Effect of Public Expenditure on Fertility Intention of a Second Child or More: Evidence from China's CGSS Survey Data[1]

Jiakai Zhang [2]   Xia Li [3]   Jie Tang [4]

Abstract: The aging population problem caused by low intention to give birth has already appeared in China, and it will become more severe in the future. Even if the two-child policy has been gradually implemented, there is still no significant change in the intention to have more children because the cost of living is very high for most households in China. This paper first investigates whether the public expenditures of local governments could significantly affect an individual's fertility intention of a second child or more in China. Our results show that the total government expenditure overall could increase fertility intention. Quantitatively, increasing 10,000 yuan per capita government expenditure would lead to fertility intention rising from 2.357 to 3.407 kids. In addition, Various specific government expenditures also could increase the fertility intention, except for social security expenditures. Finally, we explore the effect heterogeneity of public spending on fertility intention in different aspects. The government's role is still essential for an individual's fertility intention, but the costs and expenses borne by the government to increase the fertility intention will also be not small.

Key Words: Public expenditure, Fertility intention, Two-child policy, China

1   Introduction

The aging population threatens the growth prospects of living standards in many countries, mainly caused by the increasing life expectancy and the declining fertility rate (NRC, 2012). Since the 1980s, an increasing number of developed countries have reached very low fertility levels (Balbo et al., 2013). For this reason, research about fertility has flourished in these countries. It is well documented that fertility intention to have more children is a strong predictor of future fertility behavior (Schoen et al.,1999 ;Bongaarts, 2002; Islam & Bairagi, 2003). Existing studies from the developed countries have focused on how fertility intention is related to factors such as household income, occupation, human capital, marriage age, parenting time affect

[2] Department of Economics, The Graduate Center, City University of New York, New York, NY 10016, USA. E-mail: Jzhang6@gradcenter.cuny.edu

[3] Milano School of Policy, Management and Environment, The New School. E-mail: lix141@newschool.edu

[4] Corresponding Author: Jie Tang; Department of Urban Planning and Management, School of Public Administration and Policy, Renmin University of China. E-mail: cc@ruc.edu.cn

fertility intention, and how public welfare policies can increase fertility intention (Balbo et al., 2013; Bongaarts, 2002; Filoso & Papagni, 2015; Herzer et al., 2012; Thomson et al., 1990; Yang, 2017).

China's fertility has declined dramatically since implementing the one-child policy in the late 1970s and early 1980s. Although China has taken a series of new fertility policies, ranging from the selective two-child policy in 2013, the universal two-child policy in 2016, and the most recent three-child policy in 2021, the fertility rate remains very low. The low fertility intention caused by heavy economic pressure, arising from housing expenses, medical expenses, and educational expenses, rather than the fertility policy, leads to China's low fertility rate. As a result, aging and low fertility rate have become increasingly prominent economic, social, and political issues facing the Chinese government. To solve China's low fertility rate issue, scholars have conducted many studies to understand the influential factors of fertility intention and fertility behavior. However, few studies have explored the factors at the macro-level; in particular, the government's public expenditures might not be very clear about its role in encouraging fertility. Therefore, this paper poses a research question: whether the government expenditure at the local level could effectively change the fertility intention of a second child or more in China? To address the question, we examine the impacts of various government expenditures on individuals' fertility intention of households, using the 2017 Chinese General Social Survey (CGSS) data.

Our econometric results show that the total government expenditure overall could increase fertility intention. Quantitatively, an increase of 10,000 yuan per capita government expenditure would lead to the fertility intention rising from 2.357 to 3.407 kids. In addition, Various specific government expenditures also could increase the fertility intention except for social security expenditures. Finally, we explore the effect heterogeneity of public spending on fertility intention in different aspects. Our findings show that the magnitudes of the impact of government expenditure on the fertility intention of males and households with a boy generally are more significant than that of females and that of families with a girl, respectively. All public expenditures have positive effects on the fertility intention of households with one kid. Only Social security expenditure is negatively and statistically significantly associated with the fertility intention of families without kids. Various specific expenditures positively influence the fertility intention of survey respondents with rural hukou. However, all spending is negatively associated with the fertility intention of survey respondents with urban hukou.

This paper makes contributions to the literature on fertility intention in China in the following two aspects. First, it provides the first empirical evidence, to the best of our knowledge, on the impact of government expenditures on fertility intention. The existing studies on factors related to fertility intention in China have mainly focused on micro-level factors, such as individual's marriage age, educational level, labor participation, gender, living conditions, hukou status, and the number and gender of first child (Deng & Chen, 2020; Jia & Feng, 2015; Ma et al., 2016;

Meng et al., 2016; Qing & Ding, 2015; Song, 2016; Tian et al., 2017; Wang, 2015; Zhang et al., 2016). Other scholars also investigate the impact of social and public policy, such as social security and fertility policy adjustment, on rural residents' fertility intention or migrant workers (Wang & Peng, 2015; Wang, 2015; Tian et al., 2017). However, no one to date has analyzed the relationship between factors at the macro-level, such as government expenditures and their various components, and fertility intention.

Second, our paper adds to the vast body of work on the role of government in household decision-making. The one-child policy restricted the reproductive rights of households, so the fertility intention cannot be identified until the two-child policy gradually have been implemented. The fertility intention generally represents the number of children an individual wants to have without any policy constraints. This paper focuses on the relationship between the fertility intention of a second child or more and various public expenditures of government. Although the public expenditures could positively and statistically significantly affect the fertility intention of survey respondents, the costs and expenses borne by the government will not be small.

