Father present, mother absent	-1.993*	-0.298	-0.675
	(-1.94)	(-1.45)	(-0.24)
Father absent, mother absent	0.520**	0.124***	-0.260
	(2.17)	(2.58)	(-0.40)
Parental absence between 4 to 12 (ref = father and mother present)			
Father absent, mother present	-0.789***	-0.090**	1.152**
	(-4.15)	(-2.37)	(2.24)
Father present, mother absent	-0.668	-0.087	-0.464
	(-1.22)	(-0.79)	(-0.31)
Father absent, mother absent	-1.040***	-0.136***	1.234**
	(-5.41)	(-3.54)	(2.38)
Gender (ref = female)	0.232**	0.023	0.448*
	(2.54)	(1.24)	(1.83)
Age	0.292	0.057	-5.605***
	(1.64)	(1.59)	(-11.72)
Age^2	-0.007*	-0.002**	0.104***
	(-1.96)	(-2.22)	(10.57)
Father's education	0.018	0.002	0.553***
	(0.39)	(0.22)	(4.36)
Mother's education	0.003	-0.008	0.041
	(0.07)	(-0.76)	(0.30)
Urban residence	0.014	-0.005	0.447*
	(0.14)	(-0.25)	(1.67)
No. of siblings	-0.035	0.011	-0.655***
	(-0.81)	(1.27)	(-5.73)
Education	0.076	0.022**	7.112***
	(1.63)	(2.34)	(57.03)
Log family income	0.082	0.023**	0.424***
	(1.53)	(2.13)	(2.96)
Having a job	0.019	0.021	-2.593***
	(0.20)	(1.10)	(-10.10)
Marital status (ref = never married)			
Married	0.626***	-0.006	-0.518
	(5.14)	(-0.23)	(-1.58)
Cohabitation	0.115	0.073	-2.071
	(0.21)	(0.66)	(-1.40)
Divorced	-0.948	-0.079	0.678
	(-1.59)	(-0.66)	(0.42)
Widowed	-1.706	-0.346	-8.190**
	(-1.25)	(-1.27)	(-2.23)

Table 10 (continued)

	Mental health	Physical health	Cognitive ability
Constant	23.110***	3.930***	84.725***
	(10.66)	(9.07)	(14.53)
N	4809	4832	4829
R^2	0.024	0.024	0.595
Adjusted R^2	0.020	0.020	0.594
F	5.855	5.973	353.695

T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

Discussion and Conclusion

This study draws on a nationally representative dataset in China and examines the long-term effect of parental absence during childhood on individual's welling in their early adulthood, including mental health, physical health, and cognitive ability.

The life course perspective conceptualises the evolution of individuals' lives as being embedded in a macro social–historical context, which may exert influence on individuals through the microenvironment of their networks of shared relationships (Elder, Johnson, and Crosnoe 2003). The rapid economic transformations and the great internal migration tide since the reform and opening up in China provide the macro social–historical context for studying the life events considered in this paper. Under this context, the institutional and policy restrictions on migration-related issues caused many migrants to set apart from their families and leave behind their children at home. The social and institutional factors on the macro level led to a large number of family separations, which in turn transmitted the influences to individual family members. Based on the life course perspective, this research studies the transmission of the influence of the macro trends within a particular socio-historical context (i.e., the migration tide in China in the past decades) onto the lives of the individuals through the changes in their networks of relationships (i.e., the separation of family members). Hence, this study examines the impact of family separation on the wellbeing of the left-behind population facing the prolonged processes of separation from their migrant family members, i.e., the left-behind children.

More specifically, the study contributes to the existing literature by providing new findings to further our understanding of this area. In terms of the effects of parental absence on children's development and wellbeing, most previous research usually focuses on the concurrent effects of parent migration. The present empirical study looks more closely at the long-term impact of parental absence during childhood on later development in adulthood using a representative dataset from China.

