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Birth Seasonality - A Comparison between Five Countries from 2004 to 2013

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Abstract

Europe has seen in lasts years, a decline in the number of births and a rise in life expectancy at birth, which leads to population aging. The social and economic cost related with this phenomenon is likely to have major consequences in whole Europe. The birth decrease is not uniform but rather seasonal. The goal of this article is to identify and to compare the seasonal variation for the number of births in five countries: France, Germany, Romania, Bulgaria and Hungary between January 2003 and December 2013. The research is based on seasonal coefficients analysis and on Gini - Struck coefficients analysis. Results suggest that the births series presents a seasonal variation and that between the analysed countries are significant differences in seasonality pattern.
A future study will examine the impact of low fertility on economic growth.

Keywords: natality, fertility, seasonality

1. Introduction:

The new born number is a key factor in population growth. A very important feature of natality is the seasonality of this phenomenon. The demographic literature on seasonality underlined the facts that this fact is influenced by various factors.

Seasonal patterns in natality are observed in all human populations with variation from a continent to another. Lam and Miron in 1994 proved the existence of two different seasonal patterns: one in the southern United States, where number of births significantly decreases in April and May, and another in northern Europe, where number of new born children increase significantly in March and April. They argue that seasonality has increase in countries with high income and low fertility populations.

Bobak and Gjoca (2001) proved that seasonality of fertility is strongly influenced by socio-demographic factors. This conclusion is reinforced by Michael Friger et all (2009) who argue that the seasonality of birth is influenced more by socio-cultural factors, such as religion than by geographic factors using two populations living in southern Israel (Muslim and Jewish.

On the other side, Cancho-Candela et al. (2007) argue that for Spain, seasonal natality presents a decline from 1970, going to lack of birth seasonality between 1991–2000.

Mitrofanova (2013) proved that for Russian population, the demographic behavior has changed. Also she argued that in the last 50 years the desire to have children has decrease.

2. Countries in numbers

Accordingly to Population and Housing Census from 2011 the population of Romania was about 20 million, of which more than 10 million were women (51.4%). Compared to the previous census, the Romanian population decreased by 1.6 million.

According to the Eurostat Statistics, in 2011 the German population was 80.2 million. This means a decrease of 1.5 million compare to the German population from the eighties.

The France population is the only population that increased from 1980 to 2011. France has 65 million people. This increase is due more to the excess of births over deaths that migration.

In Bulgaria, as in Romania, was a decrease in population number with more than 1 million. In present, the Bulgaria population is about 7.36 millions.

The country's population declined in the past ten years, with 260.000, in Hungary, reaching more than 9.9 millions in 2011.

3. Data and method

3.1. Data

The data represent the number of new born in Romania, France, Bulgaria, Germany and Hungary. The data are available from Eurostat statistics.

The data on natality are available on a monthly basis for the period January 2004 – December 2013, except France, for which the time series is between January 2004-September 2013.

The natality is measure in total number of new born per month.

The new born is a baby born alive by a woman.

3.2. Method

The statistical analysis of time series involves the research of the variation of a phenomenon in time under the influence of determinant factors. The time series components are: the long term tendency, the seasonal component, the cycle component and the residual component. (Jaba et al., 2014).

The seasonality is defined by constant periodicity (Jaba, 2002).

To determine the seasonality of natality we use the analysis of seasonal coefficients and the concentration coefficients, Gini-Struck. To calculate the seasonal coefficient we need to calculate the moving average (Ma) with the following expression for an even number of periods (d=2p):

$$y_{6Ma} = \frac{\frac{y_1}{2} + y_2 + ... + y_{11} + \frac{y_{12}}{2}}{12}$$

The seasonal indices are calculated as a ratio between the number of births per month and the moving average.

The seasonal coefficients are calculated as:

$C_i = \frac{\sum_i^{12} I_i}{n}$

where Ii=the seasonal indice for the month i in the year j, n=numer of years to be analised.

