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Research Article

The effect of spousal separation and reunification on fertility: Chinese internal and international migration

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Contents

1	Introduction	852
2	Literature review	853
2.1	The effect of migration on fertility	854
2.2	The end of spousal separation and its effect on fertility	855
3	The Chinese context	857
4	Hypotheses	858
5	Data and methods	859
6	Results	866
6.1	Descriptive	866
6.2	Discrete-time models	869
7	Conclusion	874
8	Acknowledgments	876
	References	877
	Appendix	883

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Research Article

The effect of spousal separation and reunification on fertility: Chinese internal and international migration

Wanli Nie[1]

Abstract

BACKGROUND
In a modern society with massive long-distance migration due to rapid development of transportation infrastructure, spousal separation has a substantial and cumulative effect on marital fertility (Menken 1979) due to not only lower intercourse frequency, but also factors affecting fertility in both the destination and origin locations.

OBJECTIVE
This paper investigates the effect of spousal separation on marital fertility for Chinese internal migrants and international migrants to the US.

METHODS
Using data from the Chinese International Migration Project, I jointly model the first, second and third births, and spousal separation applying event-history techniques and controlling for unobserved heterogeneity. Time-varying information on both partners' occupations is incorporated to capture the changes in their socioeconomic status.

RESULTS
The results show that the first two births are disrupted by spousal separation. Reunification does not lead to higher fertility but rather implies lower fertility. Moreover, there is a tendency for couples who are separated due to the migration of one partner to also have higher fertility levels.

CONCLUSIONS
Concerns regarding the dramatic rise in migrant births after family reunification are not empirically grounded. Couple separation is related to a traditional division of labour. Furthermore, the correlation between migration and fertility mainly comes from the selectivity of household income.

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CONTRIBUTION

This paper sheds light on the effects of migration-related changes in couples' living arrangements on fertility, analysed by birth order in under-researched contexts: China-US migration and internal migration from Fujian province. Both migration types have dramatically increased in China in recent decades.

1. Introduction

Labour migration, especially when it involves crossing international borders, often requires the migrant to leave his or her spouse and children for a long time, which leads to a series of family changes (Yabiku, Agadjanian, and Sevoyan 2010). This paper investigates the effect of spousal separation due to short-distance or long-distance migration on the marital fertility of Chinese internal and international migrants, taking into account the selectivity of separated couples. The aims are, first, to isolate the long-term negative fertility effect of spousal separation from the short-term disruptive effect of migration on fertility; second, to shed light on fertility behaviour after return migration or migration of the left-behind spouse i.e., spousal reunification; and last, to extend the framework of "men's migration and women's fertility" (Agadjanian, Yabiku, and Cau 2011) to a more general one, i.e., "couples' living arrangement and fertility", where couples' living arrangement includes living together, living separately due to migration, and living together again due to reunification.

Studies on spousal separation and fertility add to our understanding of fertility norms for couples that have been separated at some stage, which are different to the fertility norms of couples who do not experience spousal separation. Furthermore, an exploration of the interrelationships between spousal separation and marital fertility might shed light on the unobserved dynamics of the couple regarding fertility decisions. Moreover, in some more developed countries with extremely low total fertility rates and increasing immigration flows, understanding the fertility of migrants is important for near-future population projection. Lastly, China is a unique country of origin in that the fertility level there is lower than in Chinese migrants' destination countries such as the United States. It is more common for migration to be from high-fertility to low-fertility regions.

To the best of my knowledge, this paper is one of the first attempts to quantify the effect on marital fertility of spousal separation caused by both Chinese internal and international migration and reunification, controlling for the complete occupational history of both partners and the selectivity of couples from the perspective of the migrant-sending villages. This differentiation between spousal separation caused by

internal and international migration is important because separations that are short (internal migration) and long (international migration) in distance are substantially different in terms of how they affect fertility, due to geographical distance, visiting frequency, length of stay at the destination, etc. However, until recently data on both internal and international migration from the same origin area have not been commonly available, making it impossible to draw the comparison.

Moreover, the interrelationship between migration and fertility is worth exploring at the couple level, since marital fertility is a couple's joint decision and is therefore closely related to the couple's living arrangement. Furthermore, this paper explicitly models couples' living arrangements, thus isolating the effect of couples' living arrangements from temporary economic uncertainty, which is proxied by couples' occupational status. It also sheds light on the importance of a couple's socioeconomic status in reproduction decision-making.

2. Literature review

The theoretical framework of this paper is grounded in the key classical mechanisms of selection, disruption (see section 2.1), and adaptation (see section 2.2) in migrant fertility. The selection theory argues that migration, marriage, and fertility behaviours are part of the same family formation process and thus are intercorrelated (Kulu and Milewski 2007). Migrants might be self-selected for some observed or unobserved individual characteristics, e.g., education level or personal traits, which are associated with a certain fertility level that is higher or lower than that of non-migrants at the origin, like in Ghana's internal migration context (Chattopadhyay, White, and Debpuur 2006). For example, women with lower fertility are more likely to migrate in Malaysia and Thailand (Goldstein and Goldstein 1981, 1983). Furthermore, as the interrelationship between migration and fertility differs by gender in the Mexico–United States context (Lindstrom and Saucedo 2002), couples' living arrangements might be more relevant than individuals' migration behaviour in explaining the variation in marital fertility. Spousal separation, marriage, and fertility are closely related events since the likelihood of a couple's residential separation is highest during the early years of marriage when family formation activities are most intense in the Mexico–United States migration context (Gupta 2002). In Ouagadougou, recently married couples are more likely to experience physical separation (Flahaux et al. 2019). Marriage could also be an intermediary event between migration and fertility, such as in Kyrgyzstan (Hoem and Nedoluzhko 2008). Clifford (2009) documents a significant positive component between the temporary migration of one partner and fertility at the community level in post-Soviet Tajikistan.

Previous literature has showed that living together is perceived as an obligation in Burkina Faso (Flahaux et al. 2019) and that women's long-distance commuting harms family stability in Germany (Kley and Feldhaus 2018). The persistency of spousal separation is variable. Spousal reunification can be rare, as in the cases of Senegal–Europe migration, sub-Saharan Migration to Europe, and Ghana–Europe migration (Baizán, Beauchemin, and González-Ferrer 2014; Beauchemin et al. 2015; Caarls and Mazzucato 2016), or is quick to take place, like in Germany (González-Ferrer et al. 2007). It is unsurprising that results are sometimes contrasting since they apply to different national and ethnic migration contexts, and it is always worth considering the context-specific differences. Studies on the effect of spousal separation on fertility focus on the context of temporary migration such as rural-to-urban migration (Menken 1979), and international migration to a neighbouring destination country, for example, Mexico–United States (Lindstrom and Saucedo 2002), Central Asia–Russian Federation (Clifford 2009; Nedoluzhko and Andersson 2007), or Africa–Europe (Baizán, Beauchemin, and González-Ferrer 2014). However, there is less evidence regarding the effect of spousal separation due to international migration when there is a significant geographical distance between the countries of origin and destination, as is the case for migration from China to the United States.

2.1 The effect of migration on fertility

The disruption hypothesis argues that childbearing can be disrupted or delayed by migration due to spousal separation, but recovers afterward, as in the Ghanaian internal migration and Mexico–United States contexts (Chattopadhyay, White, and Debpuur 2006; Lindstrom and Giorguli-Saucedo 2007). Goldstein and Goldstein (1983) confirm the existence of a disruption effect on fertility caused by migration: migration occurring between two events leads to longer birth intervals in Malaysia. This holds true even after controlling for the temporary separation of couples. Empirical evidence supporting this argument includes the lower fertility of Mexican-origin first-generation migrants compared with natives in the United States (Stephen and Bean 1992), the lower fertility of recent migrants compared with others who have been living in Australia for more than five years (Abbasi-Shavazi and Mcdonald 2000), reduced birth rates in the short-term due to spousal separation in the Mexico–United States migration context (Lindstrom and Saucedo 2002), and longer birth intervals for migrants compared with non-migrants based on evidence from the Philippines (Jensen and Ahlburg 2004).

