FACTORS AFFECTING REPRODUCTIVE ACTIVITY OF THE POPULATION OF RUSSIAN REGIONS

Anna Bagirova – Oksana Shubat

Abstract

The demographic situation in regional Russia is highly polarized. The disparity of socio-economic conditions around Russia creates a need for differentiated demographic policies.

This paper presents the results of a principal components analysis into reproductive activities of the population of Russian regions. The research hypothesis was that the level of reproductive activity was shaped by socio-economic stability at the level of the state, the region and the family, as well as individual livelihood. Moreover the most important factor was an overall balance between these four factors.

The analysis identified four factors that determined regional differences in reproductive activity. At the macro-level, this is socio-economic stability in the country; at the meso-level, this is socio-economic stability in the region; at the mini-level, this is socio-economic stability in the family; at the micro-level, this is socio-economic stability for the individual. The values for each of these factors were calculated for each region in Russia.

The results of the study can be used to improve the effectiveness of demographic policies by accounting for regional nuances of socio-economic processes.

Key words: reproductive activity, population, principal components analysis, multivariate stability

JEL Code: C38, J1

Introduction

Statistics provide clear evidence of depopulation in modern-day Russia: relatively high overall mortality rates, low life expectancy, a total fertility rate that is insufficient for maintaining population size and so on. However these problems look different in different regions. In a country as ethnically diverse and geographically vast as Russia, this is related to a number of factors that affect as people's views on fertility behaviour. The demographic programme that is currently being implemented essentially assumes a principle of equality in respect of people who live in highly disparate socio-economic conditions. We believe that an examination of regional differences in fertility behaviours will enable the development of

flexible mechanisms for adjusting demographic programmes to accommodate important differences that distinguish one Russian region from another. In discussing reproductive activity and fertility behaviours, we refer to the actions of a person aimed at enlarging reproduction through the birth of healthy children, their appropriate upbringing and the establishment of high-value human capital.

Reproductive attitudes are the result of a set of socio-economic, political, psychological, medical, environmental and other factors, which are tightly interlinked and continuously affect each other. Many are difficult to identify and measure. Yet the study of their interaction requires the application of multivariate analysis techniques. Such methods enable the identification of factors that drive the establishment and development of fertility behaviours at the regional level, and the aggregation of these factors into groups.

Fertility behaviour has long been one of the focal points of demographic research. However, it has also been explored through other disciplines, including sociology, anthropology, economics, medicine and psychology. A number of studies have looked at the impact of various socio-demographic and psychological factors on fertility behaviour (Berinde, 1999; Brodmann, Esping-Andersen & Güell, 2007; Del Boca, 2002; Hoem, 1990; Köppen, 2006; Lappegard & Ronsen, 2005). A recent study by Balbo, Billari & Mills (2013) considered the relationship between core determinants of fertility behaviour and the level at which they operate. Specifically, factors are seen as micro-level (individual/family-unit), meso-level (social relationships and networks) and macro-level (cultural and institutional settings). In Russian demography, there are certain traditions for studying fertility determinants based both on the official statistics and surveys (Antonov, 2012; Maleva & Sinyavskaya, 2007; Roshchina & Cherkasova, 2009).

Data and Methods

There were several stages to the examination of existing regional differences and their impact on fertility behaviour in Russian regions. At the first stage, correlation analysis (using Pearson Correlation and Spearman Rank Correlation) was applied to a set of indicators that could potentially be linked to differences in reproductive behaviour. Thirty-one variables were selected for testing. These defined economic, medical, environmental, social, psychological and moral conditions in the region. Official Russian statistics for 2010-2012 were used. The total fertility rate was selected as the indicator of reproductive activity as the dependent variable in correlation analysis.

At the second stage of the analysis, we ascertained the latent factors that determine reproductive activity through principal component analysis. Primary data was tested to determine whether these statistical methods could be applied. This included Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sample adequacy. The number of factors was determined graphically, on the basis of total variance explained. Varimax with Kaiser Normalization Rotation Method was used to determine factor scores.

At the third stage of the analysis, we calculated factor scores for each Russian region. We used one of the possible methods to assign weighting to the variables, namely calculating the ratio of the absolute value of the variable correlation coefficient to the total fertility rate.

In the course of establishing the factors, we encountered the need to reframe the values for some variables. "Supplementary" (inverse of the original) levels were determined for three of the variables. Thus the share of the population with income below the poverty line became the share of the population with income above this value; the level of unemployment was turned into the level of employment; infant mortality rates – into the number of surviving children for every 1,000 live births. All new variables were subsequently standardized.

