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How Does Internal Migration Affect the Emotional Health of Elderly Parents Left-Behind?

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How Does Internal Migration Affect the Emotional Health of Elderly Parents Left-Behind?☆

Abstract

The ageing population resulting from the one-child policy and the massive internal migration in China pose major challenges to elderly care in rural areas where elderly support is based on a traditional inter-generational family support mechanism. We use data from the first two waves of the China Health and Retirement Longitudinal Study to examine how migration of an adult child affects the emotional health of elderly parents left-behind. We identify the effects by applying fixed-effects and instrumental variable regressions which both identify the effect based on different sources of variation. We find that migration significantly reduces overall life-satisfaction by 8.8 percent and leads to an 8.7 (12 percent) percent higher probability of suffering from depressive symptoms (loneliness). Emotional health outcomes drastically deteriorate with reduced emotional support. In contrast to other developing countries, remittances cannot buffer the negative effects of emotional health. As emotional health is a key determinant of the overall health status, our findings have significant impacts for rural areas.

Keywords: Migration, China, Mental Health, Elderly Parents, Left-Behind

1. Introduction

Primary social, economic and cultural reforms since 1978 have resulted in an accelerated development of the Chinese economy. Rapid economic growth combined with urban-prioritised and pro-coastal policies caused a great demand for cheap labor. Meanwhile, the increasing efficiency level of agriculture production due to the practice of the Household Responsibility System launched in the early 1980s has led to a large labour surplus in rural China.[1] As a result, the migrant population has increased more than three-

[1]The Household Responsibility System (or Contract Responsibility System) is an agricultural system that was implemented in the early 1980s. Peasant households were given access to farmland from the village authority, which was allocated primarily by household size. This system returns some freedom back to farmers and allows the household head to be responsible for their profits and losses, empowers peasants to grow crops freely and allows them to trade their agricultural products in a relatively competitive market at an unregulated price. The implementation of this system has increased the initiative and motivation of farmers and the efficiency of the production and has contributed to generating a labour surplus in rural areas (Zweig, 1997).

fold from 70 million in 1993 to 274 million in 2014, and the number keeps rising (National Bureau of Statistics of China, 2014).

Rural China provides a very interesting framework for our evaluation of migration on the elderly. As a result of primarily younger individuals (aged between 18 and 29 years) leaving rural areas to seek better employment opportunities in cities as well as an increasing life expectancy and rapidly declining fertility rates,[2] rural areas are facing a dramatic ageing problem that many developing countries will be facing in the future (Pang *et al.*, 2004). Jackson and Howe (2004) predict that the elderly population above 60 years of age will reach 28% of the total Chinese population in 2040, more than twice the amount of 2012.

The demographic transition is causing considerable pressure to the family. In China, old age support is traditionally the role of adult children (Chyi and Mao, 2012). More precisely, according to Confucian filial piety, it is in particular the role of the eldest son and his family to care for their parent in old age. Meanwhile, the current pension system is underdeveloped in rural areas. While approximately 35.3% of urban employees are covered (Jackson and Howe, 2004), merely 4.67% of the elderly in rural areas receive pension income. As a result, elderly parents in rural areas rely heavily on their families as main source of support in old age. With the drastic amounts of out-migration from rural to urban areas, this informal safety net is however dramatically weakened leaving elderly parents often in precarious situations. In contrast, employment and hence income in cities is far from being secure. Rural migrants often work in informal or precarious employment and have risky incomes excluding them from social security payments in urban areas (Knight and Yueh, 2004; Giles *et al.*, 2010; Biao, 2007). As a consequence, financial support from a migrant child may be unreliable putting the elderly at a greater risk of falling into poverty Giles *et al.* (2010). This may significantly exacerbate the elderly parent's vulnerability leading to significant distress. Meanwhile, it is inherently more difficult for migrant adult children to provide emotional and physical support to their parents, which may further severely impair the elderly's emotional health. In this paper, we want to assess how migration of an adult child affects the emotional health of elderly parents in rural China. For this purpose, we use data from the China Health and Retirement Longitudinal Study (CHARLS) for 2011 and 2013 which is particularly well suited as it contains detailed information of both elderly parents and all of their children.

[2]The implementation of the One-Child Policy has led to historically low fertility rates – 1.64 in 2011, compared to 4.36 in 1963 (National Bureau of Statistics of China, 2012).

Due to the increasing problem of ageing across many countries the world, a growing body of literature has emerged that examines various aspects as to how migration affects families left behind. In light of our own research question, we focus on research regarding the effects on elderly here. In particular, health related outcomes have received considerable attention. The basic idea is that in developing countries remittances of migrants to their families left-behind may allow the elderly to have access to better medical care which may positively affect their health (Vanwey, 2004; Amuedo-Dorantes and Pozo, 2011; Ao *et al.*, 2015). Yet, much in contrast to other developing countries, remittances have not contributed to a substantial development of rural areas and has only had limited impact on the welfare of the left-behind (Biao, 2007) for much of the income of migrants remains in urban areas. Consequently, only limited positive health effects can be expected of remittances from migrant adult children. Moreover, Li and Démurger (2013) argue that migration reduces the number of laborers on family farms. As a consequence, elderly parents often respond to migration of an adult child by continuing to do farm and house work to replace the missing child (Pang *et al.*, 2004). This might significantly harm the elderly's health status. Not only does migration reduce the number of laborers, it also inherently reduces the number of caregivers and may lower the quality of care received by the elderly in rural areas. As a consequence, health conditions of the elderly are likely to exacerbate (Davin, 1999; Croll, 1997). Health effects resulting from migration of an adult child are *a priori* unclear and remain an empirical question. Considerably lower health outcomes among the elderly resulting from migration of an adult child are found for Mexico (Antman, 2010, 2015), and China (Huang *et al.*, 2015; Ao *et al.*, 2015). In contrast, Kuhn *et al.* (2011) find for Indonesia that migration of an adult child does not worsen elderly's health or find even a higher probability of improving it. Similar positive health outcomes are found for Bangladesh (Kuhn, 2004), Moldova (Böhme *et al.*, 2015) and Tonga (Gibson *et al.*, 2011).

It is however arguable whether over a short period of time health effects are indeed the result of migration of an adult child as any changes in health status may take some time to take effect. Even with careful estimation and identification strategies it is more plausible to believe that migration of a child first affects an elderly parent's emotional health in the short-run rather than immediately causing deteriorated physical health. In the medical literature, there is evidence that mentally healthier people are more inclined to live in a more healthy way (Veenhoven, 2008) and also people with positive mental states are found to have better immune responses (Cohen *et al.*, 1995) and are hence healthier on average.

A growing body of literature has therefore also devoted some attention to assessing the effects of migration of an adult child on parental emotional health. Reduced co-residency in extended households may result in parents feeling lonelier an powerless (Yao, 2011; Zhang and Li, 2004; Zhang *et al.*, 2005) but is also found to decrease levels of happiness among the elderly (Chyi and Mao, 2012). One may also argue that rural migration increases the elderly's psychological wellbeing as out-migration is valued as indication of the innate ability of a migrant child, which parents can be proud of (Zhuo and Liang, 2006). Moreover, migration inherently reduces the possibility of quarrels between family members which could mitigate some of the adverse effects of the absence of a child on emotional health (Zuo and Li, 2011). Antman (2015) investigates emotional health outcomes as one of many health outcomes and finds that migration in Mexico does not only significantly lower an elderly parent's physical health but also leads to worsened levels of emotional health. Similar findings are obtained by Mosca and Barrett (2016) for Ireland. The authors find that it is particularly mothers whose emotional health worsens when an adult child migrates.