The main OLS results indicate that the childhood experience of both-parental absence is negatively associated with an individual's mental wellbeing and physical health in adulthood, while positively associated with an individual's cognitive ability. A study by Xu & Xie, (2015) found little impact of parents' migration on left behind children, while our research has shown different conclusions regarding the outcomes of left behind children in their adulthood. In this sense, our research contributes to the literature by providing new evidence and perspectives on the topic. While Xu & Xie, (2015) focused on the concurrent influence of parental migration on children's

Table 11 Regression estimates of the duration of parental absence on individuals' outcomes

	Mental health	Physical health	Cognitive ability
Duration of parental absence	-0.079***	-0.016***	0.068
(years)	(-2.97)	(-3.06)	(0.96)
Gender (ref = female)	0.226**	0.021	0.465*
	(2.47)	(1.16)	(1.90)
Age	0.317*	0.060*	-5.621***
	(1.77)	(1.69)	(-11.75)
Age^2	-0.008**	-0.002**	0.104***
	(-2.04)	(-2.29)	(10.59)
Father's education	0.009	0.001	0.557***
	(0.18)	(0.13)	(4.39)
Mother's education	0.003	-0.008	0.034
	(0.06)	(-0.82)	(0.25)
Urban residence	0.042	-0.003	0.414
	(0.42)	(-0.14)	(1.55)
No. of siblings	-0.036	0.011	-0.653***
	(-0.85)	(1.27)	(-5.72)
Education	0.075	0.022**	7.111***
	(1.61)	(2.34)	(57.03)
Log family income	0.083	0.023**	0.424***
	(1.55)	(2.15)	(2.96)
Having a job	-0.010	0.018	-2.563***
	(-0.10)	(0.92)	(-9.98)
Marital status (ref = never married)			
Married	0.566***	-0.012	-0.481
	(4.63)	(-0.50)	(-1.47)
Cohabitation	0.101	0.074	-1.997
	(0.18)	(0.67)	(-1.35)
Divorced	-0.905	-0.072	0.645
	(-1.51)	(-0.60)	(0.40)
Widowed	-1.657	-0.346	-8.283**
	(-1.21)	(-1.27)	(-2.26)
Constant	22.632***	3.875***	85.114***
	(10.38)	(8.94)	(14.59)
N	4809	4832	4829
R^2	0.012	0.022	0.594
Adjusted R^2	0.009	0.019	0.593
F	3.839	7.073	470.231

T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

Table 12 The interaction effect of age on parental absence experience

	Mental health	Physical health	Cognitive ability
Parental absence	-0.378*	-0.045	1.474***
	(-1.82)	(-1.08)	(2.60)
Gender (ref=female)	0.235***	0.022	0.430*
	(2.58)	(1.19)	(1.73)
Age (ref=18–22)			
Age 23–26	-0.065	-0.072***	-3.725***
	(-0.49)	(-2.74)	(-10.34)
Age 27–30	-0.583***	-0.189***	-4.015***
	(-3.92)	(-6.35)	(-9.92)
Father's education	0.012	0.001	0.576***
	(0.24)	(0.16)	(4.48)
Mother's education	0.001	-0.008	0.082
	(0.02)	(-0.77)	(0.60)
Urban residence	0.011	-0.008	0.390
	(0.11)	(-0.42)	(1.45)
No. of siblings	-0.039	0.010	-0.680***
	(-0.91)	(1.19)	(-5.87)
Education	0.080*	0.022**	6.912***
	(1.74)	(2.38)	(55.23)
Log family income	0.082	0.023**	0.453***
	(1.55)	(2.14)	(3.12)
Having a job	0.019	0.019	-2.912***
	(0.20)	(1.01)	(-11.24)
Marital status (ref=never married)			
Married	0.610***	-0.017	-1.416***
	(5.16)	(-0.74)	(-4.40)
Cohabitation	0.079	0.062	-2.781*
	(0.14)	(0.56)	(-1.86)
Divorced	-0.952	-0.098	-0.212
	(-1.60)	(-0.82)	(-0.13)
Widowed	-1.743	-0.370	-9.275**
	(-1.28)	(-1.35)	(-2.50)
Parental absence #Age			
PA# age 18–22	-0.548**	-0.070	-0.529
	(-2.03)	(-1.29)	(-0.72)
PA# age 23–26	-0.751***	-0.033	-0.543
	(-2.64)	(-0.58)	(-0.70)
Constant	26.123***	4.426***	14.615***
	(49.33)	(41.81)	(10.13)
N	4809	4832	4829
R^2	0.023	0.022	0.584
Adjusted R^2	0.020	0.018	0.583
F	6.731	6.226	397.714

T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

wellbeing, our research has taken a life-course perspective and examined the long-term impact of parental migration, taking advantage of the historical and retrospective data in CFPS 2010 that recorded the information on parental absence in the past childhood as well as the present information on the left-behind generation's adulthood.

