Published in final edited form as:

Soc Sci Res. 2019 September ; 83: 102312. doi:10.1016/j.ssresearch.2019.06.003.

Spousal Migration and Married Adults' Psychological Distress in Rural China: The Roles of Intimacy, Autonomy and Responsibility

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Abstract

Spousal separation due to migration is a prevalent phenomenon in the developing world, but its psychological consequences for left-behind partners are largely understudied. Using data from 2010, 2012 and 2014 China Family Panel Studies (CFPS), this paper first examined whether spousal migration causes rural married adults any psychological distress; this finding was then advanced by testing the mechanisms that could potentially explain the linkage between these two variables. Inverse Probability Weighting (IPW) for multivalued treatment effect models and paired Propensity Score Matching (PSM) have been used to correct the potential selection bias of spousal migration. The results show that prolonged spousal separation through migration increases the depressive symptoms of married adults in rural China, and the detrimental effects on left-behind spouses' psychological well-being can be explained by the reduced level of emotional intimacy between husband and wife, and partially by women becoming the master of the household. Considering that being the master of the household is accompanied by elevated stress levels associated with increasing family responsibilities, further examination showed that economic resources can buffer the negative effect associated with being the master of the household when the spouse migrates. However, we did not find that time use is an effective mechanism to link spousal migration and left-behind spouses' well-being.

Keywords

Spousal Migration; Emotional intimacy; Autonomy; Psychological Well-being; Rural China

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1. Introduction

In many developing countries, households are often split into two or more places due to labor migration, aiming for the economic betterment of the entire family (Fan, Sun and Zheng 2011; Desai and Banerji 2008). The process often disrupts family life, transforms labor structures within the household and leads to a transnational or trans-regional family status (Zentgraf and Chinchilla 2012). Among various household economic strategies, solo migration (while leaving the marital partner behind) is a common livelihood strategy for many households, for whom concerns such as employment uncertainty and high cost of living in the destination areas lead to couple separation for an extended period of time. This global phenomenon has been documented in studies in the context of Mexican-U.S. migration (Lindstrom and Saucedo 2002), sub-Saharan African migration to Europe (Caarls and Mazzucato 2015; Feijten and Ham 2007), and internal migration settings such as India and China (Ma, Liaw and Zeng 1996; Desai and Banerji 2008). For instance, Lahaie et al. (2009) showed that there were almost 40% of Mexican migrant households has spouse migration.

In some ways, the physical separation of spouses caused by migration is similar to marital dissolution. In marital dissolution literature, previous studies have shown that divorce has a significant effect on adults' depressive symptoms (Rotermann 2007), happiness (Stack and Eshleman 1998), physical health (Musick and Bumpass 2012) as well as health behaviors such as smoking and drinking (Umberson 1987). Among these, a few mechanisms have been identified to explain the linkage between marital dissolution and psychological well-being, including elevated stress due to loss of an important social identity (Thoits 1986), shortage of financial resources for divorced people as well as a lack of emotional support and intimacy (Simon 2014).

However, although the couple separation is similar to marriage interruption to some extent, they are characteristically different in others. Indeed, negative mechanisms such as the loss of, or at least a reduced level of, intimacy and emotional support from the absent spouse could likewise affect one's psychological well-being. Previous study suggests that international migration can result in the increase of divorce, and part of reason is that many couples have been geographically separated (Caarls and Mazzucato 2015). Moreover, an increase in household work, care burden and the responsibilities to other family members for the left-behind partners at the original home (e.g. Fan 2002; Desai and Banerji 2008) could also take a toll on one's emotional health (Yi, Zhong and Yao 2014). But, different from marriage dissolution, there are positive mechanisms which link spousal migration and the left-behind partners' well-being. First, adult migration often aims to promote the entire family's economic well-being via financial provision, which may in turn lead to better psychological well-being for the left-behind members by reducing family financial constraint (Hadi 1999). Second, in the case of the migration of one spouse, the institutional nature of marriage remains unchanged – that is, couples remain committed to maintaining the marriage relationship. Under such circumstances, left-behind members' decision-making power could be increased, and this is particular true for women in a patrilineal and patriarchal society, where marriage may be oppressive rather than protective for married women due to men's dominant role and women's low status (Liu and Chan 1999). In these

contexts, the temporary absence of the husbands from home can provide opportunities for women to foster their autonomy, self-esteem and role expansion (Desai and Banerji 2008), possibly leading to a positive outcome to mental health.

Thus, there are multiple factors leading to different hypotheses about the linkage between spousal migration and psychological well-being. However, with a few notable qualitative studies as exceptions (Jacka 2012; Zuo 2007), empirical research on the psychological consequences for the left-behind partners caused by spousal migration is sparse, let alone a direct examination of the possible competing mechanisms discussed above. We situate the study of psychological consequences of spousal migration in the context of China because of its large scale rural to urban migration and associated couple separation. In 2016, more than 169 out of 281 million rural workers migrated to cities to work. More often than not, migrants leave family members behind in the rural region, including their spouses, children and elderly parents: less than 20 percent of them have brought their family along (China Statistic Bureau 2015). Despite a recent increase in couples migrating together, living apart due to migration among married couples is still a statistical norm in rural China, and more wives than husbands have been left behind.

Drawing on a nationally representative large-scale panel survey, the China Family Panel Studies (CFPS), we first investigated whether spousal migration has a similar effect to marriage dissolution on spousal psychological distress for the left-behind ones by looking at prolonged, recent and newly returned spousal migration separately. Secondly, instead of speculating on the reasons for the positive/negative effects, we are in a position to directly examine the multiple mechanisms including elevated levels of their labor and care time, the loss of intimacy, and increased level of autonomy accompanied by increased family responsibilities. Results based on this study can go beyond the marriage literature on couple psychological health and contribute to the understanding of the mechanism of how marriage separation will affect couple well-being in the case of migration. We also contribute to the literature on women's empowerment and its health consequences.

2. Theoretical Background

2.1. Marriage, migration and psychological well-being

Marriage status has been a key determinant of adult well-being (Brown 2000). A large body of research has documented the relationship between marriage status and adults' health, including psychological health (e.g. Lillard and Waite 1995; Waite and Gallagher 2000; Frech and Williams 2007; Musick and Bumpass 2012). They found that married people in general enjoy more health benefits and higher psychological well-being than do unmarried individuals (Liu and Umberson 2008). There are a few mechanisms linking marriage with adults' well-being, including economy of scale, reciprocal caretaking (Gove, Hughes and Style 1983), monitoring of health behaviors (Umberson 1987), and emotional support (Peters and Liefbroer 1997). Through the mechanism of economic resources, marriage as an institution expects couples to share financial resources and household work (Musick and Bumpass 2012), which have an economic scale impact on both parties' well-being. Emotionally, individuals are able to receive support from each other through daily intimate interaction. In addition, conventional theory on gender, marriage and mental health also

suggests that marriage is more important to men's well-being than to women's (Williams 2003).

In the study of marriage and adult well-being, previous research often assumes that the married spouses live together, which indeed is a social norm and expectation for marriage. Few studies have explored whether marriage would still benefit couples in the same way if they live apart due to one spouse' migration for work, although some research has examined the long-distance marriage relationship between military soldiers and their wives (e.g. Merolla 2010). A related scenario in the general population is the spousal commuters, who do not live together for work reasons, but visit weekly or monthly. In a study comparing married people to unmarried cohabiters as well as married couples who do not live with their spouse ("commuters"), Fuller (2010) surprisingly found that commuting men have better self-reported health than their married counterparts who live together, despite their poorer health behaviors such as smoking and drinking.

2.2. Mechanisms linking spousal migration and left-behind partners' well-being

Spousal separation due to labor migration is a common phenomenon in developing countries, being often a family strategy for household economic well-being. Under that circumstance, although one spouse's migration does not erode the foundation of economic sharing within a family, and even promotes it via the acquisition of better economic opportunities elsewhere by maximizing family income (Agesa and Kim 2001), it often takes away the domestic support that the spouses would otherwise provide to each other. One such loss is the labor support. That is, when spouses migrate away from home in search of job opportunities, the left-behind spouses have to take on multiple labor-intensive responsibilities, such as growing farm crops, doing the family chores, and taking care of children and seniors at home (Hoang and Yeoh 2011). These labor burdens, coupled with the reduced time for resting and leisure, may be detrimental to their mental health (Yi, Zhong and Yao 2014).

