Прикладная эконометрика, 2024, т. 75, с. 117–141.
Applied Econometrics, 2024, v. 75, pp. 117–141.
DOI: 10.22394/1993-7601-2024-75-117-141

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The Maternity Capital programs in Russia and the second birth spacing

The paper utilises survival analysis to study the role of a Maternity Capital program, introduced in 2007 in Russia to stimulate families to have a second birth (or adopt a second child), in changing the birth spacing between the first and the second child. The empirical study is carried out on the microdata of the Russian Longitudinal Monitoring survey over 2000–2019, the regional-level data from Rosstat and the data on the region's Maternity Capital programs by years from the open sources. The identification strategy compares birth spacing (via estimation of second childbirth hazards) before and after the introduction of the Maternity Capital program. The methods used do not allow us to isolate the impact of policy and time-fixed effects such as macro shocks. However, we implemented a test to check for no fertility trends in the pre-policy period. We also control for a wide range of personal and regional characteristics. Results are robust to different metrics (proportional hazard and accelerated failure time), functional forms (parametric and non-parametric) and subsamples (married women and working women). We find that the indexation of the federal Maternity Capital program leads to a 2.1% increase in the hazard of a second birth. The paper also tests the role of regional programs in addition to the federal-level program. We show that regional Maternity Capital programs also affect the probability of a second birth, and the estimated effect is two times bigger than for the federal program.

Keywords: demography; Maternity Capital; duration models; policy analysis.
JEL classification: J11; J13; J18; C41.

1. Introduction

In 2008, the population level in Russia achieved its lowest value (145.1 million people) of the period 2002–2017 within current borders, according to census data. In general, over the ten years between 2010 and 2020, there has been a slight increase in the population to 146.8 million people in 2017, which is still lower than in 2002. However, in 2018, the population growth in the Russian Federation was again negative. In 2020, the population growth reached the lowest value from 2005 (amounting to –550 thousand people), mainly due to the excess mortality during the Coronavirus pandemic (COVID-19) and decreased immigration levels. It is illustrated in Fig. 1.

Thus, like most others, one of the main goals of the Russian government is to stimulate population growth in the country. That is why in 2007, the government introduced Maternity Capital (MC) as a form of pronatalist policy. It is a measure of financial support for Russian families in which a second child was born or adopted since 2007. As in the presidential decree of the 7th of May 2018,

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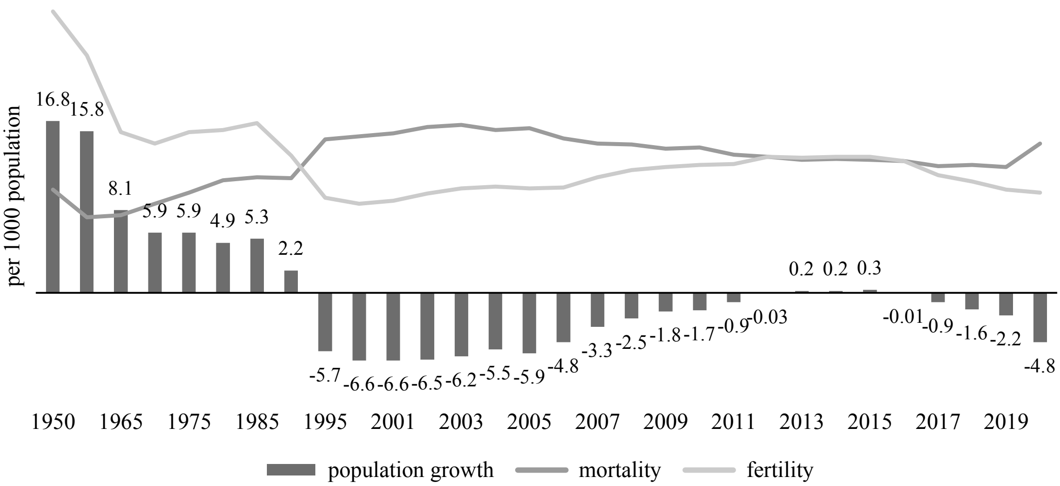

Fig. 1. Population growth in Russia from 1950 to 2020 (Rosstat data)

the task is to increase the total fertility rate[2] from 1.58 to 1.7 by 2024. A year and a half later, at the January Presidential Address to the Federal Assembly in 2020, the Maternity Capital program was extended until 2026. It should be noted that the Maternity Capital program initially aimed to stimulate the birth of the second child. A form of MC is obtaining a certificate of approximately $10000, which the family can spend on improving housing conditions, paying for the child's education, or using it to contribute to the mother's pension. From 2020, the program also supports families where the first child was born.

Moreover, starting in 2011, most parts of Russian regions adopted regional Maternity Capital programs. Mainly, they aimed at stimulating the birth of the third child and provided a certificate that could be spent on the same goals as the federal one, but they are four times lower than the federal one on average. There are also some regions where the government stimulated the birth of the first or the second child and provided money by cash transfer. In contrast, some regions do not provide any form of regional Maternity Capital. There is also some variation of dates when the law entered into force (from January 2011 to January 2013), and some regions prolonged regional programs until the current moment while others cancelled it already (and others had some gaps in time when the program was available).

However, despite the government's measures, the total fertility rate in Russia has been declining since 2015, and we have now reached the level of the early 2000s. Scholars have already covered the fertility-related effects of the federal program using ex-post econometric analysis, such as regression discontinuity design with a cut-off around a program implementation date (Sorvachev, Yakovlev, 2019) and dynamic microsimulation modelling which allows us to predict completed fertility for all the cohorts (Slonimczyk, Yurko, 2014) and found causal positive effects of the program on total fertility rate, both in the short- and long-runs.

Our paper uses survival analysis methods to study the role of the federal and regional Maternity Capital programs in changing the birth spacing between the first and the second child since the introduction of the federal program in 2007. The main identification problem while modelling fertility

2 The average number of children that would be born to a woman over her lifetime.

is the multitude of different factors. We will try to separate the effects caused by government policies, demographic factors, and economic reasons, including the broad set of controls and testing fertility trends in the pre-policy period. Since the direct promotion of the birth rate of the first child began in January 2020, we have been working with the micro-data over 2000–2019 not to mix its indirect effects on the second birth spacing.

Let us explicitly mention why we have chosen duration models over the binary choice models (probit and logit, for example), modelling the probability of a second birth. First, it allows us to use censored and truncated data: for instance, not all of the women in the sample manage to have a second child during their presence in the panel dataset and may have a second child after the interviews have ended (such observations are referred to as right-censored ones). Secondly, we could straightforwardly see how the calendar of births is changing with the program implementation, in other words, see a rescheduling timing of a births' effects. Thirdly, we would draw survival functions that are commonly used in demographic papers that would make our results more comparable with the literature. The hazard ratio of birth is considered to be a more precise estimator of fertility rates.

The paper proceeds as follows. In the next section, we discuss the institutional environment in Russia and factors affecting fertility. In section 3 we proceed to the literature. Section 4 discusses an econometrics theory on duration models and survival analysis. Section 5 discusses the data. In section 6, we proceed to an estimation and provide robustness checks. Section 7 concludes the paper, we summarise all the results and provide policy recommendations.

2. Institutional environment: Factors affecting fertility

As was already mentioned, the main government policy aimed to increase fertility rate in Russia is the federal Maternity Capital. Let us provide some details about the program. First, the amount of money provided by the government changed over the years and was non-decreasing in rubles as it shown in Fig. 2. However, if we recalculate the amount in the average subsistence minimum by regions as it done in Fig. 3, we will see that it decreased gradually from 2007 to 2020. The dollar amount (computed for Central Bank average yearly values) dropped significantly after the 2014 Ruble Collapse due to the economic crisis, you could see it in Fig. 2. It is important to note that there was no indexation of Maternity Capital in the five years from 2015 to 2019. We will include the data on the MC amounts normalized by the size of the subsistence minimum in the region for individual to see how it affects the birth spacing.

Secondly, initially the program was implemented for ten years (from the 1st of January 2007 till the 31st of December 2016) but was prolonged in 2015 till 2018, and later in 2017, prolonged till 2020. The last prolongation happened in 2020, and now the federal Maternity Capital program is extended until 2026. There could be two effects of such prolongations. At first, the program was valid without gaps from 2007, but 2 years prolongation happened in 2015, and 2017 gives some additional uncertainty, and families could postpone childbearing until they would get the certificate for sure. The last prolongation happened in 2020, which extended the program for seven years. In literature, scholars highlighted the effect of a program that has been in place for many years is diminishing over years, since citizens expect it would always be in place and there is no additional reason to give birth sooner (Keil, Andreescu, 1999).

