

SEASONAL VARIATION IN RUSSIAN BIRTH RATE: STATISTICAL ESTIMATES AND AFFECTING FACTORS

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Abstract

The article presents the results of monthly numbers examining of birth in Russia. The analysis of seasonal birth rate variations was based on official state statistics data for the period from 2006 to 2012 and the data of expert survey. Classical seasonal decomposition (additive model) was applied to identify seasonality, and the experts' opinions were used to verify statistical estimates. The analysis shows that there are seasonal fluctuations in Russian fertility dynamics: the highest values of Russian birth rate are observed during 3 months – in July, August and October, and the lowest levels – in January, February and April. The results of an expert survey shows the birth seasonality in Russia responds to variety of factors among which there are the following four: social, biological, religious and psychological ones. For some months their effect on the fertility can be restrictive and for the other period the impact of these factors can be stimulative. For some months the impact of the only one factor can appears and for the other months several factors can affect fertility simultaneously.

Key words: birth rate, fertility, seasonality, socio-psychological factors

JEL Code: J11, J13, C51

Introduction

Studying of birth seasonality has a long history (Huntington, 1940; Middleton, 1953). Researchers find out different factors determining seasonal fluctuation in birth dynamics but there is still no standart or common theory to explain completely this phenomenon. Some of the authors mention various climatic factors influencing on frequency of intercourse within human populations and frequency of conceptions. For instance, there is a connection of birth seasonality with cloud cover (Cummings, 2002), temperature (Lam & Miron, 1996; Roenneberg & Aschoff, 1990) and even rainfall (Bailey, Jenike, Ellison, Bentley, Harrigan & Peacock, 1992). Demographic literature considers socio-cultural factors as the main ones. For instance, holidays, especial New Year and Christmas, are examined as one of the main

determinants of birth seasonality and a fast growth of birth is mentioned in September in many Christian countries (James, 1971). Other researchers suppose the seasonality of conceptions is connected with the age and coitus frequency of women (Rizzi & Dalla-Zuanna, 2007).

Each country has its own seasonality of birth. In Northern Europe the peak of birth rate is in spring and the lowest value is in autumn; the opposite situation is in the USA: late summer and the beginning of autumn is the growth of birth and spring shows the lowest level (Lam & Miron, 1994). Seasonal fluctuations of demographic processes are typical for Russia as well as for many other countries. At the same time till the middle of 20th century only two factors formed the specificity of annual fertility dynamics, they are religious (orthodox) and agricultural cycles. Nowadays factors of making seasonality in Russian fertility are more complex and still unstudied.

Our research objective is revelation of seasonal fluctuations in Russian birth dynamics. We also tried to find out the explanation for discovered annual regularity in cultural and psychological context of Russian society

1 Data and Methods

We use data of Federal State Statistic Service about monthly number of registered newborn for the period from 2006 to 2012 for statistic modeling of seasonality of Russian birth rate. We realize that the analyzable time series is not too long. The reason of this limitation is the necessary data are collected in Russian demographic statistic only from 2006. At the same time for exploring of seasonal fluctuations three-year long-term data should be analyzed according to the methodological requirements of realising seasonal decomposition. Thus, existent data allows us to study Russian birth rate seasonality.

Classical seasonal decomposition of fertility time series accomplished by means of creation the additive model. We have chosen this model based on graphical realisation of time series. Liner trend of studied period with approximately equal vibrational amplitude is diagnosed on this diagram. Thereby, we assessed the next model during the analysis:

$$Y = T + S + E, \quad (1)$$

where T – trend-cycle component, S – seasonal component, E – irregular component.

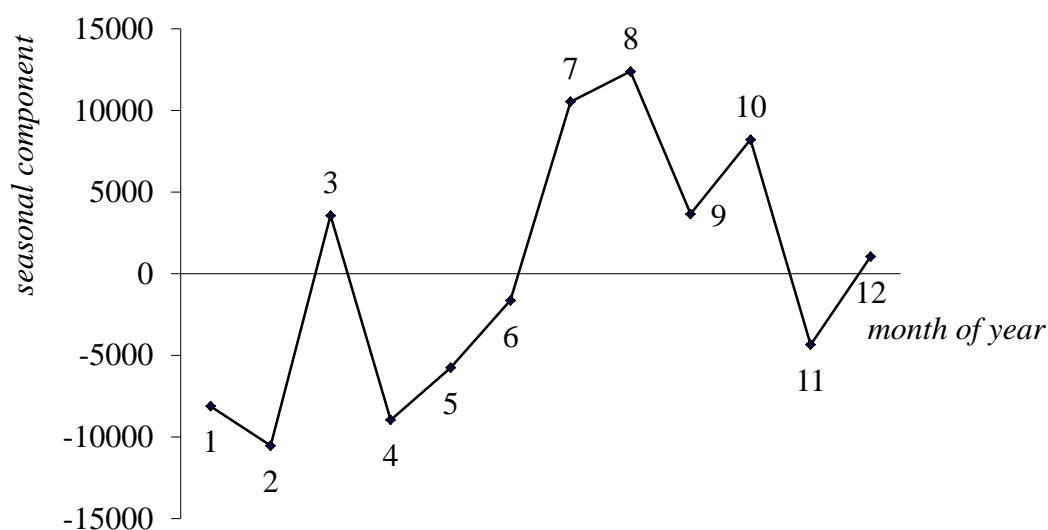
We analyzed autocorrelation function, calculated moving average for estimating seasonal component in this model, differences of the observed and smoothed series and finally the seasonal components. We organized expert survey of 50 women of fertile age to

verify seasonal component and tried to find out the women’s opinion about the months of the year which are more favorable (or unfavorable) for pregnancy and child birth by means of formalized questionnaire.

