Economics & Management Series EMS-2022-01

Do Financial Incentives on High Parity Birth Affect Fertility? Evidence from the Order of Glorious Mother in Mongolia

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April 2022

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Do Financial Incentives on High Parity Birth Affect Fertility? Evidence from the Order of Glorious Mother in Mongolia*

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Abstract

This paper exploits the change in award criteria of a pronatalist program in the Mongolia that offers financial transfers to women achieving fertility goals at high parity birth. We implement a quasi-experiment strategy by forming treatment and control groups defined by time and child parity. We found positive effect of the program on fertility, and the fertility response is diminishing when the high fertility goal jumps from a lower one to a higher one. An extension of Barro–Becker fertility model with the inclusion of social norm can support our empirical finding.

***Keywords**:* Fertility, Pro-natalist program; Social norm; Difference-in-differences; Mongolia

JEL Classification: J13, J18, H31, P23

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*We would like to thank Uujinge Ochirbal for her excellent research assistance. The authors have no conflict of interest to declare.

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1. Introduction

The government intervention on encouraging childbearing is justified by the fact that individual's family planning decision has positive externalities on society (Lee and Miller, 1990). For example, when public service programs go through intergenerational transfer where the younger generations support the old ones, higher fertility is socially beneficial through the pension scheme while such benefit is not considered by individual family. With the declining fertility rate worldwide and the associated political and economic challenges, the share of countries in the world with policies exclusively for raising fertility, such as subsidy programs aiming to reduce direct cost of raising children, has risen from 15% in 2001 to 28% in 2015 (United Nations, 2018). Among the existing pro-natalist programs, the majority are designed to offer financial transfers on a flat piece-rate basis, i.e., a constant payment to family or women for each birth. Whether and to what extent these pro-natalist programs have effects is still an open question.

Besides the common practices offering per-child benefits, there exists a distinct set of programs in practice that are designed for awarding women achieving a specific fertility goal in which the goal is typically set on a higher birth order above the average fertility level (Sobotka et al., 2019). Under such a program, women receive maternity benefit only if their children number meets a pre-specified goal or above; women with children number below the goal during her lifetime receive no subsidy. Such government funded programs with a pre-specified higher parity goal can be backed up by goal setting theory from psychology and management literature where setting a high or challenging goal can motivate behavior through multiple mechanisms (Locke & Latham, 1990; 2002).[1] Moreover, the effect of pro-natalist program is sometime argued to reflect change in the timing of births rather than an increase of completed fertility rate.

[1] According to Locke & Latham (2002), goals affect performance through the following mechanisms: goals serve as both directive and energizing functions, goals affect persistence, and goals lead to the discovery and the use of task-relevant knowledge and strategy.

This is especially the case for subsiding the first and second births since those birth orders are likely to coincide with the desired family size of individuals. But, given time constraint of women's childbearing age, such diluting effect of potential shift in the timing of birth decreases with parity (Chen et al., 2018). Consequently, the pro-natalist program targeting on higher birth order, if it is found to have effect, would be more effective in altering the desired family size compared with targeting on lower birth order.

Nevertheless, implementing a fertility subsidy program with a pre-specified higher parity goal may also change individuals' beliefs about the behavior of others (Gneezy et al., 2011). For example, people may believe that the incentives are in place because the social norm level of fertility is in fact lower than the goal. Then, if individual family tend to conform to the social norm level of fertility, such a program may result in behavior effect working against its pro-natalist motive. Given the concern, it is not clear ex ante whether implementing subsidy programs with a pre-specified higher parity goal have positive effects on childbearing. And due to high data requirement, there is very little empirical research that looks at the impact of those pro-natalist programs.

This paper provides empirical evidence on fertility impact of pro-natalist program with pre-specified higher fertility goal by using data from Mongolia over the period 2010– 2018. In Mongolia, the government inherited a policy from the socialist period till now, called Эхийн алдар [Order of Glorious Mother (OGM)], and revised it as a pro-natalist program. This program offers *annuity* to mothers for the remainder of their life (plus fringe benefits) once their children number reaches an unusual higher goal. The sizeable OGM benefits depends solely on whether a Mongolian mother's children number meets the pre-specified goal and there is no mean test or other restrictions imposed on it. We leverage a OGM program revision on birth order criterion and annual transfers in Mongolia in 2011, where the first-class award goes to mothers with 6 children (instead of 8 children) and second-class award goes to mothers with 4 (instead of 5 children) children after the revision. The annual payments of the lifetime annuities become double and they are 200,000 MNT (US$72) and 100,000 MNT (US$36) for the first-class and the second-class awards where these annual payments account for 5.3% and 2.6% of annual Mongolian female labor market earnings in 2010, respectively.[2] This exogenous policy shock can be treated as a quasi-experiment allowing us to deploy the difference-in-differences approach for the estimation of program effect on fertility where the treatment and control groups are defined by time and child parity. Our study thus complements the literature that makes use of the quasi-experimental approach in investigating the effect of pro-natalist program.[3] Also, among existing pro-natalist programs, such a awarding scheme with multiple fertility goals has not yet been explored, to the best of our knowledge.

Our results show that, compared with 2010 cohorts, the policy change of OGM increases the probability of having a newborn within two-year reproductive period of 2018 cohorts if the women had had the number of children less than 4, i.e., the newly specified fertility goal under the OGM second-class award. On the other hand, no significant impact is found for the fertility goal of the OGM first-class award (having 6 children), even though the amount of financial transfer increases exponentially from reaching the goal of 4 children to 6 children. Mothers exhibit stronger response to the birth target of the fourth child than that of the sixth child given the convex structure of financial incentive in OGM.

Theoretically, static versions of the Barro and Becker (1989) model with standard logarithmic preference for the number of children–the dominant paradigm in the economics of

[2] The exchange rate is based on 2010 level where 1 US$ was equivalent to 1,375 MNT.

[3] Some of these studies focus on the programs aiming at the provision of paid parental leave or other maternity benefits to reduce the opportunity cost of childbearing including Lalive & Zweimüller (2009) for Austria, Cygan-Rehm (2016) for German, and Bassford & Fisher (2020) for Australia. Some of them focus on the cash transfer programs, such as baby bonus, to reduce direct expenditure of childbearing including Cohen et al. (2013) for Israel, González (2013) for Spain, and Milligan (2005) and Malak et al. (2019) for Canada. There also exist studies focusing on the mixture of these programs including Björklund (2006) for Sweden, Chen (2011) for France, and Malkova (2018) for Russia.

fertility–would predict that the fertility demand is a downward-sloping convex function.[4] This implies parents' positive responses to the reduction of the shadow price of a child (due to subsidy program) is increasing in the number of children, which is at odds with our empirical results. We develop a theoretical extension of Barro–Becker type preferences of fertility model that is capable of generating the desired effects where parents exhibit a stronger response to the lower parity birth than the higher one provided that the financial incentives is convex in the number of children. The modification of the fertility model is the inclusion of social norms about family size whereby parents partially make fertility choices in respond to an ideal family size or norm in the society. They do so by minimizing their fertility distance from the social norm level in a conformist manner, as originally developed by Akerlof (1997). Thus, in this context the utility representing parents' preferences exhibits a maximum level in the dimension of fertility choice. Such alternation implies a less restrictive shapes on the demand of fertility: the effect of shadow price on fertility (in absolute value) can diminish in the order of birth.

Aside from the general result pattern of diminishing fertility response in birth order after policy revision, our findings also suggest that there exist heterogenous effects by urban-rural area. Mothers living in the rural area show larger positive response than those in the urban area for the birth orders closer to the high parity goal of four children. Another interesting finding is that there are significant negative decreases in the probabilities of having newborn just before the past OGM awards criterion in children number were achieved, i.e., having five and eight children, respectively. We discuss the potential mechanisms for such results, including the negative financial incentive and loss aversion due to the cancellation of old fertility goals.

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[4] Even if we consider the setup incorporating the trade-off between child quantity and quality as in Becker and Lewis (1973) and Becker (1981), we can still obtain convex fertility demand function as long as quality and quantity are not close substitutes (i.e., the interior solution is guaranteed). Moreover, as pointed out by Angrist et al. (2010), the traditional quantity-quality trade-off does not find empirical support in the population with demographic and social characteristics that are closer to developing countries.

