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Can China's two-child policy reverse fertility decline? An in-depth analysis of fertility behavior and desires

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Abstract

This study utilizes data from the 2014 and 2018 waves of the China Family Panel Studies (CFPS) and applies Difference-in-Differences (DID) and Propensity Score Matching-Difference-in-Differences (PSM-DID) methods to conduct an in-depth analysis of the impact of the universal two-child policy on fertility behavior and family fertility desires in China. The results indicate that although the universal two-child policy aims to increase birth rates, its effects have fallen short of desires. The relaxation of policy restrictions did not significantly encourage families to have a second child and even reduced the desired number of children per family. This study further reveals the complexities and heterogeneity in the policy's implementation, influenced by intersecting economic, social, and cultural factors, thus providing a new perspective for understanding the impact of the universal two-child policy. *(Afr J Reprod Health 2025; 29 [9]: 74-90).*

Keywords: Universal two-child policy; Fertility behavior; Fertility desires; Family decision-making

Résumé

Cette étude utilise des données issues des vagues de 2014 et 2018 du China Family Panel Studies (CFPS) et applique les méthodes de différences-en-différences (DID) et d'appariement par score de propension combinée aux différences-en-différences (PSM-DID), afin d'analyser en profondeur l'impact de la politique universelle des deux enfants sur le comportement de fécondité et les désirs de fécondité des familles en Chine. Les résultats indiquent que, bien que la politique universelle des deux enfants vise à accroître le taux de natalité, ses effets sont restés en deçà des attentes. L'assouplissement des restrictions politiques n'a pas encouragé significativement les familles à avoir un deuxième enfant et a même réduit le nombre désiré d'enfants par famille. Cette étude révèle en outre la complexité et l'hétérogénéité dans l'application de cette politique, influencée par l'interaction de multiples facteurs économiques, sociaux et culturels, offrant ainsi une nouvelle perspective pour comprendre les effets réels de la politique universelle des deux enfants. *(Afr J Reprod Health 2024; 29 [9]: 74-90).*

Mots-clés: : Politique universelle des deux enfants ; Comportement de fécondité ; Désirs de fécondité ; Prise de décision familiale

Introduction

In the global context of population management policies, China's family planning program has been notably impactful. Implemented initially in 1979, this policy rigorously restricted most Chinese families to having only one child, significantly shaping the nation's demographic structure. As a fundamental national policy, family planning has profoundly shaped China's population structure and growth patterns.

According to statistical data, China's total fertility rate (TFR) has plummeted from an initial 5.8 in the 1970s to just 1.69 in 2010, reaching as low as 1.0 by 2023, with only 9.02 million births that year. This sharp decline signifies a rapid transition in China from high to low fertility rates, with birth rates now at their lowest in six decades. Lutz and Skirbekk suggest that when a nation's TFR falls below 1.5, it may be trapped in a prolonged state of low fertility, making a natural rebound difficult—a phenomenon known as the "low-fertility trap."[1] With persistently declining fertility and increased longevity, the issue of population aging in China has intensified markedly.

The population aged 60 and above increased significantly, expanding from 127.5 million in 2000 to 296.8 million by 2023, underscoring China's rapid demographic aging relative to global standards. Rapid aging and a skewed sex ratio pose significant challenges to China's socioeconomic development, including a

shrinking labor market and an increased burden on the elderly support system.[2]

To address these demographic issues, China started to gradually relax its family planning regulations in 2013, initially allowing couples to have two children if one of the spouses came from a one-child family. This adjustment theoretically opened possibilities for higher fertility rates; however, its impact fell short of desires. By June 2015, among the 11 million people eligible for the selective two-child policy, only 1.53 million applied to have a second child, representing 13.9% of eligible applicants nationwide.[3] As a further response, the Chinese government implemented a nationwide universal two-child policy effective from January 1, 2016, substantially relaxing previous birth control measures. This policy shift marked the end of the nation's strict one-child policy, which had lasted approximately four decades, and signified an important strategic change in China's approach to population regulation.[4] This phased implementation offers a valuable quasi-natural experiment for causal inference. The 2013 selective two-child policy had already relaxed restrictions for families where at least one spouse was an only child. Therefore, the subsequent 2016 universal two-child policy primarily impacted families where neither spouse was an only child. This distinction allows for the construction of a credible control group and a treatment group, providing a rigorous framework to assess the universal policy's true impact beyond secular trends.