2 Results

Analysis of autocorrelation function allowed us to have hypothesized that there was annual cycle of Russian birth rate. The value of autocorrelation coefficient at lag 12 is 0.80 and coefficient is significant at the 0.01 level. Final estimations of seasonal components and annual cycle of birth rate are shown on Figure 1. As follows from diagram, the highest values of Russian birth rate are observed during 3 months – in July, August and October, and the lowest levels – in January, February and April.

Fig. 1: Annual cycle of Russian birth rate in 2006-2012 years

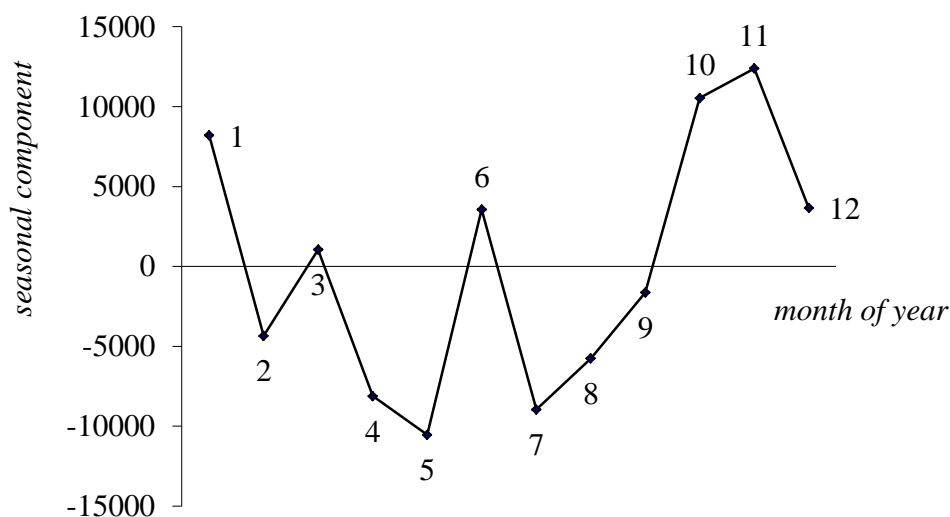


Source: calculations of the authors.

However, for correct explanation of factors forming seasonality in Russian birth rate it is also necessary to analyze the dynamics of cases of conceptions. That is why based on seasonal component of birth rate with lag -9 months we have made seasonal model of conceptions (Figure 2). No doubt, such way of forming the annual cycle of conceptions has some restrictions. Particularly, only in-time childbirth can be taken into consideration in the process of analysis. At the same time, unfavorable childbirth is out of the analysis. However, any statistical modeling suggests some abstraction from particular private cases and

concentration on the main trend of studied process. As follows from the estimated model the conceptions comes in January more often and also in October and November.

Fig. 2: Annual cycle of conceptions in Russia in 2006-2012 years



Source: calculations of the authors.

Based on experts data from our survey we identified four subjective factors which can influence on frequency of conceptions and consequently on the frequency of childbirth in different months of the year. We described them as religious, biological, social and psychological factors. Our analysis also proved the absence of correlation between annual dynamic of marriages and seasonal fluctuations of childbirth dynamics.

3 Discussions

Seasonal fluctuations in Russian birthrate can be explained by subjective factors. These factors are population perceptions about the best convenient (or inconvenient) month for childbirth or pregnancy planning. In the course of expert survey we identified four integrated subjective factors which can influence on pregnancy planning..

Religious factor connects with influence of confessional principles and traditions on pregnancy planning. Respondents noticed the pregnancy undesirable in the period of religious abstinence. At the same time, as a rule, women noticed only Lent continued seven weeks and covered the time from February till April. This period is characterized as recession on the diagram of seasonality of conception.

Biological factor connects with influence of nature-climate character on pregnancy planning. As respondents noticed pregnancy is undesirable in the spring months because of

the weakness of woman's organism, appearance of avitaminosis and high probability of catarrhal disease (noticeable is a characteristic of February too). And as the opposite one, autumn months (October – November) are better for pregnancy because of saturation of vitamins during this period which are necessary for healthy growth of the baby and favorable passing of pregnancy. On the diagram of seasonal fluctuations of conception especially spring months are characterized by recession and autumn ones by growth.