The study consolidates that the family environment is closely linked to children's development (Conger et al., 2007). Theories suggest the importance of family bonds and the downside of separation. The evidence found in the study is in line with the attachment theory and parental acceptance-rejection theory that parental presence and positive engagement in children's early childhood is crucial to individuals' growth and wellness (Bowlby, 2005; Rohner et al., 2012). The findings are also in line with the prior research that suggests stress and adverse influence on wellbeing and health resulting from family separation. The absence of the primary caretaker could cause separation anxiety to the child who cannot seek comfort and a sense of safety from their attachment figure. In particular, when the separation lasts for a relatively long period, the child tends to have a significantly strong sense of anxiety (Bowlby, 2005). Moreover, the findings in the study also support the life course perspective that the timing of events and early experiences could have impacts on later outcomes (Mayer, 2009; Elder et al., 2003).

Drawing on the relevant theories and previous literature on parental absence and children's outcomes, the negative outcome in mental and physical health conditions are to be expected and have been confirmed in the results of this study, indicating that early childhood experience of parental absence exerts a lasting impact on individuals. However, this study also finds evidence that parental absence would not always bring negative impact; parental absence could also have some positive influence, as the findings also document positive outcome in cognitive ability.

In particular, we would often expect that children without parents' company might have worse cognitive ability, so this unexpected outcome in this study is further discussed. The positive cognitive outcomes in adulthood found in this study could be explained in the context of parental migration in China for several reasons.

One reason could be resilience and positive development for individuals who experience adversity earlier while bouncing back better in later stages of development as they grow to be more independent and acquire more life skills along the way when their parents are away. The prior literature on resilience suggests a positive development for individuals who had adversity experiences, and there has also been previous evidence about positive outcomes such as in school grades of youth who have migrant parents (Wen et al., 2015). Parents who migrate to work tend to earn a higher income and also have a higher expectation for their children's future, especially about their educational achievement that may help bring better opportunities for their lives in future, and thus they may invest particularly more in their children's education and development, which may also buffer the negative influence of their absence and even boost positive development of their children. Children growing up in this circumstance may have the drive to live up to the expectation of their parents, and without much direct parental care, they may grow to be more self-reliant, and acquire more life skills and stronger cognitive ability.

Another reason is that this seemingly positive influence could be due to the confounding influences of factors that propelled the migration of the individuals' parents, which is further tested by PSM models. To test the robustness of the results, PSM approach has been adopted. When the parental attitudinal variables are not included

in the models, the PSM results are consistent with the main OLS results. However, after adding the parental attitudinal variables to the models, the effects of the parental absence on physical health and cognitive ability become insignificant. This indicates that PSM methods help to reduce the selection bias and better distinguish the effects of parental absence per se. Although the effects of parental absence are not that significant for physical health and cognitive ability, the experience of parental absence in childhood has a negative association with physical health and a positive association with cognitive ability. These associations could be due to the family characteristics and factors that propelled the migration of individuals' parents. That is, those parents who intended to migrate could at the same time be those who have higher level of cognition and higher pursuit for life, which would influence their children in the meantime, particularly in the aspect of education and cognitive development.

Thus, with the childhood experience of growing up in the family where parents migrated and being left-behind, individuals tend to have a lower level of mental wellbeing and physical health in adulthood, yet a slightly better cognitive ability, compared to their counterparts who had never experienced any parental absence in childhood. Although the depiction of the negative effects found in this study should not be overstated, we still need to be cautious about the possible subtle and nuanced adverse impact, which should not be deemed negligible. Parents' pursuing economic betterment for the family and stressing cognitive achievement cannot offset the negative outcome in terms of mental and physical health. The rapid social and economic transformations to some extent cause disadvantages to children growing up without adequate parental presence and care during childhood. Migrants have made contributions to the economic progress of society while they were also confronted with the dilemma between economic betterment and sacrifices for their companionship to children's growth.

