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Destination Matters: Long-Term Mortality Consequences of Childhood Migration, Historical Evidence from Northeast China, 1792-1909†

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ABSTRACT: This paper is one of the first studies to shed light on the long-term mortality consequences of migration and resettlement on children. I also explore different pathways for such early-life experience by including a measure of social integration at destination. I trace 80379 males (1193 of whom have childhood migration) from childhood onwards, living in 594 northeast China villages between 1792 and 1909. I take advantage of discrete-time event-history method and introduce fixed effects of grandfather to account for unobservable characteristics of descendent group. From age 16 to 45, good social integration at destination mediates the negative effects of childhood migration and significantly lowers the mortality risks. For those above age 45, childhood migration itself has positive selection effects on mortality. Such findings underline the importance of social integration at destination for migrant families and public policy makers to consider when planning migration and resettlement with children involved.

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Migration studies distinguish between individual migration – which is usually of young unmarried adults – and family migration which includes children. While the former has been among the hottest issues in the academia, the latter gets relatively less attention. As the world population is increasingly mobile, more and more children are inevitably involved in the processes of family migration and resettlement. But, during such processes, children are generally involuntary in the sense that they seldom decide either whether to migrate or where to migrate. Considering the fact that children are particularly sensitive and vulnerable to the change of living environment, there are strong implications to focus on the health consequences of migration and resettlement on children. It is particularly important to figure out pathways leading to such consequences, because such knowledge can help and benefit those involuntary but vulnerable migrant children even for life long.

During recent decades, researchers start to pay attention to the life-course perspective and find that childhood is critical to future human development and social life. Fragmentary evidence drawn from epidemiological and social scientific studies indicates that various early-life conditions and experiences have substantial influence on people's mortality in later life, either with or without the compounding or cumulative effects of different kinds of adulthood conditions and experiences (Myrskylä, 2010; Myrskylä, Mehta, and Chang, 2010; Bengtsson and Brostrom, 2009; Bengtsson and Mineau, 2009; Campbell and Lee, 2009; Gagnon and Mazan, 2009; Zeng, 2007; Hayward, 2004; Bengtsson and Lindstrom, 2003; Preston et al, 1998; Elo and Preston, 1992). Although they have not been fully tested yet, the hypothetical mechanisms, as proposed by Preston et al. (1998), can be either direct – such as physiological scarring effects, psychological shadow and immunity effects caused by adverse conditions, or indirect – for examples, specific environments that influence people's future career trajectory and therefore living conditions, and potential selectivity for genetic traits caused by adverse early-life conditions.

In such a life-course perspective, childhood migration means a change of living conditions and the following process of social integration at the destination community in one's early life. This study not only estimates whether such early-life event has long-term effects on mortality at different life stages, but also investigates one pathway of such long-term effects by examining how social integration at destination mediates childhood migration experience and affects people's later life. By exploiting a prospective, multi-generational, individual-level panel dataset from historical household registers, I trace 80379 males of whom 1193 have childhood migration experience from childhood onwards, living in 594 northeast China villages between 1792 and 1909. I compare the mortality consequences between those who stay

and those who migrate in the childhood, in both the receiving and sending communities, with many other individual, household and community-level characteristics controlled. My findings suggest that, while there is no immediate effect of migration on child mortality, such experience has substantial effects on adult and old-age male mortality. However, the long-term effects of childhood migration differ between adult population and old-age population when considering the role played by social integration at destination. Among males aged 16 – 45 *sui*[1], although individuals having childhood migration generally experience mortality disadvantage compared with local residents, living in villages facilitating social integration significantly lowers their mortality risks. For males above 45 *sui*, childhood migration itself appears to function as a selection that people who experience such early-life event in general have mortality advantage over people who do not have childhood migration.

Because of the nature of the data – namely, the prospective recording of individual life-course events with traceable residential changes – and my object of study that is rural child migrants in particular, this paper contributes in several ways to the existing literature on migration and health as well as on the life-course. First, this study is one of the first attempts to provide quantitative evidence from large-scale data on life-course health outcomes of child migration and resettlement. As previous quantitative migration studies mainly focus on individual migration, there are relatively less efforts made on family migration and resettlement with children involved, especially accounting for the long-term effects. While some anthropological studies discuss the longitudinal consequences of family migration – most of such family migration is forced migration due to warship or big dam construction, they remain in a qualitative approach and pay very little attention to the migrant children in particular.

Second, while many previous studies suffer from selection effects of migration such as 'healthy migrant effects' and 'salmon bias,' this study is relatively safe. On the one hand, this study is not influenced much from the 'healthy migrant effects,'[2] because households are unlikely to make migration decisions based on the health and other characteristics of one specific child. Consequently , the 'healthy migrant effects,' which are thought to largely account for the apparent health advantage of migrant population in most studies on individual migration, are unlikely to be a big issue in child migration even without complex statistical corrections. In other words, unlike adult migrants, migrant children are neither

[1] *Sui* is a traditional way to calculate age in China and other East Asian societies. A person is aged 1 *sui* at birth and is one year older after each lunar new year.

[2] For discussion on healthy migrant effects, please see, for examples, Jasso G, Massey DS, Rosenzweig MR, Smith JP 2004 and Sorlie PD, Backlund E, Johnson NJ, Rogot E. 1993.

fully deliberate to migrate nor highly health-selected initially. On the other hand, this study also suffers little from the 'salmon bias' – namely, the tendency for sick migrants to return home for care, which makes those return sick migrants 'statistically immortal'[3]. Because the data employed in this study record migration among a considerably close population within a large local area (Lee, Campbell and Chen 2010), there are few people who return home because of sickness. Even if there are, I can track those return migrants in the data continuously.

