

# Educational Assortative Mating and Second Birth Progressions in China

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## ABSTRACT

Despite China's phased abolition of the one-child policy, fertility rates remain relatively low. While whether to have a second child becomes more flexible, "who is having a second baby and who is not" remains unclear in China. This study highlights an understudied aspect: the association between couples' educational pairing and second-birth transitions. I apply piecewise exponential models from five waves of the Chinese Family Panel Studies (2012-2020) on a sample of 285774 couple-years. My results indicate an opposite trend as to what resource pooling theory would predict. Couples with the highest combined educational attainment ("both college and more") have the lowest likelihood of having a second child, while those with the lowest combined educational levels ("both primary and less") exhibit the highest second-birth risks. Among heterogeneously educated couples, hypergamous couples (i.e., husbands better educated than wives) consistently show higher second-birth risks than their hypogamous counterparts (i.e., wives better educated than husbands). This pattern holds across both "high-middle" and "middle-low" educational combinations. Notably, a woman's education is more influential in reducing the likelihood of a second birth than a man's. Despite changes in the policy context, the results suggest that couples are slow to transition to higher parities, especially among homogamous highly educated couples. The socio-economic determinants of continued low fertility in China demand further research attention.

## 1 Introduction

China has experienced continuing fertility decline over the past decades. Since the early 1990s, the total fertility rate (TFR) has remained below the replacement level in China. Even after the relaxation of the one-child policy in 2013 by introducing the "selective two-child policy" and later a universal two-child policy in 2016, then the three-child policy in 2021, China's fertility continued to decrease to extremely low levels.

Although the Chinese transition to low fertility levels has been widely documented and investigated, critical gaps exist in describing and understanding the driving force behind this process. In the current Chinese phase of declining fertility below the replacement level, the research should focus on the decline in first- and second-order births rather than higher-order births. As for the first births, although the childlessness rate has been increasing in recent years (Jiang et al., 2023), the estimated rate of childlessness for women aged 49 was 5.16% in China in 2020, lower than that reported in the European Union (19%) and the United States (11%) (C. Zhang et al., 2023). Thus, focusing on understanding the second birth transition bears the most critical weight in fertility research in China nowadays.

Previous research has widely documented several factors influencing the transition to a second child: economic constraints, a lack of care resources, and time constraints (Wang & Zhao, 2021; Yongai et al., 2016).

The economic reform and marketisation since 1978 contributed to the rapid economic growth in the following decades but, at the same time, left most caring responsibilities back to individual families, followed by increasing living expenses and higher levels of inequality (J. Zhang et al., 2022; Zhou & Xie, 2019). In addition, the persistence of the "child-centred" family culture in China (Yu & Xie, 2022), characterised by the high expectations and cost (not only from an economic aspect) of raising a child, also prevents Chinese couples from having more than one child. Influenced by gender perspectives, there is also a growing number of research investigating how the division of household labour and gender attitudes are associated with women's fertility intention (Yang, 2017; Li & Jiang, 2019).

However, "who is having a second baby" and "who is not" remains unclear in China. After lifting the one-child policy, decisions about whether to have a second child become more dynamic, flexible, and subject to negotiation between spouses. One crucial gap in previous research is a lack of couples' perspective that takes into account the interactive process of how partners jointly decide about childbearing, contingent on their individual, relative, or joint resources and preferences.

According to recent statistics, women's education has exceeded that of men in the youngest cohorts, surpassing men in college and graduate education (Chen & Gietel-Basten, 2023). The Fourth Survey on Social Status of Women in China indicates that women aged 18 to 24 received 12.81 years of education on average in 2020, 0.81 years more than men of the same age group. The survey also shows that 53.6% of college students are women, surpassing men's participation in higher education (Ying, 2021).

The improvement in women's socioeconomic status relative to men's results in marriage market mismatches for higher-status women and lower-status men. Lower-status men are less likely to get married. At the same time, the previous "leftover women" phenomenon (i.e., those highly-educated women were hard to get married) appears to be losing relevance, as women's economic prospect has become more important (Feng, 2022).

However, in contrast to the rapid growth in educational opportunities, women's disadvantages in the labour market have increased in terms of participation, earnings, occupational segregation, and motherhood penalty (Bai et al., 2022; Shen, 2022). Traditional gender roles and expectations still largely remain. How will these factors affect couples' childbearing choices and behaviour, especially after the lift of the one-child policy? This study aims to provide a descriptive overview of the second-birth transition among couples by partners' educational pairing in China. By evaluating the role of couple's dynamics in reproductive behaviour, the current study aims to provide insights into fertility research in the context of marketisation, changing family policy and education expansion. As a Confucian society that has experienced dramatic economic and social changes in recent decades, China offers us an opportunity to provide new insights into fertility studies, especially the transition to second birth in a lowest-low fertility context. Evaluating the potential systematic differences in couples' birth progressions contingent on the partners' education may also have implications for individuals' fertility trajectories, children's upbringing, and family life, which may ultimately reflect social inequalities in family formation experiences and chances.