Therefore, it is still critical to enact effective policy changes and sufficient social support and intervention programmes to ameliorate the parental absence issues, and mitigate the adverse impacts. First, a necessary step for the government is to foster an environment that could strengthen parental involvement in children' life courses, ensuring that more parents could live with their children during their childhood. It is vital to create better job opportunities in the migrants' hometowns to reduce family separation as well as reduce barriers for migrants in the destination cities so that these families could live together and could make freer choices of where to live and work. As the results also show that a longer duration of parental absence in childhood could lead to a lower level of mental wellbeing and physical health in adulthood, policies could be set up policies that increase the opportunity for migrant workers to visit their families at a higher frequency and reduce the cost of travelling such as providing special discounts to the migrants returning home. Second, for the children who are suffering from parental absence, the government should extend more assistance, and encourage social organisations to participate in launching compensatory projects and setting up a social supporting system. As the negative effects of both-parental absence between ages 4–12 on mental health on mental and physical health in adulthood are the most significant, policies could pay more attention to families where both parents migrated in children's middle childhood. Third, as the results show that the childhood experience of parental absence has a lasting impact on individuals, especially on their mental health condition, young adults who had the experience could also be given more assistance in terms of wellbeing

and mental health. For instance, they could be provided with better welfare access and compensatory benefits, further education training and employment opportunities, more medical care provisions and mental health counselling support.

This study has made contributions in its area, but there are several limitations and implications for future research. Many of these limitations relate to the available data and the way by which the variables of interest are measured. First, the depressive symptoms tested by CFPS2010 are not long-term depressive symptoms, but short-term depressive symptoms before questioning. However, most of the existing literature used this kind of psychological scale to measure individuals' general mental health status, as the currently available datasets mainly cover depressive symptom indicators that can capture the psychological status at the time of the survey, which could be used as a reliable reference indicator in empirical social sciences studies. It could be better for future studies to examine long-term depressive symptoms if better data become available. Second, in the retrospective data, information regarding the geographical distance is not available. It would have been useful to have available a measure of how far the absent parent was living from other household members, because it could give an indication of how frequently the migrant was able to visit. The data set could, alternatively, have asked a direct question on how frequently the migrant could visit, which would have been even more useful. However, this has not been possible with the currently available data, while we hope future research could dig further in terms of the geographical boundaries the migrants are crossing, such as inter-provincial, intra-provincial, or international. Third, there might be different types of migration, while as well known in the case of China, most of the parental absence was labour migration during the examined period, and we intend to examine how parental absence, in general, would influence individuals' outcomes. Nevertheless, as the data is retrospective and the information regarding the types of parental migration and absence is not available, it indeed could be better if future studies have more specific data in this regard. Another limitation is that for the propensity score matching analysis, although the additional parental attitudinal variables did help with the model identification, that data was available for only about half the sample, and it was measured after migration had occurred, not prior to migration. To present the picture based on the actual data and ensure accuracy, we did not use data replacement methods which would be hard to justify as appropriate. Nevertheless, it could have been better if we had a full sample of these additional variables. Again, this could be addressed in the future with better data.

Furthermore, for future studies, when more and better data with a longer span become available, we could use longitudinal analysis to help tease out the causality of the relationships in a better way, and in addition help with issues of confounding, if families with migrants and left-behinds have certain characteristics associated with wellbeing. It would be helpful to be able to observe families before migration takes place, as well as once it has already taken place. Finally, this research could be complemented by qualitative analysis such as in-depth interviews, which could be used in the future to help reveal more detailed nuances of the underlying mechanisms and enrich the findings unveiled in the study. This study has focused on China. The results will be relevant to other developing countries facing issues of migration and family separation, but this could benefit from being tested. Future research could move beyond single-society analysis and construct an empirical framework for comparative studies across various research contexts that have both commonality and heterogeneity.

Appendix

Table 13 Regression estimates of mental health status (Cronbach alpha)

	Dependent variable: Mental health		
	Model 1	Model 2	Model 3
Parental absence	-0.141***	-0.140***	-0.139***
	(-8.28)	(-8.06)	(-7.61)
Gender (ref = female)	0.020	0.016	0.038**
	(1.45)	(1.12)	(2.51)
Age	0.093***	0.089***	0.052*
	(3.46)	(3.25)	(1.75)
Age^2	-0.002***	-0.002***	-0.001**
	(-3.38)	(-3.15)	(-2.05)
Father's education		0.005	0.002
		(0.74)	(0.31)
Mother's education		0.002	-0.000
		(0.23)	(-0.04)
Urban residence		0.003	0.002
		(0.20)	(0.12)
No. of siblings		-0.008	-0.006
		(-1.22)	(-0.87)
Education			0.013
			(1.64)
Log family income			0.014
			(1.56)
Having a job			0.003
			(0.19)
Marital status (ref = never married)			
Married			0.099***
			(4.89)
Cohabitation			0.018
			(0.20)
Divorced			-0.160
			(-1.61)
Widowed			-0.291
			(-1.28)
Constant	3.438***	3.481***	3.814***
	(10.82)	(10.79)	(10.55)
N	5738	5375	4809
R^2	0.015	0.015	0.022
Adjusted R^2	0.014	0.014	0.019
F	21.245	10.540	7.140