Third, my data also help to overcome several shortcomings of most data employed in previous studies. Due to the limited availability of data, a large portion of previous studies only compare migrants with local residents in either receiving or sending site, which fail to make full comparisons by including the both at the same time. Such insufficient comparisons with absence of certain populations may bias the estimation because in some cases those included populations can be heterogeneous by nature thus not comparable at all. Besides, we should keep in mind some inherent limitations of the retrospective data, which are predominately employed in contemporary life-course studies on mortality, migration, and early-life conditions. Researchers can hardly prevent the flaws resulted from the survival bias when using those retrospective data. Namely, only survivors can be sampled in the contemporary retrospective surveys. It leads to the neglect of any individuals who are supposed to be in the target population if alive but already dead before the surveys conducted or below certain ages that those surveys are deigned to sample on. Also, retrospective data suffer much from the inaccuracy of information about one's early life conditions due to the lapse of memory. Other than retrospective data, panel data are theoretically one good source for life-course research. However, on the one hand, most contemporary panel surveys are based on probability representative sampling that by design such data cannot trace out-migrants. On the other hand, the periods covered by such contemporary panel data are so far not long enough for individual life-course studies.

Finally, because the data in this study are rural, the mortality consequences of childhood migration are net of any 'urban penalty.'[4] It is not surprising that most of current migration studies emphasize on urban populations, because the majority of individual migration is labor migration towards developed urban areas. Evidence from various both western and eastern urban populations – either historical or contemporary – suggests that urban residents usually face certain mortality disadvantages compared with their rural counterparts. Such disadvantage – probably derived from urban lifestyle, high population density

[3] For discussion on salmon bias, please see, for examples, Pablos-Mendez A. 1994.
[4] For discussion on urban panelty, please see, for examples, J. Vögele 2000 and Gould 1998.

and intense exposures to diseases – is so substantial to influence individual mortality that it may even hide the effects from other factors. Focusing on a historical rural population, this study nonetheless provides evidence to supplementary our limited knowledge on the rural migrants and more importantly to have one chance to observe the mortality consequences of migration less influenced by the overwhelming "urban penalty".

I organize the remainder of the paper into four sections. The first elaborates background information, including relevant previous works and historical settings that motivate my hypotheses. The second introduces the data, measures and methods. The third discusses the estimated results and robustness checks. The final section contains a brief conclusion.

Background

Does migration affect health? Evidence indicates that there are at least strong associations between the two. While some psychologists claim that migration is likely to be positively associated with mental health problems and disorders, either immediately or in later life (e.g. Bhugra, 2004; Rogler, 1991), some recent studies suggest that migration also correlates with specific physiological problems like the cardiovascular risks (Colon-Lopez, 2009; Gadd, 2004) and diabetes milieus (Schneider, Greenberg and Lu, 1997) . However, as many of such previous works tend to conclude based on evidence from one single destination, they may overlook the influence derived from the variation of certain characteristics across multiple destinations.

Indeed, many findings confirm that characteristics of different destinations have confounding or intervening effects upon the influence caused by migration itself, although the directions of such destination effects are sometimes inconsistent between studies. As one of the very few papers that directly examines the childhood migration and its long-term effects on adult health, Schooling et al.(2004) find that people who migrate before age 14 from mainland China to Hong Kong have higher cardiovascular risks, especially for males, while there is no significant effects observed among adult migrants. Contrastingly, Jatti et al. (2009) find that migration at an early age and good integration at destination are beneficial to vascular health associated with moving from a high to a lower CHD risk country, which suggests that an environment-sensitive period influences atherogenesis before adulthood. Besides, after reviewing a number of researches, Stevens (2008) finds that both higher and lower levels of problem behavior were found among immigrants and migrant children, thus calling for more academic attention on the fact that

particular characteristics of destinations may influence the level of mental health problems. In addition, evidence of external factors, like community, social networking, cultural difference, and adaption difficulties are found to have additional effects on health and mortality, combined with migration (Bhugra, 2004; Kuo, 1986; Saarela, 2009).

Social integration at destination has been marked as critical to migrant's later life. Apart from the above-mentioned evidence that social integration tends to be associated with health outcomes directly, there is also evidence that social integration is important in deciding migrants' social life. According to Colson's anthropological studies (1971) on the Kariba resettlement in Africa, the social integration – obtained mainly through the kin associations – plays a key role to help those forced migrants to setup the resettlement, to adapt to the new environment and to overcome the sense of insecurity. Although between different stages of the resettlement the importance of such kin associations in sustaining the community social order differs, social integration is nonetheless the first step for migrants to merge into the new community and influential to the long-term development of those component migrant families in the community. Similarly in the sociological literature on the economic and education attainment of immigrants as well as their children, the social assimilation and integration is also proved important in shaping one's social capital as well as human capital, which may lead to quite different trajectory in the later lives (e.g. Gang and Zimmerman, 2000; Zhou 1994).