The third important aspect regarding the program is changing how a certificate could be used. For example, since 2010, it has been possible to spend the certificate building a house

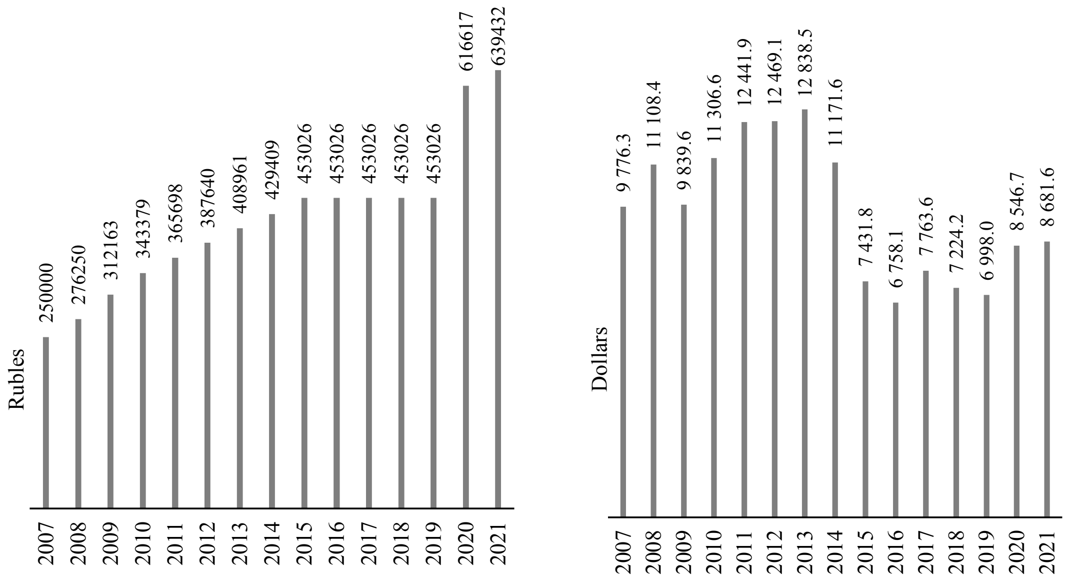

Fig. 2. Federal Maternity Capital amount (2nd child, in rubles and dollars)

in the countryside. Since 2019, the government has been fighting the ways to cash out the certificate, buying dilapidated housing or paying back a loan to a non-governmental organisation.

As mentioned in the introduction, the regional Maternity Capital is the second government policy to increase the fertility rate. Gathering the data about regional Maternity Capital programs from all 83 federal subjects of Russia within the 2014 boundaries (for data consistency), we created maps for different dimensions of the program. In Figure 4, the map shows a targeted child for a program for each region as of 2021. We define a targeted child as the child for whom the most money is provided. Most regions stimulate the third child's birth, 50 regions out of 83 in 2021. The average size of the certificate for the third child is 112384 rubles (for all regions if non-zero

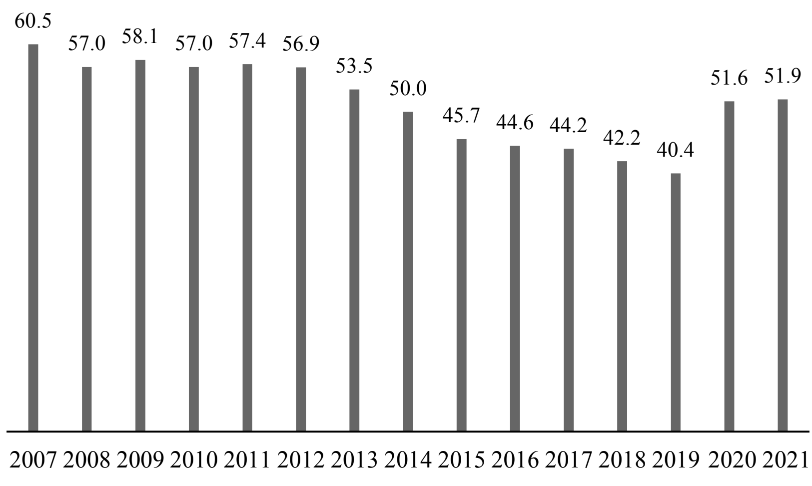

Fig. 3. Federal Maternity Capital amount (2nd child, in average regional subsistence minimum)

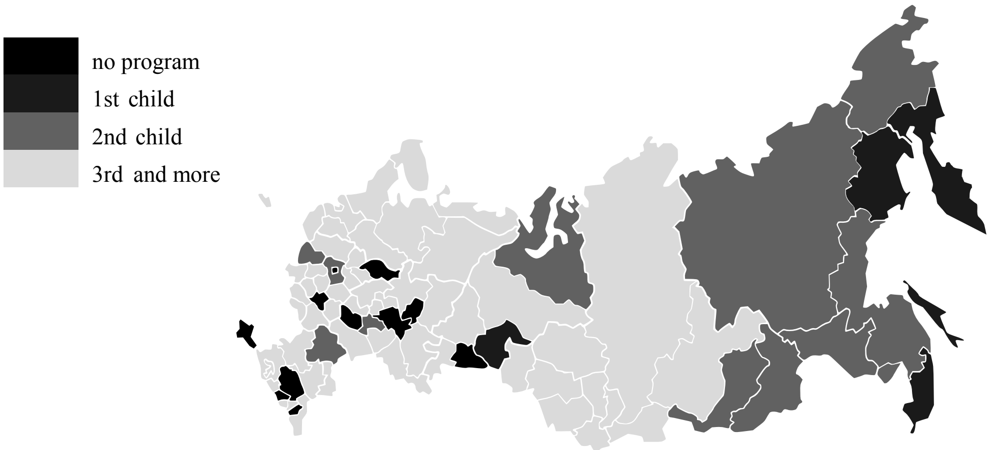

Fig. 4. Targeted child by birth parity for a regional MC (2021)

from 2011 to 2022, according to the author's computations). It is important to note that before 2018, only 6 regions aimed at stimulating the birth of the first or second child. Mainly, regions provide certificates that are spent to improve housing conditions. However, there are 13 federal subjects where cash transfers are provided (by 2021). Also, there are 9 federal subjects with no program available (in 2021). We are including the data on the regional specificities of the programs to analyze the role of regional programs on the second birth spacing.

Let us also briefly discuss associations between fertility rates and regional program generosity at the moment when regional programs were introduced. In Figure 5, a two-dimensional graph shows the total fertility rate in the region in 2012 and the amount of regional MC for the third child if it was provided. By 2012, 56 regions out of 83 introduced MC for the third child. The two most popular values by amount are round numbers: 8 federal subjects provide 50000 rubles, and 25 federal subjects provide 100000 rubles. Surprisingly, if we compute the least-square prediction for the data,

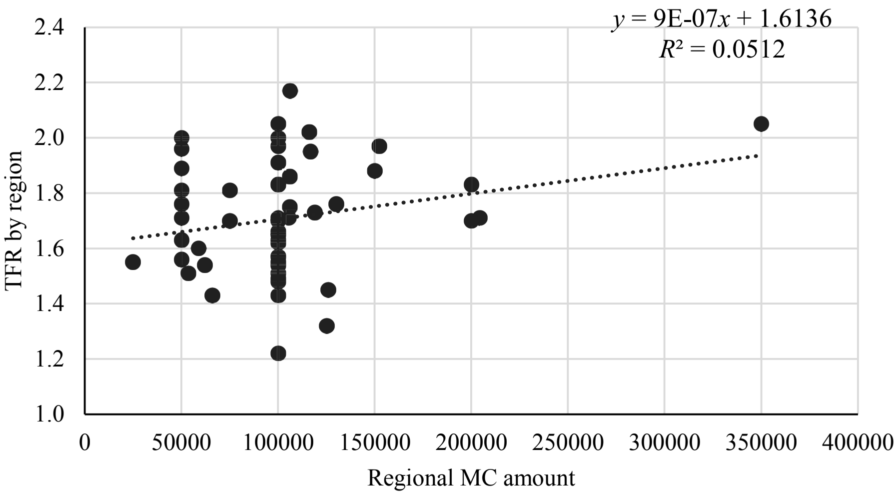

Fig. 5. Associations between fertility rates and regional program to the 3rd child amount in 2012

including the constant, we will see that the trend is rising. Regions where total fertility is higher provide more money. But the *R*-squared equals 0.05, which is relatively low, mainly because of the low variation in a program's generosity. If we compare the average fertility rate among regions by 2012 where the program was introduced to those without a program, we will see the results as 1.71 vs 1.87. It was expected to see that federal subjects with no program have bigger fertility rates, but we expect bigger differences.

