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Impact of environmental shocks on the preferred number of children of internal migrants: Evidence from China

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Abstract: Most research has used individual or group features to explain why migrants have different preferred number of children. However, these features can be identified and subdivided infinitely, with none of them broadly answering the question “why migrants desire more or less children”? This paper identified “environmental shocks”, which are a common experience for all migrants, as determinants of dissimilar preferred number of children across internal migrants in China. Environmental shocks refer to the uncertainty experienced by physical and sociocultural changes in the environment. Environmental shocks were treated as a variable rather than a constant in the analysis because shocks may differ between migrants. By sampling the 1667 internal migrants who participated in China’s 2015 General Social Survey, a quantitative analysis revealed that a farther migration distance (meaning greater environmental shocks) leads to lower preferred number of children for migrants. However, the mitigation of environmental shocks by the period at the current residence has no significant influence. Semi-structured interviews conducted with internal migrants in China revealed that the time since migration could mitigate environmental shocks and increase desired number of

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Jin Li is a post doctoral fellow in School of Government, Central University of Finance and Economics. Li’s research mainly focuses on environmental politics and policies, as well as the impact of environment on people’s attitude and behaviours. This paper explores the relationship between the environment and the attitude of migrants towards fertility, particularly the desired number of children. With the development of urbanization and society, more and more countries/regions become the countries/regions of migrants/immigrants. What are the attitudes and behaviors of this specific group of people? How can the governments provide them with better public services? The paper offers a perspective to explore the questions.

PUBLIC INTEREST STATEMENT

Why migrants desire more or less children? This paper identified “environmental shocks”, which are a common experience for all migrants, as determinants of dissimilar preferred number of children across internal migrants in China. Environmental shocks refer to the uncertainty experienced by physical and sociocultural changes in the environment. By sampling internal migrants who participated in China’s 2015 General Social Survey, a quantitative analysis revealed that a farther migration distance (meaning greater environmental shocks) leads to lower preferred number of children for migrants. The mitigation of environmental shocks by the period at the current residence has no significant influence. Semi-structured interviews revealed that the time since migration could mitigate environmental shocks and increase number willingness of children, but the time since migration brings other challenges that might decrease preferred number of children. This study improves our understanding of the determinants of migrants’ childbearing willingness.
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**Subjects:** Environmental Studies & Management; Development Studies, Environment, Social Work, Urban Studies; Social Sciences; BehavioralSciences

**Key words:** Migration; migrants; children; environmental shocks; environment

1. **Introduction**

With the development of industrialization and society, the problems on aging of population are challenging mounting countries and regions all over the world. As a result, import of immigrants/migrants becomes a significant means to cope with problems caused by the change of population structure (e.g., shortage of young labour forces). Population mobility makes both policymakers and social scientists pay more attention to the willingness and behaviours of immigrants/migrants. The attitude and behaviour of fertility are one of the classic topics. In previous studies, gender/sex preferences, timing preferences and preferences of number are frequently covered. This paper will mainly concentrate on number preferences. Empirical studies explore that, although migrants have lower preferred number of children compared to those of settled people (Courgeau, 1989; Kulu, 2005; Michelin, 2004), they have heterogeneity of childbearing preferences (Andersson, 2004; Clifford, 2009; Koc & Onan, 2004; Kraus & Castro-Martin, 2018; Kulu & Gonzalez-Ferrer, 2014; Milewski, 2010; Osazuwa & Ugal, 2018; Robards & Berrington, 2016; Wilson, 2018). Previous studies have investigated why migrants have different fertility propensities, particularly preferred number of children, by identifying individual or groups features from micro or neutral perspectives. Individual characteristics, such as the motivation for self-development and economic advancement (Koc & Onan, 2004), cumulative experiences of migration (Lindstrom & Giorguli-Saucedo, 2007), migration background, socialization influence from current residences (Kraus & Castro-Martin, 2018), and the sociodemographic characteristics of migrants, including age, educational background and marital status (Milewski, 2010; Quaranta, 2011), have impacted the different fertility propensities of migrants.