The social effects of the universal two-child policy have sparked extensive academic attention and debate, with some scholars arguing that the policy's influence on fertility is diminishing, potentially relevant to China as well.[5] From a macro-level perspective, Zhai *et al.* applied modeling techniques to project that, compared with the previous strict one-child policy, the universal two-child policy might increase the size of China's working-age population (15–59 years old) by about 50 million by 2050 and concurrently reduce the proportion of elderly individuals by around three percent.[6] Nevertheless, Zeng and Hesketh contended that despite the universal two-child policy's potential to positively influence China's demographic structure and labor market over the long term, its short-term effectiveness may remain modest, potentially taking around twenty years to become fully evident.[2]

From a micro-level perspective, Wang and Sun observed that although the universal two-child policy created a relatively favorable environment for having children, economic pressures and high living expenses played a more decisive role in fertility choices than other factors, thereby weakening the policy's actual effectiveness in promoting higher fertility rates.[7] Song indicated that the two-child policy contributed to mitigating the reduction in women's lifetime fertility rates. Although the policy notably influenced decisions regarding second-child births, it was inadequate in substantially elevating period fertility rates.[8] Clearly, scholarly debates continue regarding the effectiveness of the universal two-child policy.

On the micro level, in the formation of fertility decisions, although women are the direct agents of childbirth, fertility choices are often a complex negotiation involving multiple family members and based on individual preferences and interests. Numerous studies suggest that fertility decisions are not solely the mother's choice but rather a collective decision involving spouses, family, and sociocultural factors.[9-11]Therefore, evaluating the universal two-child policy through the lens of family-level decision-making could yield more comprehensive insights into its real-world effectiveness. Furthermore, while existing studies predominantly emphasize observed fertility behaviors, fertility intentions typically precede actual reproductive decisions within intricate family dynamics. Given that fertility intentions significantly predict actual fertility outcomes,[12-15] examining fertility intentions constitutes a central component of this research.

Based on the above analysis, this paper will explore changes in fertility behavior and family fertility desires following the implementation of the universal two-child policy, further analyzing its differential effects on families of various residential locations, regions, and income levels. This systematic analysis aims to provide scientifically grounded policy recommendations and references for improving China's future population policies.

Literature review

Related theories

Leibenstein was among the first to introduce a microeconomic analytical framework into fertility studies, proposing a "cost-utility" theory regarding children. According to this theoretical perspective, the costs associated with having children comprise both direct and indirect components.

Direct costs involve all parental expenditures from pregnancy until the child becomes independent, whereas indirect costs represent the forgone opportunities related to education and income generation due to child-rearing responsibilities. The utility aspect includes consumption utility, labor or income utility, security utility, and family utility and so on. Essentially, in deciding to have children, families weigh the utility derived from children against the costs associated with raising them.[16] Easterlin further elaborated on this theoretical framework by proposing a comprehensive fertility model grounded in a supply-demand perspective, which incorporates both economic and non-economic considerations. His model consists of three central elements: the desired number of children (demand), the potential fertility level (supply), and the costs associated with fertility regulation.[17]

Easterlin stressed that the equilibrium between the demand for and supply of children significantly determines motivations for fertility regulation, highlighting that modernization elements—including education, urbanization, and advances in fertility-control methods—play crucial roles in altering this supply-demand dynamic.[18] Becker using consumer choice theory, analyzed fertility behavior as a rational decision-making process for couples. The demand for children within a household is closely associated with the parents' economic resources, child-rearing expenditures, and expected returns from investments in children's human capital. Hence, from a theoretical standpoint, relaxed fertility regulations may lead to a greater number of children, potentially increasing parents' sense of security and overall family benefits, yet simultaneously elevating child-rearing expenses. Consequently, parents typically consider multiple dimensions when making optimal fertility decisions.[19,20]

Therefore, the theoretical impact of fertility policy adjustments on family fertility behavior and fertility desires is uncertain and necessitates further empirical research.

Impact of fertility policies

From the perspective of fertility behavior, some scholars believe that fertility policies, as significant institutional factors, can even decisively influence residents' fertility behaviors.[21] De and Tenreyro emphasized that restrictive fertility policies have significantly reduced birth rates globally, especially in developing countries.[22] In the Chinese context, sustained implementation of population control measures, particularly the strict one-child policy, has substantially contributed to the decline in fertility rates.[23] Likewise, restrictive birth-control policies implemented in Vietnam have markedly decreased women's fertility rates.[24]

Nevertheless, some studies indicate that the effectiveness of such policy interventions on family fertility is ambiguous.[25,26] Thévenon and Gauthier reviewed studies examining family policy impacts on fertility across European and OECD nations, concluding that although these policies influence fertility decisions, their overall effects tend to be relatively modest.[27] Additionally, due to difficulties in assessing the consistency and long-term effects of these policies, the impact may be underestimated.