The rest of the paper is organized as follows. Section two briefly introduces the institutional background of fertility policy in China. Section three discusses relevant literature. Section four introduces the econometric method and data as well as the main variables of interest. Section five presents the main results and robustness checks. Section six concludes with policy implications.
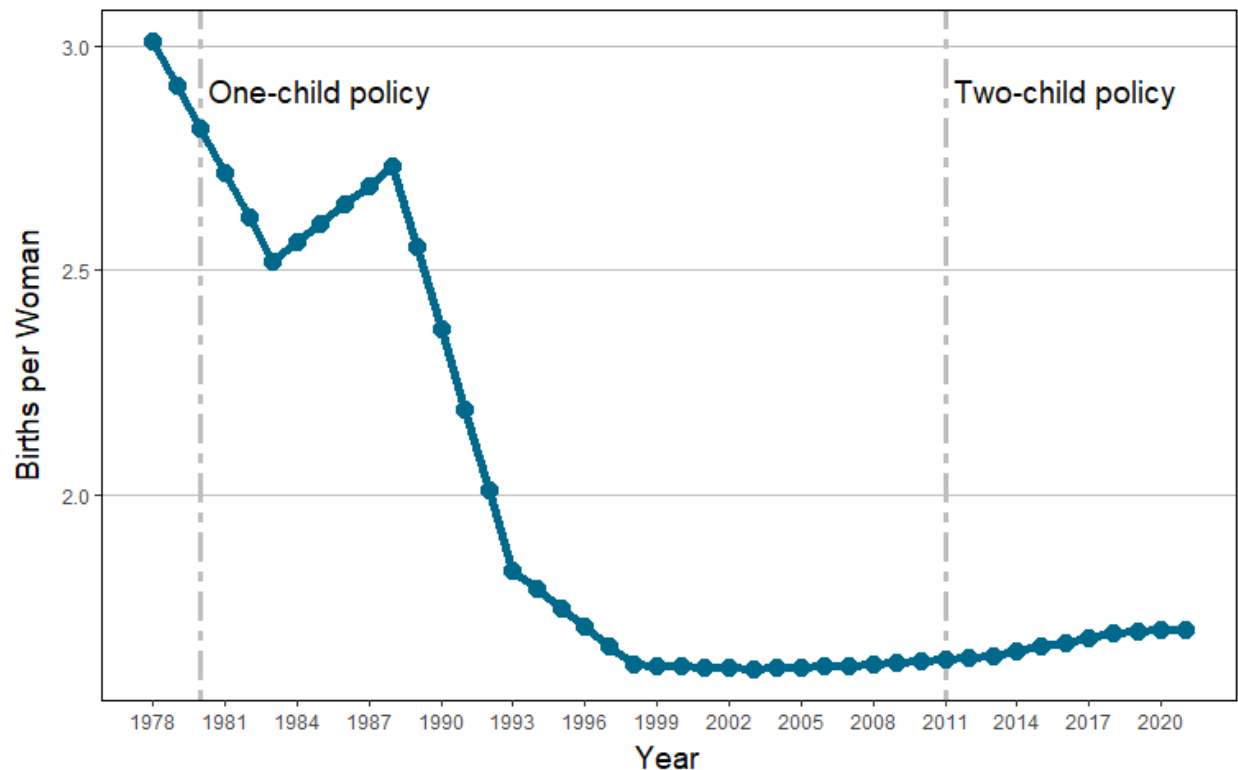
2   Institutional setting

Figure 1 Fertility rate in China between 1978 and 2020

China's fertility rate has been falling for years since the adoption of the one-child policy in 1979. As shown in Figure 1, the fertility rate reached a historically low record in 2003, with 1.61 births per woman. The falling fertility rate, coupled with the increased aging population, raises the Chinese government's fears of a "demographic timebomb," which indicates that a smaller working-aging population has to support a larger, retired population, threatening China's economic growth long-term run.[5] The central government has taken actions to avert the population decline disaster since 2010. In 2011, a married couple could have a second child if both had no siblings. Such policy is often referred to as the "selected two-child policy." Two years later, the selected two-child policy was expanded to married couples if either husband or wife had no siblings. In 2016, the "universal two-child policy" was promoted by the central government, stating that any married couple, regardless of whether they have siblings or not, can have a second child. Unfortunately, the government's move in 2016 failed to reverse the country's falling birth rate, as evidenced by a small increase in the fertility rate from 1.68 per woman in 2017 to 1.70 per woman in 2020.

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[5] Source: https://www.bbc.com/news/world-asia-china-51145251

In May 2021, China announced another major fertility policy shift, which allows couples to have up to three children, aiming at boosting the birth rate as the previous two-child policies have failed to achieve a sustained upsurge in births. Along with the three-child policy are a series of resolutions that hope to reduce the burden of raising a child in China, such as abolishing the "social maintenance fee," urging businesses to protect women's employment rights, encouraging local governments to offer parental leave, cracking down on private education industry, and improving childcare infrastructure.[6] It will take years to assess whether these measures would be effective in increasing fertility intention and behavior.

In addition to the low fertility issue, China also faces a severe aging problem. According to results from the seventh national census, the number of people aged 60 years and older reached 260 million, or approximately 18.7 % of the total population of China. There was a 5.44% increase in the ratio of the aging population above aged 60 years from 2010 to 2020.[7] The United Nations (UN) estimated that the aging population will grow more than threefold and will account for one-third of the national population in 2050, or even earlier.[8]

The low fertility, high life expectancy, and the highest accelerating aging rate change the dynamics of the age structure in China. It also suggests a shrinking youthful population and a decline in the working-age population (Zhang et al., 2012). The *age dependence ratio*, measured by the ratio of the number of people not in the labor force (ages 0-14 and aged 65+) to the number of people in the labor force (age 15-64), had reached 42.2% by 2020. It is projected that the *old-age dependency ratio* will grow from 17% in 2020 to over 50% in 2060, with the *child-dependency ratio* remaining steady between 20% and 30% during the next four decades. [9] The dramatic demographic shift has triggered an urgent alarm for the Chinese government to come up with solutions to address the issue of shortage of productive labor.