Moreover, a "substantive" recalculation was carried out for some other variables to ensure that the minimum value of the variable became the maximum value of the factor, and the reverse (this applied to variables that were inversely related to stability levels).

In order to highlight trends in the differences between fertility behaviours in Russian regions, we aggregated the regions into four quartile groups on the basis of total fertility rates. The first 25-per-cent group comprised regions with coefficient values between 1.032 and 1.206; the second group – 1.206 to 1.300; the third quartile included regions with fertility rates between 1.300 and 1.428, and the final cluster featured regions with fertility rates of 1.426 to 2.772. Subsequent analysis looked at score variations for each factor across each of the quartile groups.

Results

We obtained the following results at the first stage of the study. Correlation analysis enabled us to identify 18 variables that showed significant correlation to total fertility rates in Russian regions. The study showed that fertility rates were higher in regions that, on the one hand, had higher average monthly earnings, yet on the other hand – higher unemployment and

more people living below the poverty line. Thus, there were contradictory relationships between economic indicators and total fertility rates.

There was a positive and statistically significant correlation between total fertility rates and infant mortality rates, as well as the share of rural population in the region. We should note that one should not draw any conclusions about cause-and-effect relationships on the basis of this study.

The results of the correlation analysis also showed that fertility rates are higher in regions with lower rates of housing provision and car ownership, lower retail turnover figures and lower rates of per-capita household services consumption. Moreover, a negative correlation was found between fertility rates and a group of indicators describing so-called organizational support for families. These indicators include the share of child support payments in the per-child cost of living, the reach of pre-school institutions, the ratio of marriages to divorces, the share of consolidated regional budget spend on healthcare and sport.

We obtained the following results in the second phase of the study. A review of the primary data as regards the possibility of applying factor analysis returned positive results. Bartlett's test of sphericity for the sample yielded 776.983 ($\alpha < 0.001$, $df = 153$). The Kaiser-Meyer-Olkin measure of sample adequacy stood at 0.806, which also confirmed the appropriateness of using principal components analysis to describe links between the variables.

In applying principal component analysis, four latent factors were established. These factors explain 67.8% of the variance, which can be viewed as a satisfactory level of explained variance. We note that calculations using a tri-factor model explained 59.6% of the variance, with 71.9% for five-factor calculations. Given that the inclusion of a fifth factor in the model does not significantly raise the level of explained variance while significantly complicating the interpretation of obtained factors, four-factor model analysis was applied.

Varimax with Kaiser Normalization Rotation Method was used to create a Rotated Component Matrix. As Table 1 shows, each variable has an unambiguous relationship with only one factor. The factors include variables with a loading of at least 0.45.

Tab. 1: Rotated Component Matrix

Variable	Factors			
	1	2	3	4
Total average area of residential premises per capita	0.489	**0.642**	0.101	-0.085
Number of theatre-goers per 1,000 people	0.153	-0.098	**0.609**	0.146
Share of employees on leave at the initiative of the organization	0.106	0.035	0.109	**-0.772**
Balance between marriages and divorces	0.326	**0.771**	0.205	0.255
Share of urban population in total population	0.236	0.429	**0.707**	0.343
Wastewater discharge into surface water facilities per capita	0.102	0.318	**0.529**	0.159
Share of consolidated regional budget spend on healthcare and sport	**0.450**	0.157	-0.167	-0.416
Infant mortality rate	**-0.881**	-0.241	-0.204	0.066
Share of child support payments in per-child cost of living	0.388	-0.230	**0.476**	-0.398
Share of population below the poverty line in total population in the region	**-0.639**	-0.179	-0.353	-0.177
Prices on the secondary housing market	0.061	0.238	**0.592**	-0.169
Household services consumption per capita	0.436	-0.018	0.369	**0.456**
Retail trade turnover per capita	0.359	-0.116	0.490	**0.622**
Reach of pre-school facilities (% of children of the respective age)	0.267	**0.705**	0.465	-0.086
Number of cars per 1,000 people	0.487	0.290	-0.017	**0.595**
Unemployment rates	**-0.675**	-0.560	-0.197	-0.070
Average nominal accrued monthly salary	-0.023	0.264	0.358	**0.789**
Number of abortions per 100 births	0.071	**0.871**	0.016	0.013