## **2 Literature and Hypotheses**

### **2.1 Educational pairings and fertility**

As partners' educational pairings have emerged as decisive in childbearing behaviour, a growing number of studies discuss the couple-education-fertility nexus. The new home economics perspective originated from Becker (1991), and the resource pooling theory by Oppenheimer (1994) are the two most discussed theories in

this line of research.

Becker's specialisation model argues that gains to marriage are maximised when one partner acts as a breadwinner, and the other specialises in housekeeping. Although the theory can be gender-neutral, Becker aligned it with gender role expectations and unbalanced sex ratios in education and occupations (Becker, 1985). Accordingly, birth rates would be expected to be highest among hypergamous couples, with a higher-educated man specialising in the labour market and a lower-educated woman specialising in childcare and domestic work.

However, Oppenheimer (1994) criticised the specialisation model, arguing that as the economy becomes more unstable in modern industrial society, along with women's rising education and income, couples with two earners will be more easily able to adapt to challenges in the labour market by pooling their resources. The joint resource may serve as a buffer against economic insecurity and enable the family to invest more resources into domestic and childcare services (Oppenheimer, 1997). Thus, this resource pooling theory predicts a higher level of fertility among couples with higher levels of pooled socioeconomic resources.

In addition, bringing in the concept of opportunity cost (Happel et al., 1984; Becker, 1991) for employment breaks and lost income, women with higher education and better skills are predicted to have lower fertility. In most contexts, women still take most of childbearing- and rearing-related employment breaks and are subjected to a more considerable indirect earnings loss for care work than men. Thus, those homogamous (i.e., with the same education) higher educated couples and those hypogamous couples (i.e., couples with a better-educated wife than the husband), where wives are more likely to contribute the same or higher weights to family income, may thus be predicted to have lower fertility.

Additional insight may arise as we focus on individual perspectives and preferences. Though the previously discussed new home economics perspective and the pooling resource theory imply one joint utility function maximised in agreement within the couple unit, adding another layer of consideration of the interactive processes of childbearing decisions between the partners may be beneficial. For example, the bargaining perspective (Hook, 2006) argues that individuals who hold a larger share of resources in the partnership may have more leverage in negotiating desired outcomes. When wives contribute more economically to the family, they would have more bargaining power in enlisting their partners' help or outsourcing domestic and care work. Such negotiations may encourage women to realise the couple's desire for children, particularly a second or higher-parity child. Thus, from the point of view of bargaining power, hypogamous couples may be predicted to have a relatively higher likelihood of having a second birth.

Furthermore, the role of values and ideology among partners in different pairing statuses should also be incorporated in examining their childbearing behaviours (Nitsche et al., 2018; Bauer & Kneip, 2013). One important dimension would be degrees of consensus in gender ideology among the partners. For example, higher education has been associated with a more egalitarian gender ideology. Thus, highly educated women may receive better support in combining career and family from highly educated partners than from partners with less education, and potentially an accelerated transition to the next child than hypogamous couples.

What's more, the potential effects of educational pairing on other dimensions of marriage may further influence the fertility behaviour of couples. For example, the effect of marriage matching patterns on union stability and satisfaction (Schwartz & Han, 2014) may also affect fertility behaviour.

Evidence from previous empirical findings is mixed, given the different contexts (time and place) and the varying dimensions of educational pairings and childbearing these studies examined. While the current study focuses mainly on the progressions to second births, some previous studies have focused on the transitions to

parenthood and the probability of remaining childless, whereas some deal with fertility desire or intention. In addition, empirical couple-level studies have demonstrated greater complexity in the education-fertility nexus than individual-level studies.

The detected patterns have partially supported resource pooling theory in several high-income contexts. Specifically, second birth rates appear to be significantly higher among homogamous highly educated couples than among heterogamous couples with only one tertiary educated in Sweden (Dribe & Stanfors, 2010), Finland (Nitsche et al., 2020), Belgium (Trimarchi & Van Bavel, 2020), and 24 European countries (Nitsche et al., 2018). In addition, in their later paper among the lower-educated population, Nitsche et al. (2021) found that couples with one or two low-educated partners have lower second birth rates than couples with two highly-educated partners. However, Trimarchi & Van Bavel (2020) 's study in Central-Eastern European countries tends to support the specialisation family model. They found that in Bulgaria, Poland and Romania, couples where the woman has a high level of education have the lowest second birth rates compared to other couples. Additionally, female partners' earning potential is negatively associated with fertility rates, whereas the opposite holds for unemployment risks.