Group features within a migrant population were also revealed as determinants of the different fertility propensities, particularly preferred number of children, among migrants. Previous studies reported migrants with urban household registration in China to have lower desired number of children than those with rural household registration (Goldstein et al., 1997; Yang, 2000). Migrants who migrated downward (from urban to rural areas) had higher preferred number of children than those who migrated upward (from rural to urban areas) (Liang et al., 2014). Migrants with original residences in rural areas had decreasing desired number of children compared with those from urban areas (Courgeau, 1989; Kulu, 2005). Migrants whose current residence was in a large settlement had lower preferred number of children than those living in less densely places (Kulu & Washbrook, 2014; Tromans et al., 2009). Migrants from higher social classes had lower desired number of children than those of migrants with lower social status (Jiang et al., 2016; Max Planck Institute for Demographic Research, 2016). Migrants who spent most of their childhood in well-developed residential places and adopted mainstream norms adjusted their fertility norms to a lower level than migrants who grew up in other types of residences (Adsera et al., 2012; Wilson, 2018). Migrants who have been displaced from their original residences and were deeply influenced by current cultural factors have higher desired number of children than that of other migrants (Dubuc, 2016; Kulu & Hannemann, 2016; Kulu et al., 2017; Wilson, 2018; Wilson & Kuha, 2018). Young (20–30 years old) migrants who were born in particular countries (e.g., Pakistan and Bangladesh) have higher desired number of children over a short duration (up to 5 years) after
they have migrated to a well-developed country (e.g., the UK) than migrants born in other countries (Robards & Berrington, 2016).

The individual and group characteristics of migrants offer numerous micro or neutral perspectives on why the same migrants demonstrate dissimilar preferred number of children. However, features are defined as the typical qualities or parts of a person; hence, they are not common to everyone and can only be found among specific individuals or groups of people. Considering that everyone may have specific qualities, characteristics can be identified and subdivided infinitely, with none of them resulting in broad conclusions. In other words, no individual or group characteristics identified by previous studies can broadly explain why desired number of children differs among migrants. Considering the limitations of previous studies, this study aims to fill the gap in research from a wider viewpoint by investigating environmental shocks, which are experienced by all migrants, to enhance the understanding of factors that influence migrants’ diverse preferred number of children.

The paper will clarify the term “environmental shocks”, propose some hypotheses, explain the context of migration and fertility in China, describe the empirical methods deployed by quantitative and qualitative approaches, display the results and discuss them before reaching a conclusion and provide recommendations for future studies.

2. Environmental shocks
Unlike features that can only be found in specific individuals or groups of people, environmental shocks are common to almost all migrants (Clifford, 2009; Kulu, 2005; Lindstrom & Giorguli-Saucedo, 2007; Michielin, 2004). Environmental shocks refer to the uncertainty (Bennett, 2013; Bretschger & Vinogradova, 2017) resulting from physical and sociocultural changes in the environment. Migration introduces migrants to a physical (climate and weather dimensions) and sociocultural (the dimensions of language, habits, customs, behaviour, idioms and values) environment different from their place of origin (Kulu, 2005; Michielin, 2004). Migrants face uncertainties from environmental changes and the experience of living in unfamiliar circumstances (Bennett, 2013; Bretschger & Vinogradova, 2018). Thus, they might suffer from psychological (Ren et al., 2018) and physiological stress (He & Wong, 2013; Ren et al., 2018), which may further affect their decisions and behaviour (Bretschger & Vinogradova, 2018). Therefore, fertility decisions are likely to be affected by the uncertainties created by migration.

Demographers have noticed the impact of environmental shocks when investigating the reason why the fertility preferences, especially preferred number of children, of migrants are lower than those of nonmigrants (Clifford, 2009; Kulu, 2005; Lindstrom & Giorguli-Saucedo, 2007; Michielin, 2004). However, many previous studies have considered environmental shocks a constant (i.e., they are equal for every migrant) rather than a variable. In those studies, migration was described as an event that disrupted former lives and brought migrants into an unfamiliar environment (Clifford, 2009; Kulu, 2005; Lindstrom & Giorguli-Saucedo, 2007; Michielin, 2004). Due to stress, migrants would ignore, postpone or decrease some behaviours, such as fertility, during adaptation (Kondo, 2019).

Environmental shocks are common to migrants because many differences commonly exist between the original and current environment (Ren et al., 2018). However, environmental shocks should not be considered a constant. The dissimilarities between current and original environments may be greater or lesser and may affect migrants to a different extent depending on the level of environmental shocks, causing dissimilar attitudes and behaviours among migrants.