Lastly, there are other financial ways to support fertility in Russia. However, they are primarily minimal (less than 30 dollars per month) or provided only to families with low Social Economic Status (SES).

Let us discuss the demographic factors affecting fertility. In the literature devoted to the analysis of the impact of government pronatalist policies, scholars warn about the identification of a false positive effect of the programs. This is because many women give birth earlier to a second child (the interval between births decreases), while the total number of "desired" children (the total fertility rate) does not change. This phenomenon is called rescheduling the timing of birth. Our work will reveal whether women, with the program's introduction, give birth earlier to a second child. A false positive effect of policies could also be discovered if policies coincide in time with a positive fertility trend. To check for fertility trends in a pre-policy period, we have implemented a test to compare the hazard ratio four years before the policy implementation. Furthermore, demographers are highlighting so-called cohort effects. During the 2010s in Russia, women from a smaller cohort of the 1990s reached childbearing age. There are two reasons why women from a smaller cohort postpone childbearing: they are born in small families that affect their social norms about family size, and secondly, they face less competition in the marriage and labour market, so they have more time to make crucial decisions. We include the data on the cohort size of working women in the region as a control. The last demographic issue is the so-called age effects. A mother's age and portrait are changing over time, social norms are also changing. Mostly, social norms are considered unobserved, but we control a wide range of observed women's portrait characteristics, such as education or employment status, as well as those of her partner and family.

The last thing we will discuss is the economic reasons affecting fertility. Economists are usually interested in how fertility is affected by economic recessions. Russia faced three crises during the years from 2000 to 2020: the Great Recession of 2008, the economic recession of 2014 (the ruble collapsed in July — August 2014, reaching its lowest historical value and keeping a further downward trend) and the coronavirus pandemic (COVID-19) world crisis. We would exploit the unemployment rate in the region as an indicator of economic growth as an additional control.

3. Related literature

The most frequent starting point for a scholarly discussion of the fertility-economy interaction is the work of Becker (1960), who proposed consideration of childbearing as a rational decision that individuals make within the framework of a standard neoclassical model of consumer demand. Becker compared children to durable goods and believed that individuals when choosing between childbearing and purchasing of different goods, proceed from a budgetary constraint and try to maximise the utility function. Parents spend resources on raising children, thereby increasing the 'utility' of children themselves. Later, Willis (1973) proposed a model, where if the value of a woman's time increases, due to an increase in wages, then childbearing may become "costly". There are two consequences of this postulate. The first is the direct correlation between income and the number of children in the family, i. e. the higher the income, the more parents can invest in a child and increase the child's utility function. The second consequence is the negative relationship between income and the number of children, because the more expensive the parents' time, especially the mother's, the more "costly" it becomes to spend this time on the upbringing of children.

At the macro level, economists are studying how fertility is linked with economic growth. As mentioned in the introduction, most research on fertility and economic growth concluded that fertility is procyclical over the business cycle (Sobotka et al., 2011; Adsera, 2011a), and shifts in fertility start with a year lag after recessions. The more recent study (Buckles et al., 2021), in turn, suggests that fertility is an economic indicator with a predictive effect on economic growth. In particular, the paper concludes that conceptions' growth rate declines rapidly at the beginning of economic downturns, and the decline starts several quarters before recessions begin.

Economists have also devoted much of attention to evaluating the effectiveness of government programs to fertility incentives. The most convincing works on evaluating the effectiveness of the Maternity Capital program in Russia were already mentioned in the introduction. Slonimczyk, Yurko (2014) and Sorvachev, Yakovlev (2020) identified the long-term positive effects of the program on fertility in Russia. The papers often find minor positive effects of programs that are heterogeneous across groups of citizens. Some studies have found an effect only in poor households, as was shown in Israel (Cohen et al., 2013). There is no clear-cut answer in the literature on how different the effects of pro-natalist programs are by child parity. It is also important to note the specificity of the Maternity Capital program in Russia. In Russia, the most popular form of support, from the first year of the program, is improving housing conditions, which limits the scope for a direct comparison of the results of the program with international practices of fertility stimulation, such as the introduction of lump-sum financial assistance, as in Canada in 1988 (Milligan, 2005) and Spain in 2007 (Gonzalez, 2013), and changing the length of maternity leave, for example, in France in 1994 (Canaan, 2019). Regional differentiation of fertility in Russia is studied mostly by demographers without any econometrics analysis (Arkhangelskiy, 2019).

Proportional hazard models of second births for 13 Western European countries were used by Adsera (2011b) to find how unemployment levels affect birth spacing for women with different educational backgrounds. In Russia, the length of the interval between births up to this point was considered by two scholars (master students). The article by Zaynullin (2015) has the same topic on the same dataset over 1994–2013, but the author modelled the duration between births using OLS. It is not an appropriate way for modelling because censoring and truncation are not accounted for, and the duration takes only positive values and is not normally distributed. Kopeykina (2017) was using a different dataset (where the sample size was even smaller) and found no significant effect of Maternity Capital on birth spacing. So, our paper contributes to the literature with more precise estimators of pronatalist policies' effects on fertility using microdata.

4. Theoretical part

It is appropriate to use duration models to analyse the length of the interval between birth. The main advantages of the model are its non-linearity, the absence of the assumption of a normal distribution of durations (durations are usually asymmetric, for example, limited to zero on the left) and the possibility to account for the contribution of spells not completed by the end of the survey (since duration is limited to the observation length on the right).

Let us proceed to a theoretical description of the models used. We will denote the random variable describing the duration we are studying as T, its distribution function as $F(t)$, and its density function as $f(t)$. We exploit basic definitions of durations models such as survival functions and hazard functions. They could be found at (Verbeek, 2004).

The proportional hazards model is used to identify the relationship between characteristics and duration. Let x_i be a vector of explanatory variables. This model assumes that the explanatory variables have a multiplicative effect on the hazard function:

$$h(t \mid x_i) = h_0(t)\varphi(x_i'\beta), \tag{1}$$

where $h_0(t)$ is the baseline hazard, reflecting the distribution of durations in the absence of regressors (at $x_i = 0$); $\varphi(x_i'\beta)$ is a person-specific function that describes the effect of the characteristics, which is usually $\varphi(x_i'\beta) = e^{x_i'}\beta$. This choice of the person-specific function ensures that the hazard function is non-negative and allows us to interpret the coefficient estimates β: if the explanatory variable x_j increases by one, the hazard function at each point t will increase e^{β_j} times. Estimates of the β coefficients and parameters of the hazard function are obtained by the maximum likelihood method. Cox (1972) suggested a partial likelihood method for estimating the parameters β in a proportional hazard model without specifying the baseline hazard, which we will follow for initial computations.

We would also like to extend our analysis using parametric survival models. It can be interesting to look at how, under certain assumptions (parametric assumptions on baseline hazards), second birth duration changes before and after the policy. Parametric models can be modelled with two assumptions: a proportional hazard model (PH) or an accelerated failure time model (AFT). Proportional hazard models measure vertical shift in hazard rates with changes in covariates (higher or lower at a given time), and with AFT hazard rates have horizontal shift with changes in covariates (accelerated or decelerated). As a baseline for estimating the second birth durations, we exploit PH model, using semi-parametric models. Then, we will compare the effects of policy if we assume birth duration follows AFT models. Policy can have a decrease in the expected waiting time for failure (i.e. second birth probability is accelerated, given that they survive till t).

The second choice we will make is selecting the baseline hazard model. We are considering monotonic and non-monotonic distributions. Monotonic baseline hazard functions include Weibull distribution (or Gompertz), and non-monotonic includes loglogistic distribution (or lognormal). Under these assumptions, the hazard rates for second birth either monotonically increase, either monotonically decrease with time (for Weibull distribution and for Gompertz) or increase initially and decrease over time (for loglogistic and lognormal). The fertility preferences of individuals determine these baseline hazard rates, so we will check two options of duration dependence: the probability of a second birth decreases as time passes by (Weibull hazard function, respectively) or people want to have a child with increasing probability until the particular moment when it starts to decrease (loglogistic/lognormal distribution, respectively). For completeness, we are looking at exponential distribution (although we don't expect baseline hazard rates to be constant with time). We are modelling with baseline hazard Gompertz distribution as the PH model as AFT unavailable for that baseline distribution.