The literature has found that male migration has a negative effect on female fertility, whether through increased female autonomy (Yabiku, Agadjanian, and Sevoyan 2010), reduced intercourse frequency (Massey and Mullan 1984), or

temporary economic hardship. A mathematical model in Menken (1979) proves that the birth rate, with a seasonally varied conception rate, is similar to a reduced constant level of the annual birth rate. This means that the effect of spousal separation on fertility can be cumulative: longer separation reduces birth probabilities to a greater extent (Massey and Mullan 1984). Empirically, Agadjanian, Yabiku, and Cau (2011) highlight the negative effect of migration on fertility and a catch-up effect after men's migration at the macro level in rural Mozambique. Clifford (2009) finds a negative effect of spousal separation and positive selectivity at the community level in post-Soviet Tajikistan. Hampshire and Randall (2000) show that groups that are more involved in seasonal rural-to-urban migration present lower fertility than non-migrants due to migrants' higher risk of sexually transmitted disease. Davis (2011) finds that female migrants spending an accumulation of months abroad has a negative effect on annual fertility.[2] Fewer studies investigate the interrelationship between spousal separation, reunification, and fertility, except for Clifford (2009) and Lindstrom and Saucedo (2002) who shed light on the disruptive effect of migration on fertility due to spousal separation. Nor has much attention been paid to fertility rates resulting from spousal separation due to long-distance migration, e.g., from China to the United States and Europe.

2.2 The end of spousal separation and its effect on fertility

Spousal separation can be ended by reunification at either the destination or the origin. Reunification at destination, commonly perceived as increasing the burden on taxpayers, has become key to explaining immigration in some European countries after a decline in work-related migration (di Belgiojoso and Terzera 2018; González-Ferrer 2007). Immigration policy, gender equality, family background, and the degree of control by older community members are considered to be important factors shaping spousal separation and reunification (Beauchemin et al. 2015; Eremenko and González-Ferrer 2018). Studies on couples 'living apart together across borders' arrive at mixed conclusions. On the one hand, some find persistent patterns (Baizán, Beauchemin, and González-Ferrer 2014; Beauchemin et al. 2015; Caarls and Mazzucato 2016) even with a stable economic situation and regular migration status (Fresnoza-Flot 2018) as migrant families cope with their transnational life (Gupta 2002). On the other hand, González-Ferrer (2007, 2008) finds that both the joint migration of couples and rapid family reunification in Germany and Spain have increased over time due to the development of networks.

[2] Unfortunately, it is not possible to explore the duration effect of couple separation on fertility in a given year. This is because there are too many missing values on the departure and return months.

Socioeconomic status is important in explaining couples' living arrangements: The man having higher occupational status normally signifies a greater chance of reunification in both Senegal and Europe. Gupta (2002) finds that highly educated women are more likely to migrate with their husbands rather than being 'left behind', because education improves gender equality at home. In addition, if the woman is a skilled worker in the origin country, the chance of reunification doubles or the reunification process in Europe is accelerated (Baizán, Beauchemin, and González-Ferrer 2014; González-Ferrer 2007) because both the man and the woman having a higher socioeconomic status predicts increased capacity to feed more family members in Europe.

The catch-up effect during spousal reunification means that fertility levels might increase after the return of the migrant or the migration of the left-behind partner. This is partly derived from the theory of migration's disruptive effect on fertility, which argues that couples postpone fertility until returning to a more familiar context (Davis 2011). For example, Toulemon (2004) argues that increased fertility after migration might be due to couple reunification. Besides the short-term effect of reunification on fertility, e.g., more chances of intercourse (Millman and Potter 1984), there are important long-term effects in this regard. First, returning to the origin village normally means a more familiar environment, lower living costs, and an improved economic situation, thereby increasing fertility. However, González-Ferrer et al. (2017) find that migrants face structural constraints that result in delayed childbearing, such as economic insecurity and labour market uncertainty.

Second, migrants' fertility converges to that of the natives at the destination as stay durations increase (Milewski 2007). If this adaptation hypothesis holds, reunification at the destination should raise fertility due to adaptation to the new environment (Andersson 2004; Chattopadhyay et al. 2006). The adaptation effect of migration on fertility holds in Malaysian internal migration (Goldstein and Goldstein 1983), Thailand (Goldstein and Goldstein 1981), Mexico–United States migration (Lindstrom and Giorguli-Saucedo 2007; Lindstrom and Saucedo 2002; Stephen and Bean 1992), the Hispanic population in the United States (Parrado and Morgan 2008), and Philippine internal migration (Jensen and Ahlburg 2004). Possible mechanisms through which reunification elevates fertility include an improvement in the economic situation for the migrants' families and changes in traditional values related to postpartum abstinence (Omondi and Ayiemba 2003). By contrast, there is evidence of incomplete adaptation or cultural maintenance. For example, Australians of Italian and Greek origin do not fully adapt to the fertility norms in their destination country (Abbasi-Shavazi and McDonald 2000). Bledsoe (2004) also illustrates that migrants' fertility does not assimilate to that of Europeans until their status becomes secure.

3. The Chinese context

Internal temporary migration, or the floating population[3] (Liang and Miao 2013), is characterised by male labour migration and female marriage migration. Migration flows increased significantly during the period of the transition economy. By 2000 the eastern coastal area, especially Guangdong, had received the largest floating population (Liang and Miao 2013). Internal migration is gendered: male migration is strongly related to work, while women normally migrate for family reasons (He and Gober 2003); for example, marriage. In addition, women's migration is more sensitive to caring needs than men's (Chen and Fan 2018). Women's marriage migration reflects a strong economic rationale as women can gain local *hukou* (household registration) through marriage and internal migration (Fan 1999; Fan and Huang 1998).

The majority of migrants with a partner living separately across borders go to North America or Europe. During the period 1965–2005 many undocumented migrants in New York City from Fujian villages brought their family members for family reunification. The mass undocumented migration flow from China to the United States should be understood from a global viewpoint (Pieke et al. 2004) and from a labour-market perspective involving employers' demands for cheap labour (Kwong 1997). The selectivity of international migrants from Fujian shifted from urbanites to rural dwellers (Liang 2001). Positional power, i.e., if a household member is a cadre, plays an important role in sending a family member abroad (Liang et al. 2008).

The gender composition of both internal migrants in China and international migrants from China might trigger physical spousal separation. Young male workers dominate both migration flows,[4] while women account for more than half of the 'left-behind' population in rural areas.[5] The duration of spousal separation can last for years or even decades. Couples involved in both internal and international migration might encounter certain regulations; for example, the *hukou* policy for internal migrants and visa policy in the case of international migration. On 22 July 1998 the newly enacted *hukou* policy stated that "a citizen who has been a resident in the city where his/her spouse has lived for some years, should also be granted the *hukou* registration in the same city to avoid spousal separation". However, high living costs, lack of accessible

[3] According to Liang and Miao (2013), 'floating population' refers to temporary migrants, who, unlike permanent migrants, have not changed their household registration (*hukou*) from rural to urban status.
[4] From 1990 to 1995 male migrants consistently accounted for around 77% of the total international migrant population (Liang and Morooka 2004). Most within-border spousal separations are caused by a partner's rural-to-urban migration, or movement from China's middle and western regions to the eastern coastal area.
[5] It is estimated that of the 87 million 'left-behind' population, 47 million are married women.

children's education, and the need for one of the partners to look after the 'left-behind' family still prevent spousal reunification.[6]

Although *hukou* restrictions make it difficult for Chinese internal migrants to settle somewhere other than their original home, they can move freely throughout the country, making home visits much easier than for international migrants (see Table 2). By contrast, Chinese international migrants to the United States rarely visit their family members in China and stay at their destination for an indefinite period of time due to geographic distance and visa issues[7] (Liang and Zhang 2004). Moreover, internal and international migration differs in terms of the need to learn a new language and to adapt to a new culture and labour market, etc. Data on internal and international migration frequency suggest that the average number of times that internal migrants migrate is 1.219, while for international migrants it is 1.059. The two distributions differ significantly (p-value = 0.0001, two-sample Kolmogorov-Smirnov test). The summary statistics and full distribution of the average number of times that internal and international migrants migrate are shown in the appendix Table A-1. Only marital fertility is included. Surprisingly, a substantial share of births (27.6%) are conceived before marriage.

4. Hypotheses

Spousal separation due to the two different migration types has different effects on fertility because international migration involves longer distances, greater cultural differences, and more difficult integration than internal migration. If the disruption effect accumulates over time (Menken 1979), separation due to international migration should have a stronger effect on fertility than separation due to internal migration with a similar duration of separation. In this analysis, visits home for less than three months are not included due to a lack of data. Short stays of this nature should be more possible for internal migrants than international migrants.

> *Hypothesis 1 (Types of migration)*: Spousal separation due to international migration leads to lower fertility than spousal separation due to internal migration. This holds even when the two types of separation last for a similar period of time.

[6] Joint migration to the cities is not necessarily due to an improved economic situation, but rather increasing household expenses such as the children's education and elderly family members' healthcare, meaning both partners need to work to pay for them.

[7] Visits to China are very infrequent since they are unable to return to the United States without a green card. Normally, the 'left-behinds' can join their partners only if their partners are granted a green card, and it is very risky for the left-behind to migrate by themselves without papers.

If spousal separation only disrupts fertility temporarily and couples adapt to their new environment or overcome economic hardship, fertility will bounce back immediately after spousal reunification.