To measure the degree of uniformity, the Gini-Struck coeffiecients are calculates as following:

$$G = \sqrt{\frac{n \sum g_i^2}{n-1}}$$

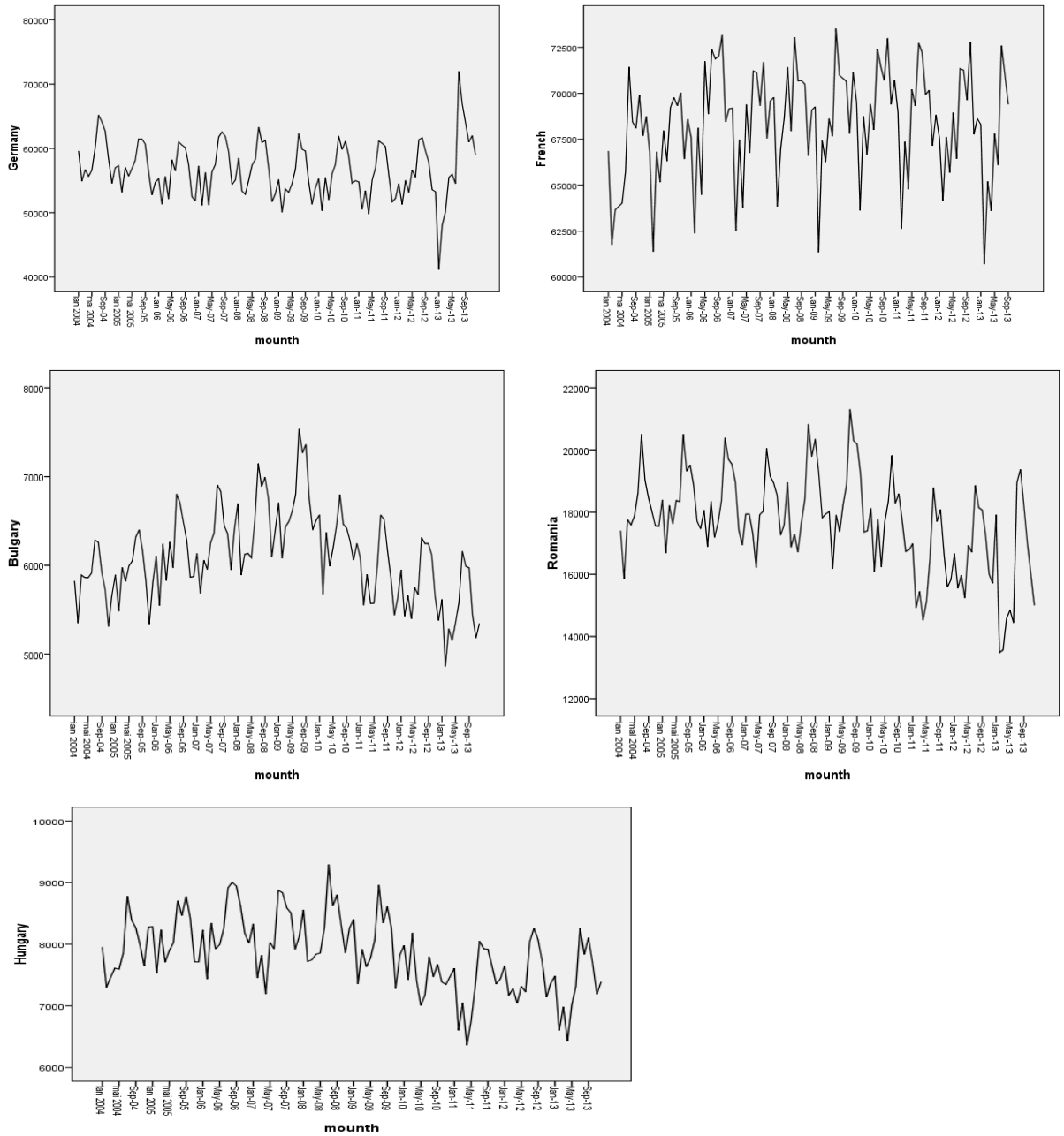
where g_i represents the weight of the births in month i within the total amount of births in a year.

