Fertility in the transition economy: *Evidence from the Czech Republic*

Nowadays, a pattern of declining fertility has occurred around the whole world. While in developing countries fertility has fallen from the high levels, in developed countries fertility has reached the below-replacement levels. In combination with an improvement in mortality, the phenomenon of population ageing has emerged. In all post-communist countries, the Czech Republic included, the fertility decline has been noticeable. In the region of Central and Eastern Europe (CEE)[1] and former Soviet Union (FSU)[1] in the year 2009, nineteen of twenty eight countries had a total fertility rate equal or below 1.5 and seven of them reached values of the lowest-low fertility[2]. The driving forces behind this decline have been still discussed. The extensive debate regarding the fertility decline in the post-communist countries covers mainly three approaches: the Second Demographic Transition, the Postponement Transition and the Economic crisis hypothesis.

The Second Demographic Transition in Lesthaeghe and van de Kaa tradition[3] assumes that families will gradually become smaller as a response to greater individualism and post-materialism resulting from increasing urbanization and post-industrialization. The desire of self-interest and cultural change are quoted as the main forces of childbearing eschewing and postponement. The second approach, the Postponement Transition based on the work of Kohler et al. (2002)[4] explains the decline in fertility via rational behavior reflecting uncertainty in the labor market. The driving force is seen in the general economic uncertainty which results in tempo and quantum effects. The last approach, the Hypothesis of an economic crisis encompasses all studies that explain decline in fertility in the post-communist countries as a consequence of transition from a command to a market economy. The transition economies, for many years, economically stagnated or declined and high unemployment and inflation rates became a standard. The main force is seen in a concentration on material needs, which are derived from many economic explanations (social anomie, specific coping strategies as extra sources of sustenance or informal work situations, etc.) (Billingsley, 2010)[5]. The economic crisis hypothesis assumes that people do not just shift childbearing to higher ages, but reduce the number of their descendants as a securing material needs become crucial in their lives.

Not all approaches clearly define the channels through which fertility is influenced by economic performance, but in all of them a change in economic output is taken into account. This study

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[1] Central and Eastern Europe (CEE): Albania, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, Hungary, Macedonia, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia. The states of the former Soviet Union (FSU): Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Turkmenistan, Tajikistan, Ukraine, Uzbekistan.

[2] The lowest low fertility is in accordance with approach of Kohler et al. (2002) and is equal to any total fertility rate at or below 1.3. Data from the World Population Data Sheet 2009 available online at web-page of Population Reference Bureau <http://www.prb.org/publications/datasheets/2009/2009wpds.aspx>.

[3] Lesthaeghe, R., & van de Kaa, R. (1986). Twee demografische transities? In D. van de Kaa & R. Lesthaeghe (Eds.), Bevolking: groei en krimp (pp. 9–24). Deventer: Van Loghum Slaterus.

[4] Kohler, H. P., Billari, F., & Ortega, J. 2002. "The emergence of lowest-low fertility in Europe". *Population and Development Review*, 28(4), 641–680.

[5] Billingsey, S. 2010. "The post-communist fertility puzzle." *Population Research and Policy Review,* Volume 29, Number 2, 193-231.

deals with the relationship of fertility and economic performance in the transition economy of the Czech Republic and tests by employing time series analysis if the economic changes had a significant impact on fertility decision of the Czech population in the short run. However, the Czech economy also performed symptoms of economic crisis they were not as severe as in other post-communist countries. For instance, the Czech Republic is one of the countries which avoided hyperinflation. Therefore, it is hypothesized, that the economic crisis approach is not so powerful for the explanation of the fertility development in the Czech Republic as it was documented for other post-communist economies.

The basic assumption of the analysis is a mutual dependence of fertility and macroeconomics variables. Fertility affects economic development while economic performance shapes a population development. To detect the channels of interactions the analysis of correlation is not enough. In this study, a multi-variable vector autoregressive model (VAR) is employed. This technique has become a standard tool of econometric analysis of multivariate time series after a critique of Sims in 1980. The VAR models assume endogenous variables, which are characterized by their dependence. These models are a natural extension of the univariate autoregressive to dynamic multivariate time series and are considered as a useful instrument for describing the dynamic behavior of economic and financial time series.

To fill a gap in the literature, in this work three models are built up. In the first one, the fertility is approximated by crude birth rate. But crude birth rate has been criticized as it does not take into account changes in the age structure. Therefore the period total fertility rate is employed in the second model. This measurement also has a shortcoming, because it does not reflect the childbearing postponement. The adjusted total fertility rate is included in the third model. Changes in economic performance are characterized in all models by the changes in output, monetary base M2[6] and unemployment rate. The endogenous variables were chosen based on approach of Wang at al. (1994), Petrucci (2003) and Maksymenko (2009)[7] utilizing economic theory, as well as, on assumptions of the Second Demographic Transition, the Postponement Transition and the Hypothesis of an economic crisis.