Pro-natalist programs with financial incentives that target on higher birth order have been observed in some countries and regions.[5] While only a few empirical studies have analyzed and evaluated the impacts of such parity-specific programs. Slonimczyk & Yurko (2014) evaluate a pro-natalist program effect in Russia, known as maternity capital, where women are entitled for a fund with limited purposes (housing, children's education, and investing in the pension) once their children number is equal or above 2. They use structural modelling approach to estimate the program effect and find a modest long-run effect on fertility. Milligan (2005) and Malak et al. (2019) studies the Allowance for Newborn Children (ANC) in the Canadian province of Quebec from late 1980s to late 1990s by implementing a quasi-experimental strategy (difference-in-differences estimation). Although the ANC program offers cash allowance starting from the first birth, the transfer payment to the third or higher order of births increases exponentially so that the payment structure can be considered as if families receive a sizeable payment once their children number is equal or above 3. Large responses for third and higher order births under ANC program are found in their studies. However, if parents can be motivated by a targeted and above-average level of fertility, in the past studies it is still not clear to what extent such strong response can persist in the parity. The OGM program in Mongolia offers the opportunity to explore how mothers' responses change given the multiple-goal structure in the award structure, shedding light on formulating tailor-made pro-natalist policy.

The remainder of the paper is organized as follows. First, we provide the institutional and policy background of the OGM. Next, we propose a simple extension of Barro–Becker fertility model with the inclusion of social norm about fertility, and discuss its empirical

[5] For instance, mothers with three or more children in Hungary have been eligible to a flat-rate child- raising support paid monthly from the third to eighth birthday of the youngest child since early 1990s (Spéder et al., 2017). In the north-eastern Italian region of Friuli-Venezia Giulia, the local government introduced a baby bonus program during 2000 to 2003 that provides 3000 euros to parents for their second birth, and 4600 euros for third and higher order births (Boccuzzo et al., 2008).

implication. Section 4 presents the data and empirical strategy. The next section estimates the responsiveness of fertility to the financial incentives of OGM. This is followed by a brief discussion and conclusion.

2. Institutional and Policy Background

According to World Bank open data, the total fertility rate in Mongolia has declined since the mid-1970s, with a major drop in the early 1990s, and reached a lowest level in 2002 (i.e., 2.08 children per woman) and then followed by a rising trend till 2016 (i.e., 2.92 children per woman). In contrast to other East Asia countries where the fertility rate has been lower than the replacement level for decades, the total fertility rate in Mongolia is continuously increasing after 2002 and is significantly higher nowadays. Several factors have contributed to its fertility trend, among which the pro-natalist policy plays an important role. We focus on a particular pro-natalist policy that inherits a long-standing Soviet tradition, called OGM, also known as "Mother Heroes."

2.1 The program of the Order of Glorious Mother

The Order of Glorious Mother was first issued on April of 1957 with the aim of promoting population growth. There are two classes of the Order: First Class and Second Class. Before 2010, the first class of the Order is awarded to mothers who raise at least eight children, and the second class is awarded to mothers who raise at least five children. Once been awarded, a mother receives annual benefit for the remainder of her life (i.e., annuity) where the annual allowance of the award and the payment structure changes over time. Starting from July of 2006, the annual allowance of 100,000 Mongolian Tughriks (MNT) and 50,000 MNT (i.e., 72 US$ and 36US$, respectively, based on 2010 exchange rate) was given to first-class and second-class recipients, respectively, and they are paid annually.[6] In addition to monetary transfers, mothers receiving OGM can retire from their work earlier than the minimal retirement age.[7]

Notice that, after Mongolia made its transition to the market-based economy and democratic system in 1990s, there are several government policies that provides fertility incentives to families. Those policies generally include allowances for pregnant and lactating mothers, and allowances for mothers with many children (i.e., OGM). The former program is to provide social welfare assistance for women during pregnant or lactating periods to meet the minimum needs, which is initially adopted with the objective of poverty reduction (Hodges et al., 2007). The latter program (Order of Glorious Mother) is particularly considered as pro-natalist program rather than social welfare assistance.[8] Moreover, only the program of OGM links the parity-specific rule (i.e., fertility goals for different classes of award) with financial incentives, while others provide flat-rate for each birth.[9]

2.2 Policy changes in awarding the Order of Glorious Mother

In 2010, the government significantly revised the scope of awarding OGM. The policy revision is in two steps. First, a new law called "Encouragement for Mothers with Many Children" (EMMC) is announced on June 25, 2010. It indicates that the minimum number of children for awarding each class of the Order is lowered down. Specifically, a mother who raises at least 6 children and 4 children will be awarded first-class and second-class medals, respectively. Mothers who met the new requirements with their existing number of children

[6] According to World Bank Group (2015), the total number of mothers receiving OGM benefits is 202,474 in 2013.

[7] The mandatory retirement age for women is 55. With OGM benefit, a mother can retire from her work at the age of 50.

[8] For example, in the award ceremony of Mother's Glory Order in 2018, the president of Mongolia emphasized that the cash allowances for mothers with many children should not be misunderstood as welfare, but is to promote population growth as well as to maintain the precious tradition. See the weblink https://montsame.mn/en/read/135338.

[9] See World Bank Group (2015), p. 21, for related discussion.

are also eligible to receive the OGM. According to EMMC, the new criterion of receiving the Order became effective on January 1, 2011. The fertility goal specified in the OGM were eased for the first time since its establishment in 1957. The EMMC becomes a stand-alone legal document that regulates the requirement of Mother's Glory Order. Second, the allowance amount was suggested by parliament members to be doubled for both classes of the Order when approving the EMMC. The suggestion of doubling the amount is later finalized by the Parliament Resolution No. 54 on October of 2010. Table 1 summarizes the award criteria in terms of number of children and the financial incentives before and after 2010 revision.

It is apparent that the policy of awarding OGM is parity-specific and particularly targeted on higher order of births compared with other pro-natalist policies in the literature. Moreover, the size of the financial incentive is substantial given that it is paid in the form of annuity. In comparison to Mongolian female workers' average monthly wage in 2010 (i.e., 314,500 MNT),[10] the revised annual monetary payment of the first-class and second-class awards account for 5.3 percent and 2.6 percent of the regular annual pay for a female worker, respectively.

Table 1: Policy changes in awarding the Order of Glorious Mother

	Award classes	Award criteria on the number of children	Annual payment of the awarded annuity
Before 2010 revision	First Class Second Class	at least 8 children at least 5 children	100,000 MNT (72 US$) 50,000 MNT (36 US$)
After 2010 revision	First Class Second Class	at least 6 children at least 4 children	200,000 MNT (144 US$) 100,000 MNT (72 US$)

Note: The exchange rate is based on 2010 level where 1 US$ was equivalent to 1,375 MNT.
Sources: The award criteria and monetary payment are based on EMMC (announced on June 25, 2010) and Parliament Resolution No. 54 of 2010, respectively.

[10] The statistics of female workers' average monthly wage are from Mongolia National Statistical Committee: http://www.1212.mn/Stat.aspx?LIST_ID=976_L04&type=tables.

Before the introduction of the EMMC on June of 2010, there already exists discussion regarding the revision of pro-natalist policy. In particular, the action plan of the Mongolia government for the period 2008–2012 (annex to the Parliament Resolution No. 35 of 2008) lays out the path of the expansion in fertility policy, and the priority is given to new families, newborns, and all children, followed by the cases of mothers with third, fourth, and fifth newborns in a family. In either case, the action plan did not clarify how the allowance is offered (i.e., one-time transfer or in the form of annuity), and it did not mention any change of the scope of OGM, either. As it turned out, the government makes a significant move of changing the minimum number of children for each class of the OGM on June of 2010, in which the original criteria had existed since 1957. Admittedly, 26 parliament members did release some details of their proposal to the press during early June of 2010 regarding the measure of doubling the allowance for OGM.[11] However, there is no hint from the government about lowering down the threshold of minimum number of children. Right after the approval of the EMMC, the changes of the specified fertility goal and the benefit of allowance in OGM caught people's attention and was reported in the major online news outlet.[12] This suggests that the EMMC is not likely to be anticipated, at least before the June of 2010, and the information about its introduction is plausibly widespread.