The main challenge of this paper is to address the endogeneity of migration. One potential source of endogeneity is the selection of migrants and their families in terms of health. An important channel of emotional health is a person's physical health status (Clark and Oswald, 2002; Easterlin, 2004; Galper *et al.*, 2006). In this context, the so-called "healthy migrant effect" states that migrants tend to be healthier compared to randomly selected non-migrants (Jasso *et al.*, 2004; Giles and Mu, 2007; Rubalcava *et al.*, 2008; Riosmena *et al.*, 2012; Farré, 2015). If healthier parents have healthier children, we would expect those parents with migrant children to have better emotional health outcomes on average. Not accounting for this selectivity may potentially understate the negative effects of migration on parental emotional health. To eliminate such time-invariant individual heterogeneity, we exploit the panel structure of the CHARLS data. More specifically, we use a Fixed-Effects approach to allow for individual differences over time to identify how changes in the migration decision of an adult child affect changes in emotional health of the elderly parent.

Another potential source of endogeneity is reverse causality which occurs if children take their migration decision responding to their parent's overall emotional health status. Giles and Mu (2007) find that poor parental health in China significantly reduces the migration probability of adult children. To address this problem, we further adopt an instrumental variable approach which helps us identify the effect of migration by exploiting variations in community characteristics rather than individual changes that might influ-

ence the child's migration decision but are not related to parental emotional health. As instruments we use (i) the percentage of the migrant population relative to the total population within a community and (ii) a community's total agricultural and industrial revenues in 2010 interacted with the share of males within a household to gain some household variation. We make use of the fact that it is more likely for a child to seek better employment opportunities in the cities if the share of migrants within a community is higher hence lowering migration costs (Rozelle *et al.*, 1999; Mckenzie and Rapoport, 2007; Fan, 2008) or if the community's economic condition is relatively worse.

Our main identification strategy relies on short-run changes in the migration status of an adult child to identify the effect on parents emotional health in rural areas in China. The reduced social support network as a result of the absence of an adult child, may cause severe feelings of unhappiness and loneliness and may eventually lead to more pronounced depressive symptoms. As a result of such deteriorated emotional health outcomes, physical health is likely to deteriorate faster over time. We therefore view short-run changes in emotional health as crucial risk factors to the elderly's overall health status. Our findings suggest that parents with migrant children have significantly worse emotional health outcomes. We find that return migration of an adult child can not entirely reduce the gap in negative emotional health outcomes. By disaggregating the effects, we further observe that mothers suffer more from the absence of an adult child. While emotional support in particular of the spouse is crucial for buffering the adverse effects of migration on a parent's emotional health, financial support in rural China is not found to ameliorate any harmful any harmful consequences.

The remainder of this paper proceeds as follows. In the next section, we will provide a quick overview into the institutional background in China. In section 3, we will briefly introduce the data and present descriptive statistics. Section 4 will detail the empirical strategy used in this paper. Our main results measuring the impact of migration on parental emotional health are presented in section 5. Some more heterogeneous effects are examined in section 6 along with different definitions of the migration variables. Finally, section 7 concludes the paper.

2. Institutional Background

The current Chinese social security system is a separated one providing different social safety nets for urban and rural areas (Wang, 2005). In urban areas, elderly are provided formal pensions given their pre-retirement incomes. In rural areas, in contrast, land is regarded as main form of insurance for old age since it can be passed on to the children.

The land arrangement laws allow young migrants to lend their land to others so their parents are not obligated to additional farming. Attempting to reform this dichotomous system, the Chinese government has been seeking to establish a reliable pension system with broad coverage as currently more than half of the rural elderly depend on family support (Du, 2003).

Because of a lack of formal pension in rural areas, elderly mainly rely on their own income from work and on support of their family members (Giles *et al.*, 2010). Traditional values are based on Confucian "filial pity" according to which adult children are responsible for the support of their elderly parents. More specifically, the main responsibility rests with the oldest son and his family. However, with improved economic development and modernization, there is an increasing concern that these traditional norms will weaken resulting in a deterioration of the willingness and ability of the younger generation to support the rural elderly (Chen and Silverstein, 2000).

The reduction in the number of caregivers for the rural elderly as a result of migration strongly weakens the informal security safety net and calls for an urgent extension of the coverage of the formal security system to rural areas. The new rural pension system[3], as proposed by the state council, aims to cover all rural regions by 2016, the end of 12th five year plan. However, it faces obstacles such as a severe funding gap and empty pension accounts (Wang, 2005) such that the Chinese pension system currently provides coverage for only 35.3% of the urban workers and covers even less in rural areas where the elderly are more financially vulnerable (Jackson and Howe, 2004). Coupled with a weakening or even an elimination of community support since the reforms in the late 1980s, the rural elderly have been relying greatly on family support. Data from Du (2003) suggest that only 19.61 percent of the elderly in rural China were able to obtain a pension providing a yearly pension of 660 RMB[4]. This is even lower than the poverty line (Giles *et al.*, 2010).

3. Data and Descriptive Statistics

3.1. Data and Variables

This study uses data from the China Health and Retirement Longitudinal Study (CHARLS), which is a joint effort of Peking University in China, the Behavioural and Social Research Division of the National Institute on Ageing and the World Bank. It surveys the mid-aged

[3]Unlike the old rural pension system, which emphasizes peasants' self-insurance via savings, the new rural pension system uses government fiscal revenue to provide subsidies.

[4]660 RMB correspond to slightly more than 100$. Pensions vary among different regions. In some rich coastal provinces such as Zhejiang Province, the basic pension amounts to 960 RMB per year.

and elderly aged 45 years or above in China. The dataset is designed for an easy comparison with the Health and Retirement Study (HRS) and other international ageing surveys such as the English Longitudinal Study of Aging (ELSA) and the Survey of Health, Aging and Retirement in Europe (SHARE). Based on the experience of the pilot survey in Gansu and Zhejiang Provinces in 2008, the survey probes 28 provinces in China since 2011 and follows the same individuals every two years. It covers around 450 villages/communities within 150 counties/districts. It contains detailed information for a random sample of people aged 45 years or older and their household members.[5] If more than one family is living together as one household, one of them with age-eligible members will be randomly chosen by the survey team. In case that there is only one household member who satisfies that age criterion, he or she is defined as the main respondent. If there are more than one age-eligible members, one of them is randomly selected as main survey respondent. Regardless of age, the spouse of the main respondent is automatically included.

For our study, we will use the nation-wide data for 2011 and 2013. One of the many appealing features of this dataset, the one that makes it particularly well suited for our analysis, as that it provides not only rich information about the elderly household head and spouse but also a vast array of information for all cohabiting and also for all non-cohabiting children. To study the impact of rural-to-urban migration on the elderly in rural China, we include only rural households in with respondents aged 60 or above. Since the main purpose of out-migration of adult children is to seek work opportunities for their own emotional health as well as that of their parents (Lee and Xiao, 1998; Chen, 1998; Sun, 2002), we further restrict the sample of elderly to include only those with working age children above the age of 16 years. This finally leaves us with 6041 observations with non-missing values available in both years.

We define an adult child as migrant if he or she lives in another county or even further away from their parents.[6] As our main variable of interest, we construct a dummy which takes the value of 1 if at least one of the adult children has migrated to another county. We observe that 36.1% and 34.5% of the sample households have at least one migrant child in 2011 and 2013, respectively. More generally, 15.4% and 16.5% of all adult children have migrated in 2011 and 2013 respectively.