Differences in geographical distance between current and original residences can indicate the extent of the differences between environments, which may generate dissimilar environmental shocks and influence fertility preferences in migrants. Natural and social science academia have proven that places closer to each other share many similarities, including weather, climate, customs, language and habits. However, places distant to each other frequently share lesser
natural and social similarities (Hazard et al., 2013; Lee & Mitchell-Olds, 2011). This finding indicates that a farther geographical distance between original and current residences causes greater differences between environments, leading to greater environmental shocks and less desired number of children in migrants.

H1: The farther migrants move from their original residence, the lower are their preferred number of children.

Environmental shocks should not be treated as a constant also because their impact changes over time (Boustan et al., 2012; Bretschger & Vinogradova, 2017). Shocks will be strong at the beginning when new people or even other creatures are encountered in a new environment (He & Wong, 2013). However, with time, people adapt to the new environment and the shocks are gradually eased (Demes et al., 2015; Lindstrom & Giorguli-Saucedo, 2002; Michel et al., 2012). Following the changing impact of environmental shocks, people's attitudes and behaviours also change (Demes et al., 2015; Michel et al., 2012). Therefore, logically, a longer period of living in current residence leads to higher mitigation of environmental shocks by adaptation and to higher preferred number of children.

H2: The longer migrants have lived in their current residence, the higher are their preferred number of children.

This paper takes migrants in China as an example by using both quantitative and qualitative methods to examine how environmental shocks and migrants' fertility propensities are related. The former method will test whether migration distance and duration of residence—two measurements of environmental shocks—influence migrants' childbearing propensities. The latter method will investigate how migration distance and duration of residence influence migrants' fertility inclinations.

3. The Chinese context

Because migration distance and resettlement duration are the two core independent variables in this research, it was necessary to select a migrant sample from a country that has a large national territorial area comprising different natural and social environments and has a long, extensive and well-established migration history. China satisfies these two requirements.

To meet the need for a low-priced labour force to support urban socioeconomic development (Cai & Lu, 2016), following 20 years of restrictions on migration, the Chinese government loosened its control on migration in 1978. Since then, a large number of surplus labour forces from rural areas flooded into urban areas (Cai, 2010, Lu & Xia, 2016). Furthermore, elites joined the interregional migrants group to support the balanced regional development strategy (Yang, 2000). From the early 1980s to mid-2009, the migrant labour force increased from 20–30 million to 150 million (Chan, 2010). Owing to this, the International Labour Organization ranked China as the country with the most widespread internal migrants. Given the diverse, comprehensive and representative sample of internal migrants, I selected Chinese migrants as the subjects of this study.

In an almost simultaneous implementation of a loose migration policy, the Chinese government initiated the one-child policy, which has been treated as the country's basic national policy since 1979 (Cai, 2010; Peng, 2011). Most families have been prevented from having more than one child. This policy was partly abandoned in 2013. Considering the imminent labour shortage because of decreased fertility and an ageing population, China allowed families whose parent was an only child to have a second child (French, 2016; Liang & Gibson, 2017). Two years later, all families were permitted to have two children.

Despite this common background of updated migration and family planning policies, migrants have demonstrated different fertility preferences across different periods. During the first few
years following the implementation of the one-child policy, migrants revealed a higher child-bearing willingness than settled people. People who preferred more children participated in migration and breached the one-child policy by having more children during migration without registering their children’s births (Yang, 2000). However, with the development of a market-oriented economy and widespread competition in society, the cost of raising children became the best “contraceptive” for decreasing the fertility of Chinese people, particularly among migrants (Liang et al., 2014). The total fertility rates have decreased from 2.7 children per woman on an average in 1979 to 1.5 children per woman in 2010 (Cai, 2010; Liang & Gibson, 2017). Migrants’ inclinations to fertility are lower despite the current “two-child” policy. J. Yang (2018) discovered that although China had already loosened its strict restrictions on fertility, only 22% of migrant families with parents of childbearing age displayed a willingness to have a second child.

4. Methods

4.1. Data and definition of the quantitative study

In order to examine the relationship between environmental shocks and preferred number of children of migrants, a survey containing the basic information of migrants will be appropriate. China’s General Social Survey (CGSS) offers an opportunity to understand some of the attitudes and behaviours of the sampled population. CGSS is biennially conducted by the National Survey Research Center at Renmin University. This paper selected a sample from a CGSS conducted in 2015 because of two reasons. First, CGSS 2015 provides the latest data available on the current thoughts and attitudes of Chinese residents. Second, 2015 was the second year of the implementation of the Selective Two-Child Policy. Considering that the influence of policy change usually lags, data collected two years after the implementation of new policies should display the impact of policies on individuals’ attitudes and behaviours.