Apart from the increased labor burden and reduced time for resting, left-behind partners may also feel mentally isolated or even abandoned, which can cause separation anxiety. Indeed, the absence of one's spouse for an extended period of time reduces reciprocal emotional support, which could in turn raise other family members' emotional burden and stress levels (Taylor et al. 1996; Lu 2012). Frequent concerns about the safety of the migrant spouse also add to the mental stress of the left-behind partners (Roy and Nangia 2005). Meanwhile, separated from partners and thereby lacking an active sex life and couple intimacy, both migrants and left-behind partners may have to deal with loneliness (Haour-Knipe 2000), which could negatively affect their emotional connection with their spouses due to the physical distance. Although modern telecommunication technology has facilitated interaction between partners living apart, it may not be able to compensate for the loss of intimacy over the geographic distance. Previous studies have found that migrants who are physically separated from their spouses may engage in risky sexual behaviors, or have new partners in the migration destination, which further erodes the emotional bond with their left-behind partners (Brockhoff and Biddlecom 1999; Yang and Xia 2006). The loss of

intimacy could thereby be a significant factor affecting left-behind spouses' psychological well-being.

Despite the potentially detrimental effect of the increased household chores and reduced emotional closeness with spouses, one should not neglect the possibility that the out-migration of one spouse may offer some beneficial outcome beyond economic contribution to left-behind partners' emotional health through the reconfiguration of within-family relations. For example, one scholar has argued that male spousal migration may increase left-behind women's decision-making power and expand their roles (Parrenas 2005). A study conducted in Mozambique (Yabiku et al. 2010) showed that both men's cumulative migration history and current migration status are positively associated with the woman's autonomy, and the effect on autonomy may persist even after the man returns. They argue that left-behind wives were able to gain new roles that included increased control over spending and decision making in economic matters. Desai and Banerji (2008) offer similar findings in India, although such autonomy is conditional on household structure. Davin (1999), in a qualitative study in China, also argues that left-behind women's welfare has risen as a result of increased autonomy as household heads.

However, the relationship between marital power and resources should be placed in cultural context (Rodman 1972). Family power goes hand in hand with household responsibilities, and in that sense is not always experienced as a privilege by the power holder (Zuo 2007). When spouses migrate, left-behind partners must shoulder greater financial, societal, and family responsibilities, insofar as they are more likely to become the master of the households with more decision-making power (Yi, Zhong and Yao 2014). The role expansions could be involuntary, which may push them to assume responsibility for entire families, and to intervene in domains and processes that were not formerly in their sphere of influence (De Haas and Rooij 2010). The left-behind partners could become more exhausted due to the stress of the decision-making process and the worry about being blamed by other family members, which could especially be the case among poor families. Indeed, Zuo (2007) has argued that women will become particularly stressed out if they have few resources. Having more decision-making power may thus not necessarily be a blessing for left-behind family members, especially when they are not economically well-off.

2.3. The context of China's spousal separation via migration

Despite couple separation via migration not being unique to China, it is particularly common in China's internal migration context, due to both the *Household Registration System* (*Hukou*) and its long-standing patriarchal marriage and gender norm.

In China, the *Hukou* system defines a series of privileges for a person in a particular area, including access to quality public schools, subsidized housing, government service and better job opportunities (Liang and Ma 2004). Based on the parents' *Hukou* registration in a specific administration area, one's *Hukou* is often granted at birth, and few channels are available for low skilled workers to change it. As a result, rural migrants are not able to receive institutional support equal to what their urban counterparts receive in the cities to which they have migrated, so they and their families have various barriers to permanent settlement in cities (Fan, Sun and Zheng 2011). This institutional barrier has created a large

number of families split for the long term. Moreover, patriarchal norms and familial obligations are influential in the setting of rural China (Jacka 2012), which often leads couples to prioritize the man's migration. This is particularly true when households have few means to outsource domestic and farm work as well as child or elderly care responsibilities in rural areas (Song 2017). Women are often expected to be the caretakers of children and elderly parents, and to manage the domestic scene, while men work outside of the home. In spite of this trend undergoing some change due to the increased number of married women migrating, with some of the women even leaving their husbands behind, it is not as common as leaving wives behind in a society with a patriarchal cultural norm (Hoang and Yeoh 2011). As a result, there are still more wives than husbands who are left behind in rural areas. A survey conducted in 2008 estimated that the number of left-behind wives in rural areas has reached 47 million (Yi, Zhong and Yao 2014).

However, despite the potentially adverse outcome for the left-behind spouses, existing studies on the psychological consequence for the left-behind members have largely focused on children or older adults, overlooking the family members' out-migration as a source of stress for the left-behind adults who are at working ages (Lu 2012; McKenzie 2005). Studies about consequences of migration on spousal relationship are more likely focusing on those who follow the spouses who have already migrated, the so-called secondary migrants. Indeed, compared to studies on left-behind children's well-being or older persons left behind by their migrating adult children, studies on the left-behind spouses are strikingly scarce. Among a few notable exceptions, Chen et al. (2015), using China Health Nutrition Survey (CHNS), found that spousal absence renders a stronger negative effect on self-rated health for married men than for married women. Beyond physical well-being, gender disparity may also exist with respect to psychological well-being, given China's patriarchal gender norms and patrilineal living arrangements, which often make marriage less beneficial to women (Liu and Chan 1999). As a result, the complex mechanisms of family responsibilities associated with decision making and couple intimacy in the context of spousal migration may particularly manifest among women, strongly affecting their psychological well-being.

Therefore, we argue that marriage separation is a common household strategy for families in the developing world, and its high prevalence in China makes it a compelling context to study the psychological consequences for left-behind partners. Bridging the migration and marriage literature, we test both the marital resource and crisis/stress process models by explicitly testing potential mechanisms such as the restructure of labor division within family, intimacy relationship and rebalance of family decision-making power. The theoretical models have been tested in the divorce and widowhood literature, but direct tests of those in the marriage separation literature are rare. Doing so, we not only contribute to the migration literature, but also add to the literature on women's empowerment by featuring how the husband's absence in the household can have both uplifting and burdensome effects on women. The findings could be extended to other patriarchal societies where women's status is low in general.

2.4. Hypotheses

We form our hypotheses based on the marriage and spousal migration literature in general as well as China's social context involving the *Hukou* system and patriarchal cultural norms specifically. First, *following the line of marriage and divorce literature, we expect that spousal migration will have a harmful effect on left-behind partners' psychological well-being (H1). However, couple separation due to migration may not lead to an immediate adverse outcome, as the marriage does not dissolve but continues upon spousal migration. Instead, we expect that the harmful effect may only show up when there is prolonged couple separation (H1.1).*

Our next a few hypotheses zero in on the multiple mechanisms that could be at play in influencing the relationship between spousal migration and psychological well-being. First, the increased labor burden of left-behind partners could be one of major mechanisms to increase the stress levels of the left-behind partners. Mu and Walle (2011) showed that the husband's migration has increased the burden of farm work for women in China, but this is not the case for men when they are left behind by migrating wives. It means that left-behind wives' workloads would increase because they have to handle more farm work customarily done by men in addition to their normal loads for domestic work and their supplementary role in farming. Although others have argued that it is also possible that the loss of labor caused by migration can result in "under-farming phenomena" (De Brauw et al. 2008), the remaining domestic chores could still be a huge burden on the left-behind spouses, severely reducing their rest and leisure time. Thus, we formulate our second hypothesis: *The negative effect of spousal migration on left-behind partners' psychological well-being may be caused by increased work time and reduced leisure time, in particular when women are left behind (H2).*

Second, through the couple relationship channel, previous studies have shown that couple separation due to migration has a higher probability of divorce and family disintegration (e.g. Sadiqi and Ennaji 2004). For instance, a study in Mexico stated that women who are left behind experienced a persistent fear of financial or complete abandonment (De Snyder 1993). Also using Mexican data, Frank and Wildsmith (2005) showed that U.S. migration significantly increased the odds of union dissolution for individuals with extensive migration experience. These findings indicate that spousal migration significantly reduces the intimacy among couples. Thus, we formulate our third hypothesis: *Spousal migration may affect left-behind partners' psychological well-being through the decline in intimacy between marriage partners (H3).*