## **2.2 Chinese contexts and hypothesis**

There is no research on educational pairings and second-birth transitions in China. One study investigated fertility intention and son preference by examining the effect of educational pairings, age pairings and income pairings (Tian et al., 2023). They found a more significant effect of educational pairing than age and income pairing, especially a more pronounced effect in weakening son preference for the better-educated couples. Another study in Hong Kong uses census data and the diagonal reference model to investigate the effect of educational pairings on fertility (Sun & Zhao, 2022). In this study, they found a negative relationship between couples' educational achievements and their fertility. Their study also suggests that the more educated a wife is relative to her husband, the less likely the couple is to have children.

Given the Chinese context, compared to the specialisation model, one may expect that the resource pooling theory is more likely to be in place. Even though it is still a common practice and belief that getting married is tightly associated with giving birth to a first child in China nowadays (Yu & Xie, 2022), previous research has documented that having a second child is highly influenced by the economic resources of the family. The rapid economic development spurred by economic reform since 1978 has ushered in new changes to family structures and individual family behaviours in China. For example, marketisation and rising inequality have changed the economic foundations of marriage and childrearing in China, and economic prospects have begun to exert a significant influence on childbearing decisions. Unlike the Nordic countries, the Chinese government provides much less support for parents to bear and rear a child, leaving the burden mainly on the parents and grandparents (Yingchun & Zhenzhen, 2020). As Nitsche et al. (2018) indicated, resource pooling theory is more likely to occur in countries with low public support for work-family reconciliation. Thus, my first hypothesis is:

*H1a: Higher educated homogamous couples may have relatively higher second birth progression rates than those with only one highly-educated member.*

Even though those higher-educated homogamous couples may have higher economic resources, thus contributing to a higher second birth rate, it is also likely that they may be less likely to have a second child given the quality and quantity trade-off consideration (Becker & Lewis, 1973). As couples' education levels increase, they may focus more on quality than the quantity of children. Coupled with the rising costs of raising children and declining child mortality in China, parents place extreme importance on childrearing. They are determined

to keep their children ahead of the starting line, leading to the phenomenon of "inversion" (the higher the parenting ability, the lower the willingness to have children) (Kang et al., 2022). Those homogamous higher educated couples may share high expectations in childrearing and thus may have lower intentions of having a higher-order child.

In addition, although economic resources are of great importance in childrearing, the family specialisation model may still be in place in China. Given the strong influence of traditional gender ideology, patriarchal values and the lack of public support for work-family reconciliation, women are still expected to contribute more to childcaring and experience a high level of motherhood penalty (Chen & Gietel-Basten, 2023). Thus, couples with higher-educated wives still face high opportunity costs in childbearing. This may apply to the higher-educated homogamous couples and the hypogamous couples with higher-educated wives and less-educated husbands. Thus, my contradictive hypothesis with H1a is:

*H1b: Higher educated homogamous couples may have lower second birth progression rates*

People in different social positions could have different understandings of the expected cost and benefits of childrearing, and there may also be gender-specific patterns of consideration (Tong et al., 2023). For example, even though people on the bottom of the social ladder have fewer resources, they may still have higher fertility intentions. Firstly, they may expect different parenting styles and thus could find their way of raising multiple children, rather than the costly "middle-class" styles. They may also be those more influenced by the traditional values of son preferences and "duo zi duo fu" ("more children, more happiness"). They may thus prefer to have more children, especially more sons. This kind of childbearing attitude applies particularly to lower-educated, rural men, who may be under the responsibility and pressure of carrying on the family blood lineage.

Secondly, given that the less educated population may be more likely to work in agricultural settings or other lower-paying, unstable positions, without stable and predictable old age support and other sources of economic income after they are too old to work, they may also be those who rely more on their children for supporting their older ages, which may increase their intentions to have more children. In addition, childbearing and childrearing may also act as a source of certainty and meaning to life during times of unemployment, unfavourable employment prospects or economic downturn, as indicated by the uncertainty-reduction framework (Friedman et al., 1994; McDonald, 2000). Thus, I proposed my second hypothesis as follows:

*H2: Lower educated homogamous couples have the highest second birth rate.*

Among the heterogamous couples, one may expect that hypergamous couples may have higher second birth rates compared to their hypogamous counterparts because of better specialisation in a society where patriarchal values still prevails. Given the social and institutional conditions, we can also argue that even in hypogamous pairings, wives' bargaining power may remain limited. In addition, they may experience higher opportunity costs when transitioning to higher-order births if wives contribute more economically.

Considering the influence of traditional gender ideology and the recent development of women's higher education, the effect of gender-equal domestic labour is likely to differ across educational groups. It is a woman with a higher level of education who may have a higher chance of exposure to gender-egalitarian ideas and thus have higher expectations for their husbands' household participation. Lower-educated men and women may share the same traditional gender ideology; therefore, those couples with lower-educated wives may be more willing to bear more weight in care work and housework. Derived from the above theoretical arguments, this is my last hypothesis:

*H3: Hypergamous couples exhibit a higher likelihood of experiencing a second birth transition than their homogamous counterparts, while hypogamous couples demonstrate the lowest probability of such an occur-*

rence.