We control for a rich set of control variables for both parents and their adult children.

[5] Under the Chinese particular residency registration system - the *hukou* system - a household usually consists of a pair of parents and their child(ren). The father or the oldest son of a family is usually registered as "the head of household".

[6] The Chinese provinces and autonomous regions are divided into autonomous prefectures, counties, autonomous counties and cities.

To allow for a non-linear impact of the parent's age, we introduce two age dummies, one for parents aged between 70 and 80 years of age and one for parents above 80 to account for life-cycle effects. Younger parents (below 70) are defined as the control group. We further account for the parent's gender, the number of children and we include a dummy for being married all of which are likely to differentially affect emotional health. As education among Chinese elderly does not vary much, we only control for illiteracy and educational levels above high school to allow for a correlation between human capital differences and emotional health (Case and Paxson, 2008; Cheng *et al.*, 2002). Moreover, emotional health are affected by health. For this purpose, we define two indicators for difficulties with basic activities of daily life (ADLs such as bathing, dressing or undressing, getting in or out of bed, going to the toilet, and eating) and instrumental activities of daily living (IADLs such as cooking meals, going shopping, taking phone calls, taking meds, doing housework or managing money). Each of these indicator takes the value of 1 if the elderly respondent reported to have some difficulties in performing at least one of the activities.

We further control for characteristics of the adult children and include the age, marital status and the education level as measured by indicators for being illiterate and educational attainments above high school. We further use the gender of the child and an indicator for being the oldest son to account for traditions and social norms that require sons and more precisely the eldest son and his family to support the parents in old age (Chen and Silverstein, 2000; Cong and Silverstein, 2008). Daughters, in contrast, are rather traditionally expected to provide emotional support even if they moved into the husband's household which is likely to affect an elderly parent's emotional health (Silverstein *et al.*, 2006).

To measure emotional health, we use three different measures indicating whether the elderly reports higher than average levels of happiness, depression or loneliness.[7] *Happiness* is our broadest indicator of emotional health. It refers to the general level of life satisfaction (Frey and Stutzer, 2002; Clark and Oswald, 2002) and describes a general feeling of satisfaction with life that is likely to be volatile and to strongly depend on daily incidents or life events. In contrast, the variable *depression* describes rather a level of (clinical) mental health, and is hence rather a long-term emotional outcome. It can be considered to be narrower than *happiness*, yet broader than *loneliness*, as it originates

[7]The three emotional health indicators are defined in the survey as "the feeling of happiness/depression/loneliness of the main respondent with scale 1 to 4 during the past week: (1) Rarely or none of the time (<1 day); (2) Some or a little of the time (1-2 days); (3) Occasionally or a moderate amount of the time (3-4 days); (4) Most or all of the time (5-7 days)".

from genetic variations, nurture environment or certain chemical influences (e.g. side effects of drugs), etc. Finally, the term *loneliness* relates to companionship, i.e. the feeling of affiliation generated by the family, other relatives or the community. Lastly, we a dummy variable indicating a person's level of physical health limitation. Based on an individual's self-rated health status, it takes the value of 1 if the respondent reports to be of "poor" or "very poor" health.

3.2. Descriptive Statistics

Average descriptive statistics of the main variables for all elderly respondents and their children are presented in the first column of 1. The average age is 69, education is generally low among rural elderly with 29.4 percent of elderly respondents being illiterate and only 9.3 percent having a high school degree or above. The elderly in our sample have on average 3.6 children and 35.3 percent of all households have at least one migrant child.

The table also reports average characteristics by migration status of the adult child where the sample migrants refers to those elderly households with at least one migrant adult child. The results show that elderly parents in such households have more children, tend to be older, are more likely to be male but tend to be less illiterate and less likely to be widowed and to have a lower aggregate household income.[8] Moreover, we do not find significant differences in limitations with ADLs or IADLs depending on the migration status of the adult children.

When focussing on child characteristics, we find that adult children are on average 40.8 years old. The vast majority is married and 63.7 percent of all adult children are men. Illiteracy rates are lower compared to the elderly generation and 14.7 percent of them have obtained at least a high school degree. Adult children in migrant households tend to be less likely to be illiterate but also slightly less likely to have a higher levels of education. Moreover, migrants are less likely to be male but have a higher probability to be married compared to adult children in households without a migrant.

[8] All financial variables are expressed in 2010 values using the national consumer price index.

Table 1: Descriptive Statistics of Elderly Parents by Migration Status of the Adult Child.

	All		**No Migrants**		**Migrants**		***t*-test**
	mean	SE	mean	SE	mean	SE	$p-$value
Household Characteristics:							
At least one migrant child	0.353	0.478	0.000	0.000	1.000	0.000	–
# of children	3.607	1.653	3.307	1.556	4.158	1.682	0.000
Agricultural hukou	0.736	0.441	0.729	0.444	0.748	0.435	0.127
Annual household income	6860	13025	7257	13288	6132	12498	0.001
Parental Characteristics:							
Age	68.933	6.664	68.529	6.442	69.673	6.993	0.000
Male	0.570	0.495	0.537	0.499	0.629	0.483	0.000
Illiterate	0.294	0.456	0.311	0.463	0.262	0.440	0.000
More than high school	0.093	0.290	0.095	0.293	0.089	0.285	0.470
Widowed	0.293	0.455	0.316	0.465	0.250	0.433	0.000
ADL difficulty	0.074	0.262	0.074	0.262	0.075	0.263	0.914
IADL difficulty	0.155	0.362	0.158	0.365	0.149	0.356	0.310
Health status	4.037	0.922	4.035	0.906	4.040	0.953	0.813
Characteristics of Adult Children:							
Age	40.787	7.711	40.114	7.706	42.023	7.569	0.000
Male	0.637	0.481	0.678	0.467	0.563	0.496	0.000
Illiterate	0.058	0.234	0.057	0.232	0.061	0.239	0.546
More than high school	0.147	0.354	0.136	0.343	0.167	0.373	0.001
Married	0.882	0.322	0.873	0.333	0.899	0.301	0.002
Outcome Variables:							
Happy	0.608	0.488	0.615	0.487	0.595	0.491	0.139
Depressed	0.287	0.453	0.275	0.446	0.311	0.463	0.003
Lonely	0.190	0.393	0.184	0.388	0.202	0.401	0.096
Bad self-rated health	0.302	0.459	0.296	0.457	0.312	0.463	0.197
N	6033		3906		2127		

Note: The test of difference is based on two-tailed t-tests of mean difference.

Finally, Table 1 shows descriptive statistics for our main outcome variables. More than 61 percent of the elderly report to be happy, 29 percent indicate that they have been depressed during the past two weeks, around 19 percent report to be lonely and 30 percent are of poor health. Furthermore, the result show a negative relationship between the migration status of the adult child(ren) and parental emotional health outcomes. Elderly parents with migrant children are more likely to report to be of poor health (31.2 percent versus 29.6 percent) and also report significantly higher levels of depression and loneliness. Part of these differences in outcomes could be explained by differences in the sample composition between the two groups.

4. Estimation Strategy

Our estimation strategy focuses on evaluating the impact of an adult child's migration status on the emotional health of the elderly parent i. Our main estimation issue is to deal with the endogeneity of the migration indicator. To purge its effect, we essentially use two approaches: (i) we identify the effect based on a fixed-effects approach and (ii) we then apply an instrumental variable approach. These approaches will be described in more detail below.