In AFT models, the natural log of survival times is expressed as linear functions of covariates:

$$\ln\left(t_i\right) = x_i'\beta + \varepsilon_i \tag{2}$$

whereas ε follows density f, it depends on our assumption of the baseline hazard. If we assume the baseline hazard follows Weibull distribution, f is Weibull distribution and so on.

Survival times and hazard rates in AFT models are modelled as

$$S_i(t) = S_0(t)\left(e^{-x_i'\beta}t\right), \quad \lambda_i(t) = \lambda_0\left(e^{-x_i'\beta}t\right)e^{-x_i'\beta}. \tag{3}$$

We interpret these beta's as the follows. If $\beta < 0$, then for positive covariates $(x_i > 0)$, $e^{-x_i'\beta} > 1$ implies that hazard rates are accelerated (expected durations are shortened). Hazard rates are shifted towards the left compared to baseline hazard rates. As we estimate a model with the baseline hazard as a Gompertz distribution with PH assumption, the interpretation would be the same as in the Cox-proportional hazard model, where we estimate the risk ratio and look at the ratio of hazard rates before and after policy implementation. We choose between these models using the AIC criterion since the sample size is the same for all. The criterion uses a trade-off between the estimated log-likelihood and a number of parameters. We select the model with the lowest AIC. We are not focusing much on this criterion selection in this paper.

Duration models make it possible to work with censored data. For instance, not all the subjects in the sample will have had a second child during their presence in the data and may have had a second child after the survey ends (such observations are referred to as censored right). For these subjects, the observed duration is equal to the difference between the year of participation and the first child's birth date. Let $\theta = \{\beta, \alpha, \gamma\}$ — vector of estimated parameters, t_i — observed duration, t_i^* — real duration, c_i — censored moment, d_i — indicator of censoring. Then the contribution of the censored observation to the likelihood function is:

$$\mathrm{P}\left\{t_i = c_i \mid x_i, \theta\right\} = \mathrm{P}\left\{t_i^* > c_i \mid x_i, \theta\right\} = 1 - F\left(c_i \mid x_i, \theta\right). \tag{4}$$

Thus, the logarithm of the likelihood function equals

$$\ln L(\theta) = \sum_{i=1}^{n}\left\{d_i \ln f\left(t_i \mid x_i, \theta\right) + \left(1 - d_i\right)\ln\left[1 - F\left(c_i \mid x_i, \theta\right)\right]\right\}. \tag{5}$$

Note that duration models also account for other types of censoring (including interval censoring) and truncation, but in our data, we only encounter right censoring. For example, we do not encounter truncation on the left, since short durations (at the time of first participation in the survey) are also represented in the sample, as are longer durations, since each survey participant also provides information on all children born before the survey.

Let us also explicitly highlight that we treat time as a continuous variable rather than discrete. The reason is quite simple: we have a relatively small ratio of length of the interval to the typical duration.The interval duration is 1 month (since we know only month of births, but it is only 1 month uncertainty even considering the fact we have a yearly panel), and the mean spell between the first and the second birth is 83 months (if we don't account for censored observations).

We also perform diagnostic tests such as Cox–Snell residuals and test for proportional hazard assumption violations commonly used in the literature to test the assumptions in the model. These tests are based on residuals and work only if the estimation of β is consistent. Nevertheless, we must be careful concluding from these tests.

5. Data

The data that was used is the Russian Longitudinal Monitoring Survey[3] (a panel data series of nationally representative surveys, around 10000 observations per year). It is available from 1994 and consists of household and individual (both for adults and children) questionnaires. We also have some year-to-year variations of the survey interview date (usually from November to February). The questionnaires from 2000 to 2019 were selected for use (184410 observations for women). In 2000, the sample was updated for residents of Moscow and St. Petersburg to fight sample attrition, which explains the choice of the first year. As mentioned before, in 2020 the MC program changed its aim also to stimulate the first birth. We restrict the data to 2019, not to mix indirect effects of the program modification on the second birth spacing. We also restricted our sample to women of age from 17 to 47 (the reproductive age for the birth of a second child) who have one or two children (zero also included only in the case of twins) (22555 observations). All waves of the individual survey were merged into a single database, using the household number to merge each individual with the data of the household to which she belongs. We also attached the individual data of spouses and children to that of the woman. This was done using the relationship matrix available in the household questionnaire. The availability of the child questionnaire provides unique data on the months of birth of the children (if they are less than 14 years old at the time of the interview), through which the length of the interval between births (in months) is calculated.

It is important to note that there is no information in the RLMS on whether the eligible family used Maternity Capital. Slonimczyk, Yurko (2014) also claimed that take-up rates were relatively small during the first years of the program being implemented. So, our analysis would be intention-to-treat.

The second dataset is The Federal State Statistics Service (Rosstat), where macro-controls are available. As we know the region where the individual lives, it allows us to link Rosstat data on unemployment in the region (by percentage), the size of the subsistence minimum (in rubles) and number of women of working age from 2000 to 2019. Let us note that the subsistence minimum data for some regions is unavailable for 2000–2002. For such regions, the subsistence minimum was calculated manually as the ratio of the average Russian subsistence minimum for that year to the average Russian subsistence minimum for the nearest available year, multiplied by the nearest available subsistence minimum for that region (if several years were missing, the procedure was iterated). We would use the unemployment rate as an indicator of economic growth and the number of women as a control for cohort effects. Cohort size was normalised to make estimates more visible.

We also merged the data on the federal Maternity Capital program amount by years in rubles (see Fig. 2 in the Introduction). We would divide the sum by the size of the subsistence minimum (calculated in Russia on the base of the regional price index) in a region for each individual since the purchasing power of the Maternity Capital varies across regions. The most scrupulous part was to collect the data on the region's Maternity Capital programs amount by years in rubles, the information about ways to spend the certificate, starting date, and validity period of each program.

[3] Russia Longitudinal Monitoring survey, RLMS-HSE, conducted by National Research University "Higher School of Economics" and OOO "Demoscope" together with Carolina Population Center, University of North Carolina at Chapel Hill and the Institute of Sociology of the Federal Center of Theoretical and Applied Sociology of the Russian Academy of Sciences. https://rlms-hse.cpc.unc.edu, https://www.hse.ru/org/hse/rlms.

It was done manually from open sources since no published database in Russia provides the information. We also divided each sum by the size of the subsistence minimum in the region in the same manner as was done for the federal program. We decided to separate information into four variables on regions where the certificate is provided as a cash transfer on the third child and others, where it could be spent only on improving housing conditions on the third child, the second child and the first child. We would also test a specification where all regional MC variables were merged.

5.1. Variables description

Let us use Table 1 to describe the explanatory variables used. 'D:' indicates that the variable is binary with the values 0 and 1; after the D stands a description of the value corresponding to 1 (and the base category is indicated in parentheses). In the table, the Sign column shows the expected signs of the influence of each of the variables on the probability of a second birth (a dot indicates that the variable is either used as a fixed effect or required for intermediate calculations).