For the social factor we integrated conditions of social kinds which influence on pregnancy planning according to the respondents' opinion. Mostly women mentioned three cases which could determine the term of the pregnancy. For the first, respondents mentioned the undesirable the summer months for pregnancy. There are vacations during this period and it is no sense to spoil the impression of it by the negative moments of the first months (toxicosis, sickness). Pregnancy is undesirable in last spring month for the same reason. As we can see on the Figure 2 two summer months and also May are characterized by recession of number of conceptions. For the second, respondents mentioned long period of holidays as a factor contributing the growing of cases of pregnancy. Actually New Year holidays in Russia last from 10 to 15 days and the number of cases of conceptions in January is much higher than average annual level. For the third, respondents (mainly those who have already had children) mentioned that it is necessary to take into account the child age of school entering for pregnancy planning. For getting full age before entering the school the birthday should be in summer months and pregnancy should occur in autumn. On the Figure 2 the number of coming pregnancies is fall at two autumn months.

Psychological factor integrates different subjective views about the pregnancy occurrence. For instance, the majority of respondent women perceive May as unfavorable month for pregnancy approach (there is a proverb in Russian folklore “who was born in May, he toils all his life”). On the diagram of seasonal fluctuations (Figure 2) there is the lowest point in May. Women also mentioned that they did not want the pregnancy approach in December, because it is “the end if annual cycle and there is no use to start such important case as childbirth in this month; the end and beginning are incompatible”. It is known that many people feel psychological tiredness at the end of the year. For the other hand, January is perceived by respondents as a favorable month for pregnancy: “The beginning of new year quite fits for the beginning of new life”. In January exactly supervised the positive seasonal component.

It is necessary to highlight that the effect from numbered factors has the complimentary character. Examined factors make special model of seasonality in dynamic of

Russian birth rate mutually reinforcing each other. In Table 1 is shown which factors display in each month of the year and what is the effect from their combined influence on the fertility

Tab. 1: The specific of display of subjective factors influenced on seasonality of Russian birth rate

<i>Month</i>	<i>Factors</i>	<i>Influence features of factors</i>
January	Social Psychological	Both factors generate positive effect, so we can see great number of conceptions on Figure 2
February	Religious Biological	Both factors generate negative effect, so we can see the recession of pregnancy cases
March		
April		
May	Social Psychological	Both factors generate negative effect, so we can see the “pit” in seasonal fluctuations
June	Social	The factor generates negative effect, there is a recession of pregnancy cases in July – August
July		
August		
September	Social Biological	Both factors generate positive effect. 70% of respondents point September as the most favorable month for conceptions. The negative component during this period connects with lag effect. Actually, pregnancy often occurs not in the particular month when the pair decided to have a baby
October	Social	Both factors generate positive effect. Lag effect works in addition. As a result we can see the growth of pregnancy cases
November	Biological	
December	Psychological	Factor generates negative effect, but by operation of lag effect we can see petty growth of pregnancy cases

Source: data of expert survey.

We would like to mention once again that the available time series as a base of investigation of seasonal fluctuations in Russian birth rate is rather short. This disadvantage of the research is explained by specific of the source information. Federal State Statistic Service shows the data about monthly number of childbirth only from 2006 year. However further, when the time series become longer, we will have the opportunity to follow not only the features of existing seasonal variation and also its changing under the influence of social, economic, cultural and other factors.

We should mention that the analysis can be continued by the research of other components of additive model of Russian fertility dynamics. So as for trend component we get the regression equation (Table 2). On its base we can conclude that during the examined

period in Russian birth rate dynamics there is the ascending trend. Later the analysis can be continued by the investigating of its reasons and factors.

Tab. 1: Main results of regression analysis

	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Std. Error	Beta		
Case Sequence	425.488	31.170	0.833	13.651	0.000
Constant	125249.716	1525.146		82.123	0.000
R ² = 0.694; significant at the 0.01 level					

Source: calculations of the authors.

Our research can be continued by the detailed analysis of irregular component of the model. This component is a reflection of incidental / occasional factors on the birth rate dynamics. Irregular component can be an independent variable for assessing the character influence of these factors on the fertility. In our case it also reflects the occurrence of those pregnancies which were not planned.

We also understand that the magnitude of seasonal fluctuations can change under the influence of maternal socio-demographic characteristics. For instance, Bobak and Gjonca found out that the seasonality of births was most pronounced in mothers who were 25–34 years old, married, better educated, and expected their second or third child (Bobak & Gjonca, 2001). We hope that the further perfection of Russian demographic statistics allows including into the research process relevant initial data and continuing the analysis in this area.

Conclusion

Conducted research allows displaying seasonal fluctuations in the dynamic of Russian fertility. The highest values of birth rate are observed during 3 months – in July, August and October, and the lowest levels – in January, February and April. Seasonal fluctuations of fertility can be explained by subjective factors. In course of the expert survey we identified four integrated subjective factors which can influence on pregnancy planning. We denote these factors as religious, biological, social and psychological. For some months their effect on the fertility can be restrictive and for the other period the impact of these factors can be

conversely stimulative. Besides, for some months the impact of the only one factor can appears and for the other months several factors can affect fertility simultaneously. The seasonal adjustment would provide an opportunity of better forecasting in demographic sphere of Russia. It also can promote implementation an appropriate measure on fertility stimulation.

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