3   Literature Review

3.1   Role of Intentions in predicting fertility behavior

The fertility rate of a whole population is determined by individual fertility behavior (Gu, 2011). scholars have used fertility intention to predict fertility behavior, examining the factors that influence fertility intention (Berrington, 2004; Iacovou & Tavares, 2011; Morgan & Taylor, 2006; Schoen et al., 1999; Thomson et al., 1990). Some argue that fertility intention is an effective predictor of actual fertility behavior (Schoen et al., 1999; Bongaarts, 2002), while others point out that there is a systematic gap between intended and actual fertility, which is the main cause of low fertility (Morgan & Taylor, 2006; Liefbroer, 2009). Multiple models and theories have been developed in advanced countries to analyze the relationship between fertility intention and behavior. The first one is the theory of planned behavior (TPB) (Ajzen, 1991),

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[6] Source: https://www.bbc.com/news/world-asia-china-58277473
[7] Source: https://www.chinanews.com/gn/2021-05-11/9475074.shtml
[8] Source: https://www.chinathinktanks.org.cn/content/detail?id=mdh8r179
[9] Source: https://www.statista.com/statistics/251535/child-and-old-age-dependency-ratio-in-china/

suggesting that intentions are influenced by attitudes, subjective norms, and perceived power about whether certain behaviors will have the expected outcomes. The second one is the traits-intentions-intentions-behavior framework (T-D-O-B) developed by Miller and Pasta (1994). This framework suggests that fertility intention is formed from a sequence of motivational traits, which translates into the actual behavior of having or not having a child (Miller, 2011). Morgan and Bachrach (2011) discuss the limitations of TPB in understanding fertility behavior and propose a new theory: the theory of conjunctural action (TCA). They argue that fertility behavior is not the consequence of a series of rational thoughts, instead, it is the result of human brain's processing and formation, consciously or unconsciously, of social circumstances, such as normative expectations and structural factors.

Many Chinese scholars study fertility behavior by focusing on fertility intention because they treat fertility intention as a proxy of actual fertility behavior (for example, Jia & Feng, 2015; Ma et al., 2016; Qing & Ding, 2015; Shi & Yang, 2014; T. Wang & Peng, 2015; Yang, 2015; Zhang et al., 2016; Zhuang et al., 2014)). Jia and Feng (2015) surveyed 558 youths in Nanjing and Baoding city in 2014 to study the second child-bearing intention of couples where both partners were the only child. They found that couples with only children were more likely to have a second child than other couples where neither partner was the only child. Some other scholars have observed the gap between fertility intention and fertility behavior (Mao & Luo, 2013; Shi & Yang, 2014). Despite the inconsistency between fertility intention and fertility behavior, it is well-acknowledged that fertility bahevior is highly correlated with fertility intention, and increasing fertility intention plays a crucial role in improving the fertility rate. Zheng (2014) discussed measurements, validity, reliability, and application of different indicators about fertility intention. Among those indicators, "expected number of children" as the measurement of fertility intention, Zhang argued, is the most appropriate and valid indicator to predict fertility behavior. For this reason, in this study, we use "expected number of children" to measure fertility intention.

3.2   Determinants of Fertility Intention and Fertility Behavior

International and domestic research on the determinants of fertility intention and behavior can be broadly categorized into three levels: determinants at the micro-level, such as an individual, partner, and household social-economic characteristics; determinants at the mesco-level, such as social influence, place of residence, and social capital; determinants at the micro-level, such as economic trends, social and public policies, and institutional constraints (Balbo et al., 2013).

3.2.1   Determinants at the micro-level

Individuals' socioeconomic conditions have been well studied as the main determinants of the fertility of intention and behavior. Willis (1973) and Becker et al. (1990) found a negative relationship between income and the number of children households had. Lee and Mason's (2010) study showed that increased expenditure on children's human capital would decrease fertility. The relationship between education and fertility is mixed. Some found that highly educated women were more likely to postpone marriage and birth due to the opportunity costs of

childbearing (Martin, 2000; Joshi, 2002; Noguera et al., 2003), while others found no significant impact of education on fertility (McCrary & Royer, 2011). Employment status and economic uncertainty were also approved to influence fertility outcomes. Blossfeld et al.(2005) found that youth would defer to starting a family and having children if not in a secure economic situation.

Chinese scholars also found similar results regarding the impacts of an individual's socio-economic conditions on fertility intention. Shi and Yang (2014) and Tan (2015) found that the fertility of bearing a second child would decrease as living and education costs increased. There was a strong negative relationship between education and fertility intention in China, as the higher education attainments a woman achieved, the less likely she would have a child or a second child (Chen & Deng, 2007; Meng et al., 2016; Zhang et al., 2014). Song (2016) and Zhang et al. (2016) found that a higher employment rate of married women would reduce their fertility intention and fertility behavior. In addition, an individual's gender and age were also approved to have significant effects on fertility intention. Zhang et al. (2016) found that within a family where neither wife nor husband was the only child, the husband tended to have a second child while the wife was not. In terms of the influence of age, Li and Zhai's (2014) study found that residents in Beijing from different age groups showed discrepant fertility intention. Mao and Luo (2013) studied married women who were eligible for bearing a second child in Jiangsu Province and found that married women tend not to bear a second child when they perceived their increased age had led to lower fertility ability. The sex composition of children has a significant effect on the probability of having more children, which is particularly obvious in the context of China. Many scholars have found that families with the first child as a girl are much more likely to have a second child (Mu & Xie, 2014; Tan et al., 2010; Shi & Yang, 2014; Zhang et al., 2016).

3.2.2 Determinants at the meso-level

Balbo & Mills (2011) studied the factors associated with fertility intentions in France, Germany, and Bulgaria and found that social pressure from friends or family members who had another child would increase an individual's fertility intention to have more children. Studies from Chen and Deng(2007), Li and Zhai (2014), and Jia and Feng (2015) all suggested that couples with siblings who had more children increased the couples' intention to have a second child. Fertility intention differences by residence, especially between urban and rural areas, persist across countries and time. Wang (2015) analyzed the fertility intention from 2011 to 2013 using the Chinese Family Happiness Survey and found that rural fertility intention was higher than urban fertility intention, consistent with the historical trend. Another important factor at the meso-level is social capital, which suggests that a strong supportive network relationship, especially support from family provided to mothers, will significantly increase an individual's fertility decision-making (Bühler & Fratczak, 2007; Harknett & Hartnett, 2011). Deng and Chen (2020) found that having support from a couple's parents is the key condition of a young couple to have a second child.

3.2.3 Determinants at the micro-level

Many studies in advanced countries focus on the micro-level factors on fertility intention, including economic trends, social and public policies, and welfare regimes. For example, Martin (2002) ound a positive relationship between economic growth and fertility in Australia. While during the 2008 economic crisis, there was a salient decline in fertility in Europe and the U.S. (Sobotka et al., 2011). Other scholars study how certain policy measures can improve fertility intentions and behaviors, such as fiscal, family, or housing policies. Overall, the findings suggest these policies only posed a small effect on the timing of fertility rather than the number of children (Gauthier, 2007; Mills et al., 2011).