From the perspective of fertility intentions, Merli and Morgan revealed the long-term influence of restrictive fertility policies, showing that although fertility policies have been relaxed, the majority of people have not increased their fertility intentions.[28]

However, other studies have drawn more optimistic conclusions, indicating that relaxed fertility policies, especially those supporting the "earner-carer" role, have a positive relationship with people's fertility intentions.[29] In a comparative study covering 20 European countries, Harknett *et al.* found that policies supportive of family life were positively associated with people's intentions to have additional children beyond their first child.[30]

Other factors influencing fertility

Beyond policy factors, numerous other elements can influence family fertility behavior and

fertility intentions. From a demographic perspective, age affects individuals' fertility intentions and capacities. There exists an optimal age range for reproduction, and as age increases, natural fertility rates gradually decline. Women generally begin to lower their fertility intentions after age 30 as their reproductive window narrows.[15] Furthermore, economic pressures, psychological needs, and shifts in social environments vary across age groups, all of which impact fertility intentions and behavior.[31] Educational attainment is widely recognized as a significant factor influencing fertility decisions. Generally, individuals, especially women, with higher education tend to delay childbirth and have smaller families. Moreover, women with advanced educational levels often end up having fewer children than they originally intended.[32,33] Health issues are another important factor affecting fertility decisions and birth rates, especially for women.[34,35] In particular, health complications arising from abortion can hinder the realization of fertility intentions.[36] Other factors, such as life events, quality of life, and life stressors, may also be potential influences on fertility.[37]

From a socioeconomic perspective, at the macro level, urbanization is a major factor reducing fertility intentions.[38] During urbanization, the establishment and improvement of social security systems also significantly impact fertility motivations. Leibenstein observed that as social security systems develop, the traditional reliance on children for old-age security diminishes, potentially leading to lower fertility intentions.[16,39] Coeurdacier suggested that strengthening social security may offset the increases in fertility that relaxed birth policies are expected to promote.[40]

At a more micro level, personal income is a key factor determining fertility decisions.[34] Some studies indicate that higher annual wages and good career prospects may encourage fertility, whereas job instability can reduce fertility intentions among younger individuals.[41,42] However, other views suggest that an increase in income may actually lower fertility intentions, especially for high-income women.[22] Additionally, housing, as a significant component of family assets, plays a critical role in Chinese marriage culture; young people often consider home ownership a prerequisite for childbearing. Those living in single-family homes tend to have higher fertility intentions than those in apartments, possibly due to differences in living space and housing conditions.[43] Cultural factors also play an important role. Given China's deeply rooted cultural preference for sons, families whose first child is a daughter often show a stronger desire for additional children.[44] Moreover, factors such as debt, childcare costs, childcare subsidies, internet technology, political sanctions, and transfer payments also affect fertility to varying degrees.[45,46]

In summary, while existing theories offer an in-depth understanding of how policies impact fertility, the integration of these theories and studies provides a multi-dimensional analytical framework for this research. However, empirical studies reveal uncertainty, complexity, and controversy regarding policy effects. Therefore, by integrating established theoretical frameworks and prior empirical findings, this study investigates the influence of the universal two-child policy through the lens of family-based decision-making, examining its effects on both actual fertility behaviors and underlying fertility intentions

Methods

Data sources

This study utilizes data derived from the China Family Panel Studies (CFPS), a nationally representative, multidisciplinary longitudinal survey administered by Peking University. The CFPS employs a multi-stage probability sampling strategy involving implicit stratification, with each sampling frame selected via a three-stage procedure. The representativeness and data quality of the CFPS sample have been widely recognized.[47]All participants in the CFPS are required to sign an informed consent form, and the survey has been approved under the approval number IRB00001052-14010.

This research adopts the nationwide implementation of China's universal two-child policy in 2016 as a quasi-natural experiment to assess its effectiveness in promoting family fertility

behavior and fertility desires. Given that the official implementation date of the policy was January 1, 2016, and the proximity of the 2016 survey data collection to this date could compromise accuracy, data from 2014 and 2018 were specifically selected to ensure precise evaluation of the policy's impact.

The treatment and control groups were first established. Since the universal two-child policy mainly targets one-child families where neither spouse is an only child (the "selective two-child" policy implemented in 2013 allowed two children if one spouse was an only child), this study uses families with one child in 2014 and either one or two children by 2018 as the research sample. The treatment group includes families where neither spouse is an only child, referred to as "non-only-child families," while the control group includes other families within the sample, referred to as "other families."

The primary focus of this study is on the potential impact of the two-child policy on families that already have one child. Therefore, within the eligible families for the policy, the mother should be of reproductive age, and both spouses should meet the legal marriage age. The reproductive age for women is defined as 15 to 49 years, with a legal marriage age of 20 for women and 22 for men. Accordingly, when selecting the sample, this study specifically includes women aged 20 to 45 in 2014 and men aged 22 and above. Based on these screening criteria, the final two-year sample size consists of 1,197 couples.