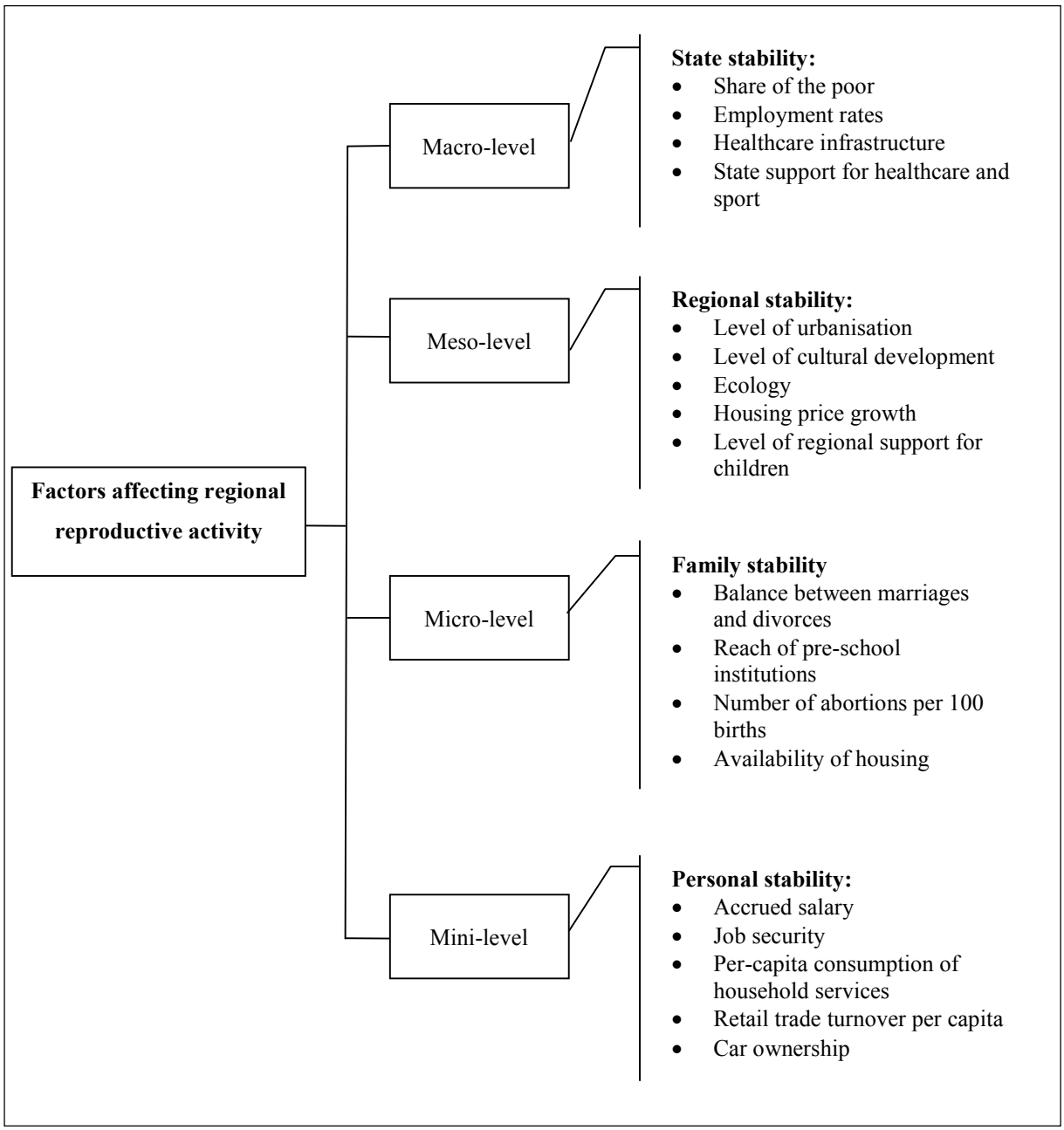
Source: Data of author's survey

Diagram 1 groups variables according to factors for which they have the highest factor loading. The factors reflect their impact on fertility behaviour in the regions. In our view, this impact should be considered across four levels:

- macro-level (state): socio-economic stability in the state, which explains 19.2% of the total variance;

- meso-level (regional): socio-economic stability in the region, which explains 16.4% of the total variance;
- micro-level (family unit): the stability of socio-economic conditions in the family, which explains 17.5% of the total variance;
- mini-level (individual): the stability of the personal socio-economic situation, which accounts for 14.7% of the total variance.

Fig. 1: Multi-level approach to identifying factors affecting reproductive activity



Source: Data of author's classification

We note that in the process of defining factors that affect reproductive activity, we established an approach based on multi-level stability. The original hypothesis stated that fertility behaviour is driven by socio-economic stability of the state, the region, the family and the individual, as well as the balance between them. In other words, the higher the value of each indicator (within certain limits), and the greater the balance between socio-economic conditions across the different levels, the more stable the situation that drives reproductive activity. Past a certain point, the reverse can occur, causing reproductive passivity. The converse is true as well: the lower the indicators and the greater the imbalance of socio-economic conditions across different hierarchical levels, the more unstable the situation which impacts reproductive activity, leader to higher likelihood of reproductive passivity (again, up to a certain critical value).