The stream of research on factors at the micro-level in China mainly focuses on the fertility policies or welfare systems on certain groups of the population's fertility intentions using the regional data. For example, Yang (2015) analyzed the impact of the two-child policy on the migrant population's fertility intention.[10] This study found that couples from a single-child family and already had a child were more likely to have a higher second-child fertility intention. Zhang et al. (2016) studied fertility intention for the second child under the selective and universal two-child policies. Their studies on eligible households in Shandong Province suggest that eligible couples under the universal two-child policy were more likely to have a second child if they believed there was a high risk of losing their only child. In contrast, an eligible couple under the selective two-child policy factored pension and psychological needs when they decided whether to have a second child. Wang and Peng (2015) studied the impact of social security – New Rural Cooperative Medical Scheme (NCMS) – on rural residents' fertility intention. They found the NCMS with subsidy from government-generated both income effect and crowd-out effect on rural residents' fertility intention, with the crowd-out effect outweighing income effect that eventually decreased their fertility intention.

Despite the extensive literature on factors associated with fertility intention in China, the review has shown a lack of factors at the macro-level, for example, the impact of local government expenditure and its various components on fertility intention. Therefore, building upon the existing theories explaining fertility intention in China, we use nationally representative data CGSS 2017 to examine the following hypotheses.

Hypothesis one: Cities with higher government expenditures will increase individuals' fertility intention.
1. Cities with higher educational expenditure and science expenditure will increase individuals' fertility intention.
2. Cities with higher social security expenditure will decrease individuals' fertility intention due to the crowd-out effect.

Hypothesis two: The impact of the city's government expenditure is larger on male's fertility intention than female's fertility intention.

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[10] This two-child policy makes couples where either the husband or the wife is from a single-child family eligible to have a second child.

Hypothesis three: The impact of the city's government expenditure is larger on families with only one boy than families with only one girl.

Hypothesis four: There is a positive relationship between government expenditure and rural individuals' fertility intention. In contrast, there is a negative relationship between government expenditure and urban individuals' fertility intention.

4   Data and econometric method

4.1   Data

We used data from the Chinese General Social Survey (CGSS) in 2017. First launched in 2003, CGSS is the earliest national representative continuous survey project on urban and rural households, which is currently carried out by the National Survey Research Center at Renmin University of China.[11] The CGSS collects quantitative data on social structure, quality of life, and underlying mechanisms that link social structure and quality life to systematically monitor Chinese behavior and attitudes in radical social change. The 2017 dataset is based on the 2010 sampling design, which used the 2009 national population as the population sampling frame. The 2010 design uses a stratified, multi-stage probability proportional to size (PPS) method to draw 14,000 adults in over 2762 county-level units. Because this paper focuses on the fertility intention of a second child or more, our sample only includes 3504 households without or with only one kid. Regional macro variables, including various per capita government expenditures, GDP per capita, and population density, are obtained from China's City Statistic Yearbook and CEIC database.

Table 1 shows the statistics of all variables. The "fertility intention of a second child or more" variable is derived from the question "If there are no policy restrictions, how many children do you want to have" in CGSS. The answer is that survey respondent is unwilling to have a second child, and the variable takes the value of 0. If they are willing to have n (n>1) children, the variable takes the value of n-1 (discuss later in detail). Results in Table 1 show that the fertility intention of a second child or more is 1.357, indicating that the number of children the survey respondent is willing to have roughly 2.36 children on average in the sample.

Moreover, based on the literature review, we selected other factors that may have an impact on the intention to bear two or more children as control variables, which mainly involve the following groups: the first group includes macro variables, such as GDP per capita, and population. The second group is the survey respondents' characteristics, including age, marital status, ethnicity, education, income, health status, hukou status, employment status, and others. The third group is characteristics of the spouse of the survey respondent, including education, hukou status, employment status, income, and having siblings. The last group is household

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[11] See http://cgss.ruc.edu.cn/English/Home.htm for a full description of the annual or biannual survey project.

characteristics, such as economic level, the number of dwellings, having a kid or not, whether the kid is a girl and education expense.

Table 1 Summary Statistics

Variables	Mean	Std	Min	Max
Fertility intention of a second child or more	1.357	1.139	0	10
Total expenditure per capita (hundred yuan)	164.108	139.624	38	1094
Educational expenditure per capita (hundred yuan)	23.666	14.856	7	108
Social security expenditure per capita (hundred yuan)	19.254	10.781	5	41
Science expenditure per capita (hundred yuan)	6.698	12.578	0	105
Macro variables				
GDP per capita (thousand yuan)	89.372	69.777	13	506
Population density (10 thousand persons /km2)	0.091	0.102	0	0
Survey respondent characteristics				
Age category (Default: 20≤Age <25)				
25≤Age <30	0.171	0.377	0	1
30≤Age <35	0.145	0.352	0	1
35≤Age <40	0.140	0.347	0	1
40≤Age <45	0.191	0.393	0	1
45≤Age <50	0.170	0.375	0	1
Female	0.525	0.499	0	1
Marital status (Default: Separated, divorced, widowed)				
Married	0.758	0.428	0	1
Never married	0.182	0.386	0	1
Ethnic minority	0.053	0.223	0	1
Education (Default: Unschooled)				
Primary and junior high school	0.364	0.481	0	1
Senior high school	0.210	0.407	0	1
College and more	0.399	0.490	0	1
Income (thousand yuan)	56.705	89.366	0	2000
Health status	0.919	0.273	0	1
Hukou status (Default: Rural Hukou)				
Urban Hukou	0.308	0.462	0	1
Resident Hukou (formally Rural Hukou)	0.110	0.313	0	1
Resident Hukou (formally Urban Hukou)	0.169	0.374	0	1
Employment status (Default: part-time job)				
Self-employed	0.105	0.307	0	1
Full-time job	0.509	0.500	0	1
Living area	102.458	78.409	6	1330
Social security	0.940	0.238	0	1
Only child	0.250	0.433	0	1
Happiness level	0.790	0.407	0	1
Attitudes to freedom of reproduction	0.338	0.473	0	1
Spouse characteristics				
Spouse education (Default: Unschooled)				
Primary and junior high school (spouse)	0.315	0.465	0	1
Senior high school (spouse)	0.172	0.378	0	1
College and more (spouse)	0.276	0.447	0	1
Hukou status (Default: Rural Hukou)				
Urban Hukou (spouse)	0.245	0.430	0	1