Variable selection

To investigate the impact of the universal two-child policy on Chinese family fertility behavior and family fertility desires, this study sets a series of variables to precisely evaluate the policy's effects. The dependent variables include "Had second child" and "Family desired number". "Had second child" is a binary variable, where 1 represents having had a second child and 0 represents not having had one. "Family desired number" records the average number of children that both spouses expect to have. The explanatory variables encompass demographic characteristics, socioeconomic factors, and other relevant aspects to comprehensively reflect the factors influencing family fertility decisions. These control variables were selected based on the established theoretical frameworks and empirical findings discussed in the literature review, which identify key demographic characteristics, socioeconomic factors, and family support systems as significant determinants of fertility decisions.[48-52] This integrated analysis of variables not only enhances the rigor of the study but also provides a solid data foundation for understanding and interpreting the actual effects of the universal two-child policy. "For a more detailed variable setup, refer to Table 1"

Model setup

The main analytical method adopted in this study is the Difference-in-Differences (DID) model, widely utilized for policy evaluation. DID assesses the impact of a policy by comparing variations within an affected group (treatment group) before and after the policy intervention, relative to simultaneous variations within an unaffected group (control group). By doing so, it isolates and measures the net causal effect attributable to the policy implementation.

To measure the effects of the universal two-child policy on families' decisions to have a second child and their desired number of children, two dummy variables were constructed in this study:

$$\lambda_i = \begin{cases} 1 \text{Families with non-only child parents} \\ 0 \text{Others} \end{cases}$$

$$\mu_t = \begin{cases} 1 \text{Post-policy implementation} \\ 0 \text{Pre-policy implementation} \end{cases}$$

In this study, variable λ_i represents the group dummy, where 1 indicates the treatment group (families where neither spouse is an only child) and 0 indicates the control group (other families). Variable μ_t is the time dummy, with a value of 0 prior to the implementation of the policy in 2014, and a value of 1 after the policy's implementation in 2018. Based on these categorizations, the regression equation constructed using the Difference in Differences (DID) model is as follows:

$$Y_{it} = \alpha + \beta DID_{it} + \varphi X_{it} + \lambda_i + \mu_t + \varepsilon_{it}$$

In the equation, Y_{it} represents the dependent variables, which are "Had second child" and "Family desired number", α is the constant term. DID_{it} represents the dummy variable indicating

the impact of the Universal Two-Child Policy, with its coefficient reflecting the level of policy effect. X_{it} denotes a series of control variables

Furthermore, to verify the robustness of our findings, this study adopts the Propensity Score Matching-Difference-in-Differences (PSM-DID) approach initially proposed by Heckman *et al.*[53] The PSM procedure is applied prior to policy intervention to match treatment and control groups based on their propensity scores, thereby ensuring comparability and achieving balance on critical covariates between the two groups.This helps to overcome potential model specification errors in the traditional DID method, making the common trend assumption more reliable. The empirical analysis in this study is conducted using Stata 17 software.

Results

Descriptive statistics

The descriptive statistical results indicate substantial variations between the treatment and control groups across several critical dimensions. Specifically, significant differences are observed concerning the likelihood of having a second child, family desired number of children, urban or rural residence, residential region, age of the first child, ages of both spouses, highest education level in the family, grandparental caregiving, and household income. Conversely, families in the treatment group reported a significantly higher average desired number of children than those in the control group ($p<0.01$), suggesting that treatment group families may exhibit greater openness to additional childbirths. Furthermore, significant differences emerged regarding the age-related variables. The average age of the first child in the treatment group (12.493 years) was significantly higher compared with that in the control group (9.812 years). In the analysis of spousal ages, the average age of husbands in the control group is 36.458 years, compared to 39.156 years in the treatment group, while the average age of wives in the control group is 34.506 years, compared to 36.945 years in the treatment group. These age differences are statistically significant at the 0.01 level. Regarding education level, the highest level of education attained in the control group is significantly higher than in the treatment group ($p<0.01$). Additionally, 32.47% of families in the control group receive caregiving assistance from grandparents, compared to only 17.21% in the treatment group. Household income is also significantly higher in the control group than in the treatment group ($p<0.01$). In summary, the significant discrepancies identified across multiple core variables between the treatment and control groups underline the necessity for further rigorous analyses to accurately estimate the policy's impact (Table. 1).

Result of basic DID method

The present study applied a Difference-in-Differences (DID) approach to investigate the impact of the universal two-child policy on second-child fertility behaviors and desired family size. Models M1 and M2 examined whether the universal two-child policy influenced the probability of couples having a second child. For the benefit of a wider international audience, it is useful to note that an Odds Ratio (OR), used here to interpret the binary outcome "Had second child," represents the likelihood of an event occurring; an OR greater than 1 suggests an increased probability, while an OR less than 1 suggests a decreased probability. Initially, Model M1 was estimated without including any control variables to preliminarily assess the policy's direct effects. Results revealed no statistically significant association between the universal two-child policy and the decision to have a second child (OR=0.997, $p>0.1$).

Subsequently, control variables were incorporated into Model M2, yet the universal two-child policy continued to exhibit no statistically significant effect (OR=0.968, $p>0.1$). Notably, regional differences emerged, with families residing in the western regions exhibiting a significantly lower probability of having a second child compared to those in eastern regions (OR=0.424, $p<0.01$). Additionally, the ages of both the husband (OR=1.112, $p<0.01$) and the wife (OR=1.163, $p<0.01$) significantly increased the likelihood of having a second child. Models M3and M4 analyzed the policy's effects on family fertility desires.