Notes T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

Table 14 The OLS estimates in previous models and models with extra variables

	Mental	Physical	Cognitive	Mental	Physical	Cognitive
Parental absence	-0.834***	-0.083***	1.056***	-0.709***	-0.018	1.222***
	(-7.61)	(-3.80)	(3.58)	(-3.95)	(-0.55)	(2.70)
Gender (ref=female)	0.229**	0.022	0.462*	0.439***	0.016	-0.501
	(2.51)	(1.20)	(1.89)	(3.07)	(0.62)	(-1.40)
Age	0.311*	0.059*	-5.613***	0.635**	0.049	-4.474***
	(1.75)	(1.67)	(-11.75)	(2.28)	(0.99)	(-6.41)
Age^2	-0.007**	-0.002**	0.104***	-0.014**	-0.002	0.078***
	(-2.05)	(-2.28)	(10.60)	(-2.43)	(-1.46)	(5.31)
Father's education	0.015	0.002	0.549***	-0.070	0.012	0.565***
	(0.31)	(0.16)	(4.33)	(-0.97)	(0.94)	(3.11)
Mother's education	-0.002	-0.009	0.041	-0.009	-0.008	0.263
	(-0.04)	(-0.87)	(0.30)	(-0.12)	(-0.63)	(1.40)
Urban residence	0.012	-0.006	0.448*	-0.033	-0.011	0.129
	(0.12)	(-0.30)	(1.68)	(-0.21)	(-0.40)	(0.33)
No. of siblings	-0.037	0.011	-0.653***	-0.035	0.030**	-0.887***
	(-0.87)	(1.25)	(-5.72)	(-0.49)	(2.27)	(-4.86)
Education	0.076	0.022**	7.111***	0.103	0.036***	6.274***
	(1.64)	(2.37)	(57.10)	(1.42)	(2.73)	(34.51)
Log family income	0.084	0.023**	0.424***	0.001	-0.015	0.176
	(1.56)	(2.15)	(2.96)	(0.01)	(-0.97)	(0.83)
Having a job	0.018	0.021	-2.594***	-0.002	0.039	-3.202***
	(0.19)	(1.12)	(-10.11)	(-0.01)	(1.42)	(-8.46)
Marital status (ref=never married)						
Married	0.595***	-0.010	-0.521	0.477**	0.047	0.686
	(4.89)	(-0.41)	(-1.59)	(2.36)	(1.28)	(1.35)
Cohabitation	0.110	0.072	-2.023	-1.513	-0.075	0.761
	(0.20)	(0.65)	(-1.37)	(-1.30)	(-0.35)	(0.26)
Divorced	-0.962	-0.081	0.706	-3.181***	-0.153	1.744
	(-1.61)	(-0.68)	(0.44)	(-3.64)	(-0.97)	(0.79)
Widowed	-1.749	-0.353	-8.158**			
	(-1.28)	(-1.29)	(-2.22)			
Hardwork_m				0.116	0.037**	0.304
				(1.30)	(2.30)	(1.36)
Famrich_f				-0.149**	0.014	-0.316**
				(-2.32)	(1.18)	(-1.97)
Talent_f				0.020	-0.005	-0.038
				(0.29)	(-0.38)	(-0.22)
Network_m				0.031	-0.006	0.116
				(0.41)	(-0.44)	(0.60)
Constant	22.885***	3.899***	84.789***	19.794***	4.194***	78.175***
	(10.55)	(9.00)	(14.55)	(5.95)	(6.98)	(9.35)
N	4809	4832	4829	2091	2105	2103
R^2	0.022	0.023	0.595	0.031	0.024	0.551
Adjusted R^2	0.019	0.020	0.594	0.022	0.016	0.547
F	7.140	7.416	472.183	3.650	2.908	142.239

Notes T statistics in parentheses. * $p<0.10$. ** $p<0.05$. *** $p<0.01$

Data Availability Data are available upon request from the following platform. Institute of Social Science Survey, Peking University, 2015, "China Family Panel Studies (CFPS)", https://doi.org/10.18170/DVN/45LCSO, Peking University Open Research Data Platform, V42.

Declarations

Competing Interests The author declares that there is no conflict of interest.

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