Moreover, in historical Liaoning, there are strong reasons to take into account the role of social integration at destination that interacts with childhood migration in shaping later life mortality. To begin with, as it is internal migration within one large area, there is neither great cultural and language difference, nor critical difference between origins and destinations in terms of economic development and living habits. Hence, the major problem for migrant children, if there is, largely comes from the adaption to the new community and self-adjustment for changes in living conditions. According to previous findings, if there are factors facilitating their adaption and adjustment, we could expect a larger chance for child migrants to have better health in later life. Lasting difficulties in social integration may put them in a rather disadvantageous position. Moreover, agriculture production is the main source of economic return for pre-modern societies. Unlike in other parts of China which suffer from extremely high population-land ratio, in Imperial frontier Liaoning, land is abundant that lots of empty land is waiting to be cultivated then. Labor shortage in land cultivation and in planting and harvest seasons, rather than land shortage in other parts of China, is more likely an obstacle for households to seek better socio-economic status. Hence,

compared with those relatively isolate migrant households, good social integration in the host communities may help migrant households to establish mutually-supportive relationships with other households in the agricultural production and thus to gain better economic return.

I propose two competing hypotheses for examining whether and how childhood migration is associated with adult mortality. First, childhood migration has independent effects on adult mortality – either monotonic decrease of the mortality risks because of a selection of the survival into later life with advantageous health conditions, or monotonic increase because of the interventions of human development due to changes in living environments in childhood. Second, social integration at destination interacts with the childhood migration in shaping later life mortality – people who migrate in childhood and live in villages facilitating social integration have lower mortality risks than their counterparts who live in villages hard to integrate.

Specifically, I would like to introduce the proportions of individual's surname in the village population as the measure of social integration. Many influential studies of contemporary Chinese use surname proportions as a measure of community social integration (e.g. Tsai 2007; Peng, 2004). In general, sharing a same surname in the community means a high possibility of establishing or having social connections in China because it indicates the high possibility of people descended from same ancestors thus belonging to the same lineages. Admittedly, in some cases, as the real lineages have their boundary, even sharing the same surname does not necessarily help outsiders to integrate. What's more, people can also establish social connections with others of different surnames in various ways. But, the surname concentration of individuals is nonetheless correlated to the social integration in the community. In addition, statistically, these kinds of measurement errors may only lead to an underestimation on the effects of social integration, because the mismatch between sharing same surname and belonging to same lineage tends to be random within such a large-scale population. Especially, the particular characteristics of lineages in Imperial Liaoning make me have even more confidence in the validity of surname proportions as a measure for social integration in this study. To be specific, on the one hand, the lineages in Imperial Liaoning are relatively weak compared with those in other parts of China. Lineages in Liaoning are often defined inaccurate (Ding et al. 2004), which make their boundary relatively ambiguous and open to new comers. On the other hand, Imperial Liaoning population largely consists of Han Chinese whose predecessors are immigrants from two provinces in North China, suggesting that sharing a surname in the studied population means much higher possibility of having same ancestors compared with other

populations. In sum, with relatively open boundary and similar origins, in my Imperial Liaoning population data, one's surname proportion among the village total population is much likely to be valid and efficient as a measure of his social integration in the community, which, for migrants, is the destination.

Figure 1 here

Figure 1 compares the surname proportions of people who have childhood migration and who do not in the village by year. Although the surname proportion of people who have childhood migration fluctuates more because they are based on a relatively small number of observations (138 observations on average each year), compared with the surname proportions of people who do not have childhood migration (11073 observations on average each year), the differences between the two groups of people are not likely to be systematic. Besides, the reason for the peak of surname proportion of childhood migration people (100 percent) in 1807 is that there is only one individual having childhood migration and living in a single surname village in that year, which, indeed, has very little weight in the overall estimation.

Data, measures and methods

In this study, I take advantage of a prospective, large-scale, multi-generational panel dataset – China Multi-Generational Panel Dataset-Liaoning (CMGPD-LN). The CMGPD-LN data is triennial household register data covering the Imperial period from 1749-1909 (Lee, Campbell & Chen, 2010). The original dataset comprises 1.5 million records describing approximately 260,000 people who lived in about 700 villages in Liaoning province in northeast China. The origins of the registers and procedures for data entry, cleaning and linkage are described by Lee and Campbell (1997, 223 - 237). Features of this dataset relevant to event-history models are discussed in Campbell and Lee (1997; 2008). Compared with other data of China before 20th centuries, these data provide far more comprehensive and accurate sociological and demographical information across individual life-course.

Map 1 here

Referring to my study, this dataset has two advantages and two limitations. The first advantage is, as suggested by Campbell and Lee (1996), this dataset is an excellent source for studies on the determinants of mortality, because the population is relatively close in the sense that entries and exits from the population are rare and annotated with specific reasons if they occur. Thus a common concern for longitudinal and panel data – attrition – could be largely avoided. The second advantage lies on its availability to continuously record migrants from origin to destination thus to continuously observe their lives before and

after migration. Indeed, such advantage facilitates comprehensive comparisons between people who stay and who migrate, before and after migration. However, one limitation of these data is that as the data are transcribed from triennial household registers, there is no specific timing information of events happening between two registers. Namely, I can only know whether people died since previous register year and before or on the current register year, without knowing the date of death. As a result, discrete-time event-history model (Allison, 1984), as an analogy of Cox regression, tends to be one good choice. The other limitation is that this dataset does not allow tracing females from their childhood, because of its omission of daughters as well as pre-marital information for married females (Campbell and Lee, 2009). Due to such reason, my study has to focus on males only.