> *Hypothesis 2 (Catch-up after reunification hypothesis)*: Couples' fertility increases temporarily or is accelerated during the reunification period.

Some unobserved heterogeneity variables determine both higher chances of migration with its related spousal separation, and a higher fertility level. One example is household income. Families in poorer economic situations send only the more efficient labour units, usually the husbands, and the wife cannot join the husband until the economic situation improves, which takes time. These economically disadvantaged households are more attached to agricultural production, which normally requires more workers so they tend to have more children.

> *Hypothesis 3 (Selectivity hypothesis):* Couples that are more likely to separate also tend to have more births or an accelerated fertility process. However, after controlling for household income, the effect on selection is non-significant.

In a patriarchal society, when the male moves out to work in a more profitable industry, the wife shoulders the domestic chores. If the wife does not need to work because remittances from the migrated husband allow her not to (Clifford 2009), this also results in a traditional division of labour.

> *Hypothesis 4 (Unemployment and spousal separation hypothesis):* Spousal separation is positively related to the traditional husband-breadwinner-wife-caregiver family type.

5. Data and methods

The population under study is Fujianese international migrants to the United States and Fujianese internal migrants to other counties in China who were born between 1950 and 1980, married at 15 or older, may have experienced spousal separation after marriage, and gave birth after marriage.[8] The data are merged from the household head file,

[8] The 1950 Marriage Law suggests registering marriage no earlier than when the man is 20 years old and the woman is 18 years old. However, anecdotal evidence suggests that in some rural areas where this study is based, de facto relationships start earlier than marriage and the resulting births are widely treated as marital fertility.

migrant file, household file, and person file of the Chinese International Migration Project (CIMP)[9], which provides detailed retrospective information on the history of migration, family formation, reproduction, and socioeconomic mobility. Up to six occupational changes are recorded for both the household head and the spouse. There are 1,806 households and 10,447 individuals in the sample, 4,646 of whom have migrated at least once, either internally or internationally. Ideally, this paper would shed light on both migration to the United States and Europe. However, 85% of the international migrants in this survey migrated to the United States, and those that went to Europe were distributed across many different countries, making it difficult to compare these two migration flows.

The unit of observation is a person year and the analysis is at the couple level. Kinships like spouses and children are established through the personal identifier. The fertility observation window starts at the year of marriage and ends at the third birth if applicable, or 15 years after the previous birth,[10] or at divorce, or at age 50, or at age at the time of the survey. The age at birth is inferred from the age of the cohabiting children. The child's birth year is lagged one year to account for the 9 months of pregnancy.[11] The observation window of spousal separation starts when married and never separated or reunified either at the origin or destination, and lasts until the occurrence of the separation event, or 30 years after getting married, or at age 50. I selected one of these conditions for censoring the observations, based on its chronological order. We identify the status of the couple's living arrangement: never separated, separated due to internal migration, separated due to international migration, and reunification. Spousal reunification can be achieved through the migrant returning to the origin village or the left-behind spouse migrating to join the migrant at the destination. This study does not differentiate between reunification at destination and origin due to limited occurrences of couple reunification. As shown in Table 2, only 18% of those who separated across borders later reunified, so this paper mainly captures reunification after the internal migration of one partner: reunification after international migration remains inconclusive due to limited sample size. Up to two round trips (migrate out and return) of one person and up to three spousal separations and two reunifications[12] are observed in the data.

We have the complete history of couple separation for 931 couples. However, 299 cases were excluded, as follows: (a) 30 couples were excluded according to the own-

[9] A detailed description of the survey can be found in the paper "Cumulative Causation, Market Transition, and Emigration from China" by Zai Liang, Miao David Chunyu, Guotu Zhuang, and Wenzhen Ye.
[10] Data suggest that almost zero more births happen if there is no birth 15 years after the last birth.
[11] Births conceived in the year of marriage are considered as marital fertility.
[12] This was the case when the husband migrated first, then the wife joined the husband at the destination, and the husband returned without the wife, and then the wife returned, and the husband migrated for a second time.

children method (Goldstein and Goldstein 1981) that suggests only including couples for whom the number of children reported by the household head and number of children within marriage is identical; (b) 2 couples were excluded that had their first birth before age 15; (c) 10 couples that had more than one birth in the same year, 4 couples whose first two children were twins, and 6 couples whose second and third births were twins; and (d) 257 couples were excluded that conceived their first birth more than one year before marriage. Results including births to unmarried women are shown in Appendix Table A-3. Not surprisingly, the inclusion of births before marriage shows a weaker effect on the first birth of spousal separation due to migration: only the negative effect on the first birth of spousal separation due to international migration is statistically significant. This is because couples normally get married soon after the first birth if they were not married before. The exclusion of cases resulted in 632 couples and 907 couple-years for the observation of the first birth, 2,455 couple-years for the observation of the second birth, and 2,966 couple-years for the third birth. Moreover, there are 555 couples and 9,148 couple-years for the observation of the separation process.

The joint modelling of the first, second, and third birth and couples' living arrangement, i.e., separated or not, is shown in Equations (1) to (4) following Rabe-Hesketh and Skrondal (2012) and is estimated using aML (Kravdal 2001; Lillard and Panis 2000). On the left side of the equations are the logarithms of the odds of first, second, or third birth or spousal separation. The subscript *i* refers to the couple, and *t* to each time unit, i.e., year. X_i denotes a vector of covariates, x_{it} denotes the couple's living arrangement variable, and w_{it} is a set of control variables. The equations of the three births and spousal separation were first estimated separately (noted as "single-process model" in the tables) and then incorporated a factor ε as shared covariance among all births and λ as unobserved heterogeneity for spousal separation at the couple-level (noted as "multi-process model" in the tables). An example of the possible time-invariant, unobserved heterogeneity is value orientation, which may lead to the interrelation of events like cohabitation, marriage, and first birth (Baizán, Aassve, and Billari 2003).

The single-process model specification only includes covariates for fertility and spousal separation equations and assumes that these covariates impact the two processes independently. Conversely, the multi-process model specification includes the covariates for the two sets of equations and two correlated error terms (or unobserved heterogeneity), one shared by the first, second, and third birth, and the other for spousal separation. The difference between these two models is two-fold. First, the single-process model assumes that the two processes are independent, which is a questionable assumption that rarely holds in the real world. In our case, spousal separation and fertility are more likely to be correlated events than independent. The

multi-process model considers the two events to be correlated. Second, regarding model specification, the multi-process model allows the unobserved heterogeneity to be correlated (Matysiak 2011), while in the single-process model no correlated component is specified in the equations of fertility and spousal separation. Some observed factors – for example, education level, age, duration since marriage, and other unobserved factors, i.e., factors not observed in the available data, for example, fertility intention – could affect both fertility and spousal separation. The identification of parameters in a multi-process model only requires that the events are repeated and that there is some unobserved heterogeneity that is constant across a lifetime (Lillard, Brien, and Waite 1995).

Duration since the first marriage, last birth, and spousal separation (as a categorical variable) is included in the model. Unfortunately, duration since reunification is not included due to sample size limitation. Hypotheses 1 and 2 can be tested using the specification of Equations (1), (2), and (3) where fertility is the dependent variable, while Hypothesis 4 can be tested using the specification of Equation (4) where spousal separation is the dependent variable. Hypothesis 3 relies on the identification of the variance and covariance of ε and λ from all four equations (see Equation (5)).

$$ln\left\{\frac{Pr(y_i^{1B}=1|X_i)}{1-Pr(y_i^{1B}=1|X_i)}\right\}=\beta_1 x_{it}+\beta_2 w_{it}+\varepsilon_i \quad (1)$$

$$ln\left\{\frac{Pr(y_i^{2B}=1|X_i)}{1-Pr(y_i^{2B}=1|X_i)}\right\}=\beta_1 x_{it}+\beta_2 w_{it}+\varepsilon_i \quad (2)$$

$$ln\left\{\frac{Pr(y_i^{3B}=1|X_i)}{1-Pr(y_i^{3B}=1|X_i)}\right\}=\beta_1 x_{it}+\beta_2 w_{it}+\varepsilon_i \quad (3)$$

$$ln\left\{\frac{Pr(y_i^{S}=1|X_i)}{1-Pr(y_i^{S}=1|X_i)}\right\}=\beta_1 w_{it}+\lambda_i \quad (4)$$

To analyse the main source of unobserved heterogeneity, we include household income in vector w_{it} so that the new ε and λ account for other sources of unobserved components (see Table A-2). By doing so, the significant covariance between spousal separation and fertility, i.e., $\rho_{\varepsilon\lambda}$ in Equation (5), may decline significantly or even become trivial, i.e., near to zero. The ε and λ are assumed to have a joint bivariate normal distribution:

$$\binom{\varepsilon}{\lambda} \sim \mathrm{N}\left(\binom{0}{0}, \begin{pmatrix} \sigma_{\varepsilon}^2 & \rho_{\varepsilon\lambda} \\ \rho_{\varepsilon\lambda} & \sigma_{\lambda}^2 \end{pmatrix}\right) \quad (5).$$

Each of the four states of spousal separation is coded as a dummy variable. 'Couple living together' is the reference category. The three fertility variables are coded as 0 if a couple does not have a first, second, and third birth, respectively, and 1 otherwise. We focus on three education levels: up to primary, junior high, and at least senior high. Individuals' employment status is coded 1 if employed in a given year, and 0 otherwise. Household income is depreciated and standardized to be comparable over time. It is assumed to be constant during the period between the year intervals: household income before 1990 is assumed to have stayed the same as in 1990, between 1990 and 1995 the same as in 1995, and between 1996 and 2001 the same as in 2001. China's family policy is included to account for the changing institutional environment regarding higher-order births. All variables except for 'ideal number of children' are time varying.