At the third stage of the study, in examining the weights of each factor in different Russian regions, we were able to identify the following trends.

1. As total fertility rates grow (i.e. moving from the first quartile group to the fourth one), the macro-factor score falls. Thus for the first regional quartile group, the average standardized macro-factor score is 0.30, 0.24 for the second group and 0.08 for the third group. In the fourth quartile group with maximum total fertility rates, this factor has a negative value (-0.60);

2. As total fertility rates grow, the meso-factor score falls. The first regional quartile group with low birth rates has an average standardized meso-factor score of 0.60, compared to 0.27 for the fourth group with high birth rates;

3. As total fertility rates grow, the micro-factor scores fall, with some increase in the fourth quartile. We note that the micro-factor for all quartiles takes only negative values, however in absolute terms, it has a much higher value in the first quartile group, than in the fourth one (-0.12 versus -0.69);

4. The mini-factor score changes sporadically, reaching its maximum (0.33) for total fertility rates between 1.30 and 1.43 (third regional quartile group). For high values of total fertility rates, the mini-factor score falls considerably (to 0.00).

Thus, with growing fertility rates around Russian regions, the variance of the values of the identified factors falls. This confirms our hypothesis that reproductive activity is aided by a balanced set of socio-economic living conditions.

Conclusions

A demographic programme for Russia (as well as other countries undergoing a population crisis) has significance beyond just improving the reproductive situation – though this is certainly the priority. The very act of the Russian state adopting and implementing such a large-scale project in a rather delicate area of human life (where the private prevails) aims to show that, if successful, fertility behaviours can and should be managed by the state. This should undoubtedly be done through flexible regulation, through the use of indirect and multi-faceted levers that shape fertility behaviours. The results of the analysis that has been carried out highlight the need for and practicability of differentiating the approach to stimulating reproductive activity, paving the way to making adjustments to regional demographic programmes around Russia.

The approach used in the research enables us to evaluate the balance of maturity of processes at different stages of reproductive activity. In turn, this creates the opportunity to surface shortcomings in the management of human reproduction and develop mechanisms for their mitigation.

References

Antonov, A.I. (2012). Sociology of the Family. Moscow: INFRA-M.

Balbo, N., Billari, F. C., & Mills, M. (2013). Fertility in advanced societies: A review of research. European Journal of Population, 29(1), 1-38. doi: 10.1007/s10680-012-9277-y.

Berinde, D. (1999). Pathways to a third child in Sweden. European Journal of Population, 15(4), 349-378. doi: 10.1023/A:1006287630064.

Brodmann, S., Esping-Andersen, G., & Güell, M. (2007). When fertility is bargained: Second births in Denmark and Spain. European Sociological Review, 23(5), 599-613. doi: 10.1093/esr/jcm025.

Del Boca, D. (2002). The effect of child care and part-time opportunities on participation and fertility decisions in Italy. Journal of Population Economics, 15(3), 549-573. doi: 10.1007/s001480100089.

Hoem, J. (1990). Social policy and recent fertility change in Sweden. Population and Development Review, 16(4), 735-748. doi: 10.2307/1972965.

Köppen, K. (2006). Second births in western Germany and France. Demographic Research, 14(14), 295-330. doi: 10.454.DemRes.2006.14.14.

Lappegard, T., & Ronsen, M. (2005). The multifaceted impact of education on entry into motherhood. European Journal of Population, 21(1), 31-49. doi: 10.1007/s10680-004-6756-9.

Maleva, T., & Sinyavskaya, O. (2007). Socio-economic factors of fertility in Russia: Empirical measurement and social policy challenges. In T. Maleva & O. Sinyavskaya (Eds.), Parents and Children, Men and Women in Family and Society (pp. 171-216). Retrieved from http://www.socpol.ru/publications/pdf/PiDMiG1_end.indd.pdf.

Roshchina, Y., & Cherkasova A. (2009). Differentiation of Birth Rate Factors for Various Socio-Economic Groups of Russian Women, SPERO, 10, 159-180. Retrieved from http://spero.socpol.ru/docs/N10_2009_07.pdf

Contact

Anna Bagirova
Ural Federal University
620002, 19 Mira street, Ekaterinburg, Russia
a.p.bagirova@urfu.ru

Oksana Shubat
Ural Federal University
620002, 19 Mira street, Ekaterinburg, Russia
o.m.shubat@urfu.ru