The empirical study covers three VAR models and employs Czech quarterly data covering period from 1. 1. 1996 to 31. 12. 2008[8]. The time series of gross domestic product (GDP), the live births, population, total fertility rate (TFR) and unemployment (UN) were obtained from the website

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[6] Monetary aggregate M2, in financial terminology, includes money that can be used for spending (M1) plus items that can be quickly converted to M1 (bank deposits with notice period 3 months and bank deposits with 2 years maturity).
[7] Maksymenko, S. 2009. "Fertility, Money Holdings, and Economic Growth: Evidence from Ukraine". *Comparative Economic Studies*. Volume 51. Pages 75-79.
Petrucci, A. 2003. "Money, endogenous fertility and economic growth". Journal of Macroeconomics 25: 527–539.
Wang, P.; Yip, C.; Scotese, C. 1994."Fertility choice and the economic growth: Theory and evidence". *Review of Economics and Statistics* 76(2): 255–266.
[8] All calculations are done in application R, in this work the vision 2.11.1 is utilized. The year 1996 is the first year for which all data are available. The year 2009 is excluded from the analysis due to its particularity caused by global economic crisis.
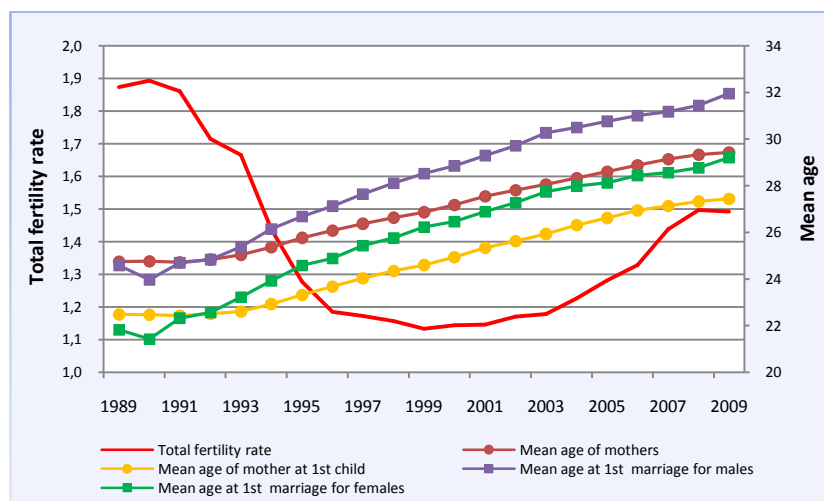
of the Czech Statistical Office[9]. The data on real money holdings (M2) were obtained from the publicly available database of the National Bank of the Czech Republic[10].

The paper is organized as follows. The two sections present the literature review considering the Second Demographic Transition, the Postponement Transition and the Economic crisis hypothesis in post-communist countries and the relationship of fertility and economic performance and its modeling. The subsequent section introduces the background of the population and economic development in the Czech Republic and the methodology of the multi-variable vector autoregressive model (VAR). The empirical study includes data description, diagnostics of the models and results in the form of impulse response functions and forecast error variance decomposition. The last section is devoted to the discussion.

The preliminary results of VAR models and the forecast error variance decompositions reveal the interdependence of macroeconomics variables, but no significant response of fertility variables. From this perspective the Hypothesis of an economic crisis for the explanation of fertility development observed in the Czech Republic from the year 1996 is not justified. But this does not mean that the economic variables do not shape the fertility pattern. The results of three VAR models indicate that the development of the Czech fertility has been forced by different mechanisms than by just poor economic forces. There is also support for utilization of distinct fertility measures. The different approximations of fertility led to distinct models specification and consequently to slightly modified results.

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[9] The Czech Statistical Office: < http://www.czso.cz/>.
[10] The National Bank of the Czech Republic : < http://www.cnb.cz/cs/index.html>.

Figure 1: Total fertility rate, mean age at 1st marriage and mean age of mothers, Czech Republic, 1989-2009

Source: The Czech Statistical Office

Table 1: Selected economic indicators, the Czech Republic, 1996-2009

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Nominal GDP (billion of US dollar)	62.0	57.1	61.9	60.1	56.7	61.8	75.3	91.3	109.5	124.6	142.5	174.1	216.6	190.4
Real GDP growth (% to previous year)	4.0	-0.7	-0.8	1.3	3.6	2.5	1.9	3.6	4.5	6.3	6.8	6.1	2.5	-4.1
Inflation	8.8	8.5	10.7	2.1	3.9	4.7	1.8	0.1	2.8	1.9	2.5	2.8	6.3	1.0
Exchange rate (crown per US dollar)	27.1	31.7	32.3	34.6	38.6	38.0	32.7	28.2	25.7	23.9	22.6	20.3	17.0	19.1
Exchange rate (crown per EUR)	.	.	.	36.9	35.6	34.1	30.8	31.8	31.9	29.8	28.3	27.8	24.9	26.4
Export of goods and services (% year change)	5.5	8.4	10.4	5.4	16.5	11.2	2.1	7.2	20.7	11.6	15.8	15.0	6.0	-10.8
Import of goods and services (% year change)	12.1	6.9	8.3	4.9	16.3	12.8	5.0	8.0	17.9	5.0	14.3	14.3	4.7	-10.6
State debt/GDP (%)	9.2	9.6	9.8	11.0	13.2	14.7	16.1	19.1	21.1	23.2	24.9	25.2	27.1	32.5
Total population (million)	10.31	10.30	10.29	10.28	10.27	10.21	10.20	10.21	10.22	10.25	20.29	10.38	10.47	10.51
Labor force (population age 15-65, million)	7.08	7.1	7.13	7.15	7.18	7.17	7.2	7.23	7.25	7.29	7.34	7.39	7.43	7.41
Unemployment rate (ILO)	3.9	4.8	6.5	8.7	8.8	8.1	7.3	7.8	8.3	7.9	7.1	5.3	4.4	6.7

Sources: The Czech Statistical Office, BussinesInfo.cz (available online:
<http://www.businessinfo.cz/cz/clanek/analyzy-statistiky/hlavni-menove-a-fiskalni-ukazatele-cr/1000431/49262/#kurzczkeur>)