Table 1: Variable definition and descriptive statistics

Variables	Variable definition	Categories	Control		Treat		Differences
			Freq.	Mean/Dist. (%)	Freq.	Mean/Dist. (%)	
Dependent variables							
Had second child	It indicates whether the couple has had a second child.	Yes	258	83.77	667	75.03	0.087***
	1 = Yes, 0 = No	No	50	16.23	222	24.97	
Family desired number	It indicates the number of children a family desires, calculated as the average of the desired values from both spouses.	Numerical	308	1.623	889	1.736	-0.113***
Independent variable							
DID	It is an interaction designed to capture the treatment effect. It is the product of the variable indicating membership in the treatment group (treat) and the variable for the post-intervention period (post). 1=The couple is in the treatment group and the year is after policy implementation, 0 = Otherwise						
Control variables							
Residence	It indicates the couple's place of residence.	Yes	92	29.87	349	39.26	-0.094***
	1 = Rural, 0 = Urban	No	216	70.13	540	60.74	
Region	It indicates the geographical location of the couple's residence within China.	Eastern	238	77.27	445	50.06	-0.389***
		Central	28	9.09	219	24.63	
	1 = Eastern, 2 = Central, 3 = Western	Western	42	13.64	225	25.31	
Age of first child	It indicates the actual age of the first child.	Numerical	308	9.812	889	12.493	-2.681***
Gender of first child	It indicates the gender of the first child.	Male	173	43.83	543	61.08	-0.049
		Female	135	56.17	346	38.92	
Husband's age	It indicates the actual age of the husband.	Numerical	308	36.458	889	39.156	-2.699***
Wife's age	It indicates the actual age of the wife.	Numerical	308	34.506	889	36.945	-2.438***
Education	It indicates the highest educational attainment between spouses, categorized into three levels.	Low	128	41.56	447	50.28	0.221***
		Middle	67	21.75	235	26.43	
	1 = Junior high school or below, 2 = High school, vocational school, or technical school, 3 = College or above	High	113	36.69	207	23.28	
Property ownership	It indicates whether the couple owns property.	Yes	270	87.66	774	87.06	0.005

	1=Yes, 0=No	No	38	12.34	115	12.94	
Grandparenting	It indicates whether care from grandparents (paternal or maternal) is provided. 1=Yes, 0=No	Yes	100	32.47	153	17.21	0.153***
		No	208	67.53	736	82.79	
Income	It indicates total household income, transformed using the natural logarithm.	Numerical	308	11.101	889	10.885	0.216***
Expenditure	It indicates total household expenditure, transformed using the natural logarithm.	Numerical	308	10.566	889	10.474	0.092
Child education expenditure	It indicates total expenditures related to children's education, transformed using the natural logarithm.	Numerical	308	0.895	889	0.605	0.290*

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Basic DID method results

Variables	(M1)Had second child	(M2)Had second child	(M3)Family desired number	(M4)Family desired number
DID	0.997	0.968	-0.137**	-0.138**
	(0.345)	(0.385)	(0.058)	(0.057)
Treat	0.583**	0.306***	0.181***	0.206***
	(0.143)	(0.090)	(0.041)	(0.042)
Post	1.000	3.863***	0.162***	0.088*
	(0.309)	(1.389)	(0.050)	(0.051)
Residence (ref. Urban)		1.033		0.028
		(0.206)		(0.029)
Region (ref. Eastern)				
Central		0.715		0.100***
		(0.157)		(0.033)
Western		0.424***		0.067**
		(0.089)		(0.032)
Age of first child		1.063*		0.006
		(0.037)		(0.005)
Gender of first child		1.247		0.031
		(0.217)		(0.026)
Husband's age		1.112***		-0.007
		(0.036)		(0.004)
Wife's age		1.163***		-0.017***
		(0.045)		(0.006)
Education (ref. Low)				
Middle		0.780		0.059*
		(0.176)		(0.033)
High		0.752		0.067*
		(0.188)		(0.036)
Property ownership (ref. No)		0.934		0.067*
		(0.247)		(0.038)
Grandparenting (ref. No)		0.753		0.009
		(0.145)		(0.033)
Income		1.189*		-0.004
		(0.105)		(0.014)
Expenditure		1.068		-0.012
		(0.098)		(0.014)
Child education expenditure		1.030		0.004
		(0.039)		(0.005)
Cons	5.160***	0.001***	1.542***	2.384***
	(1.128)	(0.001)	(0.036)	(0.214)
N	1197	1197	1197	1197
R^2			0.021	0.089