Table 1 shows that 292 and 249 couples separated within and across borders, respectively, at least once, among which 230 (78%) and 45 (18%) couples reunified once. Thus, the results regarding reunification mainly apply to internal migrants. Reunification is more likely to happen at the destination. Interviews were conducted in eight towns situated in northeast Fujian Province and New York City. About 90% of the couples that separated due to internal migration live apart across counties but remain in the same province. Only 7% of couples involved in international migration were separated in Asia. The share of couples separated between the United States and their origin village in Fujian and between Europe and their origin village was similar, at around 46%.

Surprisingly, the average number of years spent separated prior to reunification due to internal or international migration is very similar (around 8.4 years). It seems that even internal migrants spend quite a long time away from their spouses, if a stay of less than 3 months is not considered. Not including returns to origin villages of less than 3 months, the length of time Chinese international migrants remain abroad is in the same range as some Central American migrants in the United States: Guatemalan return migrants spend 4.9 years on average in the United States, while Nicaraguans spend 10.57 years on average (Davis 2011). However, due to data limitations these statistics need to be interpreted with caution. A stay of less than 3 months is more common among internal migrants. The exclusion of very short stays would underestimate both spousal separation and reunification at the destination within borders, and therefore would underestimate the negative effect of spousal separation on fertility and the catch-up effect of spousal reunification. That said, we believe that it remains of interest to focus on the couples who have separated for at least 3 months, since their reasons for

moving might be very different to those who have spent a very short period in another city, e.g., tourism.

It seems that couples that separate internally do not have the same socioeconomic status as those who separate across borders. As shown in Table 1, couples that experienced separation due to international migration had relatively low education levels compared to those separated within China. This is because Fujianese international migrants to the United States usually run small businesses, e.g. restaurants, which do not require high education levels, while Fujianese internal migrants might be businessmen, whose migration would benefit from higher levels of education (Liang and Miao 2013). This is especially the case for women: it seems to be easier for a woman with a certain level of education to migrate abroad (to run a family-owned small business, for example) than to move to other places in China. Table 1 also shows the number of children at the time of separation. However, as China's family policy might have played an important role in shaping fertility before one partner's migration, it is hard to draw conclusions regarding the disruption effect based on this cumulative measurement.

Table 1: Descriptive statistics on spousal separation due to internal and international migration

	Spousal separation due to internal migration	Spousal separation due to international migration
Summary statistics		
Mean age at separation of the husband	27.16	34.19
Median age at separation of the husband	26.00	34.00
Mean age at separation of the wife	23.62	31.53
Median age at separation of the wife	22.00	31.00
Mean time since separation when reunified	8.33	8.45
Median time since separation when reunified	5.00	8.00
Socioeconomic status		
Husband's educational level		
At most primary school	163 (56%)	148 (59%)
Junior high school	91 (31%)	78 (31%)
Senior high school	38 (13%)	23 (9%)
Wife's education level		
At most primary school	185 (63%)	176 (71%)
Junior high school	80 (27%)	60 (24%)
Senior high school	27 (9%)	13 (5%)
Separation and reunification		
Living distance while separated		
Same province	90%	
Across province	10%	
Asia		7%
US		47%
Europe or others		46%
Number (and proportion) of couples who reunified after first-time separation	230 out of 292 (78%)	45 out of 249 (18%)
At destination	194	42
At origin	36	3
Second Reunification	65	6
At destination	63	6
At origin	2	0
Third Reunification	3	2
At destination	3	2
At origin	0	0
Total (couples)	292 (100%)	249 (100%)
Fertility		
Number of children at the time of separation		
Childless	5 (2%)	1 (0.5%)
One child	65 (27%)	60 (30%)
Two children	105 (44%)	86 (43%)
Three children	66 (27%)	54 (27%)
Total (separations)	241 (100%)	201 (100%)

6. Results

6.1 Descriptive

Table 2 shows the transition rate from being childless to the first, second, and third birth for couples that have always lived together, couples who separated at least once but never reunified, and couples who separated and reunified either at the origin or destination. In rural Fujian the first birth is almost universal, and the transition rate from the second to the third birth is around 20% during the period 1965–2005 for cohorts born between 1950 and 1980. However, the transition rate of progressing to the second birth varies by couple's living arrangement: couples who never separated show a roughly 10% higher transition rate than couples who experienced separation at least once, whether due to internal or international migration. The parity progression ratios from the first to the second birth for couples that never separated, those that separated but did not reunify, and those that separated and reunified are 84%, 75%, and 73%, respectively.[13] Both the difference between the PPR for couples separated at least once but never reunified (75%) and couples who never separated (84%), and the difference between couples separated at least once and reunified (73%) and couples who never separated (84%), are statistically significant (p-value = 0.004 and p-value = 0.0007, respectively, Mann–Whitney–Wilcoxon Test). However, the difference in the parity progression ratio from the first to the second birth between couples separated at least once but never reunified (75%) and couples separated at least once and reunified (73%) is not significant (p-value = 0.66). This means that couples that separated have significantly lower progression ratios from the first to the second birth compared to those that never separated.

Table 2: Parity progression ratios to the first, second, and third birth by couple's living arrangement

	Childless – First birth	First birth – Second birth	Second birth – Third birth
Couples who never separated *(Reference)*	98%	84%	22%
Couples that separated once and never reunified	99%	75% ***	19%
Couples that separated once and reunified	98%	73% ***	19%

Note: *p < 0.1; **p < 0.05; ***p < 0.01. The percentage shows the parity progression ratios, namely, the proportion of individuals continuing to have another birth. The asterisks show if the difference between the PPRs of this category by couple's living arrangement is statistically significant according to the Mann–Whitney–Wilcoxon Test. The reference group is couples that never separated.

[13] The parity progression ratio shows the proportion of individuals who go on to have another birth.

Figure 1 shows the couple's status, i.e., separated because one of the partners has migrated, internally or internationally, during the transition from being childless to their first, second, or third birth. The figure conveys several messages. First, spousal separation between getting married and the first birth is usually shorter than the time before higher-order births, i.e., second and third births. This implies that couples might postpone separation to have at least one child first. Second, concerning the effect of spousal separation on fertility, for all three birth transitions there are signs that spousal separation reduces the likelihood of fertility. The figure shows that the censored states (births that failed to happen) follow spousal separation states more often than when the couple is not separated due to migration. Third, regarding the sequence of next birth and separation, it seems that only a small proportion of couples chose to be separated right after the previous birth. These couples are shown by the beginning of the sequence in black (the colour representing separation in the figure), which follows the previous birth. Most couples stayed together until having the next birth and then were separated for some time.