At the same time, it is possible that spousal migration may enhance left-behind partners' role in terms of giving him/her more decision-making power on household matters, especially the women's status in a patrilineal society; meanwhile, it may also increase their psychological burden with increased responsibilities. Thus, we formulate following competing hypotheses. *Hypothesis 4.1: we expect that spousal migration may affect left-behind partners' psychological well-being through being the master of the household as a source of gaining decision power, especially among women (H4.1).* However, as we argued above, being the master of the household may also increase the left-behind persons' psychological burden, since the gained family power could be responsibility-loaded (e.g. Zuo and Bian 2005). If

the latter is the case, *we expect that spousal migration may affect left-behind partners' psychological well-being insofar as being the master of the household can be a source of distress, and that the burden will be greater in economically deprived families than in well-off families (H4.2).*

3. Methods

3.1. Data and variables

The data we used are from the China Family Panel Studies (CFPS), the first nationally representative panel data on households in China, which collect data from individuals, families, and communities in the selected households bi-annually since 2010. For this study, we use the first three waves of the data in 2010, 2012 and 2014 to examine spousal migration and duration on left-behind partners' depressive symptoms. Since only 2010 data include all information on the adult time use, such as hours spent on house chores or leisure, intimate relationships, as well as who is the master of the household (*jia ting zhu shi zhe* – that is, who is mainly responsible for the household matters), we mainly used the 2010 data to examine these mechanisms. In 2014, CFPS collected a more detailed array of family decision-making variables (but not time use and intimacy relationship), so we also adopted these variables to further inform our analysis on decision-making mechanism. For all waves, we limited our sample to rural married adults ranging from age 20 to 54 only, as spousal migration for age 55 and above is very rare.

We use depression symptoms to measure rural married adults' psychological well-being. The measure of depression symptoms has been widely used in studying people's psychological health, however, in CFPS, the questions on depression symptoms are different across waves. In 2010 and 2014, CFPS surveys asked respondents to evaluate their perception of depressive mood on a scale from 1 to 5 (from “almost every day” to “never”) for the past month, which is similar to the Kessler K6 mental distress scale (Prochaska et al. 2012). In 2012, the CFPS survey used the standard CES-D measures (Radloff 1977), which has 20 items, emphasizing the affective component and depressed mood in the past week. As a result, the depression symptoms are not comparable across the three waves, which prevents a full use of panel data. To maximize the advantage of panel data, we adopted the strategy of conducting wave by wave analysis, taking into account the spousal migration from previous waves by making use the information of repeated measures on spousal migration. Thus, among the waves we analyzed, the more recent ones captured the longer periods of spousal migration. For all waves, the items on depression symptoms have high internal consistency (Cronbach's Alpha = 0.84, 0.85 and 0.84 for year 2010, 2012 and 2014 respectively). Thus, we added up all the item scores within each wave to make the greater score indicating a higher degree of depressive mood in that year.

Spousal migration status is determined by their current migration status and their migration status in the previous year (for observations in 2010 data) or previous waves (for observations in 2012 or 2014 data), including four categories: 1) Not migrated in current and previous waves/year, 2) migrated in previous waves/year, now returned, 3) not migrated in previous waves/year, newly migrated in current wave/year and 4) migrated in previous waves/year, and still migrating in current wave. Despite that we are still unable to obtain

information on the spouse's entire migration history, this way of migration coding can capture approximately whether the spousal migration is prolonged or not by each survey time.

Table 1 shows descriptive statistics by waves for the dependent variable, key independent variables as well as control variables. Control variables include individual characteristics, such as age, age squared, gender, years of education, occupation, spouses' information including spouse' age, spousal education, age difference between husband and wife, as well as household demographic structure, including households having children in age groups 0–3, 4–9, and 10–15; households having old persons in age groups 65–74 and 75 or above, as well as household income measured as logged net income per capita.

We are mainly able to use 2010 data to examine the proposed mediating mechanisms. The 2010 CFPS survey asked respondents to list the hours that they spent on household-related work per weekday and per weekend day in the last month. We grouped the summed hours per week into four scales: five hours or less, over five and below ten hours, over ten and below fifteen hours and over fifteen hours. About 31 percent of respondents answered that they needed to spend over 15 hours a week on household-related work. The hours spent on leisure are calculated as being the same as on housework mentioned above, and about 39 percent of the sample spent over 15 hours per week on leisure activities. Closeness to spouse was generated from a question that asked how close each respondent felt with his/her family members. We used four indices: “talk to him/her regularly/frequently”, “talk to him/her first when feeling frustrated with something”, “usually seek help from him/her when in trouble”, and “talk to him/her about everything”. We added these items reported on spouse together, so that a greater score indicates a closer spousal relationship. An average score of 1.86 indicates a medium to low score on the overall closeness with one's spouse among rural couples. For autonomy or family power, we used a dummy variable to indicate whether the respondent is the master of the household – that is, whether he or she is the main person taking on household matters. Overall, about 42 percent of our sample claimed they were the masters of the households. Men exhibit a much higher tendency to be household masters than women: Only 13 percent of women are the masters of the households, whereas it is 75 percent for men. Table 2 shows the distribution of mediating variables as well as key dependent and independent variables by gender for the 2010 analysis sample. Overall women have a higher score on depressive symptoms than men, and they are also much more likely to be left behind by migrating husbands. Moreover, for the three mediating variables, women spend more time on housework and they also feel closer to their partners emotionally than men do, but they are less likely to be the master of the households.

3.2. Analytical strategy

Since the dependent variable – the depressive symptom scale – is a continuous scale, we first used unadjusted multiple linear regression models (OLS) to examine the effect of spousal migration status on depressive symptoms. However, previous studies have shown that migrants are selected on a number of dimensions, including both personal traits and household characteristics (Tobler 1995; Feliciano 2005). Spousal migration may not be exceptional. For example, spouses are separated by migration probably because they have

young children at home to take care of, or a lack of their own parents' support vis-à-vis childcare. To partially take into account the selection bias of spousal migration, we used inverse-probability weighting (IPW) models to deal with the multivalued treatments, which refer to the cases in which each subject could receive one of several treatments (Linden et al. 2015). In our study, we distinguish four different spousal migration statuses according to whether it occurred in the past or is an ongoing event. For the latter, we further divided it into prolonged spousal migration and newly migrated. As a result, we have three spousal migration statuses as treatments, which are compared with no spousal migration status, the control group.

To further check the robustness of our analysis, we also used propensity score matching methods (PSM) (Guo and Fraser 2010) in our 2010 data, which is used for mediating analysis. We treated those whose spouses never migrated as the control group and made three pairwise contrasts by one-to-one nearest neighbor matching for each treatment. More specifically, using three logistic regression models, we predicted the conditional probability of receiving the treatment (having one type of spousal migration) given the observed covariates (Rosenbaum 2002). Based on the propensity score, we then produced a trimmed sample, in which the number of non-treated cases equal to the number of treated cases, for the analysis of each spousal-migration status and the no-spousal-migration status. We then had a bivariate test of each covariate and spousal migration status in the trimmed sample, and the post-matching bivariate tests showed that observed selectivity had been successfully removed. We then re-estimated the models using the trimmed match sample for each spousal migration status.

After we verified the significant effect of spousal migration on depressive score for each wave by considering the potential individual heterogeneity of falling into particular categories of spousal migration status with the observable information, we focused on 2010 data only to examine the mediating mechanisms (we also used 2014 data to supplement our mediating analysis on decision making). We conducted the mediating effect in two steps. The first step examined whether spouse migration is directly associated with the mediating variables. We then add these mediating variables to the previous model to examine their mediating effect on depressive symptoms.

4. Results

4.1. Spousal migration on depressive symptoms

We first present the OLS results by wave in Table 3. In 2010, migration duration considered both the current year and the previous year's spousal migration, as the baseline survey happened to ask respondents' migration in the previous year in 2009. It showed that prolonged spousal migration is associated with a 0.554 increment in depressive score, but that is not the case for new spousal migration and newly returned spousal migration, despite the latter is close to be significant. Using 2012 data and taking into consideration both the 2010 and the 2012 spousal migration status, Model 2 showed that all three types of spousal migration are significantly associated with increments of depressive symptoms compared to the situation of the spouse staying at home in both 2010 and 2012: The increments are 2.252, 1.339, and 1.667 for prolonged, newly and recently returned spousal migration,

respectively. Since 2012 data used the 20 items of the CES-D measure for depressive symptoms, it is possible that the CES-D measure is more sensitive and can better detect the moderate level of depressive feeling than the K6 scale. Model 3 used 2014 data, and considered all three waves of spousal migration status, so it captured an even longer exposure of spousal migration – up to five years. It showed again that respondents whose spouses migrated in previous waves and were still away from home were significantly associated with increasing levels of depressive symptoms (by 0.667), but this is not the case for newly migrated spouses and returned spouses, similar to the 2010 results. We should note that the sizes of coefficients are not comparable across waves due to the different measures of depression across waves. However, based on the performance of statistical significance across all waves, we show that a prolonged spousal migration does indeed exhibit a detrimental effect on left-behind partners' psychological well-being across all three waves of analysis, so *Hypothesis 1.1* is supported.