M1 and M2 report the Odds Ratio, while M3 and M4 report the coefficients. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Model M3, excluding control variables, and Model M4, incorporating them, both consistently demonstrated that the universal two-child policy significantly decreased families' desired number of children (Coef.=-0.137, p<0.05 in M3; Coef.=-0.138, p<0.05 in M4). Moreover, according to control variables, families located in central (Coef.=0.100, p<0.01) and western regions (Coef.=0.067, p<0.05) reported higher fertility desires relative to those in eastern regions. Furthermore, an increase in the wife's age was negatively associated with family fertility desires (Coef.=-0.017, p<0.01). (Table 2)

Results of the PSM method

Given substantial differences in characteristics between the treatment and control groups, directly applying the Difference-in-Differences (DID) method might inadequately fulfill the parallel trends assumption. This approach may also present issues of sample selection bias and omitted variable problems, potentially leading to endogeneity bias in the estimation results. To enhance the accuracy of the estimation, this study adopts the PSM-DID (Propensity Score Matching-Difference-in-Differences) method for analysis. This approach first employs the PSM method to ensure good comparability between the treatment group and control group after matching, and then applies the DID method to estimate the actual impact of the universal two-child policy on family fertility.

A one-to-four nearest neighbor matching approach was used for sample matching, with detailed balance checks performed to confirm the effectiveness of the matching process. To further confirm the quality of the matching process, this study conducted bias assessments for each control variable before and after matching. The findings demonstrated a substantial reduction in bias for all variables, with no variable exceeding the generally accepted threshold of 10% bias after matching. Additionally, t-tests showed no statistically significant differences between the treatment and control groups in key covariates after matching, indicating that the matching procedure successfully achieved balance and improved comparability between the two groups (Table 3).

Results of PSM-DID method

The estimation results from Model M5 demonstrate that the universal two-child policy does not significantly affect couples' likelihood of having a second child (OR=1.266, p>0.1), aligning with findings from the baseline DID analyses and confirming the stability of the conclusions. Similarly, Model M6 indicates that the policy significantly decreases the number of children families intend to have (Coef.=-0.174, p<0.01).

The consistency of results between the basic DID and the PSM-DID models further validates the robustness of these findings, reinforcing the conclusion that the universal two-child policy has a limited impact on both the actual fertility behavior and fertility intentions of Chinese families within the studied group (Table 4).

Results of heterogeneity analysis

Urban-rural heterogeneity

The estimation results from the heterogeneity analysis by residential location indicate that the universal two-child policy did not significantly influence the likelihood of having a second child for either rural (OR=1.041, p>0.1) or urban families (OR=0.946, p>0.1). Regarding family fertility intentions, Model M8 revealed no statistically significant effect of the policy on the desired number of children among rural households (Coef.=-0.117, p>0.1). Conversely, a significant negative impact emerged among urban households (Coef.=-0.148, p<0.05), suggesting that the universal two-child policy reduced fertility intentions particularly in urban contexts (Table 5).

Regional heterogeneity

The heterogeneity analysis across geographic regions revealed that the universal two-child policy did not significantly affect the probability of having a second child among families residing in eastern (OR=0.997, p>0.1), central (OR=0.825, p>0.1), or western regions (OR=0.999, p>0.1). Concerning fertility intentions, the analysis showed a statistically significant decline in family desired number among households located in the eastern region (Coef.=-0.172, p<0.05).

Table 3: Results of bias reduction in key variables after full sample matching

Variables		%Bias	% Reduct |Bias|	T-test	
				t	P>|t|
Residence	Unmatched	19.8	97.3	2.95	0.003
	Matched	-0.5		-0.11	0.913
Region	Unmatched	50.2	92.0	7.32	0.000
	Matched	-4.0		-0.74	0.459
Age of first child	Unmatched	52.3	98.8	7.70	0.000
	Matched	0.6		0.13	0.895
Gender of first child	Unmatched	10.0	35.1	1.52	0.130
	Matched	6.5		1.37	0.172
Husband's age	Unmatched	49.2	87.9	7.18	0.000
	Matched	6.0		1.25	0.213
Wife's age	Unmatched	48.8	84.3	7.13	0.000
	Matched	7.6		1.56	0.119
Education	Unmatched	-26.0	65.3	-4.02	0.000
	Matched	9.0		1.92	0.055
Property ownership	Unmatched	-1.8	-315.1	-0.27	0.787
	Matched	7.5		1.50	0.133
Grandparenting	Unmatched	-35.8	90.9	-5.72	0.000
	Matched	-3.2		-0.76	0.449
Income	Unmatched	-20.6	77.0	-3.05	0.002
	Matched	-4.7		-0.97	0.332
Expenditure	Unmatched	-8.6	42.8	-1.34	0.179
	Matched	-4.9		-1.16	0.246
Child education expenditure	Unmatched	-12.0	84.4	-1.91	0.056
	Matched	-1.9		-0.43	0.666