Figure 1: Sequence of yearly couple status (separated due to migration or not separated) by the time of first, second, and third birth, if these occurred

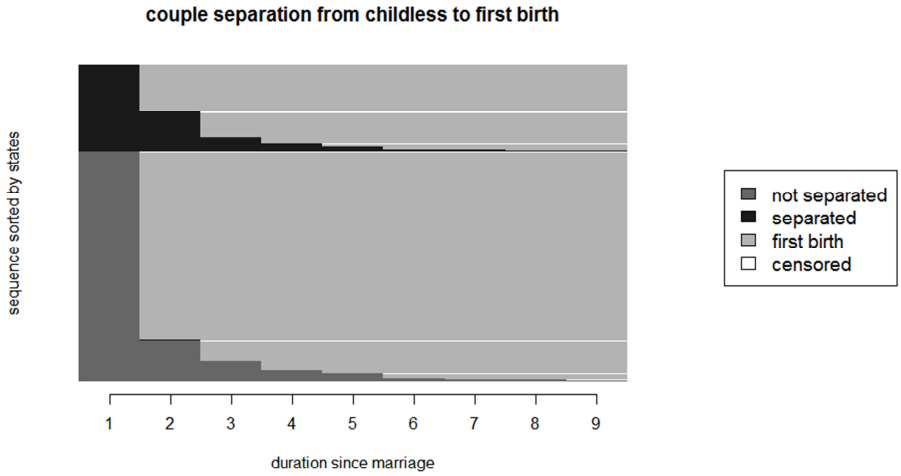
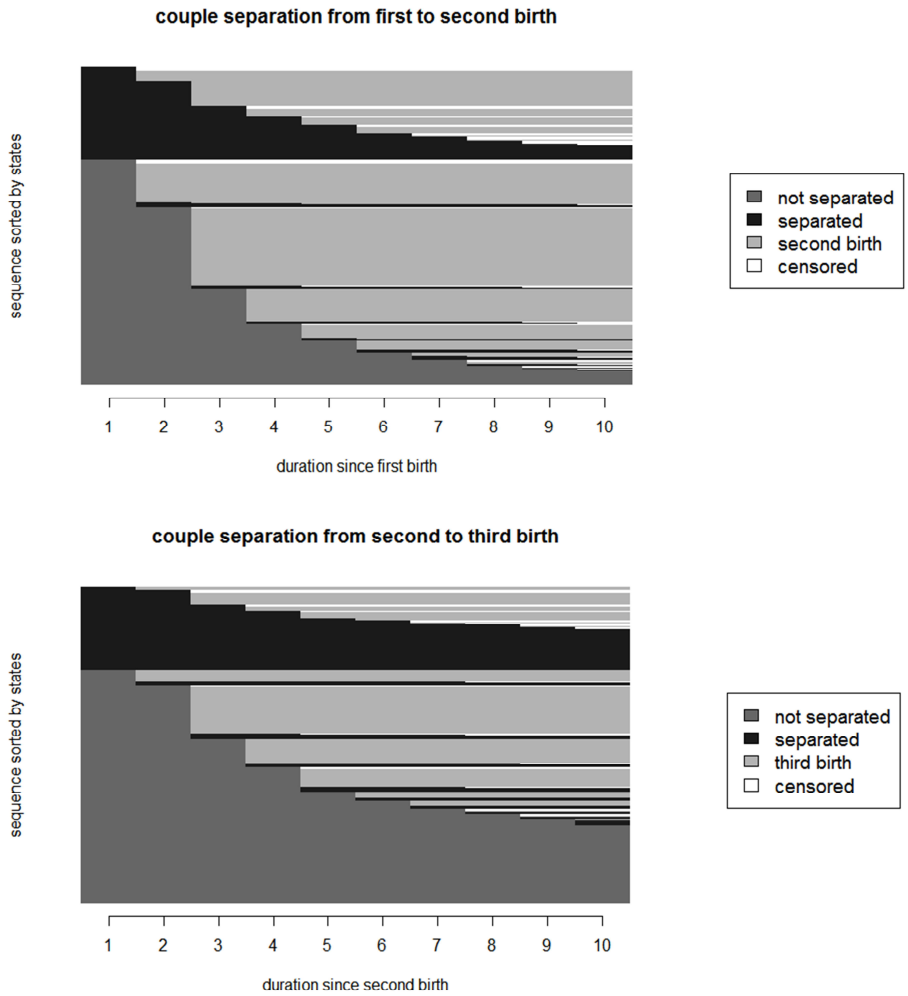


Figure 1: (Continued)



6.2 Discrete-time models

Table 3 shows that the first two births are disrupted by spousal separation due to both internal and international migration and do not recover even during a couple's reunification. Due to the limited sample size and the low occurrence of second and third births, it is not possible to differentiate the effect of spousal separation on marital fertility according to both types of migration and durations of separation for these two birth orders. However, based on the result for the first birth, we can see that even for similar durations of separation, separation due to international migration has a stronger effect on fertility than separation due to internal migration. As the unobserved heterogeneity term is significant, we explain the results based on the model specification of the multi-process model. For separations that last for 0 to 3 years, the odds of having the first birth when separated within China are around 74% lower than the odds when the couple is not separated. The odds of the first birth if couples are separated across borders for less than 3 years are only 3% of the odds of the first birth if they are not separated. Similarly, the odds of having the first birth when separated across national borders for more than 3 years are around 82% lower than for couples that are not separated. The likelihood of having the first birth when separated within national borders for more than 3 years is not significantly different from that for couples that are not separated. The first and second birth of international migrants is more severely depressed by spousal separation than that of internal migrants. The annual likelihood of a second birth for couples living across national borders is only 12% of that of unseparated couples. For these two birth orders, even after spousal reunification, the likelihood of having a first birth is still 42% of that of unseparated couples, and the likelihood of a second birth falls to 65% of that of unseparated couples, and the statistics are not significant. The effect of spousal separation on the likelihood of a third birth is not statistically significant. There is no sign of a fertility catch-up during spousal reunification (Hypothesis 2).

Table 3: Estimation of fertility and spousal separation by type and duration of separation

	Single process model			Multi-process model		
Panel 1 – First birth						
Constant	0.01	0.00–0.02	***	0.01	0.00–0.02	***
Age	2.91	1.74–4.87	***	2.91	1.74–4.85	***
Age squared	0.98	0.97–0.99	***	0.98	0.97–0.99	***
Duration since marriage	0.41	0.33–0.50	***	0.42	0.34–0.51	***
Duration since marriage squared	1.07	1.04–1.10	***	1.07	1.04–1.10	***
Wife's educational attainment (Ref. at most primary school)						
Junior high school	0.72	0.53–0.99	**	0.70	0.51–0.96	**
Senior high school and above	0.46	0.25–0.82	***	0.44	0.25–0.80	***
Husband's Educational Attainment (Ref. At most primary school)						
Junior high school	0.82	0.61–1.12		0.81	0.60–1.11	
Senior high school and above	0.80	0.49–1.29		0.79	0.49–1.30	
Couple living arrangement (Ref. Couple living together)						
Separated due to internal migration, 0–3 years	0.26	0.18–0.37	***	0.26	0.18–0.37	***
Separated due to internal migration, more than 3 years	0.67	0.39–1.13		0.65	0.38–1.11	
Separated due to international migration, 0–3 years	0.03	0.00–0.28	***	0.03	0.00–0.25	***
Separated due to international migration, more than 3 years	0.19	0.08–0.45	***	0.18	0.08–0.42	***
Reunified	0.41	0.29–0.60	***	0.42	0.29–0.61	***
Husband employed (Ref. unemployed or temporary job)	2.00	0.83–4.83		2.07	0.85–5.03	
Wife employed (Ref. unemployed or temporary job)	0.91	0.68–1.21		0.87	0.66–1.16	
Panel 2 – Second birth						
Constant	0.68	0.23–2.03		0.71	0.24–2.12	
Age at first birth	0.94	0.90–0.99	**	0.95	0.90–1.00	**
Duration since first birth	2.83	2.06–3.89	***	2.89	2.09–3.99	***
Duration since first birth squared	0.87	0.83–0.91	***	0.87	0.83–0.91	***
Wife's Educational Attainment (Ref. At most primary school)						
Junior high school	1.03	0.77–1.37		1.01	0.76–1.35	
Senior high school and above	0.37	0.20–0.69	***	0.35	0.19–0.66	***
Husband's Educational Attainment (Ref. At most primary school)						
Junior high school	0.66	0.49–0.87	***	0.65	0.49–0.87	***
Senior high school and above	0.65	0.44–0.98	**	0.65	0.43–0.98	**
Couple living arrangement (Ref. Couple living together)						
Separated due to internal migration, 0–3 years	0.33	0.15–0.75	***	0.30	0.14–0.68	***
Separated due to internal migration, more than 3 years	0.93	0.69–1.26		0.92	0.68–1.25	
Separated due to international migration	0.14	0.03–0.75	**	0.12	0.02–0.65	**
Reunified	0.65	0.44–0.96	**	0.65	0.44–0.97	**
Husband employed (Ref. Unemployed or temporary job)	0.67	0.46–0.99	**	0.66	0.45–0.98	**
Wife employed (Ref. Unemployed or temporary job)	1.00	0.79–1.26		0.92	0.72–1.17	
Chinese family policy (Ref. Without one child policy)						
Strictest one child policy (1980–1988)	0.96	0.73–1.26		0.94	0.71–1.24	
Changed/loosened one child policy (after 1988)	0.25	0.18–0.35	***	0.23	0.16–0.33	***

Table 3: (Continued)