For control variables in table 3, age and age square are only significant in 2014. Higher education level is beneficial to people's psychological well-being across all waves, although on average, rural adults' education level is low in our sample. Spousal education level is also negatively associated with depressive symptoms. Occupation only showed a significant effect in 2010, but not in 2012 and 2014. Self-rated health significantly reduces the depressive symptoms across waves. It is also interesting to find that the larger age gap between couples is associated with a higher level of depressive symptom. The presence of children and elderly are not significantly associated with depressive symptoms, except in 2010, which shows that having children 0–3 years old can reduce the depression score of rural married adults. Household income status is also beneficial to rural adults' psychological well-being, suggesting that limited economic resources is an important source of distress for rural people.

The OLS models showed that the prolonged spousal migration from previous waves is associated with rural married adults' psychological distress, but they did not take into account the potential selection effect of spousal migration. Table 4 shows how we address this issue using inversed probability weighting (IPW) for multi-valued treatments, and we presented average treatment effect (ATE) and potential outcome (PO_{mean}) for the non-treated category in all waves. In 2010, it showed that the potential outcome of the depressive score for the *no spousal migration* control group is 9.111, and will increase to 10.031 ($9.111 + 0.920 = 10.031$) in the case of prolonged spousal migration exposure. In 2012, however, the significant effect from the OLS disappeared for the case of prolonged migration in the IPW model, but it was still significant for newly migrated and returned spousal migration, while the estimate for prolonged spousal migration remained positive and consistent with both the other wave's analysis as well as the OLS estimation. In 2014, the mean potential outcome for no spousal migration was 9.301, increasing to 10.591 in case of prolonged spousal migration. Surprisingly, having a newly migrated spouse has a negative effect on depressive symptoms in 2014 IPW model. To summarize, the results from inverse probability weighting (IPW) show that results are largely similar with the OLS estimation, indicating a relatively robust relationship between prolonged spousal migration and psychological distress.

4.2. Robustness check with one-to-one propensity score matching

Since we mainly use the 2010 data for the mediating analysis – given the availability of all mediating variables in the 2010 data -- we further conducted a robustness check for three types of spousal migration status relative to no-spousal migration for the 2010 data using Propensity Score Matching (PSM) with a one-to-one nearest matching as we described in the methods section. To estimate the propensity score, we have used age, gender, education level, age differences between wives and husbands, education level of spouses, household demographic composition and household economic status as well as county level GDP per capita. This one-to-one nearest match produced three data sets: migrated in last year (2009) but returned in 2010 (ML) vs. did not migrate either year (NM), migrated this year (2010) but not last year (2009) (MT) vs. did not migrate either year (NM), and migrated both years (2009 & 2010) (MB) vs. did not migrate either year (NM). Among all three groups, any type of “spousal migration” is the treatment group and “did not migrate either year” (NM) is the control group. The modelling for propensity matching and balance information are provided in Appendix Table A1, and the results for the propensity matching (see Appendix Table A2) are consistent with OLS and inverse probability models. It showed that left-behind adults whose spouses migrated in both 2009 and 2010 have significantly higher depression scores by 0.587 compared to those whose spouses did not migrate in these years.

4.3. Examination of the mechanisms by mediating variables

We used 2010 data to test the mediating variables, the mechanisms linking spousal migration and depressive scores, including time use, intimacy with spouse and being the master of the household. In Panel A of Table 5 we present the full sample results, and in Panel B we present the results for the female sample only. To examine the mediating effect, in each set of mediation models, the first model examines whether spousal migration has any influence on the particular mediating variable (the left column), while the second model adds the mediating variable in the depressive symptom model (the right column) to examine how the coefficients of spousal migration on the psychological distress have changed compared to not having this mediator. For the first mediation model on time use in doing housework, instead of an expected increase, we found (in left column) that prolonged migration slightly reduces the hours of housework, maybe due to the absence of the migrated family member. The right column model added the hours of doing housework to the depressive model, and it showed that doing between 5 to 10 hours, and over 15 hours of housework slightly increases the depressive symptoms, but it does not play a role in mediating the relationship between spousal migration and depressive symptoms. The effect of prolonged migration on depressive symptom remains at about a similar level and statistically significant. The second mediation model examines whether leisure time is a mediating mechanism. Our result did not show any significant influence of spousal migration on the time for leisure, although increased hours of leisure can indeed reduce the level of depression: the more leisure time, the lower the degree of depressive symptoms. However, it does not play a mediating role because prolonged migration still shows a significant effect on depression with similar magnitude when the time for leisure is added. Based on the first two mediation models on time use, we therefore cannot support hypothesis 2 that spousal migration significantly raises the burden of household work or reduces the leisure time for left-behind spouses – which in turn would lead to poorer psychological well-being.

The third set of mediation models presents whether spousal migration reduces the marriage closeness, and it showed that both cases – newly migrated and prolonged spousal migration – are negatively associated with the marriage closeness. Closeness to spouse significantly reduces the depressive score, and it also works as a mechanism to explain why left-behind spouses experience a higher degree of depressive symptoms. It is noteworthy that after including the spousal intimacy variable, the significant effect of spousal migration on left-behind partners' depression symptoms disappeared. This finding supports hypothesis 3 – that couple intimacy is an important way to mediate the effect of spousal migration on rural adults' psychological well-being. This is particular true for women (in Panel B). Given the potential difference between men and women on this point, in Figure 1 we predicted the depression score by taking into consideration gender difference with respect to marital closeness. It showed that when adults have a closer relationship with their spouses, they have lower levels of predicted depressive scores, and the slope is sharper for women than men.

The fourth set of mediation models examines whether being the master of the household mediates the effect of spousal migration on psychological well-being, and we were able to confirm that spousal migration indeed increases the chance of left-behind partners becoming the masters of their households – shown in the left column. However, instead of reducing the level of depressive symptoms, being the master of the household actually increases the level of depression by 0.516 among the female sample (the fourth set of mediation models in Panel B). There is only a slight reduction (from 0.554 to 0.517) of spousal migration on the depressive score after adding the variable of being the master of the household. Therefore, this result goes against hypothesis 4.1 that spousal migration may affect left-behind partners' psychological well-being through the gain of the decision-making power when the spouse becomes the master of household. Instead, it is more consistent with hypothesis 4.2 – that being the master of the household is more a burden than a blessing for the psychological well-being of left-behinds. This is the case in particular among the women sample (Panel B), which might be related to the responsibilities that come with being the master of the household.

To examine whether the positive effect of being the master of household on depressive symptoms is associated with the household economic status, we included the interaction term between being the master of the household and logged household income per capita to examine whether economy is a constraint for rural adults enjoying the decision making power. We list the results in the last column of Table 5, and they show that the effect of being the master of the household on the depressive score could be lessened when the household economic situation improves, which is along the line of hypothesis 4.2 – that the detrimental influences of being master of household on psychological well-being will be reduced if the households are in a better-off socioeconomic position. Figure 2 shows the predicted depression scores by household income per capita, and reveals that only when household income per capita reaches a high level do the rural adults that become the masters of their households have lower depression scores than their counterparts of non-masters of the households. This is particular the case in the female-only sample.

We also included all the mediating variables in the same model (see Table A3 in Appendix Tables) and the results are consistent with the separated examination, indicating that the

intimacy relationship and being the master of households could help explain the relationship between spousal migration and left-behind partners' well-being. We also used inverse probability weighting models to check the robustness of the mediating effect with our OLS results. It showed that the results are largely consistent, which can be seen in the changes from the potential outcome for the control group (no spousal migration in both years) to the average treatment effect for the treatment groups (see Table A4 in Appendix Tables).