In exploring the effect of marital pairing on fertility from a couple's perspective, it is necessary to clarify the dimensions from which marital pairings are examined. The study argues that educational attainment is a more stable variable representative of individuals' economic and social characteristics (Breen & Andersen, 2012), other than occupation or income. Furthermore, most people have already finished their highest level of education before forming a family in China during the study period; thus, educational attainment is less problematic in terms of endogeneity than occupational-related variables.

### **3 Data and Method**

#### **3.1 Data and Sample**

I use China Family Panel Studies (CFPS) to analyse the transition to second birth from a couple's perspective. CFPS is a nationally representative longitudinal household survey, launched in 2010 by the Institute of Social Science Survey (ISSS) of Peking University. It includes individual-level, household-level, and community-level samples from 25 provinces. The survey followed members of 14,960 households from 25 provinces across six data panels (2010, 2012, 2014, 2016, 2018, and 2020). Its baseline survey was conducted in 2010 and includes 14,798 households. Later waves followed up about 80% of the individuals based on across-wave comparisons.

In this study, I pooled together the 2012, 2014, 2016, 2018, and 2020 waves of CFPS to construct a sample containing longitudinal information that is up to date for the most recent wave. CFPS interviews all household members in each sampled household, making couple-level information and birth histories available.

The working sample is constructed based on the following criteria. I keep couples who stay married and in their first marriages to avoid the potential bias brought by divorced or remarried families due to their family instability. Furthermore, I only keep these couples with wives born between 1970 and 1989 with a potential age range of 23-50 during the selected waves of 2012-2020. This age range was selected based on the consideration that at age 23, most people have already finished their education, and the age 49 or 50 was the normative cutoff point in fertility research due to biological infertility consideration.

To estimate second-birth transitions by educational pairing, I only retained unions where the first child had been born; hence, unions that did not lead to a first birth during the observed time were left out. Those with inconsistent time to event (zero or negative time) were excluded from the analysis. Variables with missing values were first computed from other waves (e.g., educational level, birth year and month, gender of first child, etc.). Those cases that cannot be computed but with missing values in all waves in our main variables are deleted. After initial cleaning, a sample of 285774 couple-year at risk of a second birth were left for analysis.

#### **3.2 Description of the Variables**

My outcome variables, which focus on the transition to the second child, are generated from the birth year and month of the couple's second child. The time process is given by the time elapsed from the first birth until the next birth or until censoring either after 15 years of the first birth or the last interviewed year, whichever came first.

My key independent variable is the couples' educational assortative mating status. I first compute the maximum educational level of the individuals for all the available data, considering potential educational upgrading

through the following waves. Instead of regrouping the educational level into three or four categories, I keep the original educational level (1. illiterate and half-illiterate; 2. primary school; 3. junior middle school; 4. senior middle school (high school); 5. junior college; 6. college; 7. master; 8. doctor) first to generate three educational pairing statuses, to avoid a certain degree of loss of information. This educational pairing status variable is constructed as the following three groups: 1. homogamous (husband's educational level = wife's); 2. hypergamous (husband's > wife's ); 3. hypogamous (husband's < wife's).

Furthermore, similar to previous studies, I tried grouping educational levels into three categories and then generating nine educational pairing groups to investigate potential heterogeneity among different combinations of couples' educational levels in fertility behaviour. I first divided educational level into three main groups: low (primary or less), medium (junior and senior middle school), and high (junior college and more). Then, I combined the partners' education to obtain a broader educational pairing variable measured in nine categories (1. both low; 2. both middle; 3. both high; 4. she low- he middle; 5. she low-he high; 6. she middle- he high; 7. she middle- he low; 8. she high - he middle; 9. she high- he low)

I controlled for the following household and personal characteristics:

(1) Wife's age

(2) Wife's and husband's educational level:

Considering simplicity, I regroup educational level into four groups: primary or less, secondary, junior college, undergraduate and more. I did not keep the broader three groups categories since there may be systematic differences in values, income, earning potential, employment participation levels, social background, childbearing preferences and behaviour among those with junior college degrees and those with bachelor's degrees and more. However, such four group categories are not feasible to generate educational pairing groups, as they produce 16 groups. It will make the interpretation harder and include many subgroups with limited observations.

(3) Gender of the first child (0 = female, 1 = male):

I included the gender of the first child in the model, given that the traditional norm of son preference could still affect fertility intentions and behaviours.

### 3.3 Analytical strategy

To assess the association between educational assortative mating and transition to second birth, first, I modelled the transition to a second birth through a standard piecewise exponential model on a sample of unions at risk of a second birth, controlling only for women's educational level. Then, I gradually add men's educational level and assortative mating status in subsequent piecewise exponential models. Finally, I estimate the association between different educational pairing combinations (nine groups) and the transition to second birth.