Table 1. Variables descriptive

Variable	Observations	Sign	Description
idind	22555	.	Individual number (same for all years)
year	22555	.	Year of participation in a survey
age	22555	+	Age
agesq	22555	–	Age squared
bad_health	22461	–	D: subjectively measured health as bad (subjectively measured health as good)
high_educ	22533	–	D: has higher education (baseline for all educational variable — finished 6 grades)
school	22533	–	D: finished school
college	22533	–	D: finished college
ownhouse	22555	+	D: owns a house (baseline is renting)
m2_perperson	21261	–	The housing area / household size
f_incomepp	21013	+	Family income/ (household size×min)
Moscow	22555	–	D: living in Moscow (baseline for all categories for place of living is a town)
Petersburg	22555	–	D: living in Saint Petersburg
rural	22555	–	D: living in a rural area
min	22308	.	Subsistence minimum in a region
unemp_rate	22555	–	Unemployment rate in a region
lagged_UR	19591	–	One year lagged value of unemployment rate in a region
unemployed	22408	+	D: unemployed
government	15569	–	D: working in a government job
highjob	17228	–	D: head of a company
wage_mzero	19575	–	monthly income (0 if unemployed) / min
hour_wzero	21715	–	weekly working hours (0 if unemployed)

End of table 1

Variable	Observations	Sign	Description
married	22520	+	D: married or living together
spouse_age	16328	+	Spouse age
spouse_w	16313	+	D: spouse is working
spouse_hbad	16232	–	D: subjectively measured spouse health as bad
spouse_inczero	14702	+	Spouse monthly income (0 if unemployed) / min
health1_bad	22333	–	D: subjectively measured kids health as bad
child1_female	22413	+	D: sex of the first child is female
secondborn	22555	.	D: second child born this year
interval	22555	.	Interval between 1st and 2nd births in months
matcap	22555	+	D: family is eligible for Maternity Capital
matcap_size	22125	+	Federal MC size in rubles per year / min
region_matcap3_money	22125	+	Regional MC size in rubles per year by cash / min (3rd child)
region_matcap3_restricted	22125	+	Regional MC size in rubles per year for housing / min (3rd child)
region_matcap2_restricted	22125	+	Regional MC size in rubles by cash plus housing / min (2nd child)
region_matcap1_restricted	22125	+	Regional MC size in rubles by cash plus housing / min (1st child)
region_matcap123	22555	+	Regional MC size in rubles for all children / min (merged var.)
cohortsize_scaled	22555	+	Normalized number of women of working age by region

Let us discuss the expected signs of the effect of some variables. Since the hazard of birth is related to the probability of having a second child, we will use the same explanatory variables as in the literature investigating the probability of birth in Russia (Karabchuk, 2017; Sinyavskaya, Billingsley, 2015). As age increases, the hazard function increases (as the woman takes into account the limitations of fertile age), until the point when she reaches a certain age, as she decides that the time to have a child has already passed (at that age it is more likely that the child will be less healthy). Since the opportunity costs of childbirth are higher for women with higher education, we would expect the sign of the highest education level to be negative. However, university education in Russia is becoming ubiquitous, thereby no longer guaranteeing a better job, so we could expect education-related variables to be insignificant. A woman with poor health is less likely to have a second child because childbirth and the first years of childcare require greater internal resources of the mother. Women living in rural areas are more likely to have a second child than urban residents, which is associated with a lesser desire for self-realisation and the persistence of traditions regarding the optimal number of children in a family for urban and rural residents. In the literature dedicated to the analysis of the interplay between the level of unemployment and fertility, scholars highlight (Adsera, 2011b) that women may choose to postpone maternity to secure their present working position or may fear that time spent in childbearing may harm their likelihood of re-employment, so the expected sign would be negative. The higher a woman's salary, the higher the opportunity cost of having a child (a job interruption, due to having a child, negatively affects the chance of returning to the same high position), thus reducing the hazard of a second birth. The husband's income produces the opposite effect: if the husband's income is high, the woman can concentrate on raising several children, and parents can invest more in a child. Here, we still consider Russia to be a patriarchal country, where the husband mostly earns the money. The number of hours worked per week for the mother has a negative effect because, with fewer hours, it is easier to quit work. On the other hand, in Russia, unlike in Western Europe, part-time employment is not widespread (which is an important indicator in the study of fertility in European literature), so the variable may not be significant. For instance, in our sample, the mean of this variable is expected to be 41.7 hours, and the variance is small: 80% of mothers work 30 to 50 hours per week. Literature dedicated to the determinants of the sex ratio at birth shows that the gender of the first child is an important predictor of the probability of a second birth (Chahnazarian, 1988). Thus, having a female as the first child increases the probability of a second birth (for some families, it is important to have a son). It could not be the case for Russia, and the variable may not be significant. We also expect the direct correlation between the federal Maternity Capital program amount and the probability of a second birth. Since the regional Maternity Capital programs are mostly stimulating the birth of a third child, their size may not directly affect the probability of a second birth. Nevertheless, it may indirectly impact the probability of having a second child. If families intend to have three or more kids, the policy on a third one could stimulate the birth of a second. As was already mentioned in the introduction section, we expect women from bigger cohorts to have a higher probability of giving a second birth: they are born in large families, which affects their social norms about family size, and secondly, they face more competition in the marriage and labour markets, so they must make critical decisions earlier.

Even though women decide about the birth of a child a year before its birth, it was decided to use explanatory variables of the year corresponding to the birth of the child rather than lagged values. It was mainly done because of the available data quality. There are gaps in the panel data set for some individuals, and taking the lagged values would even decrease its quality. As for mechanism explanation, in deciding the birth of a child, a woman should consider her situation after the birth: whether she will take maternity leave, whether moving from a large city. We are aware of the reverse causality problem that may arise. However, this problem is much less serious for second births than for transitions to maternity since most important decisions generally occur around the first birth (Browning, 1992). The only variable we use with a one-year lagged value is the unemployment rate (an indicator of economic growth), and usually test for both specifications (with lagged and present value of UR).

5.2. Descriptive statistics

Let us take a closer look at our data in terms of duration. So, in the sample of 4867 individuals, there are 21925 records (the panel structure is considered). Each individual is presented in the data on average 4.5 times, but some end up in all 20 waves. The number of births of a second child is 982, so all other observations are right censored. The median birth interval, as in the data, is 78 months, and the mean value is 93 months. Also note that 5551 observations relate to the period when the family is not eligible for Maternity Capital (before July 2007 (Slonimczyk, Yurko, 2014), 9 months after the announcement of the program), the remaining 17004 observations relate to the period when the family is eligible (and their decision is affected by policy implementation). The incidence rate of the second birth, as in the data, is 0.0017 before the Maternity Capital introduction, and 0.0023 after.

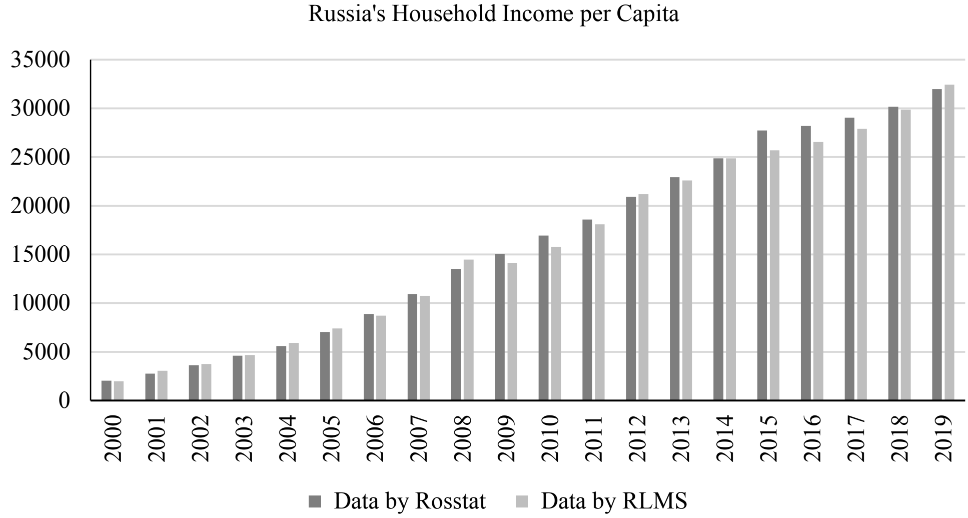

Fig. 6. Comparison of household income in Russia (RLMS and Rosstat data)

Lastly, let us compare our sample average household income (RLMS data) with Russia's household income per capita (Rosstat data) by years. Figure 6 shows, that the difference between the values of two datasets is less than 10% for each year. It gives additional evidence, that the RLMS is representative of Russia (even though we are aware that high SES families are underrepresented in RLMS), and it is appropriate for the Maternity Capital effects analysis. We are emphasising the fact because, in a broad discussion, it is highly distributed that the Maternity Capital program stimulates only poor households.

6. Results

6.1. Federal Maternity Capital program effects on the second birth spacing

We would start by showing Fig. 7, a Kaplan–Meier non-parametric comparison of survivors/hazards with 99% confidence intervals stratified by federal Maternity Capital eligibility.

Comparing the survival functions, we see that people began to have a second child earlier after the introduction of the Maternity Capital federal program. The 99% confidence intervals for the survival functions mostly do not intersect, which proves the result. The hazard functions have the same duration dependence before and after the program implementation, but the values of hazard are higher after the program implementation for durations that are shorter than 70 months (almost 6 years between births). The accuracy of the estimates is lower for durations longer than 100 months because of the lack of such observations.