To capture a more nuanced picture of the nature of autonomy gained in being the master of the household (beyond a binary variable), we took advantage of the new array of decision-making variables in 2014, asking who makes the final decision in the following situations: family expenditure, financial protection and investment, real estate, children's education and large durable goods expenditure. We coded this variable into three categories of *making no decision*, *some decision* and *full decision*. The result shows that having some power is more harmful to people's mental well-being than having full power, and it serves as a mediating mechanism to reduce the association of spousal migration and the depressive score.

5. Discussion and conclusion

Despite the prevalence of couple separation by migration in developing countries, relatively few studies have examined the influence of spousal separation due to distant work on working age adults who are left behind in the place of origin. Instead, studies on marriage, migration and well-being more often focused on how husbands' migration affects women who are the fellow migrants, such as how they have experienced mental stress due to the loss of old social ties in the migration process (e.g. Shihadeh 1991). In this study we aimed to fill some important gaps in the literature as regards spousal migration and the left-behind partners' psychological well-being. We not only examine whether spousal migration affects left-behind partners detrimentally, as has been found in divorce literature, but also advance the literature by investigating the multiple mechanisms: our research finds that these mechanisms link spousal migration and left-behind married adults' psychological distress by looking at the factors of time for housework and leisure, couple intimacy and being the decision maker of the household. Although we situated our study in the context of internal migration in China, its findings can shed light on other developing countries where solo migration is common among married couples.

Overall, we found that although separation via migration may be different from marriage dissolution, it still has negative consequence for the mental health of those who remain behind. First, our findings about the effect of spousal migration on rural married adults' well-being is not uniform. Although in our results the married adults whose spouses had migrated for a prolonged duration have higher level depressive symptoms across all waves, that is not the case among the cases of the newly migrated and returned spousal migration. Such disparity in the findings could be due to the duration of the couple's separation, however, it could also be explained by how depression was measured. In 2012, the respondents having a newly migrated spouse or a returned spouse also exhibit negative psychological well-being when the depression measure is in the format of CES-D (Radloff 1977) instead of K6, indicating that CES-D may be more sensitive and thereby conducive to detecting a moderate level of depressive symptoms. Second, in the examination of

mechanisms, previous literature suggested that spousal migration might have raised the labor burden of household work for the left-behind spouses (Mu and Walle 2011), which was speculated to lead to poorer psychological well-being, but we did not find this to be the case in our empirical testing. That is, we did not find that spousal migration actually raises the labor burden for left-behind spouses, although having more leisure time is indeed beneficial to people's psychological well-being. Third, in contrast to the null finding of time use as a mediating variable, we indeed found that loss of emotional closeness is a mediator of spousal migration on psychological well-being. Spousal migration significantly reduces the closeness between marriage partners due to the prolonged physical separation, which in turn is detrimental to left-behind spouses' psychological well-being.

Last but not least, one of the most intriguing findings of this study is that spousal migration increases the chance of the left-behind spouses becoming the master of the household, especially for women. However, instead of promoting mental health as a result of increased autonomy for the left-behind women, being the master of the household actually increases depressive symptoms. This contradicts some qualitative studies (e.g. Davin 1999), which suggest that a potential increase in the autonomy and decision-making power of the left-behind spouses are associated with improved psychological well-being of left-behind women. Instead, our study suggests that the elevated household responsibilities may offset the possible benefit associated with individual autonomy increase among rural women. Furthermore, we found that the elevated stress levels brought on by being master of the household is associated with limited family resources.

This study makes an important contribution to the discourse of consequences of couple intimacy loss and household power dynamic in the case of spousal migration, as it suggested that spousal intimacy relationship and autonomy with its associated responsibilities are important mechanisms to shape how spousal migration affects left-behind partners' psychological well-being. Different from marital dissolution, spousal migration implies an attempt to maintain the marriage as a social institution in a distance, but this comes at the cost of intimacy. To some extent, the "commuting marriages" may be similar to spousal separation in terms of loss of intimacy, although spousal separation in a normal marriage is uncommon in the setting of Western countries (Levin 2004). In commuting marriages, commuters are more dissatisfied with time spent together and with affectional communication (Govaerts and Dixon 1988), which is because couples in physical separation often lack parallel communication (Sandow 2013). A commuting marriage often means seeing each other weekly or monthly, but in couple separation due to spousal migration in the developing world, the intervals of seeing each other can vary from monthly to yearly. The left-behind spouses can easily experience isolation or even feelings of abandonment when the length of separation is long. In previous commuting marriage studies, they found that for most commuters, the monetary benefits do not fully compensate for the stress caused by separation — a so-called commuting paradox (Fuller 2010). Our findings are similar, as the potential betterment from spousal migration is not able to cover the cost of the accompanying mental stress.

The autonomy gain perspective exhibits a more puzzling result in our empirical studies. Scholars have argued that spousal migration may increase women's social status at home

insofar as they may be more likely to have more decision-making power. In patriarchal societies such as China, rural young women are at particularly high risk of committing suicide (Phillips et al. 2002; Lee and Kleinman 2000), as the traditional patriarchal social norms and the related gender role expectation require them to face unbearable problems; committing suicide is thus a way to escape the social stress before when they feel depressed in some situation (Baumeister 1990). In such a cultural context, when husbands migrate, left-behind women could gain more freedom, including increased control over spending, decision-making in economic matters, and the freedom to move around due to the role expansions: going to children's schools, attending parent-teacher conferences, visiting the post office or other local administration offices, meeting with friends (Ghuman 2003). As positive as the freedom sounds, however, it may not necessarily be beneficial to their well-being. Being the master of the household or having more decision power means to be the manager of the house, which forces them to take on more responsibilities. That is, being dominant in the household does not necessarily make them feel they are on top (Zuo 2007). This finding is particularly relevant to gender inequality and mental well-being. Radel and Schmook (2009) argued that gained autonomy within the household may not necessarily lead to gender equality, as the social environment still does not have egalitarian gender ideologies, which makes their within-household autonomy somewhat artificial. Our additional analysis with the 2014 data, whereby we divided decision-making power into *no power*, *some power* and *full power*, added further nuances with regard to power dynamic and well-being among the rural married couples. It shows that having some power is more harmful to people's mental well-being than having full power; this suggests that the power is more likely to be a burden when the power is not power enough.

This study has some limitations. First, although the CFPS data have information on the remittances of all out-migrants within the household from the previous year, there is a lack of information on remittances sent home by migrating spouses. Thus, we are unable to examine whether the migrating spouse's economic contribution can directly compensate for the mental strain felt by the left-behind partners, which means this mechanism cannot be empirically tested in our models. Second, there is a potential bias regarding the possibility that those married couples living apart suffered poor marriage quality before migration. To partially resolve this problem, we used the propensity score matching to correct the selection bias of spousal migration. However, such matching cannot completely rule out the possibility of spousal migration caused by poor relationship because we can only use the observed data. Theoretically, we argue that spousal migration due to poor marriage quality may be less true in our study, especially considering that it is men's migration that has a stronger effect on left-behind women's well-being, since men are expected to go out to work in a patriarchal society. Third, we did not find a strong mediating effect of time use on spousal migration and left-behind partners' well-being. A possible explanation is that this model cannot reflect whether spousal migration affects the amount of farm work that left-behind partners have to take on because CFPS data did not distinguish the farm work from other work. Future studies with more detailed data on labor burden on left-behind members can be used to study this in a detailed way. Last but not least, our results may still suffer from unobserved individual heterogeneity due to the unobserved variables. For example, people in poverty are in higher need for prolonged work migration, and they are also more

vulnerable to depression. Despite that we have controlled for the household income per capita, it cannot fully capture family's economic need. Propensity matching and inverse probability weighting both assume ignorability or unconfoundedness (Xie et al. 2012), which warn us that we should always interpret the results cautiously. Despite these limitations, this research produced a national-level study shedding light on how the migration-caused separation of spouses has influenced the left-behind partners' psychological well-being, which can be extended to other settings where couple separation caused by migration is common. Policy direction should include encouraging family migration instead of splitting the household by providing more family-friendly environments and settlement options in migration destinations.

Acknowledgments

We acknowledge the funding support from General Research Fund (GRF) of Hong Kong. Project # 14410714.

Appendix

Appendix Table A1.