3. A Simple Model of Fertility Choices under Social Norms

3.1 The model

Consider a society with a continuum of identical households, where each household is of measure zero. Each household derives utility from two sources: the amount of consumption

[11] See Delgertsetseg (2010). Retrieved March 30, 2022 from URL: https://news.mn/r/16055/.
[12] See Altansukh (2010). Retrieved March 30, 2022 from URL: https://news.mn/r/18067/.

goods c (≥ 0) and the number of children n (≥ 0). The household utility function is of quasi-linear form, as in Strulik and Weisdorf (2008) and Vollrath (2012), written by $U(c,n) = c + \beta \cdot v(n)$. Following standard (neoclassical) consumer theory, we assume $\beta > 0$ and v is an increasing, strictly concave, and thrice-differentiable function. The quasi-linear representation (i.e., no income effect on fertility) allows for analytically simple solution to the optimization problem of parents, but is not essential for the qualitative nature of the result (see subsection 3.3 for discussion). Also, we do not consider sequential fertility choice in the model and ignore the integer condition on n for simplicity.

As pointed out by Akerlof (1997), a social distance model helps to examine individual's decision if expectations about the proper mode of behavior were changed in the relevant social network. We apply Akerlof's insight in the standard consumer choice model where parents maximize utility by choosing the number of children and their own consumption. In particular, parents partially make fertility choices in respond to the social norm level of children number, in addition to private economic trade-offs. They do so by minimizing their fertility distance from the social norm level, denoted n_S (> 0), in a conformist manner. Let $d_n \equiv |n - n_S|$ be the aforementioned distance. Following Palivos (2001) and Bhattacharya and Chakraborty (2012), we let n_S be determined by the equal-weighted average fertility among all households.[13] Then, each individual household chooses consumption level and number of children to maximize the following objective function:

$$c + \beta \cdot v(n) - \gamma \cdot \omega(d_n),$$

where γ (> 0) is the parameter describing the taste for conformity and ω is an increasing, strictly convex, and thrice-differentiable function satisfying $\omega(0) = 0$, $\omega'(0) > 0$, and

[13] The assumption of equal-weighted average in determining n_S is not essential for our analytical result. Our result holds as long as a proportion of households in the economy are assigned with positive weight when calculating the weighted average of n_S.

$\lim\limits_{n \to +\infty} \omega''(n) = +\infty$. That is, ω is the lost utility indicating parents suffer from having too many or too few children by moving away from n_S.

The full income of a parent is denoted by y (> 0). Each child requires $p - b$ (> 0) unit of resources, measured in terms of consumption goods, for parental nurture and care where b is a positive constant capturing cash transfers from the government. Non-negativity of parental consumption places an upper bound on the number of children at $y/(p - b)$. The lifetime budget constraint of parents is then $c + (p - b) \cdot n \leq y$. Since y is taken as given, the distinction between time and good costs for children is irrelevant.[14]

3.2 Analysis

This model environment can be considered as a static game regarding fertility choice among all households. We focus on symmetric Nash equilibria in pure strategies. We show that multiple equilibria arise in the model, as a direct consequence of conformist behavior. Proposition 1 characterizes the multiplicity of equilibria. Although the presence of conformist social norms would not change the direction of the price effect on the fertility, it provides an opposite force in altering the fertility responsiveness (i.e., second-order derivative with respect to price) of households in one type of equilibria. Proposition 2 shows that in the low-fertility equilibrium, if the impetus of conformist social norms is large enough, the fertility demand can be concave rather than convex.

Consider a household's decision problem in fertility choice:

$$\max_{n \in [0, y/(p-b)]} y - (p - b)n + \beta v(n) - \gamma \omega(d_n).$$

Rewrite the penalty function $\omega(d_n) = \omega(n - n_S)$ if $n \geq n_S$ and $\omega(d_n) = \omega(n_S - n)$ if $n_S > n$. Define $U_1(n) \equiv y - (p - b)n + \beta v(n) - \gamma \omega(n - n_S)$ and $U_2(n) \equiv y - (p - b)n +$

[14] The pro-natalist policy we focus on is in the form of direct cash allowance instead of foregone earning time cost in the labor market. Hence, in our empirical context, we measure child-rearing costs in terms of consumption goods.

$\beta v(n) - \gamma\omega(n_S - n)$ where $U_1(n_S) = U_2(n_S)$. The first-order derivatives of $U_1(n)$ and $U_2(n)$ are

$$-(p-b) + \beta v'(n) - \gamma\omega'(n - n_S) \text{ and} \quad (1)$$

$$-(p-b) + \beta v'(n) + \gamma\omega'(n_S - n), \quad (2)$$

respectively. Note that, since there exists a continuum of households and n_S is determined by a simple mean, the first-order derivative of n_S with respect to n is almost zero. Let $n_1^* = \text{argmax}\, U_1(n)$ and $n_2^* = \text{argmax}\, U_2(n)$. Further note that n_1^* and n_2^* are obtained from solving the first-order conditions given that second-order condition hold for both $U_1(n)$ and $\mathrm{U_2(n)}$.

Since ω is an increasing function, it is evident that $n_1^* < n_2^*$ from the objective function. For n_1^* to be a valid optimal choice, $n_1^* \geq n_S$ must hold; similarly, $n_2^* \leq n_S$ should hold for n_2^* to be an optimum. That is, the household's objective function is $U(n) = \min\{U_1(n), U_2(n)\}$ which is kinked at n_S. To characterize the household's optimal fertility choice, we have to consider all three cases of social norm level n_S. First, if $n_S \leq n_1^* < n_2^*$, the household chooses n_1^* for all $n_S \leq n_1^*$. Second, if $n_1^* < n_S < n_2^*$, the maximum is at the kink, n_S. Lastly, if $n_S \geq n_2^*$, the household's utility reaches the maximum at n_2^*. The response function below summarizes a household i's optimal fertility choice given different levels of social norm:

$$n_i = f(n_S) \equiv \begin{cases} n_1^*, & \text{if } n_S \leq n_1^* \\ n_S, & \text{if } n_S \in (n_1^*, n_2^*). \\ n_2^*, & \text{if } n_S \geq n_2^* \end{cases} \quad (3)$$

In this static game, a household i's fertility choice is affected by other households' decision through the social norm. Since we focus on symmetric Nash equilibrium, each household i chooses $n_i = \bar{n}$ where $\bar{n}$ is the average fertility rate of the society. That is, the symmetric Nash equilibrium is determined at the fixed point where $\bar{n} = f(\bar{n})$ and the function f is defined as in (3). This leads us to Proposition 1.

Proposition 1. *There exists a continuum of symmetric equilibrium levels of fertility in the interval* $[n_1^*, n_2^*]$.

Note that, if we let $n^* \equiv \text{argmax}_{n \in [0, y/(p-b)]}\, y - (p-b)n + \beta v(n)$, we have $n_1^* < n^* < n_2^*$. That is, the multiplicity of equilibria is the result of the presence of conformist social norm (i.e., $\gamma \neq 0$). Let us call the equilibrium level corresponding to n_1^* and n_2^* the low-fertility equilibrium and high-fertility equilibrium, respectively. The equilibrium selection depends on mutual expectations among individual households as well as history. Since one significant demographic phenomenon in post-industrial societies over past few decades is the emergence of "low and lowest-low" fertility pattern (Billari and Kohler, 2004; Brinton, 2016), it is natural to expect that households in post-industrial societies had lowered their expectation regarding the ideal family size and coordinated to the low-fertility equilibrium. Below we present the comparative statics results on fertility choice, captured by dn/db, and on its responsiveness to government cash transfers, captured by d^2n/db^2, in the low-fertility equilibrium (see Appendix for the proof).