Table 4: PSM-DID Results

Variables	(M5)Had second child	(M6)Family desired number
DID	1.266	-0.174***
	(0.221)	(0.054)
Treat	0.267***	0.240***
	(0.086)	(0.047)
Post	3.216***	0.111**
	(0.573)	(0.047)
Residence (ref. Urban)	1.148	0.064
	(0.361)	(0.041)
Region (ref. Eastern)		
Central	0.667	0.097**
	(0.220)	(0.042)
Western	0.448**	0.055
	(0.152)	(0.043)
Age of first child	1.044	0.005
	(0.052)	(0.007)
Gender of first child	1.349	0.037
	(0.352)	(0.037)
Husband's age	1.077	-0.001
	(0.053)	(0.008)
Wife's age	1.171***	-0.019*
	(0.068)	(0.010)
Education (ref. Low)		

Middle	0.706	0.069
	(0.212)	(0.042)
High	0.862	0.054
	(0.322)	(0.049)
Property ownership (ref. No)	0.959	0.029
	(0.344)	(0.050)
Grandparenting (ref. No)	0.644**	-0.008
	(0.144)	(0.034)
Income	1.249	0.023
	(0.226)	(0.030)
Expenditure	1.079	-0.032*
	(0.128)	(0.019)
Child education expenditure	1.065	0.006
	(0.045)	(0.006)
Cons	0.001***	2.170***
	(0.001)	(0.359)
N	825	825
R^2		0.097

M5 reports the Odds Ratio, while M6 reports the coefficients. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

However, no statistically significant policy effect was detected on fertility intentions for families in either the central (Coef.=0.015, p>0.1) or western regions (Coef.=0.001, p>0.1), highlighting regional variations in the policy's effectiveness (Table 5).

Income heterogeneity

The heterogeneity analysis based on household income showed that the universal two-child policy had no statistically significant impact on the likelihood of having a second child among either low-income families (OR=0.991, p>0.1) or high-income families (OR=1.003, p>0.1). Similarly, regarding fertility intentions, the DID estimates indicated that the universal two-child policy did not significantly influence the desired number of children among low-income households (Coef.=-0.145, p>0.1) or among high-income households (Coef.=1.003, p>0.1). These findings suggest limited variation in the policy's effectiveness across different income strata (Table 5).

Discussion

This study conducted a comprehensive analysis of how China's universal two-child policy has influenced both actual fertility behavior and family fertility intentions. The empirical findings partially corroborate prior studies but also highlight certain notable distinctions from existing research. Zhai *et al.* predicted that policy relaxation would significantly increase the likelihood of families having a second child;[6] however, this study does not confirm that expectation, instead partially supporting Wang and Sun's view that economic, social, and cultural factors may have a stronger influence on fertility decisions than policy adjustments alone.[7] Furthermore, the findings suggest that the universal two-child policy not only failed to significantly boost fertility intentions but, in some cases, even reduced the desired number of children, echoing the conclusions of Merli and Morgan that policy relaxation does not necessarily increase fertility intentions across the board.[28] Rising costs of raising children make families less willing to increase their fertility. With more women entering the workforce, the pressure to balance work and family is especially pronounced, particularly in the absence of childcare support. Additionally, young people are increasingly prioritizing personal goals and career development, generally delaying marriage and childbearing, and once they start a family, they prefer to concentrate resources on fewer children.[4,32,54]

This study also considers factors such as housing, education, and income. While previous studies have indicated that the family-friendly environment afforded by homeownership can support fertility rates, this study does not find evidence to support this link.[43]

Table 5: Results of heterogeneity analysis

Variables	Residence				Region						Income			
	Rural		Urban		Eastern		Central		Western		Low		High	
	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20
DID	1.041	-0.117	0.946	-0.148**	0.997	-0.172**	0.825	0.015	0.999	0.001	0.991	-0.145	1.003	-0.123
	(0.649)	(0.110)	(0.514)	(0.066)	(0.537)	(0.075)	(0.830)	(0.145)	(0.908)	(0.129)	(0.592)	(0.092)	(0.557)	(0.074)
Treat	0.528	0.091	0.173**	0.260**	0.194**	0.229**	1.262	-0.134	0.348	0.247**	0.208**	0.182**	0.352**	0.219
	(0.241)	(0.081)	(0.071)	(0.049)	(0.077)	(0.056)	(0.943)	(0.107)	(0.232)	(0.092)	(0.101)	(0.074)	(0.132)	(0.051)
Post	3.461**	0.069	4.647**	0.099*	3.573**	0.131**	5.765*	-0.033	4.645*	-0.063	4.780**	0.054	3.206**	0.126
	(1.934)	(0.098)	(2.309)	(0.058)	(1.687)	(0.064)	(5.409)	(0.137)	(3.996)	(0.121)	(2.626)	(0.083)	(1.592)	(0.065)
Control variables	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
Cons	0.001**	2.192**	0.001**	2.462**	0.001**	2.267**	0.001**	2.241**	0.001**	3.064**	0.001**	2.460**	0.001**	2.452**
	(0.001)	(0.365)	(0.001)	(0.264)	(0.001)	(0.309)	(0.001)	(0.379)	(0.001)	(0.428)	(0.001)	(0.317)	(0.001)	(0.262)
N	441	441	756	756	683	683	247	247	267	267	553	553	644	644
R^2		0.090		0.110		0.066		0.121		0.164		0.110		0.096