If the value of Gini-Struck coefficient, tends to 1, then it indicates a high degree of concentration, else if the value of the coefficient tends to 0, it is a poor degree of concentration.

4. Results

The evolution of births in the analyzed countries shows that the time series present a seasonal variation (Figure1). A number of peaks are obvious, the increases and decreases in the births number repeat almost in the same months every year.

Figure1: The evolution of monthly births in analyzed countries between January 2004 and December 2013.



Source: Authors' results with SPSS package

Figure 1, is the first prove that the seasonality of births is different for the five countries.

In order to measure the variations due to seasonality we determine the seasonal coefficients by using the moving average (Table1).

For Romania, February and December are the months with minimum births level in each year. The maximum births level is reached in July. One of the reasons for this seasonal pattern could be the returning of emigrants who came to spend their vacations in the country. Another reason could be the religion behavior.

In the case of France, the natality seasonality is more intense. February and November are the months with minimum births level in each year. The maximum births level is reached in July.

For Germany, the birth seasonality is less intense than for the other countries. February and November are the months with minimum births level in each year the same as for France. The maximum births level is reached in July.

For Bulgaria, February is the month with minimum births level in each year. The maximum births level is reached in March and July.

For Hungary, November is the month with minimum births levels in each year. The maximum births level is reached in July.