The Models for Predicting Propensity of Spousal Migration Status and Bivariate Tests after One-to-one Nearest Neighbor Matching (Source: 2010 data)

Variables	Models 1: ML vs. NM ^a				Models 2: MT vs. NM ^a				Models 3: MB vs. NM ^a			
	Logit model ^b		Bivariate test		Logit model ^b		Bivariate test		Logit model ^b		Bivariate test	
	b	SE	diff.	p	b	SE	diff.	p	b	SE	diff.	p
<i>Personal characteristics</i>												
Female	1.711 ***	0.121	−0.022	0.314	1.301 ***	0.262	0.039	0.436	1.681 ***	0.178	−0.017	0.534
Age	−0.044 ***	0.008	−0.373	0.416	−0.030	0.017	−0.480	0.665	−0.045 ***	0.012	−0.145	0.813
Education years	−0.017	0.012	0.018	0.935	−0.034	0.026	0.071	0.892	−0.033 *	0.016	0.341	0.271
Occupation												
Not working or not declared clearly			0.003	0.914			0.016	0.801			0.014	0.707
Farming	−0.117	0.092	0.001	0.957	0.081	0.192	0.000	1.000	−0.173	0.123	0.003	0.939
Non-farming work	−0.011	0.130	−0.004	0.824	−0.709	0.400	−0.016	0.584	−0.709 ***	0.212	−0.017	0.412
Self-rated health	0.034	0.085	−0.004	0.872	−0.182	0.189	0.024	0.708	−0.168	0.117	0.003	0.940
<i>Spouse and household characteristics</i>												
Age of spouse												
Similar age			0.014	0.587			−0.039	0.505			0.003	0.939
Two or more years younger	0.208	0.123	−0.007	0.730	0.490	0.265	0.008	0.884	0.202	0.177	−0.006	0.838

Variables	Models 1: ML vs. NM ^a				Models 2: MT vs. NM ^a				Models 3: MB vs. NM ^a			
	Logit model ^b		Bivariate test		Logit model ^b		Bivariate test		Logit model ^b		Bivariate test	
	b	SE	diff.	p	b	SE	diff.	p	b	SE	diff.	p
Two or more years older	-0.281 ^{**}	0.095	-0.007	0.784	-0.055	0.216	0.031	0.614	-0.249	0.129	0.003	0.939
Spousal education in years	-0.008	0.012	-0.097	0.661	0.082 ^{**}	0.025	0.283	0.576	0.107 ^{***}	0.017	0.134	0.629
Number of adult children aged 16 and over in the household	-0.284 ^{***}	0.073	-0.050	0.302	-0.326 [*]	0.156	0.063	0.628	-0.339 ^{**}	0.107	-0.063	0.324
Having children aged 0–3 at home	-0.254 [*]	0.107	0.006	0.807	0.034	0.221	0.094	0.121	0.213	0.139	-0.014	0.692
Having children aged 4–9 at home	-0.066	0.095	0.027	0.290	-0.132	0.207	-0.079	0.178	0.198	0.127	0.065	0.082
Having children aged 10–15 at home	-0.037	0.102	-0.013	0.608	-0.173	0.225	-0.039	0.497	0.468 ^{***}	0.140	0.000	1.000
Having elders aged 65–74 at home	0.055	0.119	-0.012	0.536	-0.182	0.270	-0.031	0.439	-0.370 [*]	0.178	-0.003	0.906
Having elders aged 75 and over at home	0.055	0.145	0.001	0.926	0.098	0.302	0.000	1.000	0.040	0.198	0.006	0.799
Logged household net income per capita	0.249 ^{***}	0.052	-0.046	0.306	-0.463 ^{***}	0.084	0.113	0.393	-0.008	0.067	0.053	0.439
Logged GDP per capita in the county	-0.454 ^{***}	0.060	-0.050	0.231	-0.369 ^{**}	0.140	0.125	0.175	-0.526 ^{***}	0.087	0.041	0.455
Constant	0.983	0.670			3.569 [*]	1.447			2.344 [*]	0.944		
Observations	8,229		1,288		7,660		254		7,885		704	
Log likelihood	-2099				-571.9				-1193			

Note.

^aNM, ML, MT, MB respectively refer to spouse did not migrate either year, spouse migrated last year but not this year, spouse migrated this year but not last year, and spouse migrated both years. As in regression models, NM is considered as the control group, while ML, MT, and MB are the treated groups in the three matching models, respectively.

^bWe follow Guo and Fraser's approach (2010) to conduct one-to-one nearest neighbor matching without replacement within specified caliper widths. In each model sets, the first two columns report the logistic regression models used to predict the probability of receiving the treatment, while the last two columns are the results of bivariate tests in the trimmed samples after one-to-one nearest neighbor matching.

p<0.001

**
p<0.01

*
p<0.05

Appendix Table A2.

Propensity Score Matching Estimators of the Effect of Spousal Migration on Depression Status of Rural Left-behinds

	Treatment effect	Standard errors	N of treated ^b	N of controls ^b
ML vs. NM ^a	0.124	0.202	694	694
MT vs. NM ^a	0.104	0.524	127	127
MB vs. NM ^a	0.587 [*]	0.281	352	352

Note.

^a NM, ML, MT, MB respectively refer to spouse did not migrate either year, spouse migrated last year but not this year, spouse migrated this year but not last year, and spouse migrated both years. As in regression models, NM is considered as the control group, while ML, MT, and MB are the treated group in the three matching models, respectively.

^b One-to-one nearest neighbor matching is applied to estimate the average treatment effects.

*** p<0.001

** p<0.01

* p<0.05.

Appendix Table A3.

Mediating analysis by adding the mediating variables all together

	(1) Full sample: Baseline	(2) Full sample: all mediators	(3) Full sample: mediators and interactions	(4) Female sample: Baseline	(5) Female sample: Add all mediators	(6) Female sample: mediators and interactions
<i>Spousal migration status</i> (did not migrate either year =0)						
Migrated last year but not this year	0.291 ⁺ (0.149)	0.342 [*] (0.147)	0.344 [*] (0.147)	0.315 ⁺ (0.178)	0.272 (0.177)	0.271 (0.177)
Migrated this year but not last year	0.349 (0.330)	0.192 (0.328)	0.200 (0.328)	0.435 (0.397)	-0.028 (0.398)	-0.055 (0.398)
Migrated both years	0.554 ^{**} (0.204)	0.413 [*] (0.204)	0.418 [*] (0.204)	0.595 [*] (0.238)	0.127 (0.243)	0.117 (0.243)
<i>Hours of housework per week</i> (five hours or less=0)						
Over five and below ten hours		0.373 ^{**} (0.116)	0.369 ^{**} (0.116)		0.108 (0.256)	0.115 (0.256)
Over ten and below fifteen hours		0.367 ^{**} (0.119)	0.362 ^{**} (0.120)		-0.239 (0.245)	-0.234 (0.245)
Over fifteen hours		0.459 ^{***} (0.116)	0.457 ^{***} (0.116)		-0.176 (0.239)	-0.166 (0.239)
<i>Hours of leisure per week</i> (five hours or less=0)						
Over five and below ten hours		-0.685 ^{***} (0.129)	-0.681 ^{***} (0.129)		-0.810 ^{***} (0.176)	-0.810 ^{***} (0.176)
Over ten and below fifteen hours		-0.713 ^{***} (0.125)	-0.712 ^{***} (0.125)		-0.736 ^{***} (0.176)	-0.737 ^{***} (0.176)

	(1) Full sample: Baseline	(2) Full sample: all mediators	(3) Full sample: mediators and interactions	(4) Female sample: Baseline	(5) Female sample: Add all mediators	(6) Female sample: mediators and interactions
Over fifteen hours		−0.887 ^{***} (0.117)	−0.885 ^{***} (0.117)		−1.001 ^{***} (0.166)	−1.002 ^{***} (0.166)
Marriage closeness		−0.251 ^{***} (0.031)	−0.250 ^{***} (0.031)		−0.317 ^{***} (0.045)	−0.317 ^{***} (0.045)
Being the master of the household		−0.086 (0.092)	1.198 ⁺ (0.722)		0.422 [*] (0.172)	3.410 [*] (1.498)
Household net income per capita (logged)	−0.430 ^{***} (0.046)	−0.381 ^{***} (0.046)	−0.319 ^{***} (0.058)	−0.411 ^{***} (0.066)	−0.369 ^{***} (0.066)	−0.322 ^{***} (0.070)
HH master × Household net income per capita (logged)			−0.154 ⁺ (0.086)			−0.358 [*] (0.178)
Observations	8,708	8,708	8,708	4,660	4,660	4,660
R-squared	0.100	0.113	0.113	0.094	0.114	0.115

Note. All models include controls for personal characteristics (age and its square, education years, occupation, self-rated health) and spouse and household characteristics (age of spouse, spousal education in years, having children aged 0–3 at home, having children aged 4–9 at home, having children aged 10–15 at home, having elders aged 65–74 at home, having elders aged 75 and over at home, and household net income per capita). Gender is also included in full-sample models.