In a first approach, we address the endogeneity of the migration indicator caused by unobserved individual characteristics that affect both the adult child's migration decision and the parent's emotional health. To overcome this source of endogeneity, we exploit the panel structure of the CHARLS data. We start by estimating the following fixed effects model:

$$Wellbeing_{it} = \beta_0 + \gamma_1 MC_{it} + \mathbf{P}_{it}\beta_1 + \mathbf{C}_{it}\beta_2 + \phi_i + \epsilon_{it}, \quad (1)$$

where $Wellbeing_{it}$ refers to the emotional health indicators as described above for the elderly parent i in year t; MC_{it} is a dummy variable which takes the value 1 if at least one of the adult children has migrated. The vector $\mathbf{P}_{it}$ is a vector of parental characteristics as described above and $\mathbf{C}_{it}$ is composed of controls accounting for a number of child characteristics that potentially influence parental outcomes, ϕ_i captures an unobserved time-invariant individual-specific term, and ϵ_{it} is a random error.

In recent years, a considerable amount of research has focussed on the "healthy migrant effect" according to which migrants tend to be healthier as compared to randomly selected non-migrants (Jasso *et al.*, 2004; Giles and Mu, 2007; Rubalcava *et al.*, 2008; Riosmena *et al.*, 2012; Farré, 2015). The above described sources of individual time-invariant fixed effects can occur if healthy people are more likely to have healthier children and if healthier children have a greater probability to migrate. As a person's health is positively related with emotional health (Clark and Oswald, 2002; Easterlin, 2004; Galper *et al.*, 2006), we expect wellbeing of the elderly parents in migrant households to be better on average. This form of selectivity of the migrant sample may potentially understate the negative effects of migration on parental emotional health.

Fixed-effects models can deal with the potential positive selection of elderly parents in migrant households and hence to identify the effect of migration of the adult child on parental emotional health. By exploiting differences in individual responses over time, we can identify how changes in the child's migration status and other major events in an elderly parent's life affect emotional outcomes. This approach identifies this effect by

eliminating any time-invariant unobservable individual-specific characteristics, denoted as ϕ_i in equation (1), that are potentially correlated with both the adult child's migration decision and the elderly parent's emotional health.

Fixed-effects regression cannot swipe out unobserved individual specific effects that vary over time such as shocks that affect both the migration decision of the adult child and parental emotional health. Moreover, fixed effects regression cannot deal with reverse causality or simultaneity if children take a migration decision responding to their parent's overall health. As found by Giles and Mu (2007) poor parental health in China significantly reduces the migration probability of adult children. To address these sources of endogeneity caused by reverse causality, we adopt a second identification strategy. This is, we will additionally estimate an instrumental variable approach which exploits variations in community characteristics rather than individual changes that might influence the child's migration decision but are not related to parental emotional health to estimate the effect of migration on parental emotional wellbeing. As instrumental variables, we include (a) the percentage of the migrant population relative to the total population within a community and (b) a community's total agricultural and industrial revenues in 2010 interacted with the share of males within a household to gain some household variation.

Validity of the instrument requires a high correlation with the child's migration status but not with the error term and the instruments should also not be directly correlated with parental emotional health. Our first instrument - the community share of migrants - is well established in the migration literature as proxy for the migrant network (Rozelle *et al.*, 1999; Mckenzie and Rapoport, 2007; Fan, 2008). Its rationale is that active migrant networks can provide information to future migrants about job-search and living arrangements in the destination regions. This reduces the costs of migrating and hence increases the migration probability.

Our second instrumental variable - a community's total agricultural and industrial revenues in 2010 interacted with the share of males within a household - uses the community's total agricultural and industrial revenues as provided by the 2011 community survey. The rationale of the community variations in revenues is to proxy a community's relative economic condition. One of the main driving forces behind the decision to migrate is to seek better job opportunities in urban areas to be able to afford a higher standard of living for themselves and their parents remaining in rural areas (see for example Pang *et al.*, 2004; Giles and Mu, 2007; Fan, 2008). If the economic outlook in the home community is better as characterized by larger revenues, the returns from migration are lower such that migration becomes less attractive. Moreover, migrants from rural areas

face much discrimination in cities in terms of employment prospects (Knight and Yueh, 2004; Liu, 2005; Knight and Gunatilaka, 2010), they often work in informal employment and have risky incomes which often excludes them from having access to social security (Knight and Yueh, 2004; Giles *et al.*, 2010; Biao, 2007). Consequently, the probability to migrate should be negatively correlated with better economic conditions in the home community whereas the likelihood of return migration is expected to increase. To gain additional variation at the household level, we further interact these revenues with the fraction of male adult children within a household. The argument here is that men are the main breadwinners in Chinese families and sons have traditionally a higher responsibility to financially support their families and parents in old age (Chen and Silverstein, 2000; Cong and Silverstein, 2008). We therefore expect them to be more reactive to changing economic incentives than women.

5. Results

5.1. Migration and Emotional Health of the Elderly

The main results of both, fixed effects regressions and the instrumental variable approach, are reported in Table 2. Each cell refers to coefficient estimates of separate regressions in which we additionally control for a variety of factors that could affect the elderly's emotional health. The first columns additionally reports simple OLS estimate which are the simple correlations between the migration status of an adult child and the parental emotional health indicators. The estimates show that migration is associated with lower levels of happiness as well as significantly higher levels of depression and loneliness. In addition, migration tend to be associated with a higher probability of poor health among the elderly parents.

Table 1 in the Appendix illustrates the determinants of the emotional health indicators based on Linear Probability Models without accounting for endogeneity. We find that our indicators tend to deteriorate with age with the exception of loneliness. In particular, the feelings of being happy and depressed significantly worsen for parents above the age of 80 (Easterlin, 2004). Elder men tend to have significantly better outcomes. The number of adult children is associated with slightly lower probabilities of loneliness and poor health but tends to be positively related to depressive symptoms (Galper *et al.*, 2006). In line with Clark and Oswald (2002) and Easterlin (2004), we find that widowhood, difficulties in performing ADLs and IADLs as well as lower self-rated health[9] are the most important

[9]Health is defined in categories of 1 indicating excellent self-rated health to 6 for poor self rated health.

determinants of parental emotional health and are found to be related with considerably reduced probabilities emotional health of elderly parents. Child characteristics play a minor role. We find that elderly parents with better educated and married adult children tend to report on average better emotional health outcomes.

Table 2: Effect of Migration Status of Adult Children's Migration Status on Parental Emotional Health Outcomes. (Each entry represents coefficient on the indicator for having at least one migrating adult child at the time of the survey).

	OLS	**FE**	**IV**
Happy	-0.027**	-0.088***	-0.036
	(1.97)	(3.14)	(0.94)
Depressed	0.037***	0.003	0.220***
	(3.00)	(0.13)	(6.20)
Lonely	0.041***	0.033	0.087***
	(3.87)	(1.62)	(2.85)
Bad self-rated health	0.024*	0.026	0.120***
	(1.94)	(1.15)	(3.39)
Parental controls	Yes	Yes	Yes
Household controls	Yes	Yes	Yes
Adult Child controls	Yes	Yes	Yes
First stage F-stat			524
N	6041	6041	6041

* p <0.1, ** p <0.05, *** p <0.01, robust standard errors, absolute t-statistics in parenthesis.
Additional parental controls: dummy for being male, illiterate, having more than a high school degree, being widowed, having difficulties with ADLs and IADLs, the number of children, two dummy variables indicating age as well as a variable on self-reported health status (not in the model measuring the propensity of poor health); additional children controls: age, age squared, dummies for being male, married, the oldest son and two education dummies. We additional include province and time fixed effects. In fixed-effects regressions only the time-varying variables are kept.