I further restrict the data to those males whose first record is no later than 15 *sui*, whose household and residential village can be identified, whose grandfather can be traced, and whose consecutive two records are 3 years apart. As this study is on life-course but the data are limited in recording females before marriage, I restrict the data to males who enter the data since their childhood. As a result of the change in the recording formats of the household registers, only data after the year 1789 allow to identify unique household and its residential locations. Considering there are some individuals whose records do not strictly follow a triennial way but miss in some years mainly due to missing registers, I restrict the data to those individual records of which the gap between the two registers is 3 years. Such restriction facilitates relatively unbiased estimation – free from the influence caused by different intervals between individual observations – in the discrete-time event-history analysis. After all above-mentioned restrictions, my analytical data contain 377160 observations, representing 80679 males living in around 594 villages from the year 1792 to 1909. Such analytical data include 1193 individuals having childhood migration and 15732 deaths in total. To allow for different effects of childhood migration on individuals at different life stages – namely, the immediate effects on children, the long-term effects on normal adults, and the long-term effects on old-age, in other words, relatively healthy people who survive over the average age of death, in the practical analysis I divide the data into three sub-samples: 1-15 *sui*, 16-45 *sui*, and 46-75 *sui*.

Figure 2 here

Figure 2 shows the distribution of individual observations and the proportion of individual observations having childhood migration at each age in the data. Given all individuals included in my analytical data should be observed from no later than 15 *sui*, the total number of observations decreases monotonically along with the increase of age, as a result of the increasing number of deaths. The proportion

of observations having childhood migration increases from 1 to 15 *sui*, reaches the peak at 27 *sui*, and drops till around 42 *sui*, suggesting there is likely a pattern that individuals having childhood migrations experience some mortality disadvantage during such period. After 42 *sui*, as individuals keep dying out and the sample size is shrinking, the proportion of childhood migration individuals fluctuates substantially, which may put some uncertainty on the estimation for individuals of such old ages.

Table 1 here

I summarize in table 1 the characteristics of my analytical data by dependent, independent, and individual-, household- and village-level control variables included in this study. The dependent variable is a dichotomous variable indicating whether the individual is dying in next 3 years – the time interval between two consecutive register years. There are two independent variables - a binary variable indicating whether an individual has childhood (1 – 15 *sui*) migration, and a continuous variable contains the proportion of an individual's surname among population in the village he is living at. The childhood migration variable is time-variant before 15 *sui* and time-invariant after 15 *sui*, since it becomes an early-life event for adults. To distinguish the effects of childhood migration with migration at other life stages, I also construct two dummies for adulthood (16 – 45 *sui*) and old-age (46-75 *sui*) migration, in the same way as constructing the childhood migration variable that they are time-variant during the corresponding life stage but time-invariant when such stage is over. The surname proportion variable, as a measure of social integration at destination, is time-variant and calculated from the number of people of the same surname with the indexed individual divided by total population living in the same village. There are three birth-related individual-level control variables - number of brothers (count), proceeding birth interval (dummy: less than 2 years or not), and birth order (ordinal), which are supposed to be influential to individual's life-course health (Campbell and Lee, 2009; Curtis, 1993; Knodel, 1984). The household-level control variables are household size, male labor ratio and salaried official positions held by household members. While the household size and the number of household official positions are counts, the male labor ratio is specifically calculated from the number of male labor (15-40 *sui*) divided by the household size. The household male labor ratio on the one side reflects the labor supply of the household, which is essential to pre-modern agricultural production, and on the other side indicates the dependency in the household – the lower labor ratio, the heavier burden. The number of salaried positions held by household serves as another socio-economic indicator for the household – a salaried official position, no matter soldier, artisan or clerk, contributes relatively steady and higher economic return to the household, compared with

purely agriculture (Campbell and Lee, 2009). The village-level control variables are village total population (in Logarithm) and proportion of married young males (15-30 *sui*). The latter one is an indirect measure of the wealth of village, because marriage in Imperial Liaoning is quite costly to normal males (Campbell and Lee, 2001). Besides, I also control the fixed effects of year, region, and individual age and marital status, which are not shown in table 1. They are designed to take into account the secular trend of mortality, regional difference of mortality, duration effects, and individual emotional affiliation.

I apply discrete-time event-history method in my study (Allison, 1984). As discussed above, such method is one of the best appropriate methods considering the properties and structure of my data. By using previous circumstances to explain current events, this method largely avoid the problem of simultaneity in causal inference. Specifically, for each subsample there are two statistical models. In the first model I regresses the individual's risk of dying in next three years on childhood migration, surname proportion in the village, and all the other control variables[5], to test whether childhood migration itself has monotonic and independent effects on later mortality that is my first hypothesis. The second simply adds one interaction term of childhood migration and surname proportion in the village to the first, treating the social integration at destination as one pathway through which childhood migration substantially affects mortality in later life – namely, the competing hypothesis.

One critical question to any of my observed results is, what if individuals who have childhood migration and who have not, as well as individuals with childhood migration experience who later live in villages easier for social integration and who do not, are inherently different in terms of physical, socio-economic, and other characteristics related to individual health? Methodologically, my quick response to this problem is that considering the nature of childhood migration that children are not deliberate to decide either migration or destination, it may not affect my results that much, at least less than studies on adult migration. To put it differently, the results will not be largely biased by individual -level self-selection. However, admittedly, it might be influenced by some omitted factors at household or even broader level.

As a result, technically, taking advantage of fixed effects logit models (Allison and Christakis, 2006), I am able to control for constant unobservable characteristics at household, decedent group or other levels, which to some extent will address those endogenous problems such as omitted variables and selection bias.

[5] In this model, the surname proportion in a sense works as a control variable, too, as I only focus on whether childhood migration has direct effects on mortality.