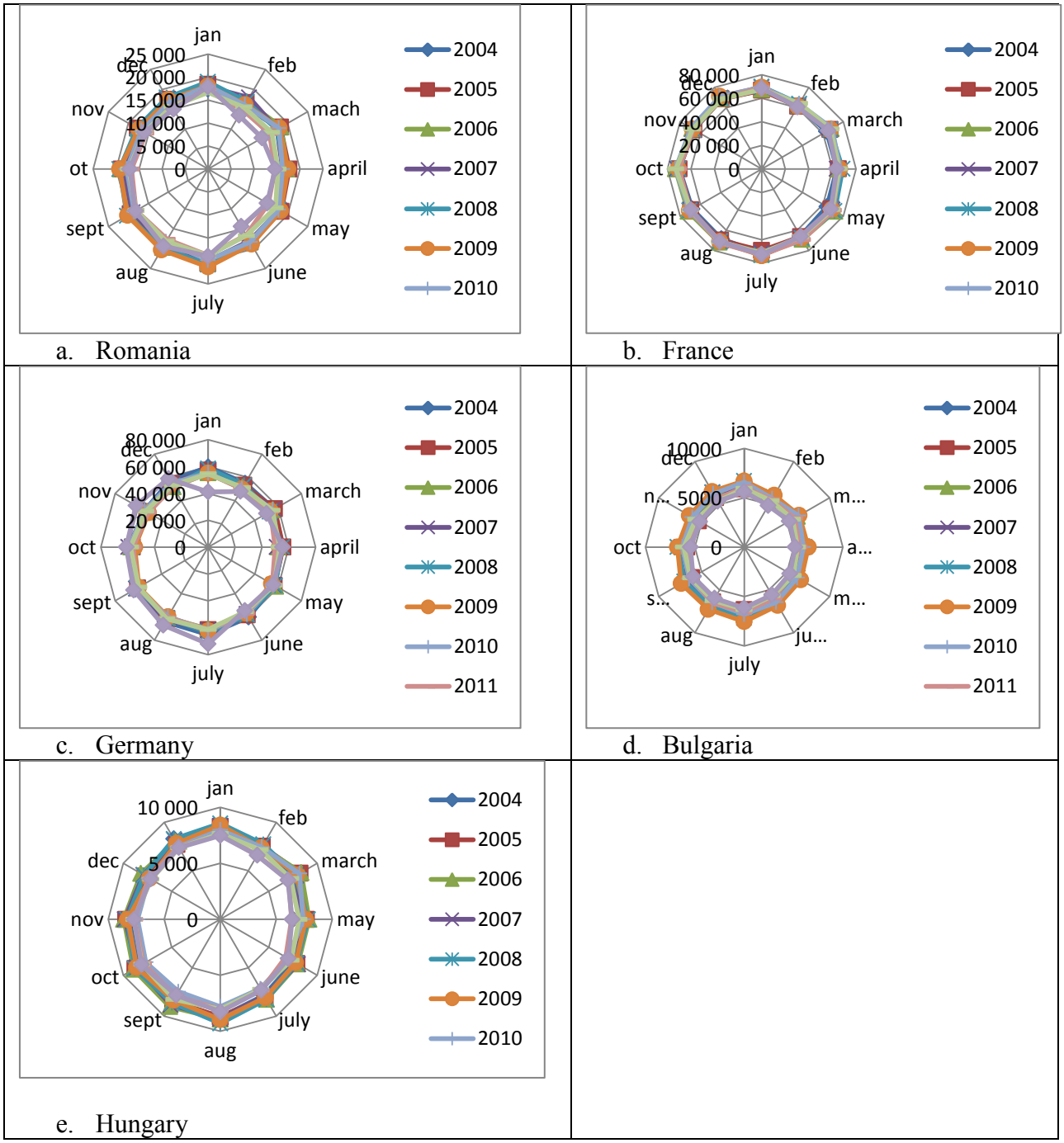
Table1: Estimated Seasonal coefficients

mounth	Coefficients				
	Romania	**France**	**Germany**	**Bulgaria**	**Hungary**
January	1.139656817	1.125579728	1.086402381	1.136543504	1.152141434
February	1.021308029	1.026125322	1.019412682	1.023879522	1.037593721
March	1.071514596	1.104840883	1.086710678	1.102541542	1.10581591
April	1.029317999	0.956680989	1.059766769	1.067406104	1.041043412
May	1.092064905	1.015204797	1.124282487	1.103710517	1.075600573
June	1.118632976	0.98541102	1.133684006	1.130657764	1.107576251
July	1.268366035	1.182068984	1.237944074	1.231212715	1.223443215
August	1.201344467	1.164621141	1.223593517	1.210386545	1.191210689
September	1.205938104	1.151322784	1.214980575	1.182519142	1.197361991
October	1.156660499	1.171971398	1.146176246	1.138445285	1.154150613
November	1.080977658	1.11137453	1.05977658	1.061409754	1.086069134
December	1.081342972	1.139585377	1.079775481	1.098218264	1.11976745

Source: Authors' results with SPSS package

The seasonal effect can be seen also using the polar diagram (Figure2a, b, c, d, e). The month July is the one with bigger number of births in every year for all five countries.