Resident Hukou (formally Rural Hukou, spouse)	0.077	0.267	0	1
Resident Hukou (formally Urban Hukou, spouse)	0.127	0.333	0	1
Employment status (Default: part-time job)				
Self-employed (spouse)	0.087	0.282	0	1
Full-time job (spouse)	0.411	0.492	0	1
Income (thousand yuan, spouse)	50.177	80.381	0	1000
Only child (spouse)	0.204	0.403	0	1
Household characteristics				
Economic level	0.087	0.281	0	1
Number of dwellings	1.117	0.698	0	11
Kid	0.759	0.428	0	1
Girl	0.299	0.458	0	1
Education expense (thousand yuan)	5.086	151.801	0	9000

4.2 Econometric method

To explore how the government expenditure affects the fertility intention of a second child or more, we conduct an ordered probit regression model as follows:

$$FW_{ij} = \Phi\left(Expend_j, Z', X'\right) \qquad (1)$$

where i denotes the household, and j denotes the city. The dependent variable, FW_{ij} is an ordinal variable that represents fertility intention of having two or more than two children. It takes a value of 0 if the survey respondent is willing to have one child or does not want children at all. FW_{ij} takes value of n-1 if the fertility intention of survey respondent is to have n children.

$$FW_{ij} =$$
$$\begin{cases} = 0; & None\ or\ fertility\ willingness\ of\ having\ one\ child \\ \\ = n-1; & Fertility\ intention\ of\ having\ n\ (n > 1)\ children \end{cases} \qquad (2)$$

$Expend_i$ denotes the local government expenditure per capita in city i, including total expenditure, education expenditure, social security expenditure, and science expenditure in per capita terms. Z' denotes macroeconomic control variables, including GDP per capita and population density. X' includes all other control variables including survey respondent characteristics, spouse characteristics, and household characteristics.

5   Results

5.1   Main Results

Columns (1)-(3) of Table 2 present the results of our baseline specification (1), using the fertility intention of a second child or more as the dependent variable. We use the logit model as a robustness check in columns (4)-(6). We start the estimation by adding macro controls and survey respondent characteristics and controlling for city-specific fixed effects in column 1 of Table 2. It turns out that the total expenditure of the local government is positively associated with the fertility intention of a second child or more. Column (2) takes a step further to add characteristics of the spouse of the survey respondent as additional control variables. The coefficient of total expenditure per capita is positive and statistically significant at the 1 percent level. Finally, column (3) includes household characteristics. As shown, our results on the fertility intention effect of government total expenditure are very robust across these alternative specifications. Quantitatively, column (3) indicates that an increase of 10,000 yuan per capita government expenditure would lead to 1.05 units of fertility intention, implying the fertility intention increasing from 2.357 to 3.407 children. The effects of the control variables in column (3) are summarized as follows. First, survey respondents aged 30 to 35 are significantly less willing to have children than 20 to 25. Second, survey respondents who are married and never married have a low fertility intention than those who are separated, divorced, and widowed. Third, the survey respondents with higher income, larger living areas, or higher happiness levels would have higher fertility intentions. Fourth, the fertility of survey responses against government intervention on reproductive rights is relatively lower. Finally, the fertility intention of survey responses is not related to the characteristics of their spouse. The effect of government expenditure per capita on fertility intention is consistently positive in columns (4)-(6), using the logit model. We prefer the probit model because CGSS is a large-scale survey database with large sample size and relatively uniform distribution, which is fitted to that the error term of the probit model is the normal distribution.

Table 2 the impact of total expenditure per capita on the fertility intention

	Dependent variable: Fertility intention of a second child or more					
	probit			logit		
	(1)	(2)	(3)	(4)	(5)	(6)
Total expenditure per capita	0.0110***	0.0113***	0.0105***	0.0201***	0.0207***	0.0195***
	(0.0019)	(0.0019)	(0.0020)	(0.0035)	(0.0036)	(0.0036)
GDP per capita	-0.0171***	-0.0174***	-0.0170***	-0.0295***	-0.0301***	-0.0294***
	(0.0028)	(0.0031)	(0.0032)	(0.0047)	(0.0051)	(0.0052)
Population density	-7.2492**	-7.4985**	-6.6455*	-14.3680***	-14.9021**	-13.5679**
	(2.9648)	(3.5254)	(3.5704)	(5.2886)	(6.1135)	(6.3125)
25≤Age <30	0.0023	-0.0002	0.0110	-0.0129	-0.0147	0.0044
	(0.0958)	(0.0949)	(0.0949)	(0.1559)	(0.1542)	(0.1545)
30≤Age <35	-0.1572**	-0.1597**	-0.1309*	-0.2637**	-0.2672**	-0.2179*
	(0.0746)	(0.0764)	(0.0784)	(0.1220)	(0.1248)	(0.1284)
35≤Age <40	0.0807	0.0804	0.0981	0.1196	0.1185	0.1505