Then, we would proceed to an estimation of the Cox proportional hazards regression for the whole sample of women using a basic set of controls (*age, agesq, bad_health, school, college, high_educ, ownhouse, m2_perperson, f_incomepp, rural, Petersburg, Moscow, unemp_rate or lagged_UR, unemployed, wage_mzero, hour_wzero, married, health1_bad, child1_female, cohortsize_scaled, matcap*), illustrated by Table 2. We would estimate two specifications: with the current value of unemployment rate and with one year lagged value of unemployment rate.

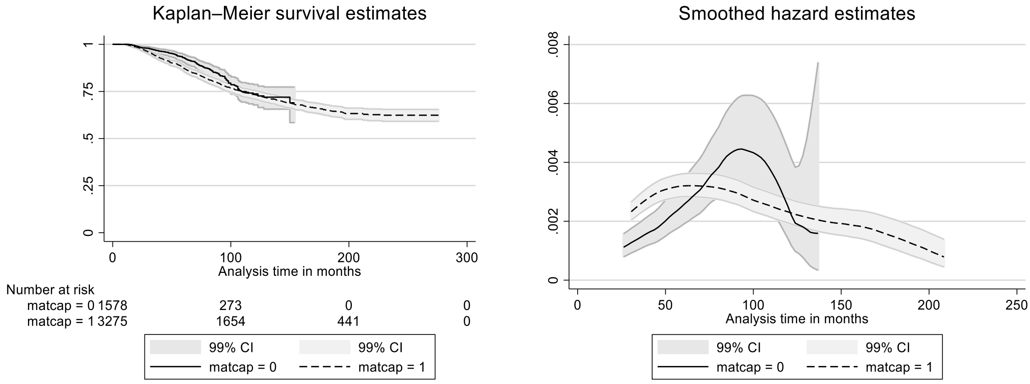

Fig. 7. Kaplan–Meier estimates

Table 2. Cox Proportional Hazard estimation (full sample). Hazard ratios

Variables	With UR	With lagged UR
matcap	2.081***	1.881***
	(0.249)	(0.229)
Controls	Yes	Yes
AIC	8150.9	7760.0
BIC	8313.0	7919.5
Observations	16625	14637

Note. Standard errors in parentheses. *** — $p < 0.01$.

As we see in Table 2, the hazard of the second birth is approximately $100 \times (2.081 - 1) = 108.1\%$ and 88.1% greater for women eligible for Maternity Capital against those who were not, and coefficient *matcap* is highly significant for both specifications. By comparison of AIC and BIC measures (they are comparable since both equations are estimated by the Cox proportional hazards regression) we are choosing the model with one year lagged value of unemployment rate for our data. We understand that a lower number of observations leads to a better model fit, but we interpret an unemployment rate as an indicator of economic growth and follow the literature where fertility is procyclical economic cycles. The full estimates for the chosen baseline model can be seen in the Appendix in the first row in Table A1. We will also discuss the coefficients and their interpretations for the statistically significant explanatory variables in the section 6.3. We would use the estimates of the Cox PH model with lagged UR to plot estimated survivor and hazard functions, where plots in Fig. 8 are evaluated at the median values of all the predictors under *matcap* = 0 and *matcap* = 1 (but it does not account for the differences between the matcap groups). We compare a 30-year-old married woman with no health-related problems, higher education, owning a house in a rural area (10 square metres per family member on average), working 40 hours per week with a salary slightly bigger than subsistence minimum under conditions of getting maternity capital and not.

Comparing the survival functions, we see that people with median characteristics began to have a second child earlier after the introduction of the Maternity Capital state program. Let us highlight that the growth of the hazard function after 125 months is random since the accuracy of the estimates is lower because of the lack of observations with longer duration.

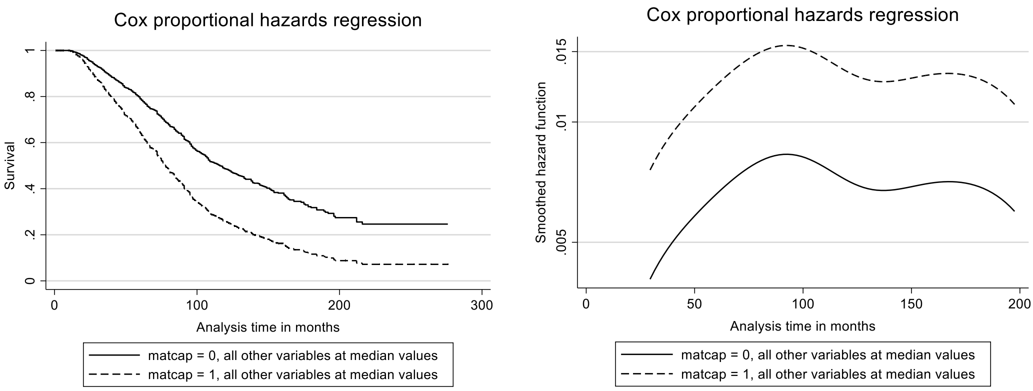

Fig. 8. The estimated survivor and hazard functions

6.2. Diagnostic tests and fertility pre-trends check

Moving to fitting the data tests for a basic specification (Cox PH model, whole sample with lagged UR), we would consider Cox–Snell residuals in Fig. 9 and test for proportional hazard assumption violations.

The graph is linear for the left tail of the distribution and ceases to be so on the right tail (the angle changes), where the baseline hazard is more volatile because of the reduced effective sample caused by prior failures and censoring (lack of observations with longer duration). Visual analysis of the Cox–Snell residuals does not allow us to consider the model inadequate. It provides additional evidence that the true parameters, β, and the true cumulative baseline hazard function, $H_0(t)$, are used to calculate the residuals. However, let us explicitly highlight that no metrics exist to confirm the visual conclusion, so we should be more doubtful about the test.

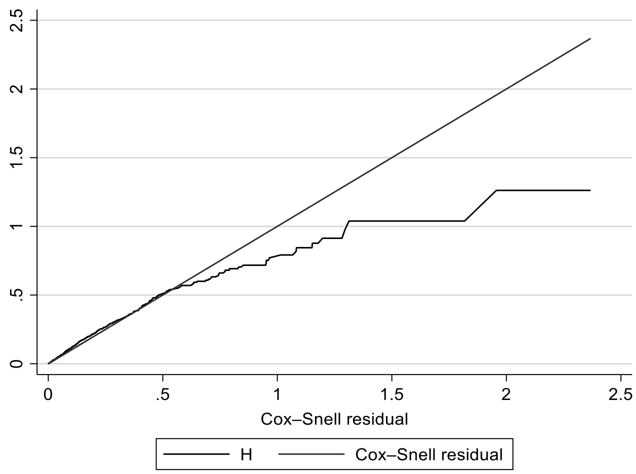

Fig. 9. The cumulative hazard function

Cox proportional hazard models assume that the hazard ratio is constant over time ($\beta(t_i) = \beta$ for all t_i), so it is important to evaluate the validity of the assumption. If we use the test proposed by Grambsch and Therneau (1994), we will see that *age*, level of education (*college* and *high_educ*) and *marriage* violate the assumption (see Table A2 in the Appendix). Further, we could use a time-varying covariate model to test PH assumption. Since *age* is the only continuous time-varying covariate that violates the assumption, we would estimate the following specification $h(t) = h_0(t)\exp\{\beta_1 \cdot age + \beta' X + t\gamma_1 \cdot age\}$. A test of the parameter $\gamma_1 = 0$ is the test of PH assumption. In Table A3 in the Appendix, we can see that γ_1 statistically differs from zero at the 5% confidence level, providing additional evidence on PH assumption violation. But *matcap* estimate keeps the same value, which is more important for evaluation.

One of the limitations of our estimation is that we cannot isolate the effect of the policy and time fixed effects (for example, macro shocks). To increase confidence that our results represent policy changes and not just a positive fertility trend that coincides with the policy, we have taken a subsample from 2000 to 2007 and created a dummy variable, *matcap_fake,* which takes 1 after June 2003 and 0 before June 2003 (other dates robustness check are available upon the request). As Table 3 shows, there is no difference in the fertility rates before and after 2003 (no difference in the hazard rates, $\beta = 0$), the hazard ratio is insignificant. Although this does not confirm that there are no time effects before and after 2007, it provides confidence that there were no fertility trends in the pre-policy period.

Table 3. PH on restricted sample with fake matcap. Hazard ratios

Variables	With lagged UR
matcap_fake	0.789 (0.237)
Controls	Yes
Observations	2536

Note. Standard error in parentheses.