Standard errors in parentheses

p<0.001

**
p<0.01

*
p<0.05

+
p<0.1.

Appendix Table A4:

Average Treatment Effect Changes from Inversed Probability Weighting Modelling when Adding the Mediating Variables in 2010

Mediating Variables	(1). No mediating		(2) Time of doing house work		(3) Time of having leisure		(4) Marriage Closeness		(5) Being the master of household		(6) Interaction between income and household master	
	ATE	POmean	ATE	POmean	ATE	POmean	ATE	POmean	ATE	POmean	ATE	POmean
<i>Spousal Migration</i>												
Migrated last year but not this year	0.331 (0.237)		0.375 (0.238)		0.321 (0.236)		0.321 (0.235)		0.333 (0.236)		0.355 (0.236)	
Migrated this year but not last year	0.824 (0.460)		0.631 (0.417)		0.786 (0.444)		0.640 (0.458)		0.763 (0.451)		0.739 (0.450)	
Migrated both years of 10 & 09	0.920 [*] (0.380)		1.007 [*] (0.395)		0.935 [*] (0.383)		0.740 (0.396)		0.849 [*] (0.392)		0.853 [*] (0.389)	
Not migrated	9.111 ^{***} (0.044)		9.110 ^{***} (0.044)		9.110 ^{***} (0.044)		9.125 ^{***} (0.045)		9.112 ^{***} (0.044)		9.112 ^{***} (0.044)	
Observations	8,708	8,708	8,708	8,708	8,708	8,708	8,708	8,708	8,708	8,708	8,708	8,708

Note. Robust standard errors in parentheses

p<0.001

**
p<0.01

*
p<0.05

Control variables are included.

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Figure 1.
Predicted Depression Score by Spousal Migration Status, Marriage Closeness and Gender

Figure 2.
Predicted Depression Score by Spousal Migration Status, Being the Master of the Household, Household Economy and Gender

Table 1:

Statistics Summary of Mean or Percentage of Variables by Analysis Samples

	2010		2012		2014	
Variables	Mean	SD	Mean	SD	Mean	SD
Dependent variable						
Depression score	9.15	3.85	14.50	7.15	9.31	3.93
Independent variable						
Spousal migration status						
Never migrated in current and previous waves/year	86.51		90.81		87.31	
Migrated in previous waves/year, now returned	7.99		3.15		5.91	
Never migrated in previous waves/year, newly migrated	1.46		4.19		3.59	
Migrated in previous waves/year, still migrating	4.04		1.84		3.19	
<i>Personal demographic background</i>						
Female	0.54	0.50	0.55	0.50	0.57	0.50
Age	40.14	8.58	41.78	7.91	43.20	7.44
Age squared	1685.25	666.43	1807.82	630.61	1921.57	610.62
Education years	5.27	4.26	5.54	4.30	6.05	4.09
Occupation						
Not working or not declared clearly	36.00		18.93		17.74	
Farming	44.96		57.89		54.56	
Non-farming work	19.03		23.18		27.70	
Self-rated health	0.50	0.50	2.87	1.23	3.07	1.25
<i>Spouse or household characteristics</i>						
Age of spouse						
Similar age	41.24		41.87		42.48	
Two or more years younger	26.63		25.42		24.70	
Two or more years older	32.13		32.71		32.81	
Spousal education in years	5.47	4.22	6.67	3.98	6.38	4.10
Having children aged 0–3 at home	0.23	0.42	0.23	0.42	0.20	0.40
Having children aged 4–9 at home	0.29	0.45	0.30	0.46	0.32	0.47
Having children aged 10–15 at home	0.30	0.46	0.29	0.45	0.30	0.46
Having elders aged 65–74 at home	0.12	0.33	0.12	0.33	0.12	0.33
Having elders aged 75 and over at home	0.09	0.29	0.10	0.30	0.11	0.32
Logged household net income per capita (Chinese Yuan)	8.35	0.93	8.55	1.23	8.73	1.25
Number of observations	8,708		6,346		5,242	

Note: a. The depression scores in 2010 and 2014 only have six items, but it has 20 items in 2012. The questions were designed in different ways.

b. The more recent waves used the repeated measures of spousal migration from previous waves, which partially lead to a reduction of sample size over time.

c. Since health has been asked differently across waves, we coded self-rated health in 2010 as dummy variable (original coding is very skewed), while it is on a five scale in 2012 and 2014.

Table 2.

Descriptive Statistics of Spousal Migration and Mediating Variables in 2010 (Mean/%)

	Overall	Females	Males	Gender Differences
Dependent variable				
Depression score	9.15 (0.04)	9.49 (0.06)	8.76 (0.06)	0.73 (0.08) ***
Independent variable				
Spousal migration status				
Did not migrate either year	0.87	0.79	0.95	-0.16
Migrated last year but not this year	0.08	0.12	0.03	0.09
Migrated this year but not last year	0.01	0.02	0.01	0.01
Migrated both years	0.04	0.06	0.01	0.05 ***
Mediators				
Hours of housework per week				
Five hours or less	0.26	0.07	0.47	-0.41
Over five and below ten hours	0.21	0.17	0.25	-0.08
Over ten and below fifteen hours	0.22	0.29	0.15	0.14
Over fifteen hours	0.31	0.47	0.12	0.35 ***
Hours of leisure per week				
Five hours or less	0.17	0.19	0.15	0.04
Over five and below ten hours	0.20	0.22	0.18	0.04
Over ten and below fifteen hours	0.24	0.23	0.24	-0.01
Over fifteen hours	0.39	0.36	0.43	-0.08
Marriage closeness	1.86 (0.01)	1.96 (0.02)	1.75 (0.02)	0.21 (0.03) ***
Being the master of the household	0.42 (0.01)	0.13 (0.00)	0.75 (0.01)	-0.61 (0.01) ***
Observations	8,708	4,660	4,048	

Note. Standard deviations in parentheses.

p<0.001

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p<0.01

*
p<0.05.

Table 3:

OLS Models of Depression Status against Spousal Migration among Rural Married Adults by Survey Waves

Variables	2010	2012	2014
<i>Spousal migration status</i> (never migrated in current and previous waves/ survey year=0)			
Migrated in previous waves/year, now returned	0.291 (0.149)	1.667 ** (0.559)	0.351 (0.244)
Not migrated in previous waves/year, newly migrated	0.349 (0.330)	1.339 ** (0.516)	-0.168 (0.259)
Migrated in previous waves/year, still migrating	0.554 ** (0.204)	2.252 ** (0.788)	0.677 * (0.345)
<i>Personal characteristics</i>			
Gender (male=0)	0.455 *** (0.101)	1.282 *** (0.189)	0.400 *** (0.117)
Age	-0.006 (0.044)	-0.111 (0.124)	-0.237 ** (0.088)
Age squared	0.000 (0.001)	0.002 (0.002)	0.003 ** (0.001)
Years of education	-0.077 *** (0.011)	-0.114 *** (0.023)	-0.075 *** (0.015)
Occupation (not working or note declared=0)			
Farming	-0.384 *** (0.089)	0.251 (0.253)	0.022 (0.158)
Non-farming work	-0.244 * (0.119)	0.427 (0.278)	-0.200 (0.170)
Self-rated health	-1.688 *** (0.080)	-1.239 *** (0.078)	-0.781 *** (0.048)
<i>Spouse and household characteristics</i>			
Age of spouse (similar age=0)			
Two or more years younger	0.202 (0.103)	0.540 * (0.230)	0.354 * (0.142)
Two or more years older	0.109 (0.098)	0.393 (0.227)	0.287 * (0.136)
Spousal education in years	-0.048 *** (0.011)	-0.056 * (0.025)	-0.057 *** (0.015)
Having children aged 0–3 at home (no=0)	-0.233 * (0.103)	0.345 (0.264)	-0.037 (0.160)
Having children aged 4–9 at home (no=0)	-0.137 (0.091)	0.220 (0.232)	0.060 (0.136)
Having children aged 10–15 at home (no=0)	-0.045 (0.096)	-0.155 (0.234)	0.218 (0.142)
Having elders aged 65–74 at home (no=0)	-0.032 (0.120)	0.428 (0.293)	-0.082 (0.184)
Having elders aged 75 and over at home (no=0)	-0.007 (0.135)	0.123 (0.341)	0.477 * (0.214)
Household net income per capita (logged)	-0.430 *** (0.046)	-0.184 * (0.079)	-0.134 ** (0.050)
Constant	14.095 *** (0.919)	20.731 *** (2.555)	17.988 *** (1.842)
Observations	8,708	6,346	5,008
R-squared	0.100	0.082	0.102
BIC	47446.45	42598.33	27595.48

Note. Migration status has taken into consideration previous waves/years' migration.