	(0.0878)	(0.0875)	(0.0943)	(0.1439)	(0.1430)	(0.1547)
40≤Age <45	0.0664	0.0699	0.0876	0.1080	0.1184	0.1524
	(0.0906)	(0.0879)	(0.0942)	(0.1503)	(0.1462)	(0.1572)
45≤Age <50	0.2251**	0.2290**	0.2460**	0.3669**	0.3773**	0.4061***
	(0.0901)	(0.0901)	(0.0958)	(0.1470)	(0.1475)	(0.1576)
Female	-0.0465	-0.0424	-0.0398	-0.0817	-0.0743	-0.0687
	(0.0672)	(0.0692)	(0.0701)	(0.1105)	(0.1137)	(0.1154)
Married	0.2802***	0.3472**	0.3356**	0.4556***	0.5880**	0.5695**
	(0.1068)	(0.1599)	(0.1647)	(0.1758)	(0.2621)	(0.2690)
Never married	0.3188**	0.3469**	0.2716	0.5099**	0.5609**	0.4281
	(0.1437)	(0.1427)	(0.1698)	(0.2388)	(0.2370)	(0.2819)
Ethnic minority	-0.0343	-0.0396	-0.0538	-0.0671	-0.0718	-0.0971
	(0.1009)	(0.1000)	(0.0988)	(0.1633)	(0.1617)	(0.1600)
Primary and junior high school	-0.0203	-0.0153	-0.0376	-0.0455	-0.0360	-0.0766
	(0.1672)	(0.1687)	(0.1679)	(0.2754)	(0.2776)	(0.2763)
Senior high school	0.0508	0.0277	0.0053	0.0752	0.0321	-0.0092
	(0.1726)	(0.1752)	(0.1753)	(0.2845)	(0.2881)	(0.2884)
College and more	0.1601	0.0825	0.0564	0.2622	0.1320	0.0862
	(0.1697)	(0.1663)	(0.1682)	(0.2788)	(0.2726)	(0.2763)
Income	0.0007***	0.0007**	0.0006**	0.0012***	0.0011**	0.0010**
	(0.0003)	(0.0003)	(0.0003)	(0.0005)	(0.0005)	(0.0005)
Health status	0.1230	0.1177	0.1092	0.1985	0.1899	0.1741
	(0.0785)	(0.0782)	(0.0783)	(0.1281)	(0.1273)	(0.1277)
Urban Hukou	-0.1165	-0.1475	-0.1436	-0.1878	-0.2426	-0.2372
	(0.0850)	(0.0963)	(0.0978)	(0.1389)	(0.1588)	(0.1612)
Resident Hukou (formally Rural Hukou)	-0.0911	-0.1576	-0.1517	-0.1493	-0.2618	-0.2510
	(0.1177)	(0.1340)	(0.1317)	(0.1953)	(0.2214)	(0.2180)
Resident Hukou (formally Urban Hukou)	-0.1540*	-0.2522***	-0.2494***	-0.2454*	-0.4140***	-0.4073***
	(0.0811)	(0.0933)	(0.0905)	(0.1335)	(0.1527)	(0.1472)
Self-employed	-0.0286	0.0201	0.0071	-0.0528	0.0290	0.0077
	(0.1124)	(0.1204)	(0.1213)	(0.1880)	(0.1996)	(0.2013)
Full-time job	-0.0407	-0.0290	-0.0258	-0.0737	-0.0494	-0.0417
	(0.1107)	(0.1100)	(0.1107)	(0.1863)	(0.1839)	(0.1851)
Living area	0.0008**	0.0008**	0.0008**	0.0013**	0.0014**	0.0013**
	(0.0003)	(0.0003)	(0.0003)	(0.0006)	(0.0006)	(0.0006)
Social security	0.0552	0.0601	0.0569	0.0932	0.1016	0.0939
	(0.1276)	(0.1253)	(0.1256)	(0.2079)	(0.2037)	(0.2043)
Only child	0.0703	0.0123	0.1242	0.1117	0.0208	0.2160
	(0.0574)	(0.0787)	(0.1111)	(0.0955)	(0.1307)	(0.1827)
Happiness level	0.1861***	0.1882***	0.1818***	0.3104***	0.3138***	0.3025***
	(0.0641)	(0.0640)	(0.0638)	(0.1066)	(0.1061)	(0.1054)
Attitudes to freedom of reproduction	-0.1014**	-0.1007**	-0.0995*	-0.1677**	-0.1668**	-0.1639**
	(0.0491)	(0.0493)	(0.0509)	(0.0799)	(0.0803)	(0.0832)
Primary and junior high school (spouse)		0.0403	-0.0006		0.0881	0.0187
		(0.1859)	(0.1932)		(0.3044)	(0.3172)
Senior high school (spouse)		0.0694	0.0279		0.1525	0.0819
		(0.2054)	(0.2137)		(0.3358)	(0.3502)
College and more (spouse)		0.1958	0.1487		0.3553	0.2764
		(0.1928)	(0.2019)		(0.3164)	(0.3323)
Urban Hukou (spouse)		0.0487	0.0469		0.0794	0.0776
		(0.0890)	(0.0875)		(0.1476)	(0.1455)
Resident Hukou (formally Rural Hukou, spouse)		0.1151	0.1232		0.1992	0.2138

	(1)	(2)	(3)	(4)	(5)	(6)
		(0.0874)	(0.0862)		(0.1445)	(0.1423)
Resident Hukou (formally Urban Hukou, spouse)		0.1631	0.1539		0.2730	0.2587
		(0.1012)	(0.1009)		(0.1688)	(0.1680)
Self-employed (spouse)		-0.1616	-0.1524		-0.2640	-0.2495
		(0.1213)	(0.1246)		(0.2001)	(0.2056)
Full-time job (spouse)		-0.0907	-0.0854		-0.1558	-0.1477
		(0.1035)	(0.1049)		(0.1729)	(0.1754)
Income (spouse)		0.0001	0.0000		0.0003	0.0001
		(0.0003)	(0.0004)		(0.0006)	(0.0006)
Only child (spouse)		0.0821	0.1139		0.1299	0.1893
		(0.0909)	(0.0931)		(0.1497)	(0.1542)
Economic level			0.1327*			0.2222*
			(0.0738)			(0.1241)
Number of dwellings			0.0083			0.0117
			(0.0373)			(0.0613)
Kid			-0.1616**			-0.2813**
			(0.0817)			(0.1320)
Girl			0.0650			0.1107
			(0.0594)			(0.0972)
Education expense			-0.0003**			-0.0005*
			(0.0001)			(0.0003)
N	3504	3504	3504	3504	3504	3504

Notes: The dependent variable is indicated on all columns. In columns (1)-(3), we use the ordered probit model. In columns (4)-(6), we use ordered logit model. All columns include control variables and city-specific fixed effects. Standard errors clustered at the city level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In columns (2)-(5) of Table 3, we replace the dependent variable with the various public expenditures, including education expenditure, social security expenditure, science expenditure. This helps to verify whether the various public expenditures can affect fertility intention in different ways. The estimated coefficient of education expenditure per capita is 0.0798, implying an increase of 1,000 yuan per capita education expenditure would lead to an 0.798 unit increase in fertility intention. This translates into fertility intention rising to 3.155 children. In column (3), the results show that the impact of social security expenditure is negative and statistically significant. Quantitively, an increase of 100 yuan per capita social security expenditure would lead to an 0.2399 decrease in fertility intention, implying fertility intention decreasing to 2.12 children. In columns (4)-(5), we find that the impacts of science and other expenditures on the fertility intention of a second child or more are positive and negative, respectively.