Proposition 2. *The effect of cash transfers,* b*, on childbearing,* n*, is positive. As the cash transfer increases, its effect on parents with more children becomes smaller than those with fewer children in the low-fertility equilibrium if households' taste for conformity is sufficiently strong.*

The result regarding cash transfers' effect on the number of children is no different from the standard fertility model. But the responsiveness of parents' fertility choice with respect to the change of cash transfers (i.e., the second-order derivative of n with respect to b) in the low-fertility equilibrium is in contrast with the result from the standard one. The logic is that, at the low-fertility equilibrium, parents choose to have more children than what the social norm suggests. Nevertheless, they respond to a social pressure of not wanting to get ahead of others. Such conformist behavior leads to low fertility relative to the no-norm choice, n^*.

Then, when the cost of raising children becomes lower due to cash transfers, the resulting income effect affects fertility choice positively, bringing it closer to the no-norm choices, n^*. Since the declining marginal utility of having more children is reinforced by the marginal utility loss of further exceeding the social norm level, the fertility increases unambiguously to the extent that the net marginal utility of children quantity equals the unit price. Hence, the economic trade-off that governs the negative relationship between children quantity and price is not affected by the introduction of social norm.[15] However, such marginal utility loss of further exceeding the norm increases in an increasing rate, providing an opposite impetus to parents' responsiveness with respect to the price change in the low-fertility equilibrium. If parents' taste for conformity is strong enough, the net marginal benefit of having more children (beyond the norm) decreases, but in an increasing rate, implying a concave fertility demand curve. Consequently, parents' responsiveness to government cash transfers is decreasing in the number of children (i.e., $\frac{d^2 n_1^*}{db^2} < 0$).

3.3 Robustness and empirical implication

In this subsection, we offer three remarks about the robustness of model results. First note that, if a society coordinate on the high-fertility equilibrium such as in pre-industrial times, our model would predict that fertility demand is convex rather than concave. Such a result of convex fertility demand is also predicted unambiguously by the standard fertility model where conformist social norm behavior is absent. Hence, the introduction of conformist social norm

[15] The same comparative statics result regarding negative relationship between children quantity and price also holds at the high-fertility equilibrium (i.e., $\frac{dn_2^*}{db} > 0$). See Appendix X for the detail.

in our model implies more flexible shapes on the fertility demand. This is where our model differs from the standard one.

Second, the quasi-linear preferences are not essential for the qualitative nature of our comparative statics results. Let us consider the alternative preference where the utility function is additively separable such that $U(c,n) = u(c) + \beta v(n)$. We impose the standard assumptions that $u'(c) > 0$ and $u''(c) < 0$. Then, we can obtain multiple equilibria under this setup, and our main result in Proposition 2 still holds.

Finally, the fertility response to the change of shadow price is less clear-cut if the renowned quantity-quality trade-off is considered in the model (Becker and Lewis, 1973; Becker, 1981). This is because a change of children-raising cost due to cash transfers would alter the quality such that internal equilibria are possible only when quantity and quality are strong complements in parental utility function. Hence, depending on the specification of the budget constraint, extra assumptions are required for characterizing a downward sloping demand once the interaction of quantity and quality is incorporated.[16] Nevertheless, from the empirical point of view, Banerjee and Duflo (2012) pointed out that there is still no conclusive evidence to show the existence of quantity-quality trade-off.[17] Angrist et al. (2010) also found that the result of nonexistence of quantity-quality trade-off is empirically evident in the populations that have a higher fertility rate and are closer to the context of developing country in terms of demographic and social characteristics. Therefore, we do not consider quality component in our model.

[16] For example, Malkova (2018) considers a quantity-quality model that incorporates maternity benefits. She shows that the effect of government cash transfers on childbearing is positive if the difference of the true income elasticity for quantity and that for the quality is sufficiently large.

[17] Black et al. (2005) also pointed out that birth order effects appear to drive the observed negative relationship between family size and child education by using data set on the entire population of Norway over an extended period of time. Specifically, they find evidence that there is little if any family size effect on child education; however, they find robust result that higher birth order has a significant and large negative effect on children's education.

In post-industrial societies where families coordinate on the low-fertility equilibrium, the following testable predictions emerge from our model. Suppose the government implements a pro-natalist program that specifies two fertility goals, N_1 and N_2, respectively, where $N_1 < N_2$, and the financial incentives is constant in the order of birth. Facing the program, a family

(1) is more likely to have another child in either of the targeting parity.

(2) with strong taste for conformist social norm in terms of fertility behavior exhibits a weakly stronger response to the goal of a N_1-th child than a N_2-th child.

The first prediction directly comes from the first part of the Proposition 2. For the second prediction, it is implied by concave shape of the fertility demand when each family has a strong taste for conformity. Final note that, the concave shape of fertility demand can also be empirically verified in the case where the financial incentives for having children follows a convex schedule rather than being a constant rate in the order of birth. This is because, if cash transfers increase exponentially from the N_1-th to N_2-th child but a family still exhibits weaker response for higher order of birth, the only possibility for the fertility demand is concave shape.

4. Data and Empirical Strategy

4.1 Data

The data used in this study were acquired from the 2010 and 2018 Multiple Indicator Cluster Survey (MICS). In Mongolia, the survey had also been named as the Child Development Survey in 2010 and Social Indicator Sample Survey in 2018, respectively. The MICS surveys were conducted by the National Statistical Office of Mongolia with technical and financial support from the United Nations Children's Fund. The surveys are nationwide representative which aim to collect data for monitoring the situation of children and women in Mongolia. The information collected covers the areas of health, education, development, protection, implementation of rights, and the socio-demographic characteristics of the households and individuals. In the MICS surveys conducted in 2010 and 2018, 10,092 and 13,798 households were interviewed respectively. The data collection fieldwork was carried out between September and December during the survey year. (National Statistics Office of Mongolia, 2013; 2019).

This analysis utilized the data obtained from the questionnaires for women aged 15-49 and children under 5. By consolidating the women and under-5 children data, we constructed the fertility history of a woman in the last five years from the survey year. The women dataset also includes the following individual and socio-demographic characteristics of women: residential location, religion, ethnicity, and total number of children a woman had.

Of the 17,789 eligible women available for analysis, 8,016 participants were from the 2010 survey and 9,773 participants were from the 2018 survey. Less than 1% of observations were dropped due to missing data when the socio-demographic variables are included in the regression models.

4.2 Empirical strategy

This study estimates the change in probability of having newborns using the difference-in-differences approach by comparing the probability of having newborns before and after the policy change. We estimated the linear probability model below using OLS:

$$birth_i = \beta_0 + \boldsymbol{C_i}\boldsymbol{\alpha} + \lambda 2018 + \boldsymbol{C_i} \cdot 2018\boldsymbol{\delta} + \boldsymbol{Z_i}\boldsymbol{\gamma} + \varepsilon_i \qquad (4)$$

in which $birth_i$ equals one if woman i had ever given birth to a baby within two years before the survey year, and $\boldsymbol{C_i}$ is a row vector of dummy variables that captures the number of children the women had by the end of 2008 and 2016 for the respondents in the 2010 and 2018 surveys, respectively. The variable *2018* is the indicator variable for the 2018 survey. The variables included in the row vector of $\boldsymbol{Z}_{it}$ are used to control for the individual's socio-economic characteristics; they are age, economic region, wealth index quintile, and ethnicity.