Standard errors in parentheses are robust

p<0.001

**
p<0.01

*
p<0.05.

Table 4:

Average Treatment Effect from Inversed Probability Weighting Modelling, by Waves

	2010		2012		2014	
<i>Spousal Migration</i>	<u>ATE</u>	<u>POmean</u>	<u>ATE</u>	<u>POmean</u>	<u>ATE</u>	<u>POmean</u>
Ever migrated, returned by the survey year	0.331 (0.237)		2.239 * (0.991)		0.324 (0.305)	
Not migrated in previous waves, newly migrated	0.824 (0.460)		1.668 * (0.720)		-0.648 * (0.263)	
Migrated before, and still migrating in survey year	0.920 * (0.380)		2.133 (1.364)		1.290 * (0.564)	
Not migrated		9.111 *** (0.044)		14.332 *** (0.093)		9.301 *** (0.060)
Observations	8,708	8,708	6,343	6,343	5,008	5,008

Note. Robust standard errors in parentheses; Control variables are included.

p<0.001

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p<0.01

*
p<0.05.

Table 5.

OLS Models of Mediating Variables on Spousal Migration and Depression Status among Rural Married Adults, Full Sample and Female Sample in 2010

Predictors (Panel A, Full Sample, N=8,708)	Mediation Models 1		Mediation Models 2		Mediation Models 3		Mediation Models 4		
	(1) Hours of housework	(2) Depression	(3) Hours of leisure	(4) Depression	(5) Marriage closeness	6) Depression	(7) Being the HH master	(8) Depression	(9) Depression
<i>Spousal migration status</i> (did not migrate either year =0)									
Migrated last year but not this year	-0.105 (0.076)	0.291 (0.149)	0.107 (0.076)	0.294 [*] (0.149)	-0.064 (0.051)	0.274 (0.148)	-0.176 (0.130)	0.291 (0.149)	0.294 [*] (0.149)
Migrated this year but not last year	-0.101 (0.166)	0.337 (0.330)	0.044 (0.166)	0.347 (0.329)	-0.811 ^{***} (0.112)	0.138 (0.329)	1.542 ^{***} (0.232)	0.318 (0.331)	0.326 (0.330)
Migrated both years	-0.235 [*] (0.104)	0.557 ^{**} (0.204)	-0.008 (0.102)	0.547 ^{**} (0.204)	-0.874 ^{***} (0.070)	0.326 (0.205)	1.768 ^{***} (0.143)	0.517 [*] (0.206)	0.521 [*] (0.206)
Hours of housework per week (five hours or less=0)									
Over five and below ten hours		0.255 [*] (0.119)							
Over ten and below fifteen hours		0.189 (0.127)							
Over fifteen hours		0.254 [*] (0.126)							
Hours of leisure per week (five hours or less=0)									
Over five and below ten hours				-0.692 ^{***} (0.129)					
Over ten and below fifteen hours				-0.730 ^{***} (0.125)					
Over fifteen hours				-0.903 ^{***} (0.117)					
Marriage closeness						-0.261 ^{***} (0.031)			
Being the master of the household								0.145 (0.107)	1.586 [*] (0.729)
Household net income per capita (logged)	-0.058 [*] (0.024)	-0.426 ^{***} (0.046)	0.256 ^{***} (0.024)	-0.396 ^{***} (0.046)	0.028 (0.016)	-0.422 ^{***} (0.046)	0.032 (0.035)	-0.430 ^{***} (0.046)	-0.361 ^{***} (0.058)
HH master × Household net income per capita (logged)									-0.172 [*] (0.086)
Observations	8,708	8,708	8,708	8,708	8,708	8,708	8,708	8,708	8,708

R-squared	0.101	0.106	0.037	0.107	0.100	0.101
Log likelihood	-10327	-11216			-3623	
Predictors (Panel B, Female Sample, N=4,660)	Mediation Models 1		Mediation Models 2		Mediation Models 3	
	(10) Hours of housework	(11) Depression	(12) Hours of leisure	(13) Depression	(14) Marriage closeness	(15) Depression
					(16) Being the HH master	(17) Depression
						(18) Depression
<i>Spousal migration status</i> (did not migrate either year =0)						
Migrated last year but not this year	-0.071 (0.087)	0.298 (0.178)	0.064 (0.086)	0.312 (0.178)	-0.091 (0.057)	0.284 (0.177)
Migrated this year but not last year	-0.376* (0.188)	0.406 (0.397)	0.136 (0.191)	0.436 (0.396)	-1.035*** (0.128)	0.081 (0.398)
Migrated both years	-0.404*** (0.115)	0.563* (0.238)	-0.112 (0.111)	0.566* (0.237)	-0.960*** (0.077)	0.267 (0.240)
Hours of housework per week (five hours or less=0)						
Over five and below ten hours		0.024 (0.258)				
Over ten and below fifteen hours		-0.376 (0.247)				
Over fifteen hours		-0.307 (0.241)				
Hours of leisure per week (five hours or less=0)						
Over five and below ten hours				-0.837*** (0.177)		
Over ten and below fifteen hours				-0.797*** (0.176)		
Over fifteen hours				-1.032*** (0.167)		
Marriage closeness						-0.342*** (0.045)
Being the master of the household						0.516** (0.173)
Household net income per capita (logged)	0.006 (0.032)	-0.407*** (0.066)	0.266*** (0.032)	-0.374*** (0.066)	0.009 (0.021)	-0.408*** (0.065)
HH master × Household net income per capita (logged)					-0.002 (0.052)	-0.411*** (0.066)
Observations	4,660	4,660	4,660	4,660	4,660	4,660
						3.470* (1.512)
						-0.365*** (0.070)
						-0.354* (0.180)

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R-squared	0.095	0.102	0.054	0.105	0.096	0.097
Log likelihood	-5341	-6066			-1668	

Note. All models include controls for personal characteristics (age and its square, education years, occupation, self-rated health) and spouse and household characteristics (age of spouse, spousal education in years, having children aged 0–3 at home, having children aged 4–9 at home, having children aged 10–15 at home, having elders aged 65–74 at home, having elders aged 75 and over at home, and household net income per capita). Gender is also included in full-sample models. Standard errors in parentheses

*** p<0.001
** p<0.01
* p<0.05.

Table 6:

Decision making power as a mediator of spousal migration and depressive symptom in 2014

Variables	Mediation		
	(1) Decision Making	(2) Depression	(3) Depression
<i>Spousal migration status</i> (never migrated in current and previous waves/ survey year=0)			
Migrated in previous waves/year, now returned	0.710 *** (0.124)	0.351 (0.244)	0.325 (0.245)
Not migrated in previous waves/year, newly migrated	1.479 *** (0.164)	-0.168 (0.259)	-0.203 (0.263)
Migrated in previous waves/year, still migrating	1.699 *** (0.166)	0.677 * (0.345)	0.618 (0.348)
<i>Decision-making power</i> (Having no power at all=0)			
Having some power			0.289 * (0.139)
Having full power			0.198 (0.132)
Constant cut1	5.088 *** (0.861)		
Constant cut2	6.598 *** (0.862)		
Constant	18.529 *** (0.903)	17.988 *** (1.842)	18.180 *** (1.845)
Observations	5,008	5,008	5,008
R-squared (or Pseudo R2)	0.1126	0.1016	0.1025
BIC	9899.121	27595.48	27607.77

Note. Model 1 is an ordinal regression model with the dependent variables as having no power, some power and full power on decision making. All models include controls for personal characteristics (age and its square, education years, occupation, self-rated health) and spouse and household characteristics (age of spouse, spousal education in years, having children aged 0–3 at home, having children aged 4–9 at home, having children aged 10–15 at home, having elders aged 65–74 at home, having elders aged 75 and over at home, and household net income per capita). Standard errors in parentheses

p<0.001

**
p<0.01

*
p<0.05.