The piecewise exponential model can be expressed as follows:

$$\log(\lambda_{ij}) = \alpha_j + x_i'\beta \quad (1)$$

Where  $\log(\lambda_{ij})$  is the log of the hazard of couple  $i$  in interval  $j$ ;  $\alpha_j$  is the log of the baseline hazard, which is assumed to be constant within each interval considered;  $x_i'\beta$  is the relative risk for a couple with that specific covariate profile (including both time-constant and time-varying covariates), compared to the baseline at any given time.

In my models, the time process of the transition to the second birth was measured as the duration from the previous birth until the second birth. The baseline duration was measured in six intervals (0–2 years since the first birth, 2–3, 3–4, 4–5, 5–10, and 10+).

## 4 Results

### 4.1 Descriptive statistics

Table 4.1: Descriptive Statistics

Variable/Categories	Count/Value	Percentage	Standard Deviation
<b>Educational Assortative Mating Status</b>			
Homogamous	128,983	45.13%	-
Hypergamous	97,506	34.12%	-
Hypogamous	59,285	20.75%	-
<b>Educational Pairing Groups</b>			
Both Middle	120,285	42.09%	-
Both High	38,377	13.43%	-
Both Low	36,917	12.92%	-
She High-He Low	448	0.16%	-
She High-He Middle	15,202	5.32%	-
She Low-He High	1,063	0.37%	-
She Low-He Middle	39,160	13.70%	-
She Middle-He High	16,869	5.90%	-
She Middle-He Low	17,453	6.11%	-
<b>Wife's Education Level</b>			
Primary and Less	77,140	27.0%	-
Secondary	154,607	54.1%	-
Junior College	28,796	10.1%	-
Undergraduate and More	25,231	8.83%	-
<b>Husband's Education Level</b>			
Primary and Less	54,818	19.2%	-
Secondary	174,647	61.1%	-
Junior College	28,948	10.1%	-
Undergraduate and More	27,361	9.57%	-
<b>Descriptive Statistics for Control Variables</b>			
Wife's Age	-	36.8 (23 - 50)	6.42
Sex-1st Child	-	0.520	0.500

Table 4.1 shows the characteristics of the analytic sample (all couple years at risk of a second birth). Homogamous couples contributed 45.13% of couple time, while hypergamous couples made up about 34.12% couple time, and hypogamous couples contributed to 20.75% of couple time. As for the educational pairing groups, those homogamous couples with middle education (middle school and high school) were the most common pairing (42.09%). I used this group as the reference category for the nine pairing groups model. Couples with homogamous high education levels (junior college and more) make up about 13.43%, while those homogamous poorly educated contributed to 12.92%. In my analytical sample (couples at risk of a second birth), couples with large educational distances are rare (0.37% "she low-he high" and 0.16% "she high-he low").



If we look at wives' and husbands' education levels separately, generally speaking, men are better educated than women. More men have undergraduate and more degrees, while fewer of them are primary and less educated. It should also be noted that the more considerable differences between men's and women's educational attainment in the analytical sample lie between "secondary" and "primary and less" categories other than higher educated categories.

## 4.2 Homogamous vs. hypergamous & hypogamous educational pairing

Figure 4.1: Transition to the Second Child by Educational Pairing Survival Curves(km)