To be specific, because the childhood migration variable is time-invariant in the adult and old-age subsamples, I cannot directly fix the effects of characteristics at individual level. Instead, I choose to introduce the fixed effects of grandfather. Conceptually, introduction of fixed effects is equal to adding dummies for clusters of interest, which facilitates comparisons between observations within one cluster, controlling for characteristics shared by individuals within the cluster. Hence, by introducing fixed effects of the grandfather, I could make comparisons on mortality risks between paternal cousins and brothers who have childhood migration and who do not, as well as who live in villages easier to socially integrate and who do not, net of influence from their paternal side gene, intergenerational transmission of traits, characteristics, growing environments, etc. Referring to the growing environments, especially, considering the fact that it is common for cousins to grow together within same environment and to influence each other, it is also one advantage of fixed effects of grandfather over fixed effects of individual.

Results

Table 2 here

Table 2 shows the results of my discrete-time event-history analysis. For children aged 1 – 15 *sui,* I fail to find any evidence suggesting a statistically significant immediate effect of childhood migration on infant and children mortality, either independently or in a combined way with social integration at destination. It is not surprising considering the generally high infant and child mortality among such pre-modern populations. Rather, those individual level birth-related covariates such as number of brothers, proceeding birth interval, and birth order are statistically significant. As the same with Campbell and Lee (2009), the number of salaried positions in the household is negatively associated to child mortality risks. Besides, living in a wealthier village, as measured by proportion of married young males in the village, may reduce children mortality risks.

Among males aged 16-45 *Sui*, as shown in model III and IV in table 2, I find childhood migration interacts with social integration at destination in shaping the adult mortality, and there is no evidence supporting the hypothesis that childhood migration itself has independent and monotonic influence on mortality. In Model IV, the main effect of childhood migration is positive and significant, suggesting that generally childhood migration tends to result in mortality disadvantage for individual in later life. However, as the coefficient of the interaction term of childhood migration and social integration at destination is

negative and significant at beyond 0.01 level, it indicates that living in a village facilitating social integration may substantially lower such mortality disadvantage for people with childhood migration substantially. The main effect of surname proportion is not significant in Model IV, suggesting that there is no statistically significant difference in mortality risks among people without childhood migration experience but having different social integration at the communities. It implies that the surname proportion variable tends to exactly capture the effects of social integration for childhood migration that it can only have influence on people's mortality risks when combined with such early life experience. This is reasonable, considering those who stay are original local residents and can develop their own social connections and integration via many ways, which may not necessarily be reflected by the surname proportion estimator. However, for new comers, the easiest and most possible way to form social connections is always seeking for and connecting with someone with similarities such as same or related potential ancestors, especially in such a pre-modern and rural population included in this study. As reflected by the insignificant coefficients of adulthood migration and the its interaction term with surname proportion in the village, we can see the social integration is particularly important to individuals who used to migrate in childhood that is critical to human development that human is rather sensitive to the change of living environments during such period.

Table 3 here

To specifically interpret the coefficients – namely, the effects of childhood migration and social integration at destination – in the fixed effects logit model requires calculating odds and odds ratios of mortality risks for different groups of people. This is particularly good because we are interested in comparisons between different pairs of people, either who stay and who migrate in the childhood, or who migrate in childhood and live in villages different in social integration. As the surname proportion variable is continuous, if we directly calculate the odds ratios from the coefficients of it and its interaction term with childhood migration, such odds ratios will reflect the comparison between individuals living in villages that 100 percent people have the same surname and living in villages that no one has the same surname with indexed individuals, which is quite rare in the real world. Hence, to have more real odds and odds ratios of the effects of childhood migration and social integration on mortality, I construct the table 3 by substituting the surname proportions 0.4 and 0.5 into calculation, accounting for different social integration in villages.

Specifically, we can see in the table 3 that no matter living in villages of 50 percent or 40 percent people sharing the same surname, the mortality risks of individuals having childhood migration are

generally higher than local residents. But, among individuals with childhood migration, living in a village good for social integration can lower the mortality risks substantially. When people's surname proportion is 50 percent in the village, the odds of individuals who migrate in childhood and die in next 3 years are 1.054 times as large as the odds of local residents without childhood migration, while when living in a village one's surname proportion is 40 percent, such odds ratio is 1.252. Regarding the comparison we are most interested in between people having childhood migration but living in villages facilitating social integration and villages relatively not – namely, the difference between 50 percent and 40 percent surname proportions in the case of table 3, the odds of dying in next 3 years for individual of good social integration is just 84.6 % of the odds for individuals of relatively not good social integration. The difference of odds between local residents living in villages of different surname proportions is not significant, indicating that social integration is only influential to those who have childhood migration experience.

Among males aged 46 – 75 *Sui*, as shown in table 2, the effects of childhood migration tend to be different from its effects on normal adults – it is independently and negatively associated with mortality risks, while there is no evidence suggesting that destination social integration plays an important role. One possible explanation is that these people who manage to survive to such old ages are generally healthy. Especially, individuals having childhood migration at these ages tend to be even more robust, because they have overcome the mortality disadvantage in adulthood. In this sense, the childhood migration works as a selection for health rather than a direct cause. However, as there is no available detailed health information for further tests, it remains unclear what factors are actually selected by childhood migration and associate with good health for those old age people. Besides, because the data size is relatively small for such old-age population and the proportion of individuals having childhood migration fluctuates dramatically across ages, the reliability of these estimated results is to some extent suspectable.