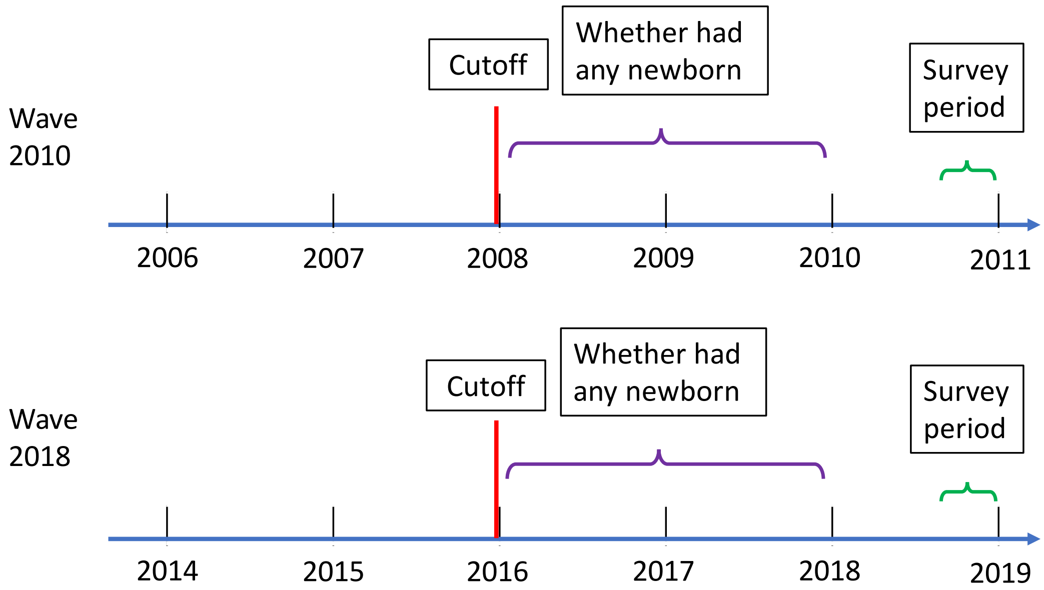

Figure 1: The cutoff year and the period for defining the dependent variable

Figure 1 illustrates the setup of the treatment variables and dependent variable applied in the regression model. As the new policy became effective in early 2011, we collected the data from the surveys conducted in quarter 4 of 2010 and 2018, respectively, which capture the fertility decisions made by the women before and after the policy change. The treatment groups are the women who had had 3 or 5 children already at a particular time which is defined as the "cutoff date". In the main models, we set the cutoff date two years before the survey years. As the surveys covered the women age 15-49, it is sensible to set the cutoff date that is close to the survey date, otherwise the older women will be missed from the dataset while they are the group that may have higher probability to have high parity children. However, we still need to keep a sufficient large time gap after the cutoff date to observe whether woman i had given birth to a baby after the cutoff date. Therefore, in this analysis, we used the cutoff dates which are two years before the survey years. This allows the women to have sufficient time to get pregnant and give birth if they decided to have one more child after the cutoff date.

Including the interaction terms $\boldsymbol{C_i} \cdot 2018$ in the model allows us to examine if the average probability of having one more child increased after the policy change, conditional on the existing number of children the women had had. The coefficients of the interaction terms, $\boldsymbol{\delta}$, therefore can be interpreted as the conditional average treatment effects of the amendment of OGM. Conditional on n children woman i had had by the end of 2016, denoted it by nc, $\hat{\delta}_{nc}$ in the equation (4) estimates the differences in the probability of the women had one more child in the post-policy-change period compared to that of the women in the pre-policy-change period. Recall that the policy transformed the award criteria in fertility goal from the women who had 5 or 8 children to the women who had 4 or 6 children for the second and first class OGM, respectively, and the financial transfers are doubled for both classes. Such policy change will increase the incentive of the women who had had 3 or 5 children after 2011 to have one more child as the revised OGM provided a higher *net* marginal financial benefit for achieving the fertility goals at fourth and sixth child. More generally, the incentive of the women who had had children number less than the goal after the policy change can increase if they are motivated to change their desired family size to achieve the goal. Furthermore, if the fertility demand is concave due to women's strong taste for conformist social norm as illustrated in our fertility model in Section 3, we should observe women's positive responses to financial incentive diminishes in parity, such as $\hat{\delta}_{3C} > \hat{\delta}_{5C}$ from our regression results.

5. Results

5.1 Descriptive statistics

Table 2 presents the descriptive statistics of the variables involved in the analysis. After excluding the observations with missing data, 23,623 women were included in the consolidated dataset in which 12,829 are obtained from the 2010 survey (hereafter referred to as 2010 cohort) and 10,794 women are obtained from the 2018 survey (hereafter referred to as 2018 cohort), respectively.

Table 2. Descriptive Statistics

	Overall		**2010**		**2018**	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
birth	0.1926	0.3943	0.1717	0.3772	0.2173	0.4125
2018	0.4569	0.4982	0.0000	0.0000	1.0000	0.0000
C1	0.1926	0.3944	0.1891	0.3916	0.1968	0.3976
C2	0.2109	0.4079	0.2026	0.4019	0.2207	0.4147
C3	0.1229	0.3284	0.1129	0.3165	0.1348	0.3415
C4	0.0550	0.2280	0.0512	0.2204	0.0595	0.2365
C5	0.0184	0.1344	0.0186	0.1352	0.0182	0.1335
C6	0.0068	0.0823	0.0078	0.0879	0.0057	0.0750
C7	0.0018	0.0426	0.0022	0.0467	0.0014	0.0373
C8	0.0007	0.0268	0.0009	0.0306	0.0005	0.0215
C9	0.0002	0.0145	0.0002	0.0125	0.0003	0.0167
Wealth index quintile						
Lowest	0.2432	0.4290	0.2026	0.4019	0.2916	0.4545
Second	0.2137	0.4099	0.1938	0.3953	0.2374	0.4255
Middle	0.1953	0.3965	0.1995	0.3996	0.1904	0.3926
Fourth	0.1866	0.3896	0.2056	0.4042	0.1641	0.3704
Highest	0.1611	0.3676	0.1985	0.3989	0.1166	0.3210
Location						
Capital City	0.3119	0.4633	0.3670	0.4820	0.2465	0.4310
Aimag Center	0.2702	0.4441	0.2646	0.4411	0.2769	0.4475
Soum Center	0.1565	0.3634	0.1212	0.3264	0.1985	0.3989
Rural	0.2613	0.4394	0.2473	0.4314	0.2780	0.4480
Ethnicity						
Khalkh	0.7809	0.4136	0.7998	0.4001	0.7585	0.4280
Kazakh	0.0669	0.2498	0.0369	0.1886	0.1025	0.3033
Other	0.1493	0.3564	0.1609	0.3674	0.1355	0.3423
Missing/Don't Know	0.0029	0.0536	0.0023	0.0483	0.0035	0.0592
Age	32.4732	9.6161	32.1868	9.7059	32.8137	9.4976
No. of observations	23,623		12,829		10,794	

Overall, 19.26% of the women had given birth within the two-year period. Compared to the 2010 cohort, the fraction of women with newborn in the two-year period for the 2018 cohort is 4.56 percentage points higher, as these fractions for the 2010 and 2018 cohorts are 17.17% and 21.73% respectively. Also, it is observed the fraction of women with low birth parities is higher for the 2018 cohort. The percentages of women having one child to four children in the 2010 cohort are 18.91%, 20.26%, 11.29%, and 5.12%, while those percentages in the 2018 cohort are 19.68%, 22.07%, 13.48%, and 5.95%, respectively. In contrast, the percentages of women having five or more children are less in in 2018 cohort compared to the 2010 cohort. In the Table 2, it can be verified that the parity distribution of 2018 cohort is first-order stochastic dominant over that of 2010 cohort.

5.2 Results from DID estimations

Table 3 presents the results from estimating equation (4) using OLS. The coefficients for the interaction terms between 2018 cohort and the number of children a woman had are the average treatment effects of OGM on having a newborn conditional on the number of children a woman had had. In additional to controlling for the age of women, we added the variables of wealth index, location of residence, and ethnicity in specifications (2) to (4) in order to control for the women's socio-demographic characteristics.