	Single process model			Multi-process model		
Panel 3 – Third birth						
Constant	0.82	0.15–4.46		0.79	0.14–4.40	
Age at second birth	0.92	0.86–0.99	**	0.93	0.87–0.99	**
Duration since second birth	1.75	0.97–3.18	*	1.75	0.96–3.18	*
Duration since second birth squared	0.93	0.86–1.00	*	0.93	0.86–1.00	*
Wife's educational attainment (Ref. At most primary school)						
Junior high school	0.79	0.50–1.23		0.80	0.51–1.25	
Senior high school and above	0.67	0.16–2.92		0.67	0.15–2.90	
Husband's educational attainment (Ref. at most primary school)						
Junior high school	0.88	0.58–1.32		0.86	0.57–1.30	
Senior high school and above	1.14	0.58–2.24		1.16	0.59–2.29	
Couple living arrangement (Ref. Couple living together)						
Couple separated due to migration	0.88	0.57–1.36		0.83	0.53–1.29	
Couple reunified after separation	0.95	0.43–2.09		0.95	0.43–2.12	
Husband employed (Ref. Unemployed or temporary job)	1.13	0.64–1.99		1.14	0.65–2.02	
Wife employed (Ref. Unemployed or temporary job)	1.00	0.71–1.43		0.93	0.65–1.33	
Chinese family policy (Ref. Without one child policy)						
Strictest one child policy (1980–1988)	0.50	0.32–0.78	***	0.49	0.32–0.77	***
Changed/loosened one child policy (after 1988)	0.14	0.08–0.25	***	0.12	0.07–0.23	***
Panel 4 – Couple separation						
Constant	0.01	0.00–0.03	***	0.01	0.00–0.03	***
Age	1.32	0.97–1.78	*	1.35	0.93–1.96	
Age squared	1.00	0.99–1.00		1.00	0.99–1.00	
Duration since marriage	1.01	0.91–1.12		1.11	0.95–1.31	
Duration since marriage squared	1.00	0.99–1.00	*	0.99	0.98–1.00	***
Wife's educational attainment (Ref. At most primary school)						
Junior high school	1.13	0.80–1.60		0.95	0.53–1.71	
Senior high school and above	0.73	0.36–1.49		0.41	0.15–1.12	*
Husband's educational attainment (Ref. At most primary school)						
Junior high school	1.01	0.72–1.41		0.81	0.49–1.36	
Senior high school and above	1.40	0.86–2.28		1.92	0.97–3.81	*
Husband employed (Ref. Unemployed or temporary job)	1.32	0.79–2.21		1.53	0.68–3.41	
Wife employed (Ref. Unemployed or temporary job)	0.29	0.20–0.41	***	0.06	0.03–0.14	***
Standard deviation of unobserved heterogeneity, fertility (Sigma ε)				0.20		***
Standard deviation of unobserved heterogeneity, couple separation (Sigma λ)				2.34		***
Correlation between fertility and couple separation (Rho)				0.71		***
Log-likelihood		–2957			–2903	
Sample size (number of couples)		632			632	

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

Women's unemployment does not substantially affect fertility, although a husband's employment does depress the chances of a second birth. This is perhaps linked to the somewhat negative selection of socioeconomic status on the second birth

(or the protection of those with "real difficulties") stated by the family policy: couples facing difficulties,[14] once these were evidenced, were allowed to have a second birth. Family policies in the origin region might affect the fertility behaviour of both non-migrants and migrants through the persistence of gender and cultural norms (di Belgiojoso and Terzera 2018). Between 1965 and 2003, rural-to-urban migrants in Fujian province experienced the strictest nationwide one-child policy during the early 1980s, and a reformed (loosened) family policy in 1988. The 1988 family policy stated that a second child was allowed under certain circumstances. These conditions included parents who were themselves only children and couples with economic difficulties.[15] In the analysis we include 'Chinese family policy' for higher order births, i.e., second and third births, to account for the effect of family policy in the region of origin, i.e., rural Fujian, on the likelihood of a second and third birth (see Table 3). We consider three periods: before 1980 when there was no one-child policy, from 1980 to 1988 when the strictest one-child policy was enforced, and after 1988 when a second birth was possible under some conditions. Rather than recovered fertility the results show a period of lower fertility or delayed higher order births – i.e., second and third births – after 1988 when conditions allowing a second birth were applicable. This lower fertility might be related to changing fertility norms (Zheng et al. 2009). For example, rural migrants might prefer smaller families after migration due to increased opportunity costs in the destination city or country.

Table 4 presents the variance of the unobserved heterogeneity component for fertility – i.e., first, second, and third births – and spousal separation, and covariance between these unobserved heterogeneity components. Table A-2 in the Appendix shows the result of a full set of variables. After controlling for age, women's educational attainment, and employment status, there are still some significant unobserved components that show a positive correlation (Rho = 0.71, see Table 3) between spousal separation and fertility (Hypothesis 3). This means that separated couples are selective of a higher likelihood of progressing to the next birth through some unobserved mechanisms. This is consistent with Clifford (2009), who shows the existence of positive covariance between fertility and spousal separation at the community level.

Some unobserved heterogeneity might influence decision-making regarding both a couple's living arrangement and fertility. Separated couples might be selective of certain levels of desired fertility. A higher ideal number of children is associated with higher fertility levels, if the couple manage to overcome difficulties and achieve the desired fertility goal. The results show that separated couples want fewer children. After

[14] These difficulties included, but were not limited to, disabilities due to public service and living in less populous areas with more land or forests, miners, and long-term fishermen.

[15] The Fujian Province Planned Fertility Policy 1988 stated that each couple living in rural Fujian could have one child. However, there were 11 conditions under which rural Fujian dwellers could have a second child.

accounting for 'ideal number of children' in all four equations, i.e., Equations (1) to (4), the correlation between fertility and spousal separation remains positive. This implies that the ideal number of children might not be the source of the selectivity of separated couples on fertility. On the contrary, the results show that household income might be an important component of the correlation between fertility and spousal separation. In post-Soviet Tajikistan, poorer households show a tendency to both send migrants abroad and have more children (Clifford 2009). The results show that controlling for both the ideal number of children and household income results in almost zero and non-significant covariance (Rho = –0.04 and non-significant, see Table 4 and Table A-2 for the full set of results) between the unobserved components of fertility and spousal separation. Separated couples are more likely to be from lower-income households. Table A-2 shows that each unit increase in the standardised household income reduces the likelihood of spousal separation by 31%. These couples from lower-income households are more attached to the agricultural production sector, which requires more labour, perhaps encouraging couples to have more children.

Table 4: Random effect parameters including different sets of controls in all equations

	Original set of controls	(...) + Ideal number of children	(...) + Ideal number of children, household income
$\delta^2{}_u$	0.20 ***	0.18 **	0.03
$\delta^2{}_v$	2.34 ***	2.09 ***	1.98 ***
$cov(\delta^2{}_u, \delta^2{}_v)$	0.71 ***	0.75 ***	–0.04
Sample size (number of couples)	632	632	632

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

The original set of controls includes the wife's age, age at the last birth, duration since the last birth, duration since marriage, wife's educational attainment, couple's employment status, and China's family policy. The results are shown in Appendix Table A-2. Spousal separation is positively related to the traditional division of labour (Hypothesis 4), i.e., husband employed and wife unemployed. After accounting for the unobserved heterogeneity, the likelihood of employed wives being separated from their husbands drops from 29% of that of separated wives who are unemployed or doing temporary work (unpaid housewives being the most likely scenario) to only 6% (see Table 3, Panel 4). Not including the unobserved heterogeneity would severely underestimate the negative effect of women's unemployment on spousal separation. The selection of education for spousal separation is opposite for the two genders: wives with higher education levels are less likely to be separated from their husbands, while husbands with higher educational attainment are more likely to be in a separated couple

due to migration (see Table 3, Panel 4). This is consistent with a substantial pattern of left-behind wives being unemployed or doing some form of unstable work, while the husbands migrated. The occupational choices of these wives are likely to be constrained not only by educational attainment but also by traditional values of being responsible for taking care of the children and elderly family members.

7. Conclusion

This paper studies fertility and spousal separation within and across national borders among the Fujianese, most of whom live in rural areas. During the period under study, couples in China had to meet certain requirements to have a second child,[16] so after migrating to the United States migrants' fertility was 'emancipated' from China's strict family policy (Hwang and Saenz 1997). However, this paper shows that international separation disrupted first and second births more severely than internal separation, even when the duration of these two types of separation was similar (see Table 4). The disruption effect might counteract the positive effect of international migration on marital fertility. Internal migrants' proximity to their partners implies lower transportation costs and allows for more frequent return visits and shorter stays away from home, compared with international migrants who rarely visit from abroad. On the other hand, international migrants usually take longer to adapt to the environment at the destination and face more challenges in terms of language, job market, and cultural values than internal migrants. Moreover, the population under study are mainly rural dwellers who may move to other places but still keep their rural *hukou*, rendering the disruptive effect of internal migration much less significant. Hypothesis 1 is therefore supported.