6.3. Robustness check for subsamples: Married and working women

We would consider whether the results are stable for different subsamples as a robustness check. Fitting the Cox model, we compare the whole sample with a subsample of working women (with additional job characteristics) and with a subsample of married women (with additional spouse characteristics). As we see in the third column in Table A1 in the Appendix, spouse income increased in the hazard of having a second child, while having bad health for the spouse moved in the opposite direction. More precisely, a one region subsistence minimum increase in spouse income leads to $100 \times [\exp(0.081) - 1] = 8.5\%$ change in the hazard (the variable is highly significant). As for job characteristics, working on a government job, being the head of a company and the number of weekly working hours are not significant. As we already mentioned, the last result is not surprising, since the culture of a part-time job is not developed in Russia. The monthly wage of a woman is highly significant and negative. Thus, 7330.2 rubles (mean value of subsistence minimum) increase in monthly wage leads to a $100 \times \left[\exp(-0.0000427 \times 7330.2) - 1\right] = -26.9\%$ decrease in the hazard. Here, we confirm the hypothesis that a higher salary for a woman increases the opportunity cost of having a child, thus leading to a decrease in the probability of a second birth.

By comparison of magnitudes for *matcap* coefficients that Table 4 below shows, we see that the program's effects are rather robust, but the program has a bigger effect on working women. One possible interpretation could be that the financial assistance from the federal government could have provided an additional cushion for families, and they could be spending more time on family planning, possibly through decreasing their labour supply. This could be one of the fruitful areas for future research to look at the effect of this policy on the labour supply for women at intensive and extensive margins.

Table 4. Robustness check with subsamples (Cox model). Hazard ratios

Variables	PH_all	PH_working	PH_married
matcap	1.881***	2.727***	2.152***
	(0.249)	(0.496)	(0.301)
Controls	Yes	Yes	Yes
Observations	14637	10108	9983

Note. Standard errors in parentheses. *** — $p < 0.01$.

As an additional robustness check, we estimated the baseline model with interaction terms. By multiplying *matcap* dummy by woman wage or age, we will check the hypothesis that the Maternity Capital program stimulates only poor households and affects mother's age at the second birth. Using the same set of controls (14637 observations), we get that both interaction terms are not statistically significant.

6.4. Parametric regressions

Now, let us move to parametric regressions. We would estimate the same specification on the whole sample with loglogistic, exponential, Gompertz, Weibull and lognormal parametric survival distributions. All the results in Table 5 below are presented in AFT metrics, except Gompertz distribution which is parameterized only as a PH model, and no comparison of magnitudes is available for different metrics. Still, we could see the effects of the Maternity Capital move in the same direction: the hazard rates are accelerated for AFT (expected durations are shortened) and the hazard ratios greater than 1 for PH models, which means that the hazard of giving birth is higher (as we have seen while estimating Cox models). Among the other four distributions, the only one that seems to be different (in terms of absolute values of estimates) is exponential. However, the restriction that the hazard is constant over time seems to be too restrictive and unreasonable. Considering the estimate for *matcap* with loglogistic parametric survival distribution, under AFT-metrics, we could claim that being eligible for Maternity Capital decreases the predicted survival time by $100\times\left[1-\exp\left(-0.352\right)\right]=29.67\%$. Since the estimate of the logarithm of the shape parameter of the loglogistic distribution (gamma) is negative, the gamma is less than 1, and the hazard function is non-monotonic (it increases at small values of the duration and then begins to decrease), so the use of this distribution is reasonable. We confirm the hypothesis that people want to have a child with increasing probability until a certain moment when it starts to decrease. The logarithm of the shape parameter of the Weibull distribution is positive, so the estimate of the shape parameter $\hat{p}$ is bigger than 1, and the hazard function is monotonically increasing. We would also explicitly highlight that the women's cohort size is not significant under all distributions. Under Weibull distribution, a one percent increase in the unemployment rate leads to 3.66% increase in the predicted survival time (the variable is highly significant). This result is consistent with the results in (Adsera, 2011b), where the author shows that higher unemployment leads to the postponement of a second child.

Table 5. Parametric models

Variables	Distributions				
	loglogistic	exponential	Gompertz (PH)	Weibull	lognormal
lagged_UR	0.03**	0.067***	0.941***	0.036***	0.036**
	(0.014)	(0.022)	(0.021)	(0.014)	(0.016)
matcap	–0.352***	–0.567***	1.718***	–0.347***	–0.357***
	(0.075)	(0.126)	(0.219)	(0.077)	(0.08)
lngamma	–0.691*** (0.043)				
nu			0.007*** (0.001)		
ln_p				0.522*** (0.041)	
lnsigma					–0.036 (0.044)
Controls	Yes	Yes	Yes	Yes	Yes
AIC	2597.4	2690.5	2651.4	2564.9	2650.8
Observations	14637	14637	14637	14637	14637

Note. Robust standard errors in parentheses. *** — $p < 0.01$, ** — $p < 0.05$.

One could be interested in which model to choose. Firstly, as we already discussed a couple of times, the non-monotonic hazard function of loglogistic distribution seems to fit the shape of the hazard from a behavioural point of view in the best way. Secondly, we already estimated the shape of the hazard function using Cox PH regression without making any distributional assumptions (Fig. 5) that also support loglogistic distribution Thirdly, in Table 5, the last line provides AIC measures for comparing maximum likelihood by models. The Weibull functional form of the baseline hazard gets the lowest score by AIC, and the loglogistic distribution is in second place. The estimation of a generalised gamma model helps us choose between loglogistic and Weibull distributions. As we see in Table A4 in Appendix, $\hat{\kappa} = 1.307$ (shape parameter). A simple Wald test for $\kappa = 1$ supports Weibull distribution since the null is not rejected (p-value = 0.1095). We have also estimated Weibull with PH assumption (see Table 6 below) and found that the results are very similar compared to the Cox-proportional model. Being eligible for a policy increased the hazard rate by 79.3% which is comparable to 88.1% for the Cox PH model we have been starting with. So, we could claim that results are robust to different functional forms.

Table 6. Parametric Weibull distribution in PH metrics

Variables	Hazard ratio
matcap	1.793***
	(0.229)
ln_p	0.522***
	(0.041)
Controls	Yes
Observations	14637

Note. Robust standard errors in parentheses. *** — $p < 0.01$.

6.5. Regional Maternity Capital program effects on the second birth spacing

Probably, the most important and innovative part of our study is an attempt to estimate the sizable effects of federal and regional programs. We expect a positive correlation between the federal Maternity Capital program amount (which is available when giving a second birth) and the probability of a second birth. Regional Maternity Capital programs mostly stimulate the birth of the third child, but it is still interesting to see whether they influence the probability of a second birth. We also suggest that the effect would be higher for regions where the regional program provides money, not just a certificate. To test the hypothesis, we would estimate the Cox proportional model using three different specifications on the whole sample with all the controls. All of them include *matcap_size* (federal Maternity Capital size in rubles per year normalised by subsistence minimum in a region), the first one also includes *region_matcap3_restricted* (regional Maternity Capital size in rubles per year for housing for a third child normalised by subsistence minimum in a region), the second one would additionally include *region_matcap2_restricted* (regional Maternity Capital size in rubles per year for housing for a second child normalised by subsistence minimum in a region). In the third regression, we use the merged value of *region_matcap3_money, region_matcap3_restricted, region_matcap2_restricted, region_matcap1_restricted* instead of separate ones.

You can see the results in Table 7 below. We see that the federal Maternity Capital program amount affects the hazard of a second birth: a 3 region subsistence minimum increase in the federal Maternity Capital certificate (mean indexation that was happening almost every year) leads to $100\times[\exp(0.0068\times3)-1]=2.1\%$ change in the hazard (variable is highly significant). We also see that regional-level programs have a statistical effect on the probability of a second birth, and the estimated value is even bigger than for federal program. A one region subsistence minimum increase in regional Maternity Capital certificate for the third child leads to 1.4% change in the hazard of a second birth (variable is significant on 10% level). For comparison, we have already seen in Table A1 that a one region subsistence minimum increase in monthly spouse income leads to 8.5% change in the hazard. The effect of the certificate for the second child is bigger as expected, but before 2018 only 3 regions (out of 83) were aimed at stimulating the birth of the second child, so it is neglectable. Estimates for federal and regional maternity amounts are stable for different specifications and subsamples (working; married women). The variable woman's cohort size is not statistically significant. Let us also highlight that the lagged value of the regional unemployment rate that we use as the economic growth indicator is also highly significant. 1% increase in the unemployment rate leads to $100\times[\exp(-0.072)-1]=-7\%$ decrease in the hazard of a second birth, which means that economic recessions negatively affect fertility in Russia. The result is consistent with the results in (Adsera, 2011a) for mid-educated women of 12 European countries (6% decrease in the hazard of a second birth). Using Weibull parametric regression in AFT-metrics, we claim that a 3 region subsistence minimum increase in regional Maternity Capital certificate for the third child decreases the predicted survival time by $100\times[1-\exp(-0.008\times 3)]=2.29\%$ (variable is significant at 10% level).