Table 3: The probability of having newborn in the two-year period

	(1)	(2)	(3)	(4)
2018 cohort	0.029***	0.019***	0.017**	0.015**
	(0.007)	(0.007)	(0.007)	(0.007)
C1	-0.033**	-0.039***	-0.039***	-0.038***
	(0.013)	(0.013)	(0.013)	(0.013)
C2	-0.100***	-0.112***	-0.114***	-0.113***
	(0.013)	(0.013)	(0.013)	(0.013)
C3	-0.118***	-0.139***	-0.143***	-0.142***
	(0.014)	(0.014)	(0.014)	(0.014)
C4	-0.091***	-0.119***	-0.123***	-0.123***
	(0.016)	(0.016)	(0.016)	(0.016)
C5	-0.081***	-0.118***	-0.122***	-0.124***
	(0.020)	(0.020)	(0.020)	(0.020)

C6	-0.079***	-0.122***	-0.125***	-0.126***
	(0.025)	(0.025)	(0.025)	(0.025)
C7	-0.041	-0.084*	-0.087*	-0.087*
	(0.048)	(0.049)	(0.049)	(0.048)
C8	-0.035	-0.083	-0.082	-0.084
	(0.080)	(0.079)	(0.079)	(0.079)
C9	-0.083***	-0.116***	-0.131***	-0.145***
	(0.012)	(0.016)	(0.019)	(0.014)
2018*C1	0.037**	0.041***	0.041***	0.043***
	(0.015)	(0.015)	(0.015)	(0.015)
2018*C2	0.017	0.02	0.021	0.023*
	(0.013)	(0.013)	(0.013)	(0.013)
2018*C3	0.02	0.023	0.026*	0.026*
	(0.014)	(0.014)	(0.014)	(0.014)
2018*C4	-0.042**	-0.039**	-0.037**	-0.038**
	(0.017)	(0.017)	(0.017)	(0.017)
2018*C5	-0.007	-0.005	-0.002	-0.003
	(0.028)	(0.028)	(0.028)	(0.028)
2018*C6	0.004	0.008	0.012	0.008
	(0.044)	(0.044)	(0.044)	(0.044)
2018*C7	-0.124**	-0.116**	-0.115**	-0.124**
	(0.049)	(0.050)	(0.051)	(0.051)
2018*C8	-0.141*	-0.123	-0.127	-0.134
	(0.084)	(0.083)	(0.083)	(0.082)
2018*C9	-0.070***	-0.084***	-0.074***	-0.090***
	(0.023)	(0.025)	(0.027)	(0.024)
Constant	-0.013***	0.025***	-0.0110	-0.0120
	(0.003)	(0.006)	(0.010)	(0.010)
Age	Yes	Yes	Yes	Yes
Wealth Index	No	Yes	Yes	Yes
Location	No	No	Yes	Yes
Ethnicity	No	No	No	Yes
No. of obs.	23,623	23,623	23,623	23,623
R-sq	0.135	0.140	0.141	0.142

Notes: Robust standard errors are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

Column (1) of Table 3 indicates that the probability of women in 2018 cohort having the first baby is 2.9% compared to 2010 cohort. In general, probabilities of having a newborn conditional on low parity births, from having had one to three children, are higher for the 2018 cohort.

After controlling for the women's socio-demographic characteristics, column (4) shows that conditional on having had one, two, and three children, the probabilities of having newborn for the women in 2018 cohort are 4.3%, 2.3%, and 2.6% are higher than that for the women in

2010 cohort. The results indicate that the change in OGM increases the probability of having a newborn within two years so long as the women had had the number of children less than the fertility goal of the OGM second-class award, i.e., less than four children. However, no significant impact is found right before reaching the fertility goal of the OGM first-class (i.e., the coefficient estimator $2018 * C5$ is not significant). Besides, no significant effects of the change in OGM on having newborn can be found for the 2018 cohort who had had six and eight children.

Another interesting finding is that there are significant negative decreases in the probabilities of having newborn right before the old fertility goals of OGM awards (i.e., having 5 and 8 children) were achieved. That is, the coefficient estimates of $2018 * C4$ and $2018 * C7$ in column (4) are -0.038 and -0.124, respectively, and these impacts are statistically significant. The negative coefficient of women having had 7 children is clear since the monetary incentive for achieving fertility goal at 8 children is cancelled after the policy change. While the negative coefficient of women having had 4 children can due to multiple mechanisms. First, it is possible that the higher monetary incentive of fertility goal at 6 children under new policy (i.e., new first-class award) only motivates women having had 5 children but not had 4 children. Then, the cancellation of reaching the fertility goals at 5 children under old policy would create negative financial incentive for women having had 4 children. Second, if the new first-class award also motivates women having had 4 children, we may still observe the negative coefficient estimator of $2018 * C4$ if women show loss aversion in their behavior–the disutility of cancelling out an award is greater that the utility associated with having it (Rabin & Thaler, 2001).

5.3 Heterogenous effects

Further to the main model, we have investigated the heterogenous effects of the change in OGM in rural and urban areas. The rural-urban fertility difference is a common issue concerning the policy makers. Compared to the people living in rural areas, the opportunity costs of childbearing, such as costs of childcare services and income forgone due to pregnancy, tend to higher for people living in the urban areas. Also, the couples who live in urban areas are more able to implement fertility preferences because of the easy access to fertility related services. Those rural-urban differentials raise the concern of the effectiveness of the new OGM in different areas.

To examine the heterogeneous effects of the change in OGM, we have performed a subsample analysis that estimates equation (4) on women who lived in urban and rural areas, respectively. The regression results are presented in Table 4.

Table 4. The probability of having newborn in the two-year period in urban and rural areas

		Urban			**Rural**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
2018	0.041***	0.032***	0.030***	-0.02	-0.02	-0.032**
	(0.008)	(0.008)	(0.008)	(0.016)	(0.016)	(0.016)
C1	-0.055***	-0.060***	-0.059***	0.02	0.019	0.023
	(0.015)	(0.015)	(0.015)	(0.029)	(0.029)	(0.029)
C2	-0.113***	-0.121***	-0.121***	-0.110***	-0.111***	-0.108***
	(0.015)	(0.015)	(0.015)	(0.028)	(0.028)	(0.028)
C3	-0.127***	-0.141***	-0.141***	-0.148***	-0.150***	-0.148***
	(0.016)	(0.016)	(0.016)	(0.029)	(0.029)	(0.029)
C4	-0.086***	-0.106***	-0.107***	-0.144***	-0.147***	-0.147***
	(0.019)	(0.019)	(0.019)	(0.031)	(0.031)	(0.031)
C5	-0.081***	-0.108***	-0.109***	-0.124***	-0.126***	-0.132***
	(0.025)	(0.025)	(0.025)	(0.036)	(0.036)	(0.036)
C6	-0.075**	-0.108***	-0.107***	-0.125***	-0.129***	-0.133***
	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)
C7	-0.007	-0.046	-0.048	-0.153***	-0.157***	-0.155***
	(0.069)	(0.070)	(0.069)	(0.027)	(0.027)	(0.027)
C8	-0.118***	-0.162***	-0.163***	0.085	0.079	0.079
	(0.019)	(0.019)	(0.019)	(0.217)	(0.218)	(0.217)
C9	-0.092***	-0.110***	-0.130***	-0.110***	-0.113***	-0.108***
	(0.014)	(0.015)	(0.019)	(0.025)	(0.027)	(0.028)
2018*C1	0.051***	0.053***	0.054***	-0.007	-0.006	0.001
	(0.017)	(0.017)	(0.017)	(0.034)	(0.034)	(0.034)
2018*C2	0.01	0.011	0.013	0.056**	0.055*	0.062**
	(0.015)	(0.015)	(0.015)	(0.028)	(0.028)	(0.028)
2018*C3	0.011	0.013	0.013	0.063**	0.062**	0.066**
	(0.016)	(0.016)	(0.016)	(0.028)	(0.028)	(0.028)
2018*C4	-0.074***	-0.073***	-0.073***	0.035	0.035	0.034
	(0.020)	(0.020)	(0.020)	(0.032)	(0.032)	(0.032)
2018*C5	-0.018	-0.02	-0.02	0.04	0.038	0.036

	(0.036)	(0.036)	(0.036)	(0.044)	(0.044)	(0.044)
2018*C6	-0.015	-0.014	-0.014	0.063	0.063	0.051
	(0.064)	(0.064)	(0.064)	(0.061)	(0.061)	(0.060)
2018*C7	-0.148**	-0.139**	-0.139**	-0.03	-0.031	-0.074**
	(0.068)	(0.070)	(0.069)	(0.031)	(0.031)	(0.033)
2018*C8	-0.076**	-0.062*	-0.062*	-0.239	-0.235	-0.295
	(0.037)	(0.036)	(0.034)	(0.219)	(0.220)	(0.220)
2018*C9				-0.032	-0.034	-0.104***
				(0.033)	(0.036)	(0.039)
Constant	-0.018***	0.020*	0.0160	0.0090	0.0120	0.0070
	(0.004)	(0.011)	(0.011)	(0.007)	(0.008)	(0.009)
Age	Yes	Yes	Yes	Yes	Yes	Yes
Wealth Index	No	Yes	Yes	No	Yes	Yes
Location	No	No	Yes	No	No	Yes
Ethnicity	No	No	Yes	No	No	Yes
No. of obs.	17,450	17,450	17,450	6,173	6,173	6,173
R-sq	0.135	0.139	0.139	0.150	0.151	0.154

Notes: Robust standard errors are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

The estimation results reveal the difference in the response to the policy between the individuals in urban and rural areas. The probability of having a newborn conditional on having had one child is higher in urban than rural areas. However, for the scenarios of having had two and three children, the probabilities of having a newborn in the next two years increase by 6.2% and 6.6% in rural area, which are higher than that in urban areas and the coefficient estimates for urban area are statistically insignificant.