After spousal reunification, fertility does not bounce back from this negative effect of spousal separation. Thus, Hypothesis 2 is not supported. This result needs to be interpreted with caution since it mainly captures the reunification of internal migrants: 78% of couples who were separated internally were reunified, while for couples separated at least once across national borders the proportion is only 18% due to the low migrant return rate (Liang and Zhang 2004). We did not find a significant 'bounce back' effect, although Chinese women in the United States present higher fertility than women from other countries (Hwang and Saenz 1997). There is also a difference between marital fertility and women's fertility. In addition, the data show that couples that have been separated across national borders are on average quite old by the time

[16] The population under study is mostly rural Fujianese, who were allowed a second child under at least 11 conditions. These 11 conditions were not applicable to urban dwellers.

reunification occurs (see Table 2).[17] It is likely that couples that married before one of the spouses migrated would not have improved fertility after reunification, unlike migrant couples that did not experience separation, for example, Chinese couples who married in the United States and lived together thereafter. The relative timing of migration and marriage matters in shaping fertility outcomes. Moreover, couples that follow a traditional single-breadwinner division of labour during spousal separation, whether separated within or across national borders, are more vulnerable to temporary economic shocks or crises, which reduce the intention to have more children (Baizán 2006).

There is a significant covariance between spousal separation and fertility: couples that have separated at some stage due to the migration of one partner are selective of higher fertility levels (Hypothesis 3). This is perhaps because of unobserved heterogeneity, such as time-varying household income, which becomes trivial after controlling for the interrelationship between spousal separation and fertility. Rural households with lower total incomes are more attached to agricultural production and favour more children, but are more vulnerable to the migration of only one partner since higher living costs at the destination makes it hard for them to move together.

A couple's socioeconomic status is closely related to their living arrangement. Couples who live separately due to internal or international migration are more likely to divide labour in a traditional way than couples that live together. Hypothesis 4 is therefore confirmed. This could be due to the selection of education on spousal separation: the husband in the separated couple is likely to be more highly educated than the wife. Just as women's higher skill levels predict higher chances of reunifying (Baizán, Beauchemin, and González-Ferrer 2014; González-Ferrer 2007), women with lower education levels are more vulnerable to spousal separation and often remain in the village of origin without a formal job. It could also be that given the money sent by the husband there is no need for them to take a formal job, or that higher living costs prevent spousal reunification, especially for couples where there is a significant education gap between the partners.

To the best of our knowledge, this paper is one of the first attempts to study the effect of spousal separation due to both internal and international migration on fertility in the Chinese context, considering the unobserved heterogeneity between these two events. However, several limitations must be acknowledged. First, the data we used are not nationally representative and therefore the results cannot be generalised to apply to the whole of China, since migrants from different regions might have very different behaviours; second, results regarding the 'catch-up' effect mainly capture reunification after separation within China, since international migrants to the United States rarely

[17] Average ages at reunification are around 35.5, 32.0, 42.6, and 40.0 for male internal migrants, male international migrants, female internal migrants, and female international migrants, respectively.

return; and third, the 'men migrate, women follow' pattern may not reflect today's reality. This calls for future research to investigate new patterns using more recent data.

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Appendix

Table A-1: Summary statistics and full distributions of migration frequency for internal and international migrants

Summary statistics						
	Min.	1st Quantile	Median	Mean	3rd Quantile	Max.
Internal migrants	1.00	1.00	1.00	1.215	1.00	6.00
International migrants	1.00	1.00	1.00	1.056	1.00	5.00
Full distribution						
	One time	Two times	Three times	Four times	Five times	Six times
Internal migrants	437	83	6	2	2	1
Total number of internal migrants			531			
International migrants	495	21	2	0	1	0
Total number of international migrants			519			

Table A-2: Multi-process model for fertility and couple separation odds ratio, controlling for ideal number of children and household income

	(…) + Ideal number of children			(…) + Ideal number of children + household income		
	O.R.	C.I.		O.R.	C.I.	
Panel 1 – First Birth						
Constant	0.00	0.00–0.00	***	0.00	0.00–0.00	***
Age	3.27	1.94–5.50	***	3.21	1.91–5.39	***
Age squared	0.97	0.96–0.99	***	0.98	0.96–0.99	***
Duration since marriage	0.38	0.29–0.49	***	0.36	0.28–0.47	***
Duration since marriage squared	1.13	1.07–1.20	***	1.13	1.07–1.19	***
Wife's educational attainment (Ref. At most primary school)						
Junior high school	0.68	0.48–0.96	**	0.71	0.51–0.98	**
Senior high school and above	0.55	0.29–1.02	*	0.58	0.32–1.08	*
Husband's educational attainment (Ref. At most primary school)						
Junior high school	0.83	0.61–1.13		0.84	0.62–1.13	
Senior high school and above	0.84	0.46–1.51		0.79	0.45–1.37	
Couple's living arrangement (Ref. Couple living together)						
Couple separated due to internal migration	0.43	0.32–0.57	***	0.45	0.34–0.59	***
Couple separated due to international migration	0.11	0.05–0.25	***	0.12	0.05–0.27	***
Couple reunified after separation	0.44	0.31–0.63	***	0.45	0.32–0.64	***
Husband employed (Ref. Unemployed or temporary job)	2.15	0.87–5.32	*	1.77	0.81–3.90	
Wife employed (Ref. Unemployed or temporary job)	1.00	0.75–1.33		1.05	0.80–1.39	
Ideal number of children	1.20	0.95–1.53		1.20	0.95–1.51	
Standardised household income				1.00	0.91–1.10	
Panel 2 – Second Birth						
Constant	0.15	0.04–0.64	**	0.16	0.04–0.65	**
Age at first birth	0.95	0.90–1.00	*	0.94	0.89–1.00	**
Duration since first birth	3.12	2.26–4.32	***	3.02	2.20–4.14	***
Duration since first birth squared	0.86	0.82–0.90	***	0.87	0.83–0.91	***
Wife's educational attainment (Ref. At most primary school)						
Junior high school	1.08	0.79–1.47		1.11	0.81–1.51	
Senior high school and above	0.40	0.22–0.76	***	0.44	0.23–0.82	***
Husband's educational attainment (Ref. At most primary school)						
Junior high school	0.65	0.48–0.89	***	0.66	0.49–0.89	***
Senior high school and above	0.67	0.44–1.02	*	0.65	0.43–0.98	**
Couple's living arrangement (Ref. Couple living together)						
Couple separated due to internal migration	0.85	0.65–1.11		0.88	0.67–1.14	
Couple separated due to international migration	0.16	0.03–0.80	**	0.14	0.02–1.03	*
Couple reunified after separation	0.66	0.44–0.98	**	0.65	0.44–0.97	**
Husband employed (Ref. Unemployed or temporary job)	0.67	0.43–1.03	*	0.69	0.45–1.05	*
Wife employed (Ref. Unemployed or temporary job)	0.94	0.73–1.20		1.02	0.80–1.30	

Table A-2: (Continued)

	(…) + Ideal number of children			(…) + Ideal number of children + household income		
	O.R.	C.I.		O.R.	C.I.	
Panel 2 – Second Birth						
Chinese family policy (Ref. Without one child policy)						
Strictest one child policy (1980–1988)	1.03	0.76–1.41		1.05	0.78–1.42	
Changed/loosened one child policy (after 1988)	0.31	0.21–0.45	***	0.33	0.23–0.48	***
Ideal number of children	1.74	1.35–2.23	***	1.76	1.37–2.25	***
Standardised household income				0.98	0.86–1.11	
Panel 3 – Third Birth						
Constant	0.07	0.01–0.59	**	0.08	0.01–0.63	**
Age at second birth	0.93	0.87–1.00	**	0.93	0.87–0.99	**
Duration since second birth	2.06	0.98–4.35	*	1.95	1.00–3.81	*
Duration since second birth squared	0.91	0.82–1.01	*	0.92	0.84–1.00	*
Wife's educational attainment (Ref. At most primary school)						
Junior high school	0.95	0.60–1.49		0.95	0.61–1.48	
Senior high school and above	0.70	0.15–3.17		0.67	0.14–3.23	
Husband's educational attainment (Ref. At most primary school)						
Junior high school	0.90	0.60–1.36		0.90	0.60–1.35	
Senior high school and above	1.30	0.66–2.54		1.17	0.59–2.32	
Couple's living arrangement (Ref. Couple living together)						
Couple separated due to migration	0.83	0.52–1.34		0.87	0.55–1.39	
Couple reunified after separation	1.12	0.51–2.45		1.18	0.55–2.53	
Husband employed (Ref. Unemployed or temporary job)	1.26	0.71–2.23		1.23	0.70–2.18	
Wife employed (Ref. Unemployed or temporary job)	0.96	0.65–1.40		1.06	0.73–1.52	
Chinese family policy (Ref. Without one child policy)						
Strictest one child policy (1980–1988)	0.59	0.37–0.94	**	0.61	0.39–0.97	**
Changed/loosened one child policy (after 1988)	0.17	0.09–0.32	***	0.20	0.10–0.37	***
Ideal number of children	2.22	1.54–3.19	***	2.16	1.52–3.07	***
Standardised household income				1.08	0.99–1.18	*
Panel 4 – Couple separation						
Constant	0.00	0.00–0.51	**	0.00	0.00–0.13	***
Age	1.29	0.89–1.86		1.31	0.92–1.85	
Age squared	1.00	0.99–1.00		1.00	0.99–1.00	
Duration since marriage	1.15	0.97–1.35		1.15	0.98–1.34	*
Duration since marriage squared	0.99	0.98–1.00	**	0.99	0.98–1.00	***
Wife's educational attainment (Ref. At most primary school)						
Junior high school	0.97	0.40–2.37		0.98	0.63–1.53	
Senior high school and above	0.43	0.10–1.90		0.50	0.21–1.19	