CGSS 2015 included 10,968 valid samples. The author screened the samples on the basis of the following criteria. (1) Individuals who were outside childbearing age (15–49 years) were eliminated. (2) Because desired number of children was the dependent variable of the research, individuals were screened on the basis of their answers to the question “if there were no restrictions from fertility policies, how many children would you prefer to have?” Participants whose answers were “I don’t know” and “I don’t care” were removed. (3) Individuals were eliminated if they were not migrants. Individuals’ responses to the question “when did you move to the current city” were screened, and their cases were eliminated if they answered “I was born here”, “just for a short-term living, such as summer vacation”, “rejected answer” and “I don’t know”. Finally, the study obtained data from 1667 migrants of childbearing age. The sampled migrants covered 28 out of 31 provinces in Mainland China.

Migrants’ preferred number of children were the dependent variable in the study and were measured in terms of the number of children that the migrants preferred. In the survey, the question was designed as “If there were no restrictions from fertility policies, how many children would you prefer to have?” Migrants’ answers to this question were considered their desired number of children.

The core independent variables in the study were two measurements of environmental shocks: migration distance and duration of residence at the current location. Living time was calculated using the difference in time between 2015 (the year in which the survey was conducted) and the migrants’ answers to the question “when did you move to your current place?” Years were used as units of living time. The measurement of migration distance was more complicated. CGSS offered information about the original residence (accurate at district level) of each individual, but the migrants’ current residence information at the city and district levels was covered by codes to protect their privacy. Only information about the current residence’s provincial administrative unit was available. Thus, on the basis of the limited accessibility of data needed to calculate migration distance, I calculated the least number of provinces that each migrant had to pass through to reach their destination as the measurement of migration distance. The coding scheme was as
follows: Individuals who migrated within their home provinces were coded as ‘1’. Migrants who changed their residence to provinces next to their home provinces were coded as ‘2’. Migrants who changed their residences to a neighbouring province of a province next to their home provinces were coded as ‘3’. The rest were coded in the same manner. The further the migrants moved, the higher was the code they were given. To ensure coding reliability, the least number of provinces that migrants traversed to their destination was selected. Two researchers conducted the coding; we coded all the 1667 samples and arrived at a high level of intercoder reliability. The percentage in agreement was 97.84%, the value of the chi-square was 7910.21, p < .01, and Cohen’s kappa (a chance-corrected measure of agreement) was 0.956.

On the basis of previous studies, this research introduced a series of control variables including factors that may affect individuals’ physical abilities to reproduce, such as age; individual features such as gender, nationality and household registration; factors that may affect migrants’ attitude towards reproduce, such as educational background, religion, and social welfare participation⁴; and factors that may affect individual’s reproductive behaviour, including marital status, childbearing history, income⁵ and housing tenure.

4.2. Analysis model of the quantitative study

The dependent variable in this research was the number of children preferred by migrants, counted in nonnegative integer values. Linear regression is not appropriate for estimating the counted data because it cannot consider the limited number of values denoting the number of children preferred by migrants (Cameron & Trivedi, 1998). Poisson or negative binomial regression is optional for modelling counted data (Cameron & Trivedi, 1998). The outcome of the likelihood ratio test was prob. ≥ chibar² = 1.000, which did not reject the null hypothesis that errors do not exhibit over-dispersion. Therefore, Poisson regression was appropriate for this research.

\[ Y_i = \text{the dependent variable. Observations } y_i \text{ were assumed to follow the Poisson distribution of } \lambda_i. \text{ Its probability density function was as follows:} \]

\[ P (Y_i = y_i | \lambda_i) = \left( \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!} \right), (y_i = 0, 1, 2 ...). \]

\[ \lambda_i = E (Y_i | x_1, x_2, x_3, ..., x_n), x_i (i = 1, 2, 3, ..., n) \text{ are factors that may influence the fertility preferences of migrants:} \]

\[ \lambda_i = \exp (\beta_0 + \beta_1 \text{migrationdistance} + \beta_2 \text{livingtime} + X_i y + \varepsilon). \]

The core independent variables in this research are migration distance and living time. \( X_i \) includes the control variables of the study.