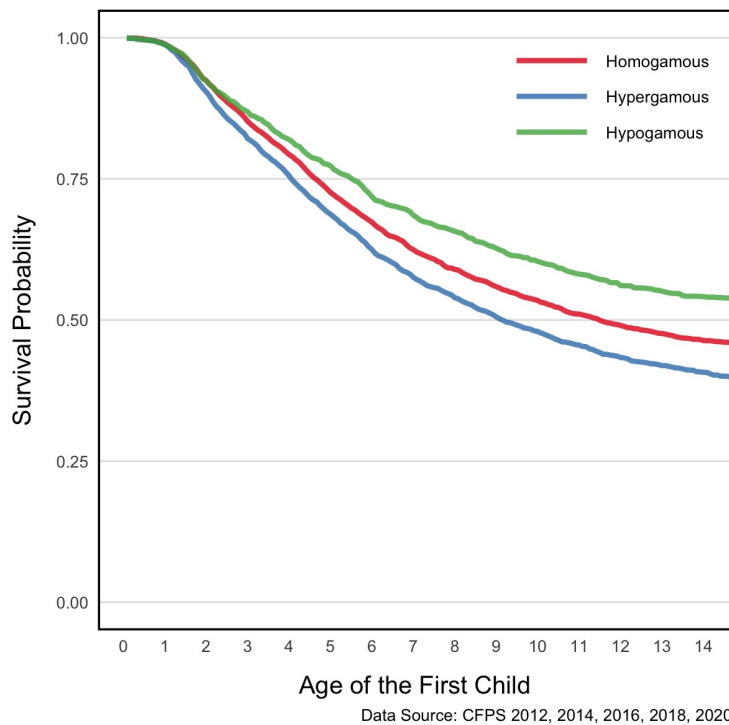


Figure 4.1 shows the survival curves for the transition to the second child by educational pairing. Fifteen years after the birth of the first child, only roughly 50 per cent have another child, indicating couples in China are generally slow to the transition to higher parities, despite the gradual relaxation of the one-child policy. As for the differences in the progression ratio by educational pairing status, the overall pattern is consistent with what H3 predicted, that hypergamous couples have the second child more rapidly than homogamous couples, while hypogamous couples encounter the lowest transition rate to the second child. In the following, I fit the piecewise survival models to assess further the association between educational assortative mating and transition to second birth.

In all the piecewise survival models, I present the transformed relative risks, or hazard ratios, instead of the original coefficients to make the interpretation easier. The relative risk can be calculated as the following:

$$RR(\text{or } HR) = e^{-\text{coefficient}}$$

After the transformation, a relative risk greater than 1 suggests an elevated hazard or a heightened probabil-

Table 4.2: Regression Results with Relative Risks

	<i>Dependent variable:</i>			
	Duration to second birth			
	Wife edu (1)	Wife edu + mating (2)	Hus edu (3)	Hus edu + mating (4)
<b>Wife's education (Ref: Middle)</b>				
Wife_Primary and less	1.306*** (0.006)	1.350*** (0.006)		
Wife_Junior college	0.487*** (0.013)	0.486*** (0.013)		
Wife_Undergraduate and more	0.375*** (0.015)	0.369*** (0.015)		
<b>Educational Pairing (Ref: Homogamous)</b>				
Hypergamous		0.924*** (0.006)		1.170*** (0.006)
Hypogamous		1.010*** (0.008)		0.769*** (0.008)
<b>Husband's education (Ref: Middle)</b>				
Hus_Primary and less			1.212*** (0.006)	1.309*** (0.006)
Hus_Junior college			0.538*** (0.012)	0.533*** (0.012)
Hus_Undergraduate and more			0.408*** (0.014)	0.387*** (0.014)
Wife_age	0.972*** (0.001)	0.972*** (0.001)	0.969*** (0.001)	0.972*** (0.001)
Sex_c1 (1 = male)	0.884*** (0.005)	0.884*** (0.005)	0.891*** (0.005)	0.891*** (0.005)
Constant	1.057*** (0.017)	1.065*** (0.017)	1.162*** (0.017)	1.073*** (0.017)
Log-Likelihood	-404307.85	-404218.3	-405971.75	-404590.78

Note:

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

ity of the second birth occurring at any specific time point for the respective group compared to the reference group.

Table 4.2 shows distinctive educational gradients in the second birth progressions among the four models. There is a cut-off point of junior college, which lowers the probability of a second birth progression to nearly a half, looking at either wives' (model 1, relative risk of 0.49 for junior college vs. middle education) or husbands' educational level (model 3, r.r = 0.54 for junior college vs. middle).

Another consistent pattern found in these four models is that having a firstborn son was associated significantly with a lower second-childbirth hazard (a relative risk of around 0.89 in all four models), presumably due to son preference and concern over parental investment. Already having a son lowers the probability of having a second child, potentially because couples may feel they have already fulfilled the responsibility of "carrying on the family blood lineage". What's more, it may also be possible that some parents believe that they need to provide the son with a house and a car so that the son can get married and establish their own family (but not for the daughter). Thus, being afraid of a large amount of parental investment, they may not proceed with a second child, given the first child is already a son.

As for educational pairing status, model 2 suggests that when holding the wife's education level constant (reference group: middle school), women who marry up in education are less likely to have a second birth than those in homogamous relationships (r. r of 0.92). In this case, since the reference group for the wife's education level is middle school, marrying up would be those with a husband of at least more than junior college. This may only suggest that those couples with a middle-educated wife and a college-educated husband have a lower progression rate to second birth than couples with both middle education. More detailed results for other types of hypergamous groups (e.g., "she low-he middle") compared with homogamous groups or hypogamous groups will be discussed in the later nine educational pairing group model.

Model 4 suggests that, when holding the husband's educational attainment constant at the middle school level, hypergamous couples are more likely to have a second birth than homogamous couples; hypogamous couples are less likely to have a second birth than homogamous couples. This seems to be consistent with H3.

### 4.3 Hazard ratios for nine educational pairings groups

Figure 4.2 illustrates Hazard Ratios (HR) corresponding to various educational pairings groups, controlling for the wife's age and the gender of the first child, as in previous models. In this figure, each point represents the hazard ratio and the confidence interval for a specific educational pairing, with the dashed red line indicating the hazard ratio of 1 (reference group: both middle).