Table A-2: (Continued)

	(…) + Ideal number of children			(…) + Ideal number of children + household income		
	O.R.	C.I.		O.R.	C.I.	
Panel 4 – Second Birth						
Husband's educational attainment (Ref. At most primary school)						
Junior high school	0.79	0.42–1.46		0.86	0.55–1.36	
Senior high school and above	1.56	0.48–5.01		2.10	1.22–3.62	***
Husband employed (Ref. Unemployed or temporary job)	1.56	0.66–3.66		1.55	0.71–3.36	
Wife employed (Ref. Unemployed or temporary job)	0.07	0.03–0.20	***	0.07	0.03–0.16	***
Ideal number of children	0.62	0.36–1.05	*	0.63	0.43–0.93	**
Standardised household income				0.69	0.51–0.92	**
Standard deviations and correlation between heterogeneity components (error terms)						
Standard deviation of the heterogeneity component, fertility (Sigma ε)	0.18		*	0.03		
Standard deviation of the heterogeneity component, spousal separation (Sigma λ)	2.09		**	1.98		***
Correlation between fertility and spousal separation (Rho)	0.75		**	–0.04		
Log-likelihood	–2882			–2877		
Sample size (number of couples)		632			632	

Note: *p<0.1; **p<0.05; ***p<0.01

Table A-3: Single- and multi-process model including both marital and non-marital fertility

	Single process model			Multi process model		
	O.R.	C.I.		O.R.	C.I.	
Panel 1 – First birth						
Constant	0.00	0.00–0.01	***	0.00	0.00–0.01	***
Age	2.56	1.66–3.96	***	2.53	1.64–3.91	***
Age squared	0.98	0.97–0.99	***	0.98	0.97–0.99	***
Duration since marriage	0.85	0.67–1.08		0.87	0.68–1.10	
Duration since marriage squared	1.01	0.97–1.05		1.01	0.97–1.05	
Wife's educational attainment (Ref. At most primary school)						
Junior high school	0.73	0.54–0.98	**	0.71	0.53–0.96	**
Senior high school and above	0.87	0.50–1.52		0.85	0.48–1.50	
Husband's educational attainment (Ref. At most primary school)						
Junior high school	0.80	0.61–1.06		0.80	0.60–1.06	
Senior high school and above	0.83	0.53–1.29		0.83	0.53–1.29	
Couple's living arrangement (Ref. Couple living together)						
Couple separated due to internal migration	1.17	0.88–1.57		1.16	0.87–1.55	
Couple separated due to international migration	0.21	0.10–0.44	***	0.20	0.09–0.42	***
Couple reunified after separation	1.05	0.73–1.52		1.06	0.73–1.54	
Husband employed (Ref. Unemployed or temporary employment)	1.18	0.70–2.00		1.2	0.71–2.02	
Wife employed (Ref. Unemployed or temporary employment)	1.09	0.85–1.39		1.04	0.81–1.33	
Panel 2 – Second birth						
Constant	0.60	0.20–1.76		0.61	0.21–1.78	
Age at first birth	0.95	0.90–1.00	**	0.95	0.90–1.00	**
Duration since first birth	2.99	2.18–4.10	***	3.04	2.21–4.19	***
Duration since first birth squared	0.87	0.83–0.91	***	0.86	0.83–0.90	***
Wife's educational attainment (Ref. At most primary school)						
Junior high school	1.02	0.77–1.36		1.01	0.76–1.34	
Senior high school and above	0.37	0.20–0.69	***	0.36	0.19–0.67	***
Husband's educational attainment (Ref. At most primary school)						
Junior high school	0.66	0.49–0.87	***	0.65	0.49–0.87	***
Senior high school and above	0.65	0.43–0.97	**	0.64	0.43–0.97	**
Couple living arrangement (Ref. Couple living together)						
Couple separated due to internal migration	0.80	0.61–1.05		0.78	0.60–1.03	*
Couple separated due to international migration	0.14	0.03–0.73	**	0.12	0.02–0.65	**
Couple reunified after separation	0.64	0.43–0.96	**	0.65	0.43–0.96	**
Husband employed (Ref. Unemployed or temporary job)	0.67	0.46–0.99	**	0.66	0.45–0.98	**
Wife employed (Ref. Unemployed or temporary job)	1.00	0.79–1.26		0.94	0.74–1.19	
Chinese family policy (Ref. Without one child policy)						
Strictest one child policy (1980–1988)	0.95	0.73–1.25		0.94	0.71–1.24	
Changed/loosened one child policy (after 1988)	0.24	0.17–0.34	***	0.23	0.16–0.33	***

Table A-3: (Continued)

	Single process model			Multi process model		
	O.R.	C.I.		O.R.	C.I.	
Panel 3 – Third birth						
Constant	0.83	0.15–4.56		0.8	0.14–4.43	
Age at second birth	0.92	0.86–0.99	**	0.93	0.86–0.99	**
Duration since second birth	1.77	0.97–3.26	*	1.77	0.96–3.24	*
Duration since second birth squared	0.93	0.85–1.00	*	0.93	0.85–1.00	*
Wife's educational attainment (Ref. At most primary school)						
Junior high school	0.78	0.50–1.23		0.79	0.50–1.24	
Senior high school and above	0.66	0.15–2.93		0.66	0.15–2.93	
Husband's educational attainment (Ref. At most primary school)						
Junior high school	0.87	0.58–1.31		0.86	0.57–1.30	
Senior high school and above	1.14	0.58–2.23		1.15	0.59–2.27	
Couple's living arrangement (Ref. Couple living together)						
Couple separated due to migration	0.85	0.55–1.31		0.81	0.52–1.26	
Couple reunified after separation	1.04	0.46–2.35		1.04	0.46–2.35	
Husband employed (Ref. Unemployed or temporary job)	1.12	0.63–1.99		1.14	0.64–2.01	
Wife employed (Ref. Unemployed or temporary job)	1.00	0.70–1.42		0.94	0.66–1.34	
Chinese family policy (Ref. Without one child policy)						
Strictest one child policy (1980–1988)	0.51	0.32–0.79	***	0.5	0.32–0.78	***
Changed/loosed one child policy (after 1988)	0.14	0.08–0.25	***	0.13	0.07–0.23	***
Panel 4 – Couple separation						
Constant	0.00	0.00–0.04	***	0.00	0.00–0.03	***
Age	1.30	0.96–1.76	*	1.35	0.93–1.96	
Age squared	1.00	0.99–1.00		1.00	0.99–1.00	
Duration since marriage	1.01	0.91–1.12		1.11	0.95–1.31	
Duration since marriage squared	1.00	0.99–1.00	**	0.99	0.98–1.00	***
Wife's educational attainment (Ref. At most primary school)						
Junior high school	1.13	0.80–1.61		0.95	0.53–1.70	
Senior high school and above	0.74	0.36–1.50		0.41	0.15–1.12	*
Husband's educational attainment (Ref. At most primary school)						
Junior high school	1.01	0.72–1.41		0.82	0.49–1.37	
Senior high school and above	1.41	0.86–2.29		1.95	0.99–3.84	*
Husband employed (Ref. Unemployed or temporary job)	1.33	0.79–2.22		1.53	0.68–3.42	
Wife employed (Ref. Unemployed or temporary job)	0.29	0.20–0.41	***	0.06	0.03–0.14	***
Standard deviations and correlation between heterogeneity components (error terms)						
Standard deviation of the heterogeneity component, fertility (Sigma ε)				0.17		***
Standard deviation of the heterogeneity component, spousal separation (Sigma λ)				2.34		***
Correlation between fertility and spousal separation (Rho)				0.71		***
Log-likelihood		–3158			–3104	
Sample size (number of couples)		889			889	