Another interesting difference between the urban and rural areas is that the negative effect on having a newborn conditional on having had four children (i.e., having newborn right before the old fertility goal of OGM) exists in urban area only with the estimate of 7.3%, while this effect is statistically insignificant in rural area.

5.4 Robustness check

In this section, we proposed two alternative estimation strategies to show that our estimation results are robust to specifications. First, we re-consider the specification of our main model in which we constructed the age dummies for each year of ages of the individuals. The advantage of using age dummies instead of treating age as a continuous variable is that it allows the flexibility of the impacts of ages on fertility as we do not impose any functional form on the effect of age. However, using age dummies may induce a concern that the inclusion of a large number of age dummies may lead to serious multicollinearity and hence inflates the standard errors.

In order to address this issue, we re-estimated the main model without the age dummies but using the continuous age variable and the squared term of it. The regression results are presented in Table 5.

Table 5. The probability of having new born in two-year period with continuous age variable

	(1)	(2)	(3)	(4)	(5)	(6)
2018	0.025***	0.023***	0.019**	0.027***	0.024***	0.021***
	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)
C1	0.114***	0.111***	0.113***	-0.001	-0.002	-0.001
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
C2	-0.017	-0.022*	-0.021*	-0.093***	-0.096***	-0.095***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
C3	-0.097***	-0.104***	-0.104***	-0.126***	-0.131***	-0.131***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
C4	-0.118***	-0.126***	-0.126***	-0.104***	-0.109***	-0.110***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
C5	-0.152***	-0.160***	-0.163***	-0.095***	-0.101***	-0.104***
	(0.021)	(0.021)	(0.021)	(0.020)	(0.020)	(0.020)
C6	-0.181***	-0.188***	-0.189***	-0.090***	-0.095***	-0.096***
	(0.025)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
C7	-0.162***	-0.165***	-0.166***	-0.047	-0.051	-0.052
	(0.051)	(0.052)	(0.050)	(0.048)	(0.048)	(0.047)
C8	-0.155*	-0.154*	-0.156*	-0.049	-0.05	-0.051
	(0.080)	(0.079)	(0.080)	(0.078)	(0.077)	(0.077)
C9	-0.223***	-0.250***	-0.271***	-0.033**	-0.053***	-0.069***
	(0.017)	(0.024)	(0.015)	(0.016)	(0.019)	(0.014)
2018*C1	0.035**	0.035**	0.038**	0.036**	0.036**	0.038**
	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)
2018*C2	0.017	0.019	0.021	0.014	0.016	0.018
	(0.014)	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)
2018*C3	0.027*	0.031**	0.031**	0.015	0.018	0.019
	(0.015)	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)
2018*C4	-0.036**	-0.032*	-0.034*	-0.050***	-0.047***	-0.048***
	(0.018)	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)
2018*C5	-0.002	0.003	0.001	-0.018	-0.014	-0.015
	(0.029)	(0.029)	(0.029)	(0.028)	(0.028)	(0.028)
2018*C6	0.019	0.024	0.018	-0.009	-0.004	-0.008
	(0.045)	(0.045)	(0.045)	(0.044)	(0.044)	(0.044)

2018*C7	-0.097*	-0.097*	-0.110**	-0.137***	-0.134**	-0.144***
	(0.050)	(0.051)	(0.050)	(0.052)	(0.053)	(0.053)
2018*C8	-0.098	-0.107	-0.118	-0.141*	-0.148*	-0.156*
	(0.080)	(0.079)	(0.081)	(0.086)	(0.086)	(0.085)
2018*C9	-0.050***	-0.033	-0.057***	-0.135***	-0.121***	-0.139***
	(0.015)	(0.022)	(0.013)	(0.043)	(0.044)	(0.042)
Age	0.002***	0.002***	0.002***	0.075***	0.075***	0.075***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Age^2				-0.001***	-0.001***	-0.001***
				(0.000)	(0.000)	(0.000)
Constant	0.162***	0.106***	0.105***	-0.694***	-0.735***	-0.734***
	(0.009)	(0.012)	(0.012)	(0.015)	(0.017)	(0.017)
Wealth Index	Yes	Yes	Yes	Yes	Yes	Yes
Location	No	Yes	Yes	No	Yes	Yes
Ethnicity	No	No	Yes	No	No	Yes
No. of obs.	23,623	23,623	23,623	23,623	23,623	23,623
R-sq	0.041	0.043	0.044	0.121	0.122	0.123

Notes: Robust standard errors are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

In Table 5, columns (1)-(3) show the results from including the continuous age variable, and columns (4)-(6) show the results form including both the age variable and its squared term. The results from these two specifications are generally consistent with the results obtained from the main model in Table 3. In particular, the coefficient estimates for the interaction terms between 2018 cohort and number of children had had exhibit the same directions as the estimates in Table 3, though some of them are not statistically significant. The coefficient estimates of our variables of interest are plausible and robust under these two different specifications, and so the consideration of less restrictive form in age effect supports the structural validity of our main model.

Second, we perform another robustness check by deploying the propensity score matching (PSM) method to estimate the impact of OGM. PSM is a commonly used quasi-experimental approach in which each of the treated unit is matched with a non-treated unit with similar characteristics. Using these matches, the ceteris paribus effect of the program can be estimated even we suspect that the selection bias may exist.

In order to perform PSM, we divide the women who had had different numbers of children into sub-groups. Since the number of women who had had eight or above children is very low, we grouped the women with the children number of eight or above as one sub-group. Then we classified the women in 2018 and 2010 cohorts as the treatment and control groups. We then estimated the average treatment effects of OGM conditional on the number of children had had. Table 6 shows the results from using PSM conditional on the number of children a woman had had from one to eight or above.

Table 6. Results from propensity score matching

Average Treatment Effect (ATE) on 2018 cohort	Coefficient estimate	Robust Abadie–Imbens standard errors	p-value	Number of matched observations
C1	0.049	0.015	0.001	9,100
C2	0.046	0.012	0.000	9,962
C3	0.036	0.014	0.010	5,808
C4	-0.031	0.017	0.073	2,594
C5	-0.013	0.032	0.699	852
C6	0.036	0.041	0.385	322
C7	-0.047	0.040	0.241	86
C8 or above	-0.103	0.100	0.303	34

Note: the ATE is estimated by matching each individual in the treatment group to a single individual in the control group whose propensity score is closest.

The results from PSM are consistent with the results from the main model–the estimated average treatment effects on $C1$ to $C4$ for 2018 cohort exhibit significant impact with the same directions as we obtained from the main model. However, for the estimation conditional on number of children had had from 5 to 8 or above, the effects of OGM on the treatment groups estimated by PSM are statistically insignificant. This may be because the number of observations for those sub-groups are relatively small, from 852 observations to 34 observations only.

One essential assumption to secure the validity of the PSM estimator is the overlap assumption. This assumption requires that every individual should have a positive probability of receiving all the treatment levels. We therefore plotted the estimated densities of the probability of receiving different treatment levels which are presented in Figure 2.