4.3. Method of the qualitative study

Through the semi-structured interviews with some migrants, the qualitative method investigated how the measurements of environmental shock, namely, migration distance and living time, influenced migrants’ preferences of family size.

Interviews with 16 internal migrants in China were performed since April 2018 to obtain rich and in-depth insights. For this paper, some interviewees were selected to finish the analysis. Among the interviewees, the preferred number of children, migration distance, living time, age, gender, extent of environmental shocks they experienced and extent of their adaptation to the environment are different, whereas other personal information (including nationality, household registration, educational background, social status, participation in welfare programmes, childbearing history and wealth) were similar. These could minimise the possible bias of a heterogeneous sample.

The follow-up interviews included open-ended questions about the following: 1) influence of migration distance on migrants’ desired number of children and 2) reason why living time at the final destination
place did not influence the number of inclinations of children of migrants. Specifically, for the second question, migrants whose hometowns were far from their current residence and had adapted to the current residence environment were asked the following question: “You are already used to the current environment, which means that environmental shocks are not so challenging. Why do you remain unwilling to have children?” Migrants whose original residences were far from their current place and were still struggling with the unfamiliar natural and social environment were asked the following: “Imagine that you have lived in this city for a long time, for example, over 20 years, which means you are used to the current environment, would you be more willing to have more children?” These semi-structured interviews with the internal migrants in China elicited in-depth information about the impact of environmental shocks on the migrants’ preferred number of children and the reasons why the duration of residency does not significantly influence the inclination to have children.

5. Results

5.1. Results of basic regression

Supplementary Table 1 shows statistical descriptions of variables, along with their measurements, sample size and other descriptive statistics. The number of children preferred by migrants varied from 21 to zero. The mean of migrants’ desired number of children was 1.89, indicating that their number preferences remained less than two despite the two-child policy. The maximum number of provinces that migrants had to pass through to reach their destination was seven; the minimum migration distance was one province, indicating that the destination of migration remained within the migrants’ province of origin. The mean migration distance was 1.68, revealing that the average migration distance in this sample was relatively short. The duration at the new residence varied between 1 and 48 years, and the average duration at the current location was 11.7 years.

Table 1 displays the Poisson regression results for the independent variables and preferred number of children of migrants. The independent variables include the core independent variable in the research, environmental shocks measured by migration distance and living time and control variables. All regression results could be found from Supplementary Table 2.

Column 1 in Table 1 displays the Poisson regression results for all independent variables and migrants’ desired number of children. The migration distance variable in columns 1 and 2 was coded by the primary coder. Column 1 shows that the impact of migration distance on the preferred number of children of migrants is \(-0.018, p < .05\), indicating that the farther the migrants moved, the fewer was the number of children they preferred. Therefore, Hypothesis 1 was confirmed. The impact of living time in the current residence on the desired number of children of migrants was 0.002, suggesting that the longer those migrants lived in their current residence, the higher was the number of children they preferred. However, the coefficient between living time and desired number of children was low, and no statistical significance was found. This indicates that the duration of residence at the current location is not a significant factor in the migrants’ preferred number of children. Thus, Hypothesis 2 was rejected. The qualitative method aimed to explain the possible reasons via interviews with migrants. Column 3 shows the regression outcomes by using the migration distance variable coded by the secondary coder. The outcomes in Column 3 are almost the same as those in Column 1.

In China, gender and household registration may particularly affect individuals’ attitudes toward fertility (Jiang et al., 2016). Traditional Chinese concepts of gender expect males to play the key role in society, whereas females are confined to family chores, resulting in different attitudes toward fertility across genders (Yang, 2000). Traditional notions of fertility, which propose an “early marriage, more childbearing and sex discrimination” (Liang et al., 2014, p. 311) still exist, particularly among rural residents, and exert further impact on the fertility attitudes of residents with different household registrations. Therefore, to test whether the relationship between environmental shocks and desired number of children differed across migrants who belonged to a different gender and household registration, the following four interactive terms were introduced into the model: migration distance and male, migration distance and non-agricultural household registration, living time and male and
Table 1. Poisson regressions on independent variables and preferred number of children of migrants