As we have mentioned before, the migration indicator is likely to be endogenous if unobserved characteristics affect both an adult child's migration decision and parental emotional health. For example, healthier and emotionally more stable adult children may be more likely to both migrate and to have emotionally healthier parents. Such unobserved time-invariant factors are likely to underestimate the impact of migration on parental emotional health and prevent us from interpreting the OLS results in a causal way.

Fixed effects estimates eliminate such influences of unobserved individual characteristics and identify the effect of migration by means of changes in the child's migration status over the survey years. Coefficient estimates are reported in the second column of

Table 2. They reveal that parents with at least one migrant child report to be 8.8 percent less happy and to be 3.3 percent lonelier. The differences of the FE estimates with those obtained from OLS tell us that unobserved time invariant individual heterogeneity has an important impact on explaining parental emotional health. A closer comparison of the magnitudes of the respective differences in coefficient estimates is in line with the expectation that migrants and their parents are positive selected in terms of emotional health, which leads to a significantly understated negative impact of migration on overall levels of happiness but does less strongly affect loneliness or poor self-rated health. Moreover, depression can be thought of as being a clinical indicator of rather long-run emotional ill-health. Consequently, it is likely to vary only little over time which could explain the absence of a systematic relationship.

Determinants of fixed effect regressions, as reported in Table 2 in the Appendix, confirm that a deterioration of health status is the most important factor explaining a worsening of all emotional health indicators. An increasing probability of ADL limitations drastically increases the probability of feeling depressed and to report poor health but it leads to only marginally deteriorated feelings of unhappiness and loneliness. Elderly parents, who have more difficulties with IADLs, are found to be 6.9 percent less happy, to feel 5.5 percent more depressed and 7.9 percent more likely to report poor health. Clearly, deteriorations of physical health adversely affect emotional health of the elderly parent (Clark and Oswald, 2002; Easterlin, 2004). The estimates further reveal that other important life events, such as the loss of a child, significantly impairs happiness (the point estimate is 0.024). Widowhood, in contrast, is found to be related with a significantly higher probability of poor health as well as with higher levels of happiness. This clearly supports findings of Easterlin (2004) who notes that the emotional health of people adjusts only slowly to widowhood.

A further concern is reverse causality and simultaneity between the migration indicator and parental emotional health both of which are not eliminated by fixed effects regressions. To this end, column 3 shows IV estimates, which use community variations in the migration decision to identify the effect of a child's migration status on parental emotional health. Results of IV regressions crucially depend on the choice of instruments. To evaluate the strength of our instruments, Table 3 in the Appendix illustrates first stage regression results for the probability of a family having at least one migrant child. The table shows that the fraction of migrants per community is highly positively correlated with the probability of a household to have at least one migrant child. This is in line with our expectation that a larger migrant network facilitates migration by reducing its costs

and hence increases the probability of new migration (Rozelle *et al.*, 1999; Mckenzie and Rapoport, 2007; Fan, 2008). Moreover, communities with a higher proportion of industrial or agricultural revenues in 2010, are related with lower migration probabilities. The first-stage F-statistics on excluded instruments are 524, suggesting that our instruments are strong (Stock and Yogo, 2002; Angrist and Pischke, 2009). The Hansen J statistic, which are not reported here, further shows that all instruments are valid and that the set of instruments is over-identified in all cases.

The IV coefficient estimates, as reported in the last column of Table 2, strengthens our previous findings that the migration status of an adult child negatively affects the parent's emotional health. We find that elderly parents are about 3.6 percent less likely to be happy, are 8.7 percent lonelier and have a 12 percent higher probability of reporting poor health. Parents also tend to have a greater likelihood to be depressed when at least one of their children migrated but the coefficient estimates seem implausably high. It bears noting that all compared to the IV estimates OLS results are found to be significantly biased toward zero which is in line with a positive selection on physical and emotional health of migrant children and their parents..

5.2. Exploring the Dynamics of the Adult Child's Migration Status

Results obtained so far are instructive in that they allow us to learn about the effect of migration on parental emotional health. In China, migrants tend to be young, unmarried and to have no children (Knight *et al.*, 1999; Zhao, 1999; Démurger *et al.*, 2009). This implies that the migrant adult children in our sample with parents aged 60 or older are likely to have taken their migration decision when they were younger and less dependent on other household members. As we have no information on the migration history of each adult child, we will exploit the panel structure of the data in the remainder of this section to assess how changes in an adult child's migration decision over the survey period affect emotional health outcomes of the elderly parents. This is possible because emotional health reacts quickly to changes in an elderly parent's environment.

To examine how migration and emotional health interact, we will replace the migration dummy from (1) by two separate dummies to distinguish between the differential effect of newly migrating children and return migrants. We include those parents who did not see an adult child return or newly migrate between the survey years in the reference category. We will start by re-estimating equation (1) for emotional health outcomes from the separate survey years to assess the association with parental emotional health prior to changes in the migration status and afterwards. To reduce the risk of introducing further

sources of endogeneity, we control for pre-determined characteristics of 2011 only. Coefficient estimates of these regressions are reported in Table 3. Each first column refers to reported emotional health for 2011 and each alternating column indicates 2013 values.

The findings essentially show that while parents of return migrant tend to report lower levels of emotional health prior to the change in the migration decision, parental emotional health significantly deteriorates only after adult children newly migrate. This is an important finding as it suggests that parental emotional heath is likely to affect returning migration decisions but is not related to the decision to newly migrate.

Table 3: The Effect of Return and New Migration on Emotional Health in 2011 and 2013 based on Predetermined Characteristics for 2011. (Each entry in the table represents coefficient estimates for having at least one returning migrant child or having at least one newly migrating child)

	Happy		**Depressed**		**Lonely**		**Poor Health**	
	2011	2013	2011	2013	2011	2013	2011	2013
Return Migrant Child	-0.099*** (3.22)	-0.020 (0.60)	-0.005 (0.19)	0.047* (1.75)	0.052** (2.04)	0.027 (1.12)	-0.002 (0.08)	-0.016 (0.57)
New Migrant Child	0.019 (0.61)	-0.083** (2.32)	0.034 (1.09)	0.025 (0.83)	0.030 (1.08)	0.060** (2.24)	-0.065** (2.16)	-0.032 (1.05)
N	2694	2541	2694	2519	2694	2532	2694	2679

* p<0.10, ** p<0.05, *** p<0.01, robust standard error, absolute t-statistics in parenthesis.
All control variables refer to values for the 2011 survey. Additional parental controls: dummy for being male, illiterate, having more than a high school degree, being widowed, having difficulties with ADLs and IADLs, the number of children two dummy variables indicating age as well as a variable on self-reported health status (not in the model measuring the propensity of poor health); additional children controls: age, age squared, dummies for being male, married, the oldest son and two education dummies. We additional include province and time fixed effects.