Table 3 The impact of various public expenditures on fertility intention

	Dependent variable: Fertility intention of a second child or more			
	(1)	(2)	(3)	(4)
Total expenditure per capita	0.0105***			
	(0.0020)			
Education expenditure per capita		0.0798***		
		(0.0148)		
Social security expenditure per capita			-0.2399***	
			(0.0584)	

Science expenditure per capita							0.1415***
							(0.0262)

	(1)	(2)	(3)	(4)
Controls	YES	YES	YES	YES
City fixed effect	YES	YES	YES	YES
N	3504	3504	3327	3504

Notes: The dependent variable is indicated on all columns. Columns (1)-(4) show various public expenditures of government on the fertility intention, respectively. All columns include control variables and city-specific fixed effects. Standard errors clustered at the city level in parentheses. $^{*}\,p < 0.10$, $^{**}\,p < 0.05$, $^{***}\,p < 0.01$.

5.2 Effect Heterogeneity

Table 4 The impact of public expenditure on the fertility intention: Effect Heterogeneity

	Fertility intention of a second child or more							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Male	Female	Boy	Girl	No kid	One kid	Rural	Urban
Total expenditure	0.0199***	-0.0007	-0.0466***	0.0125*	0.0030	0.0161***	-0.1124***	-0.0311***
per capita	(0.0043)	(0.0030)	(0.0032)	(0.0069)	(0.0059)	(0.0028)	(0.0104)	(0.0056)
N	1627	1788	1579	1003	796	2638	2410	1044
Education expenditure	0.1503***	-0.0050	0.2124***	0.0948*	0.0366	0.1222***	0.5126***	-0.2354***
per capita	(0.0324)	(0.0225)	(0.0747)	(0.0525)	(0.0735)	(0.0215)	(0.0473)	(0.0424)
N	1627	1788	1579	1003	796	2638	2410	1044
Social security expenditure	-0.0256	-0.4233***	0.0959	0.3177***	-0.6731***	0.2138***	0.1819**	-0.1470***
per capita	(0.0799)	(0.1065)	(0.01317)	(0.1562)	(0.1240)	(0.0810)	(0.0839)	(0.0163)
N	1550	1700	1497	964	765	2498	2281	1009
Science expenditure per	0.2665***	-0.0089	0.2230***	0.1675*	0.0567	0.2163***	0.5398***	-0.4172***
capita	(0.0575)	(0.0399)	(0.0785)	(0.0951)	(0.1944)	(0.0382)	(0.0498)	(0.0751)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
City fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
N	1627	1788	1579	1003	796	2638	2410	1044

Notes: The dependent variable is indicated on all columns. Columns (1)-(8) show various public expenditures of government on the fertility intention of different groups, respectively. All columns include control variables and city-specific fixed effects. Standard errors clustered at the city level in parentheses. $^{*}\,p < 0.10$, $^{**}\,p < 0.05$, $^{***}\,p < 0.01$.

Table 4 presents the effect heterogeneity of various public expenditures on fertility intention. To begin with, we focus on the gender of the survey respondent. In column (1), the results show that the impacts of various public expenditures on the fertility intention of male survey respondents are positive and statistically significant, except for social security expenditures. However, only the social security expenditure has a negative and statistically significant impact on the female survey respondent's intention to give birth, and impacts of other government expenditures are insignificant. Therefore, the increasing government spending may not significantly impact women's fertility intention except for social security expenditure. In addition, because our sample only includes households with one child or no children, we also investigate whether

government expenditure has different effects on families with one child and those without a child. In column (5), we find that only the social security expenditure has a negative and statistically significant impact on the fertility intention of households without a kid, and impacts of other government expenditures are insignificant. On the other hand, results in column (6) show that the different government expenditures would increase the fertility intention of the households with one kid. Finally, in columns (7) and (8), we explore the effect heterogeneity of government expenditure arising from hukou status. Column (7) shows that an increase in total expenditure could decrease the fertility intention of individuals with rural hukou; However, the impacts of other specific government expenditures, including the expenditures of education, social security, and science, are positively and statistically significant. In column (8), the increase in government expenditure generally would lower the fertility intention of individuals with urban hukou.

Table 5 The effect Heterogeneity of different types of survey respondent

	Fertility intention of a second child or more			
	(1)	(2)	(3)	(4)
	Rural male	Urban male	Rural female	Urban female
Total expenditure per capita	-0.1753***	-0.0284**	-0.0610***	-0.0198***
	(0.0183)	(0.0120)	(0.0209)	(0.0064)
Education expenditure per capita	0.7993***	-0.2149**	0.2780***	-0.1514***
	(0.0833)	(0.0907)	(0.0955)	(0.0487)
Social security expenditure per capita	0.4542***	-0.0624*	-0.0743	0.0074
	(0.1142)	(0.0335)	(0.1535)	(0.0337)
Science expenditure per capita	0.8417***	-0.3810**	0.2927***	-0.2981***
	(0.0877)	(0.1607)	(0.1006)	(0.0958)
Controls	YES	YES	YES	YES
City fixed effect	YES	YES	YES	YES
N	1104	443	1,191	507

Notes: The dependent variable is indicated on all columns. Columns (1)-(4) show various public expenditures of government on the fertility intention of different groups, respectively. All columns include control variables and city-specific fixed effects. Standard errors clustered at the city level in parentheses. $^{*} p < 0.10,$ $^{**} p < 0.05,$ $^{***} p < 0.01.$

Table 5 presents the effect heterogeneity of government expenditure on fertility intention arising from different types of survey respondents. We split the sample based on the gender and hukou status of the survey respondents into four groups, including rural male, urban male, rural female, and urban female survey respondents. In column (1), the results show that the total expenditure per capita is negatively associated with the fertility intention of rural males. The impacts of three other specific government expenditures are positive and statistically significant at the 1 percent level. We find that the effects of all government expenditures are significantly negative on the fertility intention of urban male survey respondents. In columns (3) and (4), we investigate the impacts of various government expenditures on the fertility intention of female survey respondents with rural and urban hukou, respectively. Total government expenditure has a negative impact on the intention of female survey respondents to have children, regardless of the type of hukou they hold. However, the magnitude of total government expenditure is greater on the rural females' fertility intention than urban females. In addition, the impacts of social security expenditure are not statistically significant on the fertility intention of females. Finally, we find that education and science expenditures have opposite effects on females' intention to give birth

in urban and rural areas. Higher education and science expenditures would increase the fertility intention of rural females but reduce that of urban females.