|                      | Column 1       |       | Column 2       |       | Column 3       |       | Column 4       |       | Column 5       |       |
|----------------------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
|                      | Coefficient    | Robust SE | Coefficient    | Robust SE | Coefficient    | Robust SE | Coefficient    | Robust SE | Coefficient    | Robust SE |
| Environmental Shocks |                |         |                |         |                |         |                |         |                |         |
| Migration Distance   | -0.018**       | (0.009) | -0.029**       | (0.013) | -0.018**       | (0.009) |                |         |                |         |
| Migration within     |                |         |                |         |                |         |                |         |                |         |
| Home Provinces       |                |         |                |         |                |         |                |         |                |         |
| Migration outside    |                |         |                |         |                |         |                |         |                |         |
| Home Provinces       |                |         |                |         |                |         |                |         |                |         |
| Living Time          | 0.002          | (0.002) | 0.001          | (0.002) | 0.002          | (0.002) |                |         |                |         |
| Less than 10 years   |                |         |                |         |                |         |                |         |                |         |
| 10–20 years          | 0.012          | (0.025) | 0.012          | (0.025) |                |         |                |         |                |         |
| Over 20 years        | 0.049          | (0.037) | 0.049          | (0.037) |                |         |                |         |                |         |
| Interaction Terms    |                |         |                |         |                |         |                |         |                |         |
| Migration Distance+  |                |         |                |         |                |         |                |         |                |         |
| Male                 | -0.013         | (0.02)  |                |         |                |         |                |         |                |         |
| Migration Distance+  |                |         |                |         |                |         |                |         |                |         |
| NAHR                 | 0.03*          | (0.018) |                |         |                |         |                |         |                |         |
| Living Time+         |                |         |                |         |                |         |                |         |                |         |
| Male                 | -0.001         | (0.004) |                |         |                |         |                |         |                |         |
| Living Time+         |                |         |                |         |                |         |                |         |                |         |
| NAHR                 | 0.002          | (0.003) |                |         |                |         |                |         |                |         |
| Control Variables    | Yes            |         | Yes            |         | Yes            |         | Yes            |         | Yes            |         |
| _Cons                | 1.797***       | (0.605) | 1.767***       | (0.601) | 1.797***       | (0.606) | 1.776***       | (0.606) | 1.708***       | (0.61) |
| Observations         | 1481           |         | 1481           |         | 1481           |         | 1481           |         | 1481           |         |
| Wald Chi2            | 106.6          |         | 113.53         |         | 106.53         |         | 105.14         |         | 105.14         |         |
| Prob > Chi2          | 0.0000         |         | 0.0000         |         | 0.0000         |         | 0.0000         |         | 0.0000         |         |

Note: NAHR stands for nonagricultural household registration. *p < 0.1, **p < 0.05, ***p < 0.01. Robust standard errors clustered by individuals in parentheses.
living time and non-agricultural household registration. The Poisson regression results are shown in Column 2. A negative relationship remained between migration distance and preferred number of children of migrants. After the four interactive terms were introduced, the coefficient value of migration distance decreased from −0.018 to −0.029, p < .05. The coefficient of the interactive term of migration distance and non-agricultural household registration was 0.03, p < .1. This means that the impact of migration distance on the preferred number of children of people with non-agricultural household registration is higher than that on people from agricultural households. The coefficient of the interactive term of migration distance and male had no statistical significance, indicating that the relationship between migration distance and desired number of children of migrants does not differ across genders. Living time at the current residence, as well as the interaction between living time and gender and that between living time and non-agricultural household registration, had no significant influence on migrants’ preferred number of migrants.

5.2. Robustness checks
Owing to the limited accessibility of data about migrants’ current residence, it was impossible to calculate the linear distance of migration for each migrant. Therefore, I categorised the core variables and tested the robustness of the outcomes. The migration distance was divided into two groups: migration within home provinces and migration outside of home provinces. Each group would be individually introduced into the model, and the other group would be used as a reference group to test if the migrant would prefer fewer children the farther they moved. Living time was divided into three groups: less than 20 years, 10–20 years, and more than 20 years. The first group was the reference group and the latter time categories would be introduced into the model to test whether the migrants preferred more children the longer they lived at their current residence.

Columns 4 and 5 in Table 1 show the Poisson regression outcomes from the robustness tests. Column 4 shows that the coefficient between migration outside of home provinces and preferred number of children was −0.068, p < .01. Column 5 shows that the coefficient migration within home provinces was 0.068, p < .01. Both outcomes suggest that desired number of children are higher among migrants who migrated within a shorter distance (within home provinces) and lower among migrants who migrated over a longer distance (outside of home provinces). Migrants who lived for a longer time (10–20 years and more than 20 years) preferred a greater number of children. The coefficient was 0.012 for migrants living at their current residence for 10–20 years and 0.019 for migrants who had lived at their current residence for over 20 years. However, these coefficients were not statistically significant. Both the outcomes shown in columns 4 and 5 verified the robustness of the outcomes, thus confirming the relationship between environmental shocks and the preferred number of children of migrants.