Our results indicate that elderly parents of returning migrants are 9.9 percent less likely to be happy and 5.2 percent lonelier prior to the change in migration status. In contrast, we do not find systematically differences in depressive symptoms or poor health which could be reasons for adult children to return to their hometowns to better support the elderly parent left behind. In the case of newly migrating adult children, in contrast, we find that emotional health of elderly parents cannot be distinguished from all other parents before the migration decision is made. In support with the healthy migrant hypothesis, parents of new migrants tend to be significantly less likely to report to be of poor health in 2011 (point estimate is -0.065).

Results in the alternating columns reveal that the systematically lower levels of happiness and loneliness vanish if at least one of the migrant children return migrates. In addition, parents of return migrants are found to have significantly augmented probabilities of feeling depressed. As we only condition on pre-determined characteristics for the first survey wave, this specification does not allow us to account for other life events

that could have occurred in an elderly parent's life between the two waves that could potentially explain such drastically worsened feelings of depression. Apart from that, all remaining estimates point into the same direction which is that elderly parents with newly migrating children have a 8.3 percent lower probability of being happy and the likelihood of being lonely is raised by 6 percent. Depression and poor self-rated health are indicators for the overall physical wellbeing of the elderly parent, we do not expect them to vary greatly on average.

So far, we have established average associations between changes in the adult child's migration status and parent's emotional health. Yet it is crucial to account for major life events in the elderly parent's life that occurred over time to identify the differential effect of changes in migration on emotional health, as shown in the previous section. We therefore estimate a fully first-differenced specification in which we examine how both return and new migration of the adult child are associated with changes in the elderly parent's emotional health over time.[10] Parents who did not see a child return or newly migrate between the two waves are included in the reference group.

Table 4: Effect of Return and New Migration on Changes in Emotional Health based on Fully First-Differenced Specifications. (Each entry in the table represents coefficient estimates for having at least on returning migrant child or one newly migrating child)

	ΔHappy	**ΔDepressed**	**ΔLonely**	**ΔPoor Health**
Return-migrating child	0.084***	0.024	-0.033*	-0.004
	(3.18)	(1.06)	(1.80)	(0.19)
Newly migrating child	-0.097***	0.027	0.047**	-0.016
	(3.64)	(0.97)	(2.33)	(0.76)
N	6042	6042	6042	6042

* p<0.10, ** p<0.05, *** p<0.01, robust standard error, absolute t-statistics in parenthesis.
Additional parental controls: differences in age, being widowed, the number of children, health status, differences in ADL and IADL limitations; additional children controls: changes in age, age squared, marital status.

The results, as presented in Table 4, support our previous findings in that return migration leads to improved parental emotional health. Elderly parents who see at least one of their children return migrating, are found to be 8.4 percent happier and 3.3 percent less lonely. In contrast, if at least one of the adult children decides to newly migrate, the elderly parent's probability to be happy falls by almost 10 percent and feelings of loneliness rise by 4.7 percent controlling for other time varying events. Depressive symptoms and

[10] As shown by Wooldridge (2010), first-differencing is equivalent to a specification with individual fixed effects when only two years of data are available.

self-rated health are again much less affected by both return and new migration as these indicators rather refer to long term health outcomes which do not change quickly over time.

A comparison of the differences of estimates obtained for 2011 and 2013 as reported in Table 3, with those from fully first-differenced specifications as given in Table 4,[11] allows us to assess the importance of controlling for life events that have occurred in an elderly parent's life between the two survey years. We find that both the positive differential effect on parental emotional health in the case of a returning migrant child as well as the strong adverse effects of a newly migrating children are more pronounced if we allow for other major life events to affect emotional health. In particular, the considerably positive likelihood of being depressed in 2013 (the point estimate is 0.047 as reported in Table 4) after a child has return migrated is to a large extent driven by a deterioration in self-reported health and limitations with respect to ADLs and IADLs over time rather than being the consequence of return migration.

6. Heterogeneity

6.1. Heterogeneity of Parental Emotional Health

So far, we have investigated average effects of having at least one migrant child on overall parental emotional health. In this section, we want to evaluate migration effects along additional dimensions to understand how much parents are differentially affected by gender, if they are living with a spouse or not and if they receiving financial support from their adult children. All results are presented in Table 4 in the Appendix.

In line with our main findings, migration of at least one child is associated with lower levels of emotional health. Interestingly, we find that only fathers have significantly lower probabilities of being happy if at least one migrant child migrated. For mothers, in contrast, variations are not enough to identify systematic differences. When it comes to feelings of depression and loneliness but also to poor self-rated health, we observe that it is mothers who are particularly strongly and adversely affected by the migration of a child with IV estimates being at least twice as high as compared to fathers.

Living arrangements are often used as a proxy for the elderly's access to different sources of support (Giles *et al.*, 2010). We therefore examine differential effects of an adult child's migration for elderly who either live with a spouse or who don't. The second panel of Table 4 illustrates the resulting estimates. Those elderly parents who do not live with a spouse

[11] These estimates are merely accounting for predetermined characteristics based on 2011 observations.

may rely more on other household member for emotional and physical support. The inherently more difficult support provided by a migrant child may therefore have more severe effects on an elderly parent's emotional health. Our findings reveal that elderly who do not live with a spouse are found to be significantly unhappier (point estimate of -0.112 of FE regressions compared with -0.092 for elderly who live with a spouse) and lonelier (point estimate of 0.207 compared to 0.034 of IV regressions). These effects suggest that the absence of a child as a result of migration may be felt more strongly if the elderly parent is not emotionally supported by a spouse.

Finally, we test for the role of financial support provided to the elderly. The idea is that such supports may be used to supplement the rural household income and could hence reduce the risk of falling into poverty. Migrant adult children are found to purchase housing and to financially support the living standards of the family left-behind (Giles *et al.*, 2010). This could have direct positive effects on the elderly parents' emotional health (Zuo and Li, 2011) but could also allow them afford them to afford better medical care which could indirectly improve emotional health. In contrast, as suggested by Giles *et al.* (2010), elderly parents with migrant adult children are at greater risk of falling into poverty which could be partly due to the absence of a laborer on the family farm. Such vulnerability may lead to exacerbated emotional health in particular when elderly parents lack emotional and physical support in their daily lives. To assess the extent to which financial transfers may differentially affect emotional health, we re-estimate our models by transfer status as reported in the third panel of Table 4.

OLS estimates show significantly aggravated associations between migration of an adult child and emotional health for parents who do not receive financial support from their children. Yet none of our identification strategies provides support of these findings. However, we do find that parents who receive financial transfers from their adult children have 7.8 percent lower probabilities of being happy and are about 10 percent more likely to feel lonely. These findings show even augmented adverse effects of migration on emotional health compared to our main results as reported in Table 2. One possible explanations is that financial transfers are paid to parents to substitute for the absence of the child to help with daily chores such as field work (Taylor *et al.*, 2003). Yet even if such transfers allow for a more stable financial situation, they cannot substitute for emotional support which a migrated child is inherently not able to provide to the same extent. Clearly, this imparts significantly stronger feelings of loneliness, unhappiness and depression.

6.2. Redefining the Migration Variable

So far, we have measured the effect of migration by a dummy variable which takes the value of 1 if at least one of the adult children has migrated outside of the home county. In the remainder of this section, we will be looking at the effects of migration based on different definitions. Basically, we expect the impact of migration on parental emotional health to be more pronounced if more children and particularly if more sons migrate to urban areas. To this end, we define migrants by the number of migrating children, the number of migrant sons as well as the fraction of migrant children(sons) compared to all children within a household. Table 5 in the Appendix, shows the results of this exercise.