The dependent variable for M7, M9, M11, M13, M15, M17, and M19 is 'Had second child,' reporting the Odds Ratio values; for M8, M10, M12, M14, M16, M18, and M20, the dependent variable is 'Family desired number,' reporting the coefficients. Standard errors in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Education is generally regarded as an important predictor of fertility behavior and intentions,[32,33] but in this study, the educational attainment of spouses does not significantly influence fertility. Similarly, although multiple studies have found that income or employment status has either a positive or negative effect on fertility behavior or intentions,[22,41,42] this study does not confirm a similar impact. This divergence from previous literature could be attributable to the unique characteristics of my study's population, that is established one-child families. For these families, the substantial financial and spatial commitments for a first child have already been made. Consequently, the marginal influence of factors like property ownership or educational attainment on the decision to have a second child may be diminished compared to their impact on the initial decision to have any children at all. Additionally, in Confucian culture, there is evidence suggesting a preference for male children, where mothers may be less willing to have more children if the firstborn is male.[44,55]

However, in this study, the gender of the first child does not significantly affect fertility desires. Traditionally, the concept of "more children, more blessings" was widely prevalent in China, with large families symbolizing prosperity, especially in rural areas.[56] Yet, with the implementation of family planning policies and rapid economic development, younger generations' views on fertility have changed significantly. Unlike the previous generation, modern young couples prefer to have fewer children. Thus, the traditional view of "more children, more blessings" has minimal influence on contemporary fertility desires, reflecting the impact of urbanization and other modernization factors on the supply-demand dynamics of children.[17,18]

In the heterogeneity analysis, the universal two-child policy shows varied effects across regions. In economically developed eastern regions with higher living costs and a more modernized lifestyle, couples are less inclined to have a second child, contrasting with findings by Liu *et al.*[57] Additionally, the negative impact of the universal two-child policy on the fertility desires of urban residents is more pronounced, partially supporting Zhou's argument that urbanization is a critical factor in reducing fertility intentions.[38]

In summary, this study systematically examines the universal two-child policy's effects, providing a robust empirical basis that contributes to advancing scholarly understanding of fertility policies and their implications in China.

Conclusion

Although the universal two-child policy aims to increase fertility rates, its actual effects have fallen short of desires, as it has not significantly promoted fertility behavior among couples and has, in fact, reduced the desired number of children per family. Policymakers should fully consider the inhibiting effects of high living costs and modern lifestyles on fertility intentions, especially in urban and economically developed areas. To more effectively encourage childbearing, the government could enhance family support measures, such as expanding public childcare facilities, providing childcare subsidies, and extending paid parental leave, to reduce the costs of childbirth and child-rearing and improve the policy's practical effectiveness.

The empirical evidence presented in this study questions the prevailing scholarly assumption that the universal two-child policy would exert an unequivocally positive influence on fertility outcomes. By adopting a family-based perspective, focusing on the joint role of both spouses in fertility decision-making, and analyzing both fertility behavior and fertility desires, this study provides a more comprehensive understanding of the policy's impact, further enriching the knowledge of its effects.

However, this study has its limitations. Due to data constraints, it may not capture all factors influencing fertility decisions. For instance, individual values and variations in social and cultural backgrounds are not fully reflected in this study, which may affect the interpretation of the results. Future research could use broader datasets and more complex statistical models to verify these findings and further explore other potential factors

influencing fertility behavior and intentions.

In conclusion, China has entered a low-fertility trap, with the phenomenon of only-child families becoming the norm. Although marriage remains common in Chinese society, under the universal two-child policy, young couples still tend to opt for having only one child. The experiences observed in China offer important policy implications for other nations currently facing persistent declines in fertility rates below the replacement threshold

Data availability statement

The data used in this study are publicly available from the China Family Panel Studies (CFPS) at the following link: https://opendata.pku.edu.cn/dataverse/CFPS.

Ethical approval and informed consent

This study is based on secondary data analysis of the China Family Panel Studies (CFPS), a nationally representative longitudinal survey administered by Peking University. The original data collection was reviewed and approved by the Biomedical Ethics Review Committee of Peking University (Approval No. IRB00001052-14010). All data used in this study are de-identified and publicly available for academic research. Therefore, no additional ethical approval was required for this analysis.

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Contribution of Authors

The sole author was responsible for the conception and design of the study, data analysis, manuscript preparation, and approval of the final manuscript.

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