5.3. Results of the qualitative study
Similar to the results of the quantitative study, the results from the interviews with internal migrants in China revealed that lower (higher) preferred number of children were associated with a farther (shorter) migration distance, whereas desired number of children did not vary according to the time spent living at the current residence.

Migrants whose hometowns were closer to their current residence may have felt fewer shocks in the new environment upon arrival, whereas migrants whose original residence was far away may have experienced stronger shocks. A farther migration distance entails adjustment to a different climate, weather, language, habits, customs, behaviour and idioms that compel migrants to adapt to the new environment as soon as possible. Therefore, fertility may be ignored, postponed or decreased relative to the level of adaptation required. Migrants whose original residences were far from their current places suggested the following:

All things are different from my hometown, not only the social environment, but also the natural environment. Now, I’m still struggling with the native idiom, as well as the cold and dry weather here. So, for me, I don’t want to enlarge my family size.

—F. B
The social environment here is different from my hometown, such as food, climate, especially language. Both my wife and I have tried hard to adjust our accent in the first few years... Hence, during that time, environmental adaptation, is the most important thing.

-M. C

I've spent a lot of years getting used to the cold and long winter in this city. My hometown is in southern China, whose temperature in winter is much higher than here... It's hard for a female who's still struggling with the strange environment to be pregnant and give birth to babies.

-F. C

The duration that migrants have spent at their current residence tended to mitigate these environmental shocks. With time, the effects of environmental shocks weakened, which can help to increase migrants' preferred number of children. M. C stated the following:

After living here for more than a decade, we've got used to the current social and natural environment. No disturbances from the surroundings... So, with such a peaceful life, we could have more children.

-M. C

However, time also bring challenges, such as older age, relatively weaker reproductive capacity and greater pressure to compete in society, which may decrease preferred number of children for migrants of different ages and genders. Under the pressure caused by these challenges, migrants may desire fewer children. Migrants remarked the following:

Considering my wife's age, we are not going to have more children.

-M. C

As time goes on, I already got used to the environment here. However, I'm 40 years old now. My physical condition is getting worse, so it is not a good choice for me to give birth to more children.

-F. A

I know I'm young, but I do not want to do (have more children) that. The competition is stiff in current society, so I need to work hard to survive the social competition. Children would cost too much of my attention and energy.

-F. C

Even though I've adapted to the current environment, I may have limited physical ability and energy to give birth to and bring up more children.

-F. B

In conclusion, the time migrants have spent at their current residence may both increase and decrease their desired number of children. As a mitigation of environmental shocks, living time can ease anxiety and increase the childbearing willingness of migrants. However, passage of time also delivers new challenges, such as weaker physical condition, older age and pressure owing to social competition, which decreases migrants' desires to enlarge their families. Therefore, living time did not exert a significant influence on migrants' childbearing willingness.

6. Discussion
A discussion of the results is presented in as follows. First, environmental shocks are significant factors that affect the preferred number of children of migrants. Specifically, the geographical distance traversed during migration exerts a significant negative influence on migrants' preferred number of children. Farther migration distances cause stronger environmental shocks and cause lower willingness to have more children among migrants.
Environmental conditions in various places are different, causing shocks for migrants. Uncertainties in the unfamiliar environment make migrants rank adaptation to the new environment as their first priority. Consequently, fertility is neglected or postponed by them. However, dissimilar geographical distances result in different environmental shocks and would further influence migrants' attitudes and behaviours differently. Places that are far from each other shared less similarity in both their natural and social environments; therefore, these places may generate stronger environmental shocks. Thus, fertility would be neglected or postponed much more among migrants who experience stronger environmental shocks.