The figure indicates that irrespective of the specific educational pairing, couples featuring at least one member with a high level of education (i.e., junior college or beyond) exhibit a reduced likelihood of experiencing a second birth compared to couples with only combinations of middle or low education. Homogamous lower-educated couples ("both low") displayed the highest second birth rates compared to all other pairing categories.

Specifically, within the subset of couples featuring at least one college-educated individual, highly educated homogamous couples manifest the lowest probability of a second birth. In contrast, hypergamous couples, characterized by a college-educated husband and a wife with moderate education ("she middle-he high"), demonstrate a higher likelihood of a second birth than their hypogamous counterparts ("she high-he middle"). These support H1b and reject H1a, while H3 was partly supported, except for the likelihood sequence for the homogamous groups.

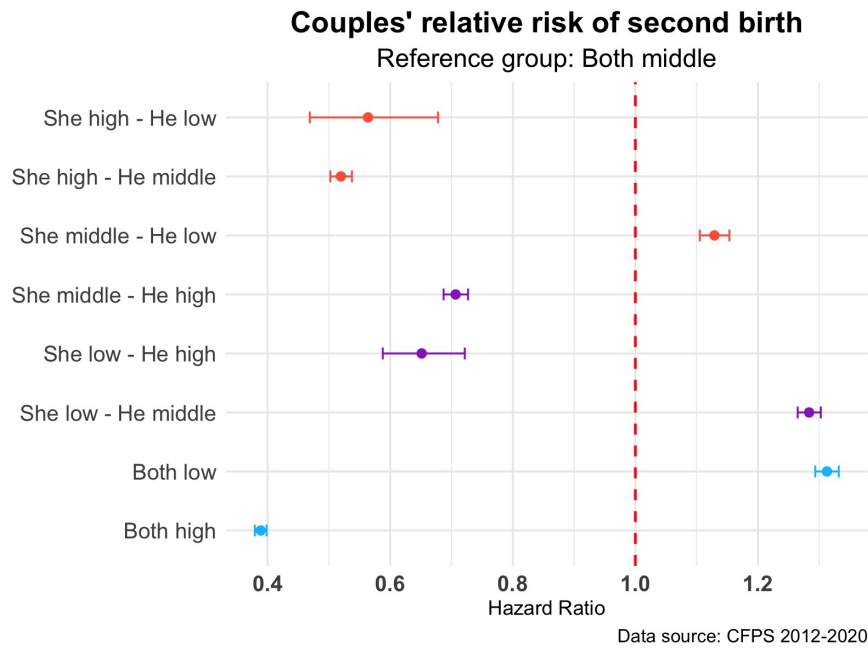


Figure 4.2: Hazard Ratios for nine educational pairings of couples (reference group: both middle).

Consistent with my hypotheses (H2), couples with both low education levels, followed closely by hypergamous "she low-he middle" pairs, exhibit the highest propensity for transitioning to a second birth. Then, the lower educated hypogamous "she middle-he low" couples followed, with a higher second birth progression likelihood than the homogamous middle-educated couples.

Since couples with long educational distances are rare (i.e., "she low - he high" and "she high - he low"), the confidence interval for these two groups is relatively wide, overlapping with other pairing groups. Thus, I did not discuss their results here.

In sum, the overall pattern highlights that while the assortative pairing status remains impactful, the effect builds upon the significance of the educational gradient itself for the progression to a second birth. Among heterogeneous couples featuring at least one highly educated partner, a recurrent trend emerges wherein hypergamous couples tend to display a higher likelihood of transitioning to a second birth when compared to hypogamous couples. The same trend also applies among couples with at least one lower-educated partner, i.e., hypergamous couples (she low - he middle) have a faster transition to a second birth than hypogamous couples (she middle- he low). Consequently, the overall relationship between educational pairing and progression to second birth in China contrasts what was predicted by the resources pooling theory and what was consistently tested in the Western world.

## 5 Conclusions and Discussions

This research sought to investigate the relationship between educational attainment and progression into second birth in China from a couple's perspective. Using five waves of CFPS data, this study confirms that educational pairing did play a role in couples' transition to a second child. However, the effect of educational pairing status builds upon the significance of the educational gradient itself. With a negative relationship between educational attainment and second-birth risks, the findings in China contradicted those in Western societies, denying the relevance of the resource pooling theory.

The results show that couples with the highest combined educational attainment ("both high" group) had the lowest second birth risks. In contrast, couples with the lowest combined educational attainment ("both low" group) had the highest second-birth risks. Generally speaking, China still has a negative educational gradient in fertility. Much remains to be explored about why highly educated homogamous couples are reluctant to have a second child. The findings in this study correspond to a previous study using Hong Kong Census data (Sun & Zhao, 2022).

Furthermore, this study partly supports the specialisation model in China. Among the "high-middle" educated combination, hypergamous couples are more likely to have a second birth than hypogamous couples; the same goes for the "middle-low" combination. The results suggest that women's education drives down the second birth risk more than men's. This may be attributed to higher opportunity costs for better-educated women, and potentially a higher level of discrepancy in gender ideologies and expectations in the division of housework and childcare among hypogamous couples.