Table 6 Interacted effect of individual income and government expenditure

	Fertility intention of a second child or more					
	(1)	(2)	(3)	(4)	(5)	(6)
	Male	Female	No kid	One kid	Rural	Urban
High	0.2105	-0.3599	0.4966	0.0083	-1.3118***	-3.4637***
	(0.3105)	(0.2551)	(0.5536)	(0.1843)	(0.1465)	(1.1928)
High*income	-0.0037***	-0.0000	-0.0066***	-0.0009	0.0004	-0.0054*
	(0.0014)	(0.0014)	(0.0022)	(0.0010)	(0.0013)	(0.0030)
income	0.0041***	0.0003	0.0079***	0.0010	-0.0000	0.0055*
	(0.0013)	(0.0013)	(0.0022)	(0.0010)	(0.0013)	(0.0031)
Controls	YES	YES	YES	YES	YES	YES
City fixed effect	YES	YES	YES	YES	YES	YES
N	1627	1788	796	2638	2410	1044

Notes: The dependent variable is indicated on all columns. Columns (1)-(6) show interactive effects of expenditure level and income on the fertility intention of different groups, respectively. All columns include control variables and city-specific fixed effects. Standard errors clustered at the city level in parentheses. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

We explore the impacts of individual incomes and government expenditure on fertility intention in Table 6. We create the "High" dummy variable representing levels of per capita total government expenditure across cities. It takes the value of one if the city's per capita total government expenditure is greater than the median of per capita total government expenditure across cities; otherwise, zero. The income in Table 6 refers to the income of the survey respondent. In columns (1) and (2), we explore the fertility intention of females and males, respectively. We find that the fertility intention of both males and females is not significantly different in regions where the levels of per capita government expenditure are different. In addition, Higher income could increase fertility intention, but it has no significant effect on females' fertility intention. In cities with higher per capita government expenditure, the income effect on males' fertility intention approaches zero, as shown in column (1). Column (3) shows that a higher income level would increase the fertility intention of the survey respondents without a kid. In cities with higher per capita government expenditure, the income effect on these households' fertility intention approaches zero. In column (4), we find that the fertility intention of households with one kid could not be affected by the difference in the income of the survey respondent or the level of per capita expenditure of the government. Columns (5) and (6) show that the fertility intention is lower in the cities with higher per capita government expenditure, regardless of the types of hukou the survey respondents hold. In addition, a higher income level would increase the fertility intention of the survey respondents with urban hukou. In cities with higher per capita government expenditure, the income effect on these households' fertility intention approaches zero.

6   Conclusion

The problem of population aging caused by low intention to have children ultimately threatens the development of the economy. This problem has also begun to appear in China, and it will become more severe in the future. The increase in the cost of living comes from education, medical care, and housing expenses, which leads the Chinese households to have no bright expectations for the future. Therefore, the benefits of having a baby gradually become smaller than the costs of having a baby. The Chinese government has implemented a two-child policy for almost one decade, and it has recently announced the three-child policy, but the intention to give birth or have more children has not significantly changed with the lateralization of reproductive rights. The government can play an essential role in the reproductive rights of Chinese families. Therefore, we want to examine whether the government could intervene in the family's fertility intention. In particular, this paper investigates how government public expenditures affect the fertility intention of a second child or more.

Our econometric results show that the total government expenditure overall could increase fertility. Quantitatively, an increase of 10,000 yuan per capita government expenditure would lead to the fertility intention rising from 2.357 to 3.407 kids. In addition, various specific government expenditures also could increase the fertility intention except for social security expenditures. These results support hypothesis one. Finally, we explore the effect heterogeneity of public spending on fertility intention in different aspects. We also test hypotheses two-four. First, the impact of the public expenditure is larger on the fertility intention of males than that of females. Second, the effect of the government expenditure is larger on families with only one boy than families with only one girl. Third, there is a positive relationship between government expenditure and rural individuals' fertility intention. In contrast, there is a negative relationship between government expenditure and urban individuals' fertility intention.

This paper's findings have significant policy implications for the Chinese government to improve fertility intention and boost the falling birth rate. First, local government should increase its public expenditure, especially the spending on education and science. The Chinese government has taken a tough crackdown on after-school tutoring provided by the for-profit tutoring industry, hoping to reduce the cost of childbearing and education. Many reasons lead to the prevalence of private after-school tutoring in China. To begin with, there is a large variation in the quality of schools at all educational levels, and students have to study hard to get enrolled in the limited number of best schools and universities. Parents believe the education their children receive at regular schools is not enough and therefore look for private after-school tutoring that can give their children an edge in the "morbidly wide race." Secondly, many public-school teachers are not paid well and choose to work in private tutoring companies to earn an extra salary. Thirdly, it is the business strategy of the private after-school tutoring companies to spread anxiety through advertising to convince parents to purchase their highly-cost courses. As local governments start to implement the "double reduction" policy in reducing the burdens of homework and after-school tutoring, they need to develop parallel strategies to tackle the rooted

causes of educational burden. To be more specific, local governments should invest more in local education to build more schools, improve the quality of the current education system, increase teachers' salaries, and provide free government-sponsored tutoring services.

Second, providing employment protection for women is another way to encourage more women to have more children. Gender discrimination in the workplace is widespread in China. Discrimination can happen during the hiring stage when women are asked if they are married and have kids. Pregnancy will also cause a woman to be fired, although companies may use other legal excuses to justify their decision. The governments need to enforce strict measures to protect women's employment rights to keep their job and have an equal opportunity of promotion, while they can be free of fear to extend their family size at their own will.

Third, local governments should provide more generous tax breaks and reform the current public school enrollment system which will give young couples' confidence to have more children. In 2019, China offered tax breaks to parents who have a second child, which can help with education fees to a certain extent. However, the impact of the tax breaks may be very limited and will not show significant results in a shorter period. In addition, under the current public school enrollment system, only households with local housing property can send their children to nearby schools. This system adds fuel to the skyrocketed housing prices in large cities in China, preventing young people from forming a family and having children. Therefore, local governments should reform the current school enrollment system, such as granting the children of tenants an equal opportunity and access to nearby schools.

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