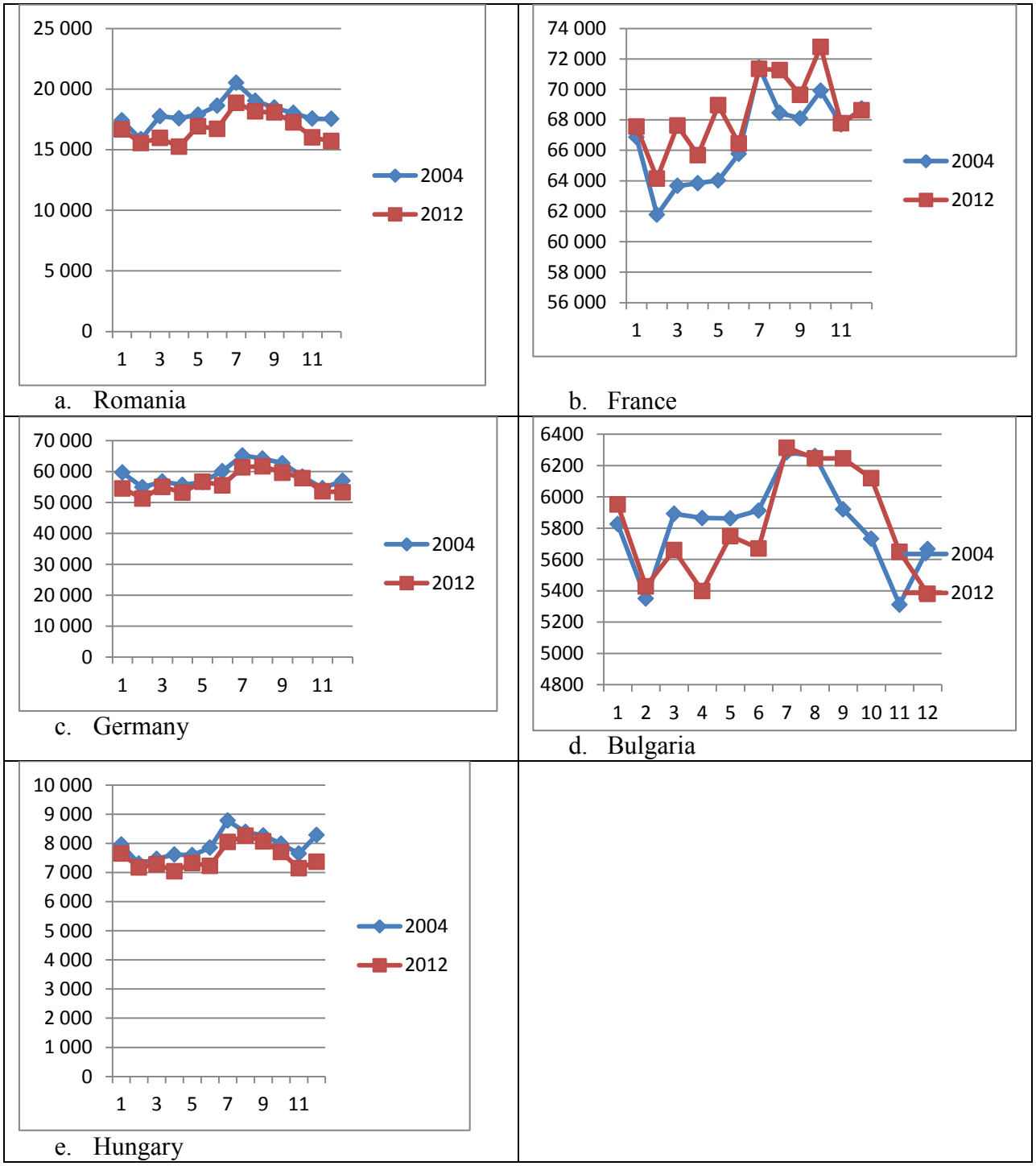
Figure2: The Polar diagram



Source: Authors' results with Excel package

When we compare 2004 and 2012, using the Diagrams, the variation of births per moths is less intense than for 2012. One of the factors for this variation could be the economic crisis from 2008.

Figure3: The diagrams for 2004 and 2012



Source: Authors' results with Excel package

The analysis of coefficients on the concentration/diversification can indicate the difference in comparison with the state of uniform and balanced distribution of births register in the analyzed countries.

Because the value of all the Gini Struck coefficients exceeded 30%, there is a relative concentration that can be mentioned and taken into account. The calculations were made starting with 2004, taking into account the limitations related to available statistical databases.

Comparing the analysis years, it is found that there was a small increase in the concentration of births, except for 2010 when a small decrease in concentration occur.

5. Conclusion

This paper aimed to analyze the births evolution in in Romania, France, Bulgaria, Germany and Hungary between 2004 and 2013 using monthly data. The births levels are important for population number. The last 10 years brought a decrease in population, in all analyzed countries, except for France, due to the decrease in birth level and to the increase in the number of emigrants.

The global crisis could have an impact on the number of births. The births seasonality is pointed out by repeated increases and decreases in every year. The lowest level is for all the countries in February except for Hungary. The maximum level is reached in July.

A future study will reveal the most important factors that influenced this seasonal pattern.

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