However, some limitations should be noticed when interpreting the results of this study. First and foremost, the results are descriptive associations rather than causal effects. More effort should be made to investigate the causal mechanisms underlying the association found in this study. Secondly, holding a couple's perspective, this study only concerned those married and staying in their first marriage, disregarding those divorced, remarried, and ignoring the selection processes into partnership.

Furthermore, this study did not include the control of transition to first birth. Given that during the study period, Chinese society can still be characterised as a "universal marriage and universal childrearing" society, there may be less selection effect in whether couples have a first birth or not (Yu & Xie, 2022). However, there may still be substantial differences in age at first birth among couples with different educational pairing statuses, which may subsequently influence the progression into the second birth. Later research effort may consider using the recurrent event history modelling of first and second-birth transition with a frailty term to control unobserved couple-level heterogeneity (Nitsche et al., 2020). Such models are believed to be better than adding women's age at first birth as a control variable in event-history models predicting the time to next birth, given that the time squeeze effect, if present, may be further exacerbated (Kreyenfeld, 2002; Nitsche et al., 2020). Moreover, modelling first birth and second birth together by adding a common frailty term can also provide the benefit of accounting for the unobserved factors that could affect fertility, e.g., partners' fecundity, psychological and physical traits, thus obtaining a "cleaner" effect. This study plans to devote more effort to fit such a model.

In addition, focusing on the progression to second birth, this study did not discuss potential differences in childbearing and childrearing preferences, values and beliefs among different educational assortative pairing groups. We still know less about whether the lower second birth risks are due to lower fertility intentions or more substantial barriers to realising fertility intention, as well as the levels of consensus among couples with different pairing statuses. Also, this study failed to distinguish the rural and urban samples. Further effort will be made to incorporate such considerations to dig more into the driving force among the patterns found in this study. (Preliminary descriptive tables can be found in the APPENDIX).

Influenced by the COVID-19 pandemic, the current unstable housing market and declining economic opportunities among young adults in China urge more research efforts to discuss how such new challenges will influence family formation and child-bearing decisions among young adults with different levels of socioeconomic resources. As more developing countries are expected to reach below-replacement fertility levels in the near future, there is a compelling need for future research to understand better the effect of couples' education on fertility and help address the policy challenges posed by lowest-low fertility.

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## APPENDIX

### Fertility behaviour and attitudes among different educational pairing groups

Table 5.1: Number of couples and average number of children for each educational mating group (CFPS 2018)

Pairing	N	%	nkid
both high	1095	6.60	1.05
both low	5348	32.24	2.22
both middle	4559	27.48	1.52
she high-he low	35	0.21	1.26
she high-he middle	494	2.98	1.13
she low-he high	114	0.69	1.82
she low-he middle	3045	18.36	2.01
she middle-he high	626	3.77	1.30
she middle-he low	1272	7.67	1.66

Table 5.2: Fertility preferences for husbands and wives in each pairing group (CFPS 2018)

Pairing	nkid <sub>hus</sub>	nkid <sub>wife</sub>	nboy <sub>hus</sub>	nboy <sub>wife</sub>	ecof <sub>hus</sub>	ecof <sub>wife</sub>
both high	1.76	1.70	1.00	0.89	3.08	3.24
both low	2.33	2.42	1.35	1.36	2.99	3.04
both middle	1.91	1.90	1.10	1.01	3.08	3.27
she high-he low	2.80	1.84	1.25	0.94	3.80	3.37
she high-he middle	1.80	1.63	1.02	0.88	3.34	3.26
she low-he high	2.82	2.04	1.68	1.09	3.39	3.30
she low-he middle	2.19	2.24	1.24	1.23	3.11	3.11
she middle-he high	1.89	1.84	1.10	0.97	3.13	3.12
she middle-he low	1.98	2.02	1.13	1.05	3.04	3.16

Using the survey questions regarding fertility preferences in CFPS2018, this section preliminarily explores potential differences in fertility behaviour and attitudes among educational pairing groups. Table 5.1 shows that the "both low" group has the highest average number of children (nkid = 2.22), followed by the "she low-he middle" group (nkid = 2.01). In contrast, the "both high" group has the lowest average number of children (nkid = 1.05). The "she high-he middle" combination has a relatively low average number of children (nkid = 1.13) while its hypogamous counterpart - the "she middle-he high" combination has a higher average number of children (nkid = 1.30).

Table 5.2 presents the fertility preferences for husbands and wives in each pairing group, regarding the ideal number of children, the ideal number of sons ("How many sons you want?") and the importance of economic factors in deciding whether to have a child ("How important is the child support payments in your decision to have a child or not?", 1= no influence to 5= highly important).