Table 7. PH Cox model with sizable programs. Hazard ratios

Variables	(1)	(2)	(3)
lagged_UR	0.928***	0.927***	0.93***
	(0.021)	(0.022)	(0.021)
matcap_size	1.007***	1.007***	1.007***
	(0.002)	(0.002)	(0.002)
region_matcap3_restricted	1.014*	1.013*	
	(0.008)	(0.008)	
region_matcap2_restricted		1.111*	
		(0.071)	
region_matcap123			1.014*
			(0.008)
Controls	Yes	Yes	Yes
Observations	14637	14637	14637

Note. Standard errors in parentheses. *** — $p<0.01$, * — $p<0.1$.

7. Conclusion

We have used survival models to estimate how a federal policy on fertility is affects second birth duration, as the policy was applied to mothers who have second births or more. We found that the hazard ratio, after the policy, is greater than 1 when modelled using the Cox proportional model under PH assumption, which means that people began to have a second child earlier after the introduction of the Maternity Capital program (the hazard of a second birth is 88.1% higher for eligible women). We have found consistent and similar results for various sub-samples of the population (working women and married women), but the program has slightly bigger results for working women. We have also discovered that an increase in spouse and woman wage moves in the opposite direction, and the negative effect of woman wage decrease on the probability of a second birth is approximately 3 times higher. We have found no statistical effect of the women's cohort size on the probability of a second birth, and no evidence that the Maternity Capital program stimulates only poor households. To check for time-varying effects in the pre-policy period, we have implemented a test to compare the hazard ratio 3.5 years before the policy, and we found zero effects due to macro shocks (time-varying shocks) in the pre-policy period. We have also estimated the effect using parametric models (Weibull and loglogistic distributions for baseline hazard) and found that the effect is very similar. With parametric regression, we assumed AFT metric and found that the post-policy hazard rates are accelerated (or expected durations are shortened). These results are consistent for various parametric assumptions on the baseline hazards. Although we can't directly compare the results with Cox proportional models, we can see that the effect of the policy is also similar to the AFT assumption. We discovered a direct correlation between the federal Maternity Capital program amount and the probability of a second birth: a 3 region subsistence minimum increase in federal Maternity Capital certificate leads to a 2.1% change in the hazard. We also see that regional-level programs have a statistical effect on the probability of a second birth: a 1 region subsistence minimum increase in regional Maternity Capital certificate for the third child leads to 1.4% change in the hazard of a second birth. Lastly, we discovered that economic crises negatively affect fertility in Russia.

To sum up, let us again briefly discuss all the factors affecting fertility and try to explain why the fertility rate has declined during the six years from 2015. First, during the five years, from 2015 to 2019, there was no indexation of the federal Maternity Capital, and we have seen that it affects the instance of a second birth, mainly because the effect of the program that has been in place for many years is diminishing over years. Secondly, we discovered that regional maternity capital programs are even more effective than federal one. However, regional government rarely makes an indexation of the certificate and adapt the way certificates could be used, so the effect decreases over time. Moving to demographic factors affecting fertility, we have shown that after the program's introduction, rescheduling the timing of birth takes place, and women give second births earlier. The last important factors negatively affecting fertility are the economic recession of 2014 and the coronavirus pandemic (COVID-19) world crisis.

Let us proceed to policy recommendations. The Russian government is aware of the demography conditions (and the situation is getting worse due to the current crisis), that is why, in 2020, the federal Maternity Capital size was increased, and indexation has taken place every year since 2020. Now, it also stimulates the birth of the first child. We would suggest that regional Maternity Capital programs should be updated as well. Regions should also change the size of the financial support, at least make an indexation, look carefully at the fertility rates and not just apply the round numbers as an amount. Another way is to stimulate second child's birth on a regional level (since stimulation of the first birth could be too expensive). It is also important not to forget about the quality of childcare and access to kindergartens since they impact family decisions.

Acknowledgements. I thank my research supervisors, Elena Vakulenko (HSE) and Elena Stancanelli (PSE), for their patient instruction and passionate support. I would also like to thank seminar participants at the HSE research group on economic and mathematical modelling of demographic processes for data collection and fruitful discussions, participants at the Joint Meeting of VII International Conference Modern Econometric Tools and Applications (META2020) and 2nd Workshop on Applied Econometrics; XXIII Yasin (April) International Academic Conference on Economic and Social Development; 2023 Conference in Applied Econometrics using Stata (France) for helpful discussions and comments. This research is supported by a grant from the Russian Science Foundation (No. 22-28-00952).

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Received 19.07.2022; accepted 29.12.2023.

Appendix

Table A1. Robustness check with subsamples (Cox model). Coefficients

Variables	PH_all	PH_working	PH_married
highjob		0.129	
		(0.139)	
government		–0.107	
		(0.122)	
hour_w		–0.001	
		(0.006)	
wage_m		–0.000***	
		(0.000)	
married	1.171***	1.331***	
	(0.162)	(0.224)	
health1_bad	0.632**	0.026	0.906***
	(0.294)	(0.585)	(0.296)
child1_female	–0.115	–0.189*	–0.027
	(0.083)	(0.113)	(0.092)
cohortsize_scaled	–0.090	0.037	–0.056
	(0.082)	(0.108)	(0.093)
matcap	0.632***	1.003***	0.766***
	(0.122)	(0.182)	(0.140)
unemployed	–0.232		–0.361
	(0.231)		(0.259)
wage_mzero	–0.640***		–0.631***
	(0.073)		(0.083)
hour_wzero	0.000		–0.002
	(0.005)		(0.006)
spouse_age			–0.020*
			(0.012)
spouse_hbad			–0.734
			(0.455)
spouse_inczero			0.081***
			(0.014)
spouse_w			–0.229
			(0.154)
Controls	Yes	Yes	Yes
Observations	14637	10108	9983

Note. Standard errors in parentheses. *** — $p < 0.01$, ** — $p < 0.05$, * — $p < 0.1$.

Table A2. Grambsch and Therneau (1994)

Variables	rho	chi2	df	Prob>chi2
age	0.11212	7.42	1	0.0065
agesq	–0.12638	9.22	1	0.0024
bad_health	0.01313	0.10	1	0.7495
school	0.02721	0.43	1	0.5104
college	0.1316	10.01	1	0.0016
high_educ	0.11659	7.76	1	0.0053
ownhouse	0.01749	0.18	1	0.6730
m2_perperson	–0.00765	0.03	1	0.8521
f_incomepp	–0.01986	1.21	1	0.2722
rural	–0.03719	0.87	1	0.3508
Petersburg	0.00361	0.01	1	0.9302
Moscow	–0.06412	2.50	1	0.1138
lagged_UR	–0.03234	0.61	1	0.4358
unemployed	0.00830	0.04	1	0.8391
wage_mzero	0.00861	0.11	1	0.7439
hour_wzero	–0.01218	0.08	1	0.7743
married	0.12093	8.82	1	0.0030
health1_bad	0.01424	0.12	1	0.7266
child1_female	–0.00653	0.03	1	0.8725
cohortsize_scaled	0.03730	0.80	1	0.3713
matcap	–0.06176	2.50	1	0.1136
Global test		53.35	21	0.0004

Table A3. PH with time-varying covariates. Hazard ratios

	Baseline covariates	Time-varying covariates
age	1.209**	0.999**
	(0.102)	(0.000)
matcap	1.871***	
	(0.228)	
Controls	Yes	
Observations	14637	

Note. Standard errors in parentheses. *** — $p < 0.01$, ** — $p < 0.05$.

Table A4. Generalized gamma model

Variables	AFT regression, coefficient
matcap	–0.335***
	(0.079)
lnsigma	–0.678***
(log of scale parameter)	(0.111)
kappa	1.307***
(shape parameter)	(0.192)
Controls	Yes
Observations	14637

Note. Standard errors in parentheses. *** — $p < 0.01$.