Independent of the measure we use, we observe a consistent and strong adverse effect of migration on emotional health of the elderly parent. More specifically, a higher number of migrated adult children but more so, a higher number of migrated sons reduce the probability of elderly parents being happy and lead to significantly deteriorated feelings of depression and loneliness. As adult children and according to Confucian traditions sons and their families are the main providers of elderly care, a shrinkage of the support network drastically impairs emotional as well as physical health. Fixed effects regressions are only able to identify worsened feelings of unhappiness and marginally aggravated feelings of depression resulting from the migration of an additional child/son.

The last three columns of Table 5 further illustrate a significantly stronger association between the number of migrant children/sons and ill-health. One potential explanation for this finding is that physical and instrumental support of the elderly parent is basically the role of the adult children and their families according to the traditional generational contract in China. Meanwhile the market for formal elderly care is still poorly developed in rural China, indicating a further absence of potential physical tending for elderly (Wu *et al.*, 2009; Giles *et al.*, 2010). This means that the reduction in caregivers due to migration of adult children may not just lead to potentially less physical care but also to a deterioration in its quality which in turn may exacerbate an elderly's physical health condition (Davin, 1999; Croll, 1997).

7. Conclusion

As a result of two main demographic phenomena in China, ageing and large-scale internal migration without a national pension system and with lacking formal institutional support mechanisms such as nursing homes, the situation for elderly parents in rural China exacerbates. In this context, we are concerned with the effect of out-migration of adult children on the emotional health of rural elderly parents.

Our main findings suggest that the emotional health of an elderly parent significantly deteriorates if an adult child migrates. This holds independent of the estimation strategy, FE and IV, which rely on different sources of variation to identify these effects. We find that migration reduces the level of life satisfaction by 8.8 percent and leads to a 8.7 percent (12 percent) higher probability of suffering from depressive symptoms (loneliness). Given that both strategies lead to the same conclusion, we are confident with the robustness of our results.

We further examine the adjustments in emotional health outcomes resulting from a change in the adult child's migration decision. We find that overall life satisfaction deteriorates over time as parents of returning migrants are more likely to report to be unhappy prior to the return decision compared to parents of newly migrating children. Loneliness, in contrast, is found to have the strongest effect on the elderly parents in response to migration and seems to slightly ameliorate with time. While we parent's emotional health does not differ systematically before a new migration episode, we observe that parents of newly migrating children are significantly less likely to be of poor physical health supporting the "healthy migrant effect" (Farré, 2015).

By disaggregating the fact by gender, we find that the significantly augmented probabilities of feeling depressed and loneliness comes from mothers who suffer more from reduced social interactions with their children (Mosca and Barrett, 2016). Yet, in contrast to Mosca and Barrett (2016), it is rural Chinese fathers who report significantly lower probabilities of life-satisfaction resulting from the out-migration of an adult child. We further find that that migration of an adult child leads to significantly more pronounced adverse emotional health outcomes for parents who do not co-reside with a spouse either because of divorce or widowhood. This supports the idea that emotional support is crucial for the emotional health of an elderly person. Finally, remittances are often viewed as means of ameliorating negative effects experienced by the absence of an adult child by allowing for an improved standard of living (Kuhn *et al.*, 2011). In contrast, our findings suggest that remittances cannot buffer the negative effects on emotional health. Rather to the contrary, among households who receive financial support from their adult children migration is found to have an even more harmful effect on parental emotional health outcomes, in particular in terms of depression and loneliness. One potential explanation comes from the fact that rural migrants are often informally employed and consequently have risky incomes excluding them from social security payments (Knight and Yueh, 2004; Giles *et al.*, 2010; Biao, 2007). As a consequence, financial support to their elderly parents may be unreliable. Without a formal pension system, elderly with migrant children are at

a greater risk of falling into poverty (Giles *et al.*, 2010) which may be negatively reflected in their emotional health status.

The United Nations (2013) anticipated for China that by 2050, the elderly support ratio, i.e. the number of elderly aged 65 or above divided by the number of population aged between 25 and 64, will sharply decrease to 1:2 compared to the ratio of 1:13 in 2000. This sharply decreased ratio will place an even greater strain on the traditional elderly supporting mechanisms prevalent in China. This is an important issue not only because the rural elderly are a highly vulnerable and disadvantaged group within society but also because the shrinking number of adult children will face an even higher supporting pressure. The Chinese government has put various reforms in place to improve the social support of the elderly. For example, the revised version of the 'Law on Protection of Rights and Interests of Seniors' explicitly states that children are obliged to provide financial, physical and psychological support for their parents, even though the enforcement can hardly be guaranteed. These pilot regulations, however, have often been criticized of having a too narrow coverage and of being inefficient. Therefore, mature, established and well-functioning security and pension systems are an extremely urgent matter for China given the dramatic demographic population outlook.

Compliance with Ethical Standards

Conflict of interests: The authors declare that they have no competing interests.

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Appendix

Table 1: Determinants of Linear Probability Models Between Emotional Health Outcomes and children's migration status. (Dependent Variables: Dummies for being Happy, being Depressed, Being Lonely and Being of bad self-rated health).

	Happy	**Depressed**	**Lonely**	**Poor Health**
Migrant Child	-0.027**	0.037***	0.041***	0.024*
	(1.97)	(3.00)	(3.87)	(1.94)
Parent: Aged [70; 80]	0.003	-0.031**	-0.022*	0.001
	(0.19)	(2.17)	(1.77)	(0.04)
Parent: Aged above 80	-0.038	0.054**	-0.067***	0.026
	(1.29)	(1.99)	(2.73)	(0.91)
Parent: Male	0.035**	-0.159***	-0.063***	-0.059***
	(2.44)	(12.04)	(5.43)	(4.40)
Parent: Widowed	0.020	-0.055***	0.188***	-0.063***
	(1.32)	(3.85)	(13.53)	(4.52)
Parent: ADL limitation	-0.008	0.120***	0.024	0.235***
	(0.31)	(4.76)	(1.07)	(9.72)
Parent: IADL limitation	-0.089***	0.055***	0.021	0.243***
	(4.73)	(3.00)	(1.33)	(12.83)
Parent: Health status	-0.102***	0.090***	0.065***	–
	(15.37)	(14.75)	(12.27)	–
Parent: Number of children	-0.003	0.009**	-0.009***	-0.012***
	(0.60)	(2.25)	(2.68)	(2.84)
Child: Age	0.019***	-0.010*	-0.003	0.004
	(3.04)	(1.66)	(0.55)	(0.71)
Child: Illiterate	-0.065**	0.026	-0.038*	0.044
	(2.31)	(0.99)	(1.65)	(1.62)
Child: Above high school	0.040**	-0.029*	-0.029**	-0.023
	(2.19)	(1.86)	(2.20)	(1.39)
Child: Male	0.001	-0.018	-0.009	-0.003
	(0.03)	(1.14)	(0.68)	(0.16)
Child: Married	0.052**	-0.023	-0.022	-0.055***
	(2.50)	(1.19)	(1.26)	(2.79)
N	6041	6041	6041	6041

* p <0.1, ** p <0.05, *** p <0.01, robust standard errors clustered at the household level, absolute t-statistics in parenthesis.

Additional children controls: age squared, being the oldest son; province and time fixed effects.

Table 2: Determinants from FE regressions Between Emotional Health Outcomes and Children's Migration Status. (Dependent Variables: Dummies for being Happy, being Depressed, Being Lonely and Being of bad self-rated health).