Focusing on 16-45 *sui* males, I have made several robustness checks and the estimated results in the main analysis persist with statistical significance. First, I apply logistic models with fixed effects of father, to test whether there is any selection bias or omitted variable problems caused by constant unobservable factors at household level, although the estimation is at risk being driven by very few cases since only brothers having different statuses of childhood migration are included in the comparison. Second, I replace the continuous year control variable with a set of dummies for each year, to test whether there are some periodic effects coexisting with childhood migration in certain years, which can make the effects of childhood migration spurious. Third, I test whether my results are sensitive to the cut-off ages between

subsamples by adding or minus 2 *sui*. Fourth, to address any systematic selections – either omission or late entry – of child records in the original household registers, I restrict my analytical data to those males who can be traced from no later than 10 *sui*. In all above-mentioned robustness checks, the direction and statistical significance of childhood migration, surname proportion in the village, and their interaction term remain similar, which suggests my estimated results are relatively reliable.[6]

Conclusion

My findings raise the possibility that childhood migration causes long-term mortality consequences in later life. However, we should bear in mind the complexity of such consequences to people at different life stages. To be specific, for adults aged 16 – 45 *sui*, while childhood migration generally leads to mortality disadvantages compared with local residents, living in villages facilitating social integration substantially lowers the mortality risks of individuals having childhood migration. It indicates that the effects of childhood migration interact with social integration at destination in shaping the adult mortality. However, referring to males aged 46-75 *sui*, childhood migration is associated with individual's mortality risks negatively and independently, which possibly functions as an selection of health.

Such finds contribute to a better understanding on the long-term effects of migration and resettlement on children and reveal one pathway for such effects that is social integration at destination for adult males. The findings are relatively robust from selection effects of migrants, limitations of other datasets, and certain endogenous problems in the causal inference. However, it also has some major limitations that caution against over-interpretation. First, the findings are restricted to males only. Second, given it exploits historical data compiled in pre-modern time there is insufficient information related to causes of death, as well as other alternative health measurements. Third, the results here can only provide hints rather than direct evidence to contemporary studies, given possible changes in the modern life.

Beyond the academia, as this study underlines the importance of social integration at destination in mediating the possible mortality disadvantages in the later life of child migrants, it has significant implications for families, public organizations, and policy makers to consider when planning migration and resettlement as well as following projects. To benefit migrant children in a long run, improvements in social institutions and policies that facilitate social integration at destination communities should be taken into consideration seriously.

[6] All the results of these robustness checks are available from the author upon request.

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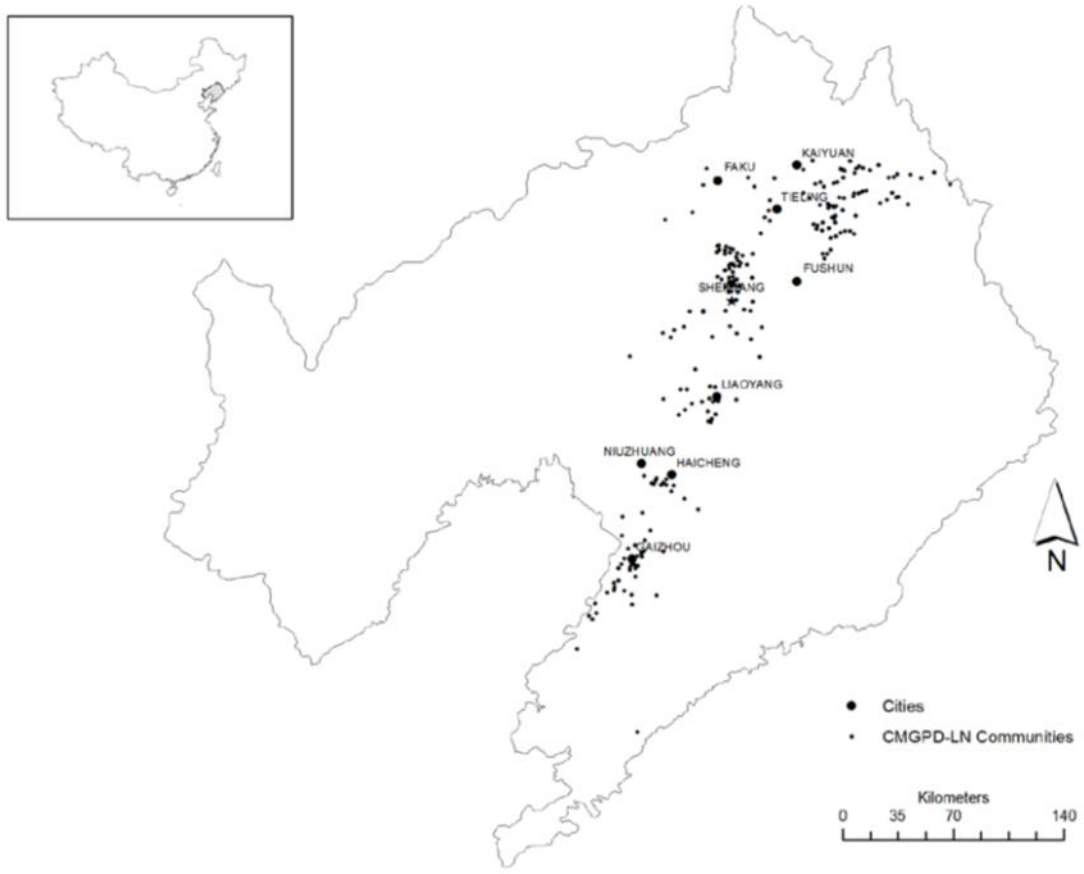
Map 1. Located CMGPD-LN villages