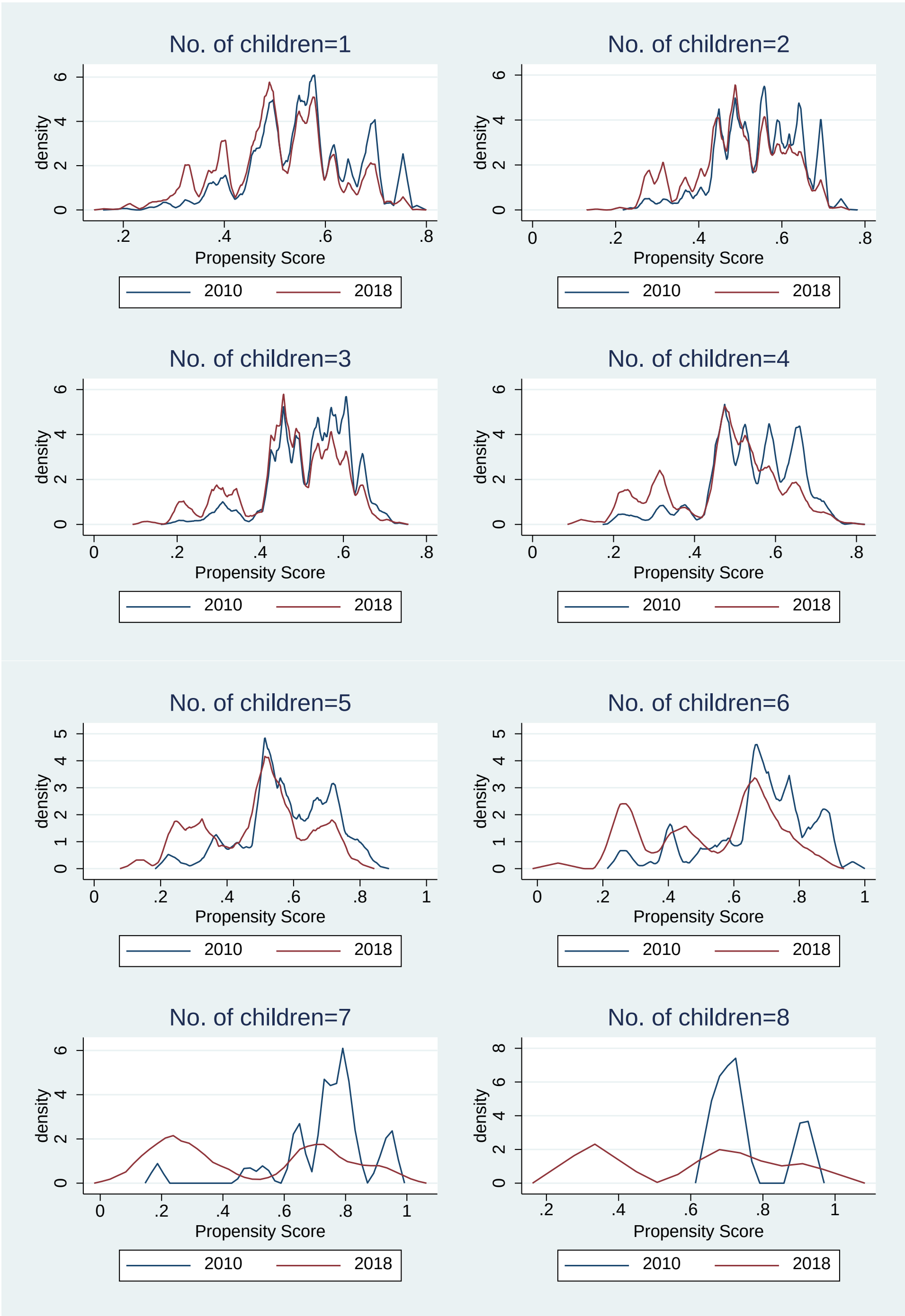

Figure 2. The estimated densities of the probability of being in the treatment group conditional on the number of children had had

The plots indicate that the overlap assumption is satisfied when the number of children had had is between one and six. However, this assumption seems to be violated when the number of children had had is seven or above.

6. Concluding Remarks

This paper presents new evidence on the causal relationship between a pro-natalist program with pre-specified higher parity goal and fertility response, using a policy experiment in the Mongolia. Our results confirm that women are motivated by a financial incentive scheme with two specific fertility goals on high parity birth. Moreover, we find the positive response of women's fertility response is diminishing when the fertility goal jumps from a lower one to a higher one. These results can be explained by an extension of Barro–Becker fertility model with the inclusion of social norm where the specified goal in fertility level is above the norm. The pattern of positive and diminishing fertility response also exists in the rural and urban areas where women in the urban area have higher opportunity cost in raising children, while women living in the rural area show larger positive response than those in the urban area for the birth orders closer to the high parity goal.

There is a caveat of our empirical finding. The results of this study apply in a specific context. In Mongolia, there are other programs that provides one-time payment for pregnant and lactating mothers. Although those programs are not parity-specific, the effects of financial benefits on high parity birth may be partly due to the complementarity of other programs with pro-natalist features, and so may not applied to other countries with different availability of other social programs.

To conclude, this study contributes to under-explored literature regarding financial incentives on high parity birth. It is also the first study to explore the program of the OGM in Mongolia. Since there exists heterogenous fertility responses for different orders of high parity births, a tailor-made pronatalist policy should take the finding into account for cost-effective consideration. To facilitate a more cost-effective policy formulation, further studies might attempt to provide estimation by incorporating the program cost from the government and shadow price of raising children from families.

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Appendix

The proof of Proposition 1 is done in the text. In this appendix, we present the proof for Proposition 2.

<u>Proof of Proposition 2</u>

Recall that n_1^* is determined by $F(b, n_1^*) \equiv -(p-b) + \beta v'(n_1^*) - \gamma\omega'(n_1^* - n_S) = 0$ where $n_1^* \geq n_S$. Evaluating $F(b, n_1^*) = 0$ with implicit function theorem gives

$$\frac{dn_1^*}{db} = -\frac{F_b'}{F_n'} = \frac{-1}{\beta v''(n) - \gamma\omega''(n - n_S)} > 0, \tag{4}$$

since $v''(n) < 0$ and $\omega''(n) > 0$. Hence, pro-natalist policies that provide cash transfers to parents will increase the fertility rate. Note that, the pro-natalist policies also has positive effect on fertility in high-fertility equilibrium. Because, in the equilibrium n_2^*, it is evaluated by $G(b, n_2^*) \equiv -(p-b) + \beta v'(n_1^*) + \gamma\omega'(n_S - n_2^*) = 0$. Given that $G_n' < 0$, $\frac{dn_2^*}{db} > 0$ holds.

Regarding the response to cash transfers given different number of children in the low-fertility equilibrium, it requires the evaluation of second-order derivative of n_1^* with respect to b. By applying implicit function theorem, we have

$$\frac{d^2 n_1^*}{db^2} = -\frac{\left[F_{bb}'' + F_{bn}'' \cdot \left(\frac{dn_1^*}{db}\right)\right](F_n') - (F_b')\left[F_{nb}'' + F_{nn}'' \cdot \left(\frac{dn_1^*}{db}\right)\right]}{(F_n')^2}$$

$$= \frac{[\beta v'''(n) - \gamma\omega'''(n - n_S)](dn_1^*/db)}{[v''(n)]^2} \tag{5}$$

Note that $v'''(n) > 0$ given v is an increasing, strictly concave, and thrice-differentiable function. Also, $\omega'''(n) > 0$ given that $\lim_{n\to+\infty} \omega''(n) = +\infty$ and ω is an increasing and strictly convex function. Since $\frac{dn_1^*}{db} > 0$, we obtain that $\frac{d^2 n_1^*}{db^2} < 0$ if γ is sufficiently high. A concave fertility demand, implied by $\frac{d^2 n_1^*}{db^2} < 0$, suggests the effect of cash transfers on parents with fewer children is stronger than those with more children.