Furthermore, household registration, which is unique to China, significantly influences migrants' preferred number of children. Since 1958, Chinese citizens were divided into agricultural and non-agricultural registered residents on the basis of their birth places (Yang, 1993). Frequently, people who were born in rural areas were considered agriculturally registered residents. Traditional concepts of fertility, which held that people should marry and give birth to as many children as possible at an early age, were popular among rural residents (Liang et al., 2014). Moreover, although number of children was restricted by family planning policy, rural residents did not need to follow the one-child policy. Rural residents were allowed to have a second child if their first child was female (Jiang et al., 2016). Hence, with this ideology of fertility and related policies, residents from agricultural households were frequently identified as the group with higher number preferences of migrants (Liang & Gibson, 2017). This could explain why the current study found that migrants with non-agricultural household registration preferred smaller families than agricultural household registration holders. Furthermore, this study found that the influence of migration distance on people with non-agricultural household registration was higher than that on people with agricultural household registration. This also indicates the strong influence of the deeply rooted concepts of fertility that exist among agriculturally registered residents, which may lessen the negative influence of environmental shocks caused by migration distance on number preferences of children.

Finally, the time spent at the current residence did not significantly influence the migrants' number preferences of children. Interviews with migrants revealed that there were two influential interactions between living time and preferred number of children, which may increase and decrease migrants' desired number of children. The duration of residence at the current location mitigates environmental shocks, eases the anxiety caused by an unfamiliar environment and further increases migrants’ desires to enlarge their families. However, the duration of residence also brought new challenges, such as older age, weaker reproductive capacity and intense social competition, which may decrease the desired number of children of migrants.

7. Conclusion
Migrants’ childbearing willingness and behaviour is a decisive factor in the long-term impact of migration on the size of the population (Wilson, 2018). Numerous fertility research studies and theories (i.e., selectivity hypothesis, socialisation hypothesis, adaptation hypothesis and disruption hypothesis) have been developed and used in academic demography for decades. Most of them concluded that migrants are a group of people who have a lower desire to reproduce and have relatively fewer children than local settled people. Recently, more research studies have noticed differences in childbearing willingness within migrants. Specific features of individuals or groups of migrants were used to explain the causes of the dissimilar desired number of children of migrants. However, such features can be identified and subdivided infinitely, but none of them can broadly explain why migrants have different preferred number of children of migrants. Therefore, this paper filled this research gap from a wider viewpoint by identifying environmental shocks, which are experienced by all migrants, to enhance the understanding factors that influence migrants’ diverse preferred number of children. In addition, the research analysed the influence of environmental shocks on the desired number of children of migrants, using environmental shocks as a variable rather than a constant.
In this study, environmental shocks were embodied and transferred into two measurable variables—migration distance and living time. By statistical analysis and interviews with migrants, this study determined the relationship between environmental shocks and preferred number of children of migrants and the mechanisms that influence the relationship between environmental shocks and childbearing willingness.

On the basis of the empirical findings of the current paper, I suggest the following. To prevent migrant birth rates from decreasing and further increase the fertility rate, it is necessary for the Chinese government to help weaken the impact of shocks and uncertainties from the environment, at least from the social dimensions of the new environment. The limits of the household registration (hukou) system need to be eliminated by offering migrants public services that are similar to nonmigrants, thereby shortening their adaptation time and helping migrants integrate into the local community and culture as soon as possible.

However, this study has limitations. The main limitation was the inaccurate measurement of migration distance. Linear distance would be a better method for measuring migration distance. If data is available, future studies should examine the relationship between preferred number of children of migrants and linear migration distance to test whether the findings of this study are robust. Another limitation is that the data used in this research was collected only 2 years after China’s fertility policy was updated in 2013. The one-child policy was implemented for over 30 years and the selective two-child policy had been implemented for only 2 years; therefore, people’s attitudes toward fertility may remain conservative. This limits the generalizability of this study’s findings because of the specific conditions surrounding a sample of migrants in a certain country over a fairly unique period. The fertility willingness of migrants may also vary with the length and strength of the implementation of China’s fertility policy. Therefore, future studies should investigate migrants’ fertility inclinations when the updated fertility policy has been implemented over a longer period.

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Notes
1. http://www.ilo.org/beijing/areas-of-work/labour-migration/lang-en/index.htm
2. Liang et al. (2014) and Rokicki et al. (2014) verified that the popularization of social welfare would change the traditional concept that descendants are the only people who can take care of parents in their old age.
3. Considering that intra-household labour division may differ between husbands and wives, salary may not demonstrate individual wealth. Therefore, this study used household income per capita to measure people’s wealth.
4. The interviews began after I discovered that there was no significant relationship between living time and desired number of children.
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Supplementary material
Supplemental data for this article can be accessed here.

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