	Happy	**Depressed**	**Lonely**	**Poor Health**
Migrant Child	-0.088***	0.003	0.033	0.026
	(3.14)	(0.13)	(1.62)	(1.15)
Parent: Aged [70; 80]	0.007	0.043	0.034	-0.027
	(0.18)	(1.18)	(1.17)	(0.95)
Parent: Aged above 80	0.097	-0.004	-0.141**	-0.019
	(1.19)	(0.05)	(1.98)	(0.33)
Parent: Widowed	0.116*	-0.038	-0.007	0.220***
	(1.90)	(0.63)	(0.13)	(3.57)
Parent: ADL limitation	-0.050	0.140***	0.044	0.120***
	(1.25)	(3.42)	(1.29)	(2.96)
Parent: IADL limitation	-0.069**	0.055*	-0.010	0.079***
	(2.24)	(1.95)	(0.43)	(2.62)
Parent: Health Status	-0.056***	0.024**	0.028***	–
	(4.70)	(2.13)	(3.15)	–
Parent: Number of children	0.024*	-0.008	-0.008	-0.009
	(1.93)	(0.60)	(0.72)	(0.83)
Child: Age	-0.013	-0.005	-0.020	-0.019
	(0.41)	(0.14)	(0.75)	(0.68)
Child: Married	-0.021	-0.142**	-0.068	0.015
	(0.32)	(2.24)	(1.30)	(0.28)
N	6041	6041	6041	6041

* p <0.1, ** p <0.05, *** p <0.01, robust standard errors clustered at the household level, absolute t-statistics in parenthesis. Additional children controls: age squared.

Table 3: First Stage Regressions.

	2011 & 2013 sample (1)	2011 sample (2)
Community's Fraction of migrant population	1.483***	1.482***
	(32.36)	(21.11)
Male share × community's total agr. and ind. revenues	-0.000	-0.000
	(0.89)	(0.47)
Parental Controls	Yes	Yes
Children Controls	Yes	Yes
Household Controls	Yes	Yes
N	6041	2694
F-stat for excluded instruments	524.00	222.87

* p <0.1, ** p <0.05, *** p <0.01, robust standard errors clustered at the household level, absolute t-statistics in parenthesis.

All control variables refer to values for the 2011 survey. Additional parental controls: dummy for being male, illiterate, having more than a high school degree, being widowed, having difficulties with ADLs and IADLs, the number of children two dummy variables indicating age as well as a variable on self-reported health status (not in the model measuring the propensity of poor health); additional children controls: age, age squared, dummies for being male, married, the oldest son and two education dummies. We additional include province and time fixed effects.

Table 4: Heterogeneous Effects of Children's Migration Status of Children on Parental Emotional Health Outcomes. (Each entry in the table represents coefficient estimates on indicator for having at least one migrant child at the time of the survey).

	Happy			**Depressed**			**Lonely**			**N**
	OLS	FE	IV	OLS	FE	IV	OLS	FE	IV	
I. Results by gender of the Elderly Parent:										
Mothers	0.001	-0.039	-0.081	0.058***	-0.003	0.405***	0.086***	0.019	0.129**	2599
	(0.04)	(0.90)	(1.28)	(2.66)	(0.05)	(6.32)	(4.31)	(0.54)	(2.23)	
Fathers	-0.052***	-0.130***	-0.007	0.017	0.001	0.134***	0.014	0.030	0.067*	3442
	(2.96)	(3.57)	(0.15)	(1.14)	(0.04)	(3.08)	(1.20)	(1.27)	(1.94)	
II. Results by cohabitation Status of the Elderly Parent:										
Lives with Spouse	-0.008	-0.092***	-0.028	0.023	-0.011	0.144***	0.034***	0.050**	0.034	3978
	(0.46)	(2.65)	(0.65)	(1.58)	(0.35)	(3.65)	(3.11)	(2.48)	(1.13)	
Lives without Spouse	-0.072***	-0.112**	-0.034	0.067***	-0.040	0.362***	0.064***	0.008	0.207***	2063
	(2.86)	(2.02)	(0.44)	(2.90)	(0.83)	(4.92)	(2.72)	(0.16)	(2.89)	
III. Results by Remittances from Adult Children to the Elderly Parent:										
Household receives no remittances	-0.128***	-0.037	-0.022	0.009	-0.085	0.177**	0.079***	0.028	0.012	2482
	(4.96)	(0.44)	(0.23)	(0.37)	(1.28)	(2.00)	(3.73)	(0.39)	(0.16)	
Household receives remittances	0.006	-0.075*	-0.036	0.042***	0.024	0.242***	0.029**	0.023	0.101***	3559
	(0.33)	(1.87)	(0.75)	(2.80)	(0.68)	(5.36)	(2.26)	(0.78)	(2.63)	

* p<0.10, ** p<0.05, *** p<0.01, robust standard errors, absolute t-statistics in parenthesis.

All control variables refer to values for the 2011 survey. Additional parental controls: dummy for being male, illiterate, having more than a high school degree, being widowed, having difficulties with ADLs and IADLs, the number of children two dummy variables indicating age as well as a variable on self-reported health status (not in the model measuring the propensity of poor health); additional children controls: age, age squared, dummies for being male, married, the oldest son and two education dummies. We additional include province and time fixed effects.

Table 5: The Effects of Children's Migration Status on Parental Emotional Health Outcomes Using Different Definitions of the Migration Variable (Each entry in the table represents coefficient estimates for different definitions of the migration variable).

	Happy			**Depressed**			**Lonely**			**Poor Health**		
	OLS	FE	IV	OLS	FE	IV	OLS	FE	IV	OLS	FE	IV
# of migrant children	-0.001	-0.022	-0.015	0.017***	0.005	0.092***	0.016***	0.008	0.036***	0.011*	0.000	0.050***
	(0.18)	(1.42)	(0.95)	(2.96)	(0.49)	(6.09)	(3.03)	(0.81)	(2.84)	(1.86)	(0.01)	(3.39)
# of migrant sons	-0.019*	-0.037*	-0.024	0.013	0.024	0.149***	0.025***	0.016	0.059***	0.021**	0.012	0.081***
	(1.87)	(1.74)	(0.92)	(1.49)	(1.50)	(6.07)	(3.25)	(1.37)	(2.84)	(2.32)	(0.69)	(3.38)
% of migrant children	-0.006	-0.150***	-0.051	0.052***	0.036	0.334***	0.057***	0.040	0.135***	0.044**	-0.013	0.183***
	(0.25)	(2.92)	(0.88)	(2.43)	(0.80)	(6.10)	(3.10)	(1.20)	(2.89)	(2.03)	(0.32)	(3.40)
% of migrant sons	-0.061*	-0.189***	-0.075	0.026	0.029	0.535***	0.059**	0.020	0.220***	0.088***	0.023	0.294***
	(1.83)	(2.80)	(0.80)	(0.92)	(0.52)	(6.01)	(2.39)	(0.53)	(2.91)	(2.89)	(0.42)	(3.38)

* p<0.10, ** p<0.05, *** p<0.01, robust standard errors, absolute t-statistics in parenthesis.

All control variables refer to values for the 2011 survey. Additional parental controls: dummy for being male, illiterate, having more than a high school degree, being widowed, having difficulties with ADLs and IADLs, the number of children two dummy variables indicating age as well as a variable on self-reported health status (not in the model measuring the propensity of poor health); additional children controls: age, age squared, dummies for being male, married, the oldest son and two education dummies. We additional include province and time fixed effects.