Source: Lee, Campbell and Chen (2010:16)

Figure 1. Surname proportions in the village between individuals who have childhood migration and who do not, 1792-1909

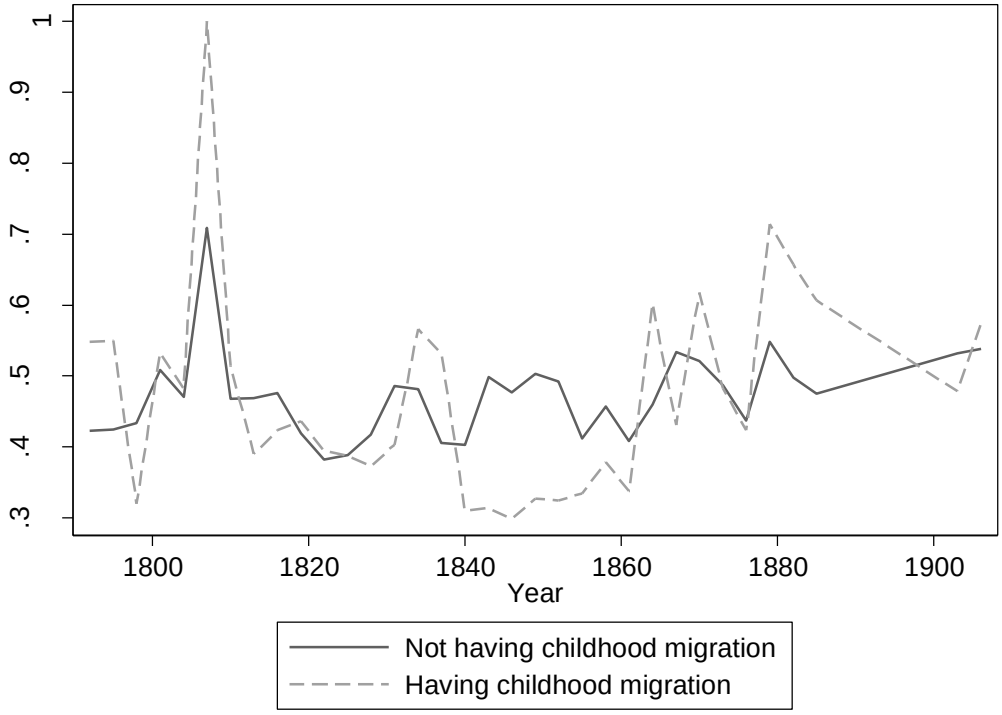


Figure 2. Proportion of people having childhood migration and number of total observations by age

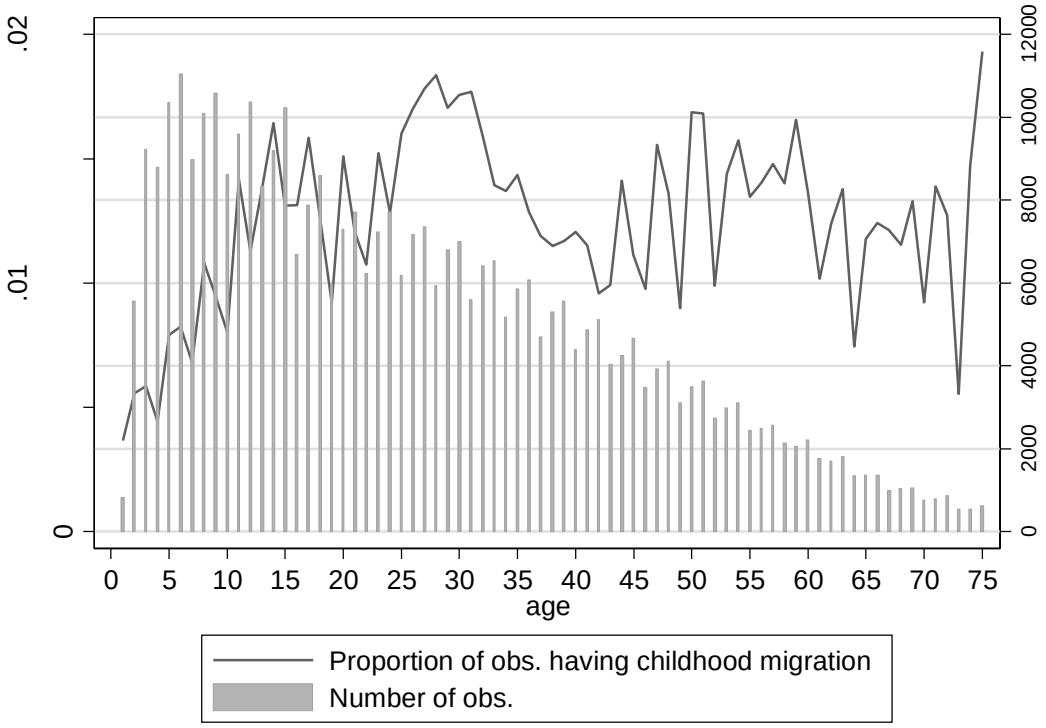


Table 1 Summary Statistics of the Analytical Data: Males Aged 1 - 75 *sui* from China Multi-Generational Panel Dataset-Liaoning (CMGPD-LN)

Variable	Obs.	Mean/%	S.D.	Min	Max
Dying in next 3 years	377160	0.042	0.200	0	1
Childhood (1-15 *sui*) migration	377160	0.012	0.111	0	1
Adulthood (16-45 s*ui*) migration	377160	0.013	0.112	0	1
Old-age (46-75 *sui*) migration	377160	0.002	0.047	0	1
Proportion of surname in the village	377160	0.479	0.343	0.001	1
Number of brother	377160	1.121	1.298	0	11
Proceeding birth interval < 2 years	377160	0.586	0.492	0	1
Birth order	377160	3.268	2.804	1	43
Household labor ratio	377160	0.240	0.138	0	1
Household size	377160	14.322	12.696	1	127
Salaried positions held by household	377160	0.165	0.587	0	9
Village population in logarithm	377160	5.708	1.205	0	7.951
Proportion of married young males	377160	0.565	0.145	0	1

Period	1792-1909
Number of individual having childhood migration	1193
Number of death	15732
Total individual	80679

Table 2. Effects (Coefficients) of Migration Age and Social Integration at Destination on Mortality Risks among Males Aged 1 - 75 *Sui* in Liaoning, China, 1792-1909, Adjusted for Fixed Effect of Grandfather, Birth-related, Household, Village and Other Characteristics.

	Logistic regression, with fixed effect of grandfather					
	1-15 *sui*		16-45 *sui*		46-75 *sui*	
Variable	I	II	III	IV	V	VI
Migration in						
Childhood (1-15 *sui*)	0.068	0.088	0.190	0.915**	-0.887***	-1.262***
	(0.275)	(0.410)	(0.241)	(0.359)	(0.282)	(0.466)
Adulthood (16-45 *sui*)			0.117	0.282	-0.392	-0.267
			(0.218)	(0.296)	(0.270)	(0.328)
Old-age (46-75 *sui*)					-0.024	0.003
					(0.208)	(0.296)
Social integration at destination						
Surname proportion in the village	0.631***	0.633**	-0.004	0.052	0.083	0.940
	(0.243)	(0.245)	(0.206)	(0.209)	(0.223)	(0.229)
Interaction of migration and social integration						
Childhood migration × Surname proportion in the village		-0.044		-1.724***		0.845
		(0.677)		(0.659)		(0.815)
Adulthood migration × Surname proportion in the village				-0.370		-0.305
				(0.478)		(0.504)
Old-age migration × Surname proportion in the village						-0.031
						(0.437)
Birth-related characteristics						
No. of brothers	0.511***	0.511***	0.173***	0.173***	0.173***	0.173***
	(0.033)	(0.033)	(0.022)	(0.022)	(0.025)	(0.025)
P.B.I ≤ 2 years	0.199***	0.199***	0.066	0.067	0.052	0.052
	(0.042)	(0.042)	(0.042)	(0.042)	(0.047)	(0.047)
Birth order	-0.228***	-0.228***	-0.019**	-0.019**	0.006	0.006
	(0.015)	(0.015)	(0.009)	(0.009)	(0.010)	(0.010)
Household characteristics						
Labor ratio	1.579***	1.579***	-0.144	-0.146	-0.148	-0.151
	(0.256)	(0.256)	(0.138)	(0.138)	(0.182)	(0.182)
No. of household members	0.021***	0.021***	0.025***	0.025***	0.010***	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
No. of salaried positions	-0.112**	-0.112**	-0.064	-0.065	0.197***	0.198***
	(0.053)	(0.053)	(0.057)	(0.057)	(0.058)	(0.058)
Village characteristics						
Village population in Logarithm	0.156*	0.156*	0.052	0.047	0.090	0.087
	(0.085)	(0.085)	(0.068)	(0.068)	(0.073)	(0.073)
Proportion of married young males	-0.871***	-0.871***	-0.039	-0.044	-0.461***	-0.465***
	(0.208)	(0.208)	(0.165)	(0.165)	(0.175)	(0.175)
Year, age and region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Marital status fixed effects	No	No	Yes	Yes	Yes	Yes
N	30613	30613	55476	55476	30865	30865
Group	3334	3334	3884	3884	4225	4225

Notes:

1. Dependent variable: dying in next 3 years (1: Yes; 0: No).
2. The fixed effects of year and age are controlled as continuous variables, while the fixed effects of region are controlled as a set of dummies.

* p < 0.1; ** p < 0.05; *** p < 0.01.

Table 3. Odds and Odds Ratios for Comparison across Groups of Adult Males Aged 16-45 *sui,* Liaoning, China, 1792-1909

	Proportion of individual's surname in the village		
Childhood migration	0.5	0.4	Diff.(Odds ratio)
Yes	$e^{[\beta1 + (\beta2 + \beta3)*0.5]} = 1.082*$	$e^{[\beta1 + (\beta2 + \beta3)*0.4]} = 1.279*$	$e^{(\beta2 + \beta3)*(0.5-0.4)} = 0.846**$
No	$e^{\beta2*0.5} = 1.032$	$e^{\beta2*0.4} = 1.021$	$e^{\beta2*(0.5-0.4)} = 1.005$
Diff. (Odds ratio)	$e^{(\beta1 + \beta3*0.5)} = 1.054**$	$e^{(\beta1 + \beta3*0.4)} = 1.252**$	$e^{\beta3*(0.5-0.4)} = 0.842***$

Notes:

1. Odds are calculated from the estimated coefficients of Model IV in Table 3. β1 is the coeffecient of Childhood migration; β2 is the coefficient of proportion of surname in the village; β3 is the coefficient of their interaction.

2. For cells including multiple coefficients, p-value is based on the joint significance (Wald test) of those coefficients.

* p < 0.1; ** p